# 4.3 Natural Environment

Since the publication of the DEIS, the following substantive changes have been made to this chapter:

- Text in **Section 4.3.1.7**, *Karst and Springs*, was clarified.
- Added information in **Section 4.3.2.1**, *Groundwater Resources*, regarding publicly-available information for Lemon Lane Landfill and Bennett's Dump.
- Total corridor acreage for emergent and scrub-shrub wetlands in **Section 4.3.2.2**, *Wetlands, Lakes, and Ponds*, was revised slightly following a field meeting with the U.S. Army Corps of Engineers (USACE) and Indiana Department of Environmental Management (IDEM).
- Text in **Section 4.3.2.3**, *Rivers, Streams and Watersheds*, was added regarding cleanup measures at Lemon Lane Landfill.
- Acreage of the Mill Creek Easement has been updated in **Table 4.3-1** based on coordination with City of Bloomington.

The I-69 Section 5 corridor is located in Monroe County and Southwest Morgan County of Southwestern Indiana. The proposed I-69 follows existing SR 37 throughout the Section 5 corridor. I-69 will utilize the existing SR 37 right-of-way, with additional adjacent acreage required based on design requirements and topography. The following sections describe the corridor's geology (**Section 4.3.1**), water resources (**Section 4.3.2**), and ecosystems (**Section 4.3.3**).

## 4.3.1 Geology

### 4.3.1.1 Natural Regions and Physiographic Divisions

A Natural Region is defined as "a major, generalized unit of the landscape where a distinctive assemblage of natural features is present. It is part of a classification system that integrates several natural features, including climate, soils, glacial history, topography, exposed bedrock, pre-settlement vegetation, species composition, physiography, and flora and fauna distribution to identify a Natural Region. A section is a subunit of a natural region where sufficient differences are evident such that recognition is warranted" (Homoya, et al., 1985). Natural Region classifications provide information on predominant land use, native plants, and animal species of an area.

Section 5 is located entirely within the Highland Rim Natural Region with the Mitchell Karst Plain Section south of Sample Road and the Brown County Hills Section to the north (see **Figure 4.3-1**). Full page figures are located at the end of the chapter. The Monroe County portion of the Highland Rim Natural Region is unglaciated in Section 5, while the Morgan County portion was subject to Illinoian glaciation. The primary feature of the Mitchell Karst Plain Section is the karst plain characterized by visible karst features such as sinkholes and springs. The Brown County Hills Section is characterized by deep valleys and siltstone, shale, and sandstone near the surface. Though the Highland Rim Natural Region is described as an area of "low relief" by Schneider (1966) and "relatively level" by Homoya et al., topography can be hilly to rugged in areas traversed by the proposed alignment of I-69 through Section 5.

A physiographic division is an area that has similar topography and land use. Four physiographic divisions of the Southern Hills and Lowlands Physiographic Region are crossed by the Section 5 corridor (**Figure 4.3-2**):

- Mitchell Plateau – The Section 5 corridor extends within Mitchell Plateau for approximately eight miles from the southern terminus to the north (38% of Section 5) before descending into the Norman Uplands at the Beanblossom Valley. The Mitchell Plateau is a limestone plateau dissected by many major stream systems that are deeply entrenched. In addition, the Mitchell Plateau is influenced by extensive, and in places, deep karst development. The area is deeply dissected by several large streams. Steep slopes and limestone ledges are common in this area. Associated with this area, especially to the west, are large patches of karst, sinkholes, caves, and springs along the valley bottoms (Gray, 2000).

- Crawford Upland – The Section 5 corridor (includes only some of the Section 5 alternatives) only extends into the Crawford Upland for approximately 800 feet (<1% of Section 5) west of SR 37 along Tapp Road. The Crawford Upland is largely unglaciated and is a rugged highland with considerable relief and varied elevations, and karst terrain in Section 5. Valleys within the Crawford Upland are generally v-shaped with sharp ridges or u-shaped with rounded ridges (Gray, 2000).

- Norman Upland – The Section 5 corridor continues across the Norman Upland from the Beanblossom Valley north about eight miles (38% of Section 5) to the Bryant Creek valley at the northern end of the bifurcation. The Norman Upland is characterized by high relief and generally rugged topography due to the underlying Mississippian Age siltstone bedrock of the Borden Group. In the study area, the uplands remain relatively flat among a maze of dendritic ridges (Gray, 2000).

- Martinsville Hills – The Section 5 corridor is located in the Martinsville Hills from the Bryant Creek valley at the northern end of the bifurcation, north approximately five miles (24% of Section 5) to the northern terminus of the Section 5 corridor. The topography of the Martinsville Hills section is distinguished from the other sections to the south due to modification by pre-Wisconsin glaciations and the presence of a generally thin layer of pre-Wisconsin glacial drift (Gray, 2000).

Topography: Section 5 is largely unglaciated with rugged highlands, considerable relief, and varied elevations. The average elevation of Monroe County is about 760 feet above mean sea level (msl), with highest elevation at 995 feet msl, and the lowest at 490 feet msl. The average elevation of Morgan County is about 604 feet msl, with the highest elevation at 950 feet msl, and the lowest at 590 feet msl.

The entire study area ranges in elevation from approximately 900 feet to 580 feet msl. It is crossed by low points along the Beanblossom Creek, Bryant Creek, and Little Indian Creek. The difference from ridge tops to valley bottoms is up to 300 feet along Beanblossom Valley. The region contains some highly dissected areas along streams and with karst topography found within the corridor southwest of Bloomington. Refer to **Section 4.3.1.7**, *Karst and Springs*, for a definition of karst topography.

Land Use: Land use and land cover within the Section 5 corridor are dominated by developed land in the southern potion and by undeveloped upland and agriculture to the north. Developed land accounts for about 40% of the land cover while upland habitats account for about 42% of the land cover. Agricultural lands, primarily pasture, account for approximately 16% of the Section 5 land use. Water and wetlands comprise about the remaining 2% of the corridor, while sand/gravel operations and limestone quarry companies make up less than less than 1% of the land cover within the Section 5 corridor. The existing 1970's SR 37 4-lane pavement, structures, and right-of way make up a significant portion of the Section 5 corridor.

### 4.3.1.2 Soils

#### Glaciation

About three quarters (southern 16 miles) of Section 5 are comprised of unglaciated terrain in Monroe County to the bifurcation near Bryant Creek, with the remaining one quarter (northern five miles) comprised of pre-Wisconsin glaciated terrain extending into Morgan County. Many of the differences in topography among the physiographic regions in Indiana come from glaciation during the Ice Age, the Pleistocene Period. A glacier is defined as a slowly moving sheet of ice, often containing boulders, cobbles, gravel and sand. The Wisconsin glacier (approximately 70,000 years ago) covered about two-thirds of Indiana to the north of Section 5. The Illinoian glacier began approximately 125,000 years ago and reached farther south into Section 5.

Land that once was glaciated is often very flat with rich soils; unglaciated land is often much more hilly and forested (from not being cleared for agricultural or other development uses). The heavy weight of the glacier acted to scour and compress the land during advancement and deposited soil, rocks, and other debris during retreat. The glaciers underwent at least two fluctuations (Wisconsin and Illinoisan glacial advances) before receding to the north, leaving behind a number of glacial lakes, outwash plains, and lake plains.

The absence of glacial scour and deposition in the southern three quarters and the thin deposits in the northern quarter of the Section 5 corridor are the main reasons for the high frequency of bedrock outcrops and thin soil formations in comparison to the Wisconsin glaciated terrain to the north. This is important in Section 5, as the prevalent limestone bedrock exhibits karst features at and near the surface, as opposed to glaciated karst terrain where most karst features are more deeply buried, crushed, or eroded away. Refer to **Section 4.3.1.7**, *Karst and Springs*, for a more detailed discussion of karst terrain.

## Soil Associations

The Section 5 corridor traverses four major soil associations defined for Monroe County and two major soil associations defined for Morgan County (IndianaMap: http://inmap.indiana.edu/index.html: Soil Associations-STATSGO). Soils generally conform to the underlying bedrock configurations across these two counties. The impacted soil associations are described below and shown on **Figure 4.3-3**. The relative change in soil volume that occurs with changes in moisture content is referred to as shrink/swell potential. The extent of shrinking and swelling is influenced by the amount and type of clay present in the soil. Shrinking and swelling of soils can cause damage to building foundations, roads, and other structures (USDA, 1993).

Monroe County:

- Crider-Baxter-Bedford Association (IN112) *Crider-Caneyville*: On uplands, soils are deep or moderately deep, gently sloping to moderately sloping, well drained, and formed in loess and residuum from limestone. Soils in this association are generally suited to cultivation, though limited somewhat by slope and the presence of karst features. Soils have been used for development and for hay and pasture. Steeper slopes are generally wooded. Shrink-swell potential is moderate (Thomas, 1981).

- Hosmer-Zanesville-Stendal (IN092) *Hosmer-Crider:* On uplands, soils are deep, nearly level to moderately sloping, well drained, and formed in loess and residuum from limestone, sandstone, siltstone, and shale. Soils in this association are generally suited to cultivation and, though limited somewhat by slope and the hazard of erosion, have been used for development. Steeper slopes are generally wooded while level areas are used for hay, pasture, or development. Shrink-swell potential is moderate (Thomas, 1981).

- Haymond-Wakeland-Pekin (IN080) *Haymand-Stendal:* On bottom land, soils are deep, nearly level, somewhat poorly drained soils formed in alluvium. Soils in this association are generally unsuitable for development, but generally suited to cultivation, though limited by wetness and frequent flooding. Much of this association is currently cultivated, in hay or pasture, or wooded where too wet. Shrink-swell potential is low (Thomas, 1981).

- Wellston-Berks-Gilpin (IN104) *Berks-Weikert:* On uplands, soils are moderately deep and shallow, steep and very steep, well drained, and formed in loess and residuum from limestone, sandstone, siltstone, and shale. Soils in this association are generally unsuited to cultivation or development due to severe hazard of erosion, steepness, and depth to bedrock. Slopes are generally wooded with only minor areas used for crop, hay, or pasture. Shrink-swell potential is low (Thomas, 1981).

Morgan County:

- Wellston-Berks-Gilpin (IN104) *Berks-Gilpin-Zanesville*: On uplands, soils are moderately deep and deep, gently sloping to very steep, well drained, and formed in loess and residuum from sandstone and shale, or in loess and the underlying residuum of sandstone. Soils in this association are generally unsuited to cultivation or development due to hazard of erosion, steepness, and depth to bedrock. Slopes are generally wooded with only minor areas used for crop, hay, or pasture. Shrink-swell potential is low (Strum, 1981).

- Rensselaer-Darroch-Whitaker (IN003) *Rensselaer-Whitaker-Martinsville:* On bottom land, soils are deep, nearly level, well drained, and formed in loamy and silty alluvium. Most of the area within this association has been cleared for cultivation or hay/pasture and wooded slopes. The shrink-swell potential of this association is moderate (Strum, 1981).

- Three Morgan County soil associations are only minimally located within the Section 5 corridor:

    - Hickory-Cincinnati-Berks (IN109) *Alford-Hickory/present west of SR 37 at Paragon Road:* On uplands, soils are deep, nearly level to very steep, well drained, formed in loess or loamy glacial till, and have moderate shrink-swell potential (Strum, 1981).

    - Bloomfield-Princeton-Ayrshire (IN088) *Princeton/present east of SR 37 at Bridges 161 and 224*: On uplands, soils are deep, nearly level to moderately steep, well drained, formed in windblown silt and sand, and have low shrink-swell potential (Strum, 1981).

    - Sawmill-Lawson-Genesse (IN029) *Genesee-Shoal/only present west of SR 37 at Godsey Road:* On bottom land, soils are deep, nearly level, well drained and poorly drained, formed in loamy and silty alluvium, and have low shrink-swell potential (Strum, 1981).

## Soil Types

Within a given association, there can be many types of soil. Soils in Section 5 consist primarily of deep to moderately deep soils derived from sandstone and limestone in the uplands. Soils in the first eight miles of Section 5 to Beanblossom Valley are deep to moderately deep, gently to strongly sloping, well drained, and formed in loess and residuum from limestone on uplands (Thomas, 1981). The soils on the Beanblossom Bottomlands (approximately two miles), are deep, nearly level, well to somewhat poorly drained, medium textured, and formed in alluvium (Thomas, 1981). The following nine miles of Section 5 to Little Indian Creek cross into Morgan County and have soils that are moderately deep, nearly level to strongly sloping, well drained, and formed in loess and residuum from limestone, sandstone, and shales (Thomas, 1981 and Strum, 1981). The remaining Section 5 soils, from Little Indian Creek to Indian Creek bottomlands, are deep, nearly level, well to somewhat poorly drained, and formed in alluvium (Strum, 1981).

The Section 5 corridor does not contain clay soil units, but does have soil units with clay components. However, it is unlikely that lacustrine-derived clays containing a significant percentage of expansive clay are located within the corridor. This material has low load-bearing capacity; subsidence is a concern when structures (such as bridges) are placed on it (Gray, 1971). Soil borings will give a better understanding of the mineral content of the soil within the corridor. Borings will be conducted during geotechnical investigations for the Preferred Alternative in the design phase of the project.

#### 4.3.1.3 Bedrock

Most of Southwestern Indiana is underlain by Pennsylvanian and Mississippian rock units. The bedrock tends to dip to the southwest at a rate of about 20 feet per mile (Stafford et al. 1988:17). The Section 5 corridor is underlain by both Pennsylvanian and Mississippian rocks (Hall, 1998; Thompson, 2007; Hasenmueller, 2008) (see **Figure 4.3-4**).

- Ste. Genevieve Limestone (*Blue River Group*) is present under about 1,000 feet (<1%) of Section 5 at the existing Whitehall Crossing Boulevard. The Ste. Genevieve Limestone is a carbonate-rock reported to be 45 to 220 feet (14 to 67 m) thick (Rupp, 1991; Gates, 1962).

- St. Louis Limestone (*Blue River Group*) is present under approximately six miles (30%) of Section 5 from the southern terminus to just north of Arlington Road. The upper portion consists largely of thin beds of medium to dark gray-brown limestone with very thin beds of gray shale. The lower portion is predominantly composed of limestone, calcareous shale, and silty dolomite approximately 250 feet (76 m) thick (Rupp, 1991; Gates, 1962).

- Salem Limestone (*Sanders Group*) is present under several scattered locations that total about one mile (5%) of the Section 5 corridor including: Fullerton Pike just east of SR 37, Wapehani Mountain Bike Park, Packinghouse Road, west of SR 46 interchange, one-half mile north of Arlington Road, and at Sample Road. The Salem Limestone is a medium to coarse grained limestone that occurs in exceptionally thick beds and is used as building stone (Dimension Stone) about 60 to 100 feet (18 to 30 m) thick (Rupp, 1991; Gates, 1962).

- Harrodsburg Limestone and Ramp Creek Formation Undivided *(Sanders Group*) is under about six miles (25%) of Section 5, from just north of Arlington Road to just north of Kinser Pike, and from Showers Road north to the bifurcation/Burma Road. The Harrodsburg Limestone is dominantly well-cemented limestone, but includes some dolomite, shale, minor amounts of chert, up to 70 feet (21 m) thick. The Ramp Creek Formation is dominantly a carbonate unit consisting of interbedded, very fine-grained dolomite and limestone, but containing small amounts of siltstone and shale of relatively uniform thickness of about 20 to 25 feet (6 to 8 m) (Rupp, 1991; Gates, 1962).

- Borden Group is present for about eight miles (40%) of Section 5 from just north of Kinser Pike north to Showers Road and from the bifurcation/Burma Road north to the northern terminus. Borden Group is composed dominantly of gray siltstone and shale commonly with fine-grained sandstone and the occasional limestone formation and is approximately 600 to 800 feet thick (Rupp, 1991).

### 4.3.1.4 Topography

The primary factor influencing topography in Section 5 is the lack of glaciation. Section 5 is largely unglaciated with rugged highlands, considerable relief, and varied elevations. The entire study area ranges in elevation from approximately 580 feet to 900 feet msl. It is crossed by low points along the Beanblossom Creek, Griffy Creek, Bryant Creek, and Little Indian Creek. The difference from ridge tops to valley bottoms is up to 300 feet along Beanblossom Valley. The Mitchell Plain is between 700 and 900 feet msl, the Norman Uplands ranges between 600 and 800 feet msl, and the Martinsville Hills area is between 600 and 750 feet msl. The region contains some highly dissected areas along streams and with karst topography found within the corridor southwest of Bloomington. Refer to **Section 4.3.1.7**, *Karst and Springs*, for a definition of karst topography.

### 4.3.1.5 Minerals

Limestone is an important mineral resource in the vicinity of the Section 5 corridor, particularly the southern portion of the corridor in Bloomington. Mining in the study area is largely limited to limestone and includes dimension stone, high calcium-rich limestone, crushed stone for construction, agricultural lime, and livestock feed. Within the Indiana limestone belt that crosses Monroe County, the Salem Limestone deposits of Mississippian age have been quarried since the early to mid-19th century. Dimension stone quarrying, milling, carving, and distribution operations are present in the southern portion of Section 5 (see **Figure 4.3-5**):

- Two active quarries – B.G. Hoadley Quarries Inc. and Reed Quarries, Inc.;
- Three operating mills - B.G. Hoadley Quarries Inc., Hoosier Sawyer, and C & H Stone Company;
- Three Dimension Limestone Historic Landscape Districts (North Clear Creek, Hunter Valley, and Reed);
- Numerous abandoned/buried limestone quarries, equipment, buildings, rail beds, and large piles of limestone remnants; and
- Quarries in close proximity to the Section 5 corridor use local roads near the Section 5 corridor (Rockport Road, Fullerton Pike, Arlington Road, Gourley Pike, Acuff/Prow Road, SR 37, and SR 46) to transport dimensional block, slab, and aggregate limestone products.

Historic mineral resources found in Monroe and Morgan counties include: iron ore, crushed stone, high calcium limestone (such as for cement), dimension/construction grade limestone, coal, clay, oil, and gas. However, the historic production of iron ore, grindstones (largely sandstone), lime, clay, and coal was minor and short-lived. No mining of coal, clay, or iron ore for commercial purposes is known to be occurring presently within the Section 5 corridor (IndianaMap: http://inmap.indiana.edu/index.html). Sand and gravel operations and reserves are located in the northern portion of Section 5, primarily associated with the White River valley deposits near Martinsville (Droste Bulletin 63).

While oil and natural gas reserves have been utilized throughout Monroe County, the conditions for additional reserves beyond the previously used sources, along the axis of the Leesville Anticline (a convex fold in the bedrock) and the approximately parallel Mt. Carmel Fault, are not favorable for commercial production in the foreseeable future (Gates 1962 and Harke 1998) (see **Figure 4.3-4**). Information contained on the Indiana Geological Survey (IGS) Petroleum Database Management System Website was reviewed on the IndianaMap website: http://inmap.indiana.edu/index.html (see **Figure 4.3-5**). Gas storage domes and associated gas injection, retrieval and monitoring wells are located along the Leesville Anticline with the Hindustan Dome (a bedrock fold capable of trapping oil or gas) located in the Section 5 corridor.

### 4.3.1.6 Seismic Risks

Seismic considerations for the I-69 Evansville to Indianapolis studies are based primarily on potential impacts from faults in the New Madrid seismic zone, and to a lesser extent, the Wabash Valley seismic zone. A seismic zone is an area with a geographic and historical distribution of earthquakes. The New Madrid seismic zone is a series of faults beneath the continental crust in a weak spot known as the Reelfoot Rift. It cannot be seen on the surface. The New Madrid seismic zone extends more than 120 miles southward from Cairo, Illinois, at the junction of the Mississippi and Ohio rivers, into Arkansas and through parts of Kentucky and Tennessee. The Wabash Valley seismic zone corresponds to a small concentration of earthquakes within the Wabash Valley fault system. This fault system is in Southeastern Illinois, Southwestern Indiana, and Northwestern Kentucky.

In recent history, earthquakes in the New Madrid seismic zone have been more numerous and larger in magnitude than those in the Wabash Valley seismic zone. However, the Wabash Valley seismic zone is considered capable of producing New Madrid-size earthquake events. Documented earthquakes with an epicenter in the general vicinity of Section 5 are:

- April 8, 1976, 5.0 Magnitude: The epicenter was approximately 13.1 miles northwest of Bloomington in Monroe County, and approximately nine miles west of the Section 5 corridor.

- January 30, 1907, 5.0 Magnitude: The epicenter was approximately 11 miles northwest of Martinsville in Morgan County, and approximately 11 miles northwest of the northern corridor terminus.

- September 20, 1903, 4.0 Magnitude: The epicenter was approximately five miles east of Martinsville in Morgan County, and approximately eight miles east of the northern corridor terminus.

While no other earthquakes were reported, the Leesville Anticline and the Mt. Carmel Fault cross the Section 5 corridor at approximately the Morgan/Monroe County line (see **Figure 4.3-4**).

The American Association of State Highway and Transportation Officials (AASHTO) Load and Resistance Factor Design (LRFD) Bridge Design Specifications address the requirements for seismic design. They divide the United States into four separate seismic zones and give seismic design requirements for these zones rated from 1 to 4, with Zone 1 having the lowest seismic risk. Determination of the seismic zone for a given location in the project corridor is based on acceleration coefficients and site class given in the specifications. Seismic design requirements also depend on the importance category assigned to each bridge by the owner. Three importance categories are identified in the specifications: critical, essential, and other, and the basis of classification, which includes consideration of social/survival and security/defense requirements. Structures within the Section 5 corridor will be designed to seismic design requirements for zones 1 and 2. Appropriate steps will be taken in the design of Section 5 structures to ensure that seismic considerations are incorporated.

The design of bridges for I-69 will be in accordance with the latest edition of the AASHTO LRFD Bridge Design Specifications, and the Indiana Department of Transportation (INDOT) will select the importance category for each bridge.

#### 4.3.1.7 Karst and Springs

Karst ecosystems are important, unique, and unusual features of southern Indiana. The term karst refers to “landscapes characterized by caves, sinkholes, underground streams, and other features formed initiated by the slow dissolving, rather than the mechanical eroding of bedrock” (American Geological Institute, 2001). However, turbulent flow and erosion can play a major role in conduit enlargement and is necessary for the transport of sediment including organic matter and dissolved oxygen. Karst forms as water internally dissolves bedrock. Carbonic acid is a weak acid naturally found in water. This acid is formed as water reacts with carbon dioxide in the atmosphere and in soil gases. The slightly acidic water readily dissolves the mineral calcite, which is found in limestone, and dolomite. Carbonate rocks, particularly limestone, are associated with karst terrain.

Groundwater in karst terrain is contaminated easily because surface waters are channeled rapidly into the underlying bedrock by flowing into openings in the ground such as sinkholes, swallets, and losing and sinking streams. These openings are collectively called insurgence features – a surface feature that directs surface water into the karst groundwater system. These waters then flow underground without the benefit of filtration, long residence time, or exposure to sunlight, which may remove or kill some organic contaminants. Eventually, the groundwater discharges at springs.

Karst terrain represents a physical challenge to highway construction, as the collapse of filled sinkholes and cave passages can compromise adjacent and overlying structures. Such failures can occur without surface expression prior to collapse. Also, impervious surfaces, such as roads, alter the natural patterns of run-off and infiltration. These surfaces can also degrade the runoff quality. Concentrating and/or redirecting runoff into open sinkholes or sinkholes with no surface expression can result in sinkhole collapse. An unlined pond or runoff water holding structure can increase the localized water pressure (head), which could result in collapse of adjacent sinkholes or in collapse of the pond. Alteration of surface run-off can also increase erosion which can effectively block drainage or flow paths with sediment or debris.

Karst features and springs are common within Section 5, particularly in Monroe County (see **Figure 4.3-6**). The Section 5 karst study area encompasses the I-69 Tier 1 and Tier 2 karst feature data, and extends from Clear Creek, south of Section 5, northward along SR 37 to roughly Chambers Pike. Relevant karst was divided into three areas as follows:

- Bloomington Karst – The relevant karst begins at the proposed Section 4 SR 37 interchange location (near Victor Pike) and continues north to approximately Arlington Road (old SR 46), within Section 5.

- Bloomington North Karst – The relevant karst begins at approximately Arlington Road and continues to the southern slope of the Beanblossom Creek Valley.

- Simpson Chapel Karst – The relevant karst begins at the northern slope of the Beanblossom Creek Valley and continues north to just south of Chambers Pike.

Sinkholes, sinking stream watersheds, and springs within Section 5 are shown on **Figure 4.3-6**. Although some particular karst features may be avoided, karst geology cannot be avoided within the Section 5 corridor. Four areas of special concern are noted within the Section 5 corridor:

- The Lemon Lane Landfill Superfund site is approximately 800 feet from existing SR 37 pavement and adjacent to the eastside of the Section 5 corridor. The revised recharge area shows that minimal portions of SR 37 are located in the Illinois Central Spring (ILCS) recharge area.

- The Bennett's Dump Superfund site is located approximately 1,400 feet from existing SR 37 pavement and adjacent to the Section 5 corridor in the northwest corner of the SR 46 interchange.

- The SR 45/2nd Street interchange is an area of special concern due to the presence of a reported former cave and numerous sinkholes that were filled as part of SR 37 construction prior to 1970 and other local development.

- Cave A and nearby Cave B are areas of special concern due to the biological significance of diverse troglobitic (obligate cave dwelling) fauna and state-listed threatened and endangered species. Refer to **Section 5.21**, *Karst Impacts*, for additional information pertaining to karst features.

The existing 1970's SR 37 4-lane pavement, structures, and right-of way make up a significant portion of the Section 5 corridor. As discussed in **Section 5.21**, *Karst Impacts*, depending on the alternative, from one-half to three-quarters of the Section 5 karst features and acreage are located in the existing SR 37 right-of-way (see **Table 5.21-4**).

## 4.3.2 Water Resources

### 4.3.2.1 Groundwater Resources

#### Aquifers

An aquifer is a reservoir of groundwater. Aquifer formations can be composed of bedrock, often with increased permeability from cracks, fractures, or conduits (such as caverns) located within the rock (i.e., a consolidated aquifer), or in formations such as loose gravel, sand, silt, or clay (i.e., an unconsolidated aquifer), from which groundwater can be extracted. Water is available from both consolidated and unconsolidated aquifers in the Section 5 study area. The consolidated aquifer systems in the region are bedrock aquifers composed of Mississippian aged limestone and sandstone. The unconsolidated aquifers predominant in the Section 5 study area include surficial sand deposits (see **Figure 4.3-7**).

**Bedrock Aquifer Systems** — The bedrock (consolidated) aquifers in the Section 5 have generally limited availability; the majority of the local water supply comes from reservoirs in Monroe County. Where they are in use, the majority of wells exist in the Salem, Harrodsburg, St. Louis, and Ste. Genevieve limestone formations primarily along joints, fractures and bedding planes. Other study area formations are known for poor production of groundwater. As a consequence, well production in these areas is typically low (in the range of less than two gallons per minute (gpm), to rarely as much as ten gpm). However, the few wells that intersect fracture zones and karst conduits can have greater yields (Maier, 2003a).

**Unconsolidated Aquifer Systems** — Groundwater resources in unconsolidated material along much of the study area are limited; the majority of the area's water supply comes from reservoirs in Monroe County. While water wells have been completed in unconsolidated materials along or near the study area, the unconsolidated materials in the study area are typically too fine for yielding groundwater and, therefore, are primarily limited to along valley fill and terraces, such as Beanblossom Valley (Maier, 2003b).

**Sole Source Aquifers** — A sole source aquifer is an aquifer that has been designated by the United States Environmental Protection Agency (USEPA) as the sole or principal source of drinking water for an area. As such, it receives special protection. There is no designated sole source aquifer within the Section 5 study area. The USEPA Sole Source Aquifer Protection

Program[1] lists only one Sole Source Aquifer in Indiana – the St. Joseph Aquifer System near South Bend.

## Groundwater Flow

IGS data was used to analyze groundwater in Section 5. The data from the water well records, karst data, and topography suggest the following:

- Regional groundwater flow in Section 5 is divided by watershed.
  - Groundwater from the southern terminus to just north of SR 48/3rd Street generally flows to the south in the Lower East Fork of the White River watershed.
  - Groundwater from just north of SR 48/3rd Street to the bifurcation generally flows toward the Beanblossom Valley and northwest in the Lower White River watershed.
  - Groundwater from the bifurcation to the northern terminus generally flows toward the west in the Upper White River watershed.
- Groundwater flow varies locally as the groundwater drains towards local surface water outlets.

## Groundwater Quality

Groundwater quality is generally within recommended drinking water standards established by the USEPA and IDEM.[2] However, groundwater in the region is generally hard due to high concentrations of dissolved calcium and magnesium. In addition, total dissolved solids levels often exceed the USEPA non-mandatory water quality standards for drinking water. The groundwater typically has iron and manganese concentrations greater than the secondary standards for drinking water. Chloride, fluoride, nitrate, sulfate, and pH levels in the groundwater are usually below the secondary standards for drinking water, but some areas exceed this level. Some of these contaminants are naturally occurring (Ground-Water Resources in the White and West Fork White River Basin, Indiana, 2002).

The quantity and quality of the groundwater in the White River Basin meet the needs of most users. Groundwater in Indiana generally is very hard with the highest groundwater concentrations in bedrock aquifers. The Mississippian carbonate aquifer is near the surface

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1 USEPA, "Designated Sole Source Aquifers in EPA Region 5: Illinois, Indiana, Michigan, Minnesota, Ohio, low," http://www.epa.gov/safewater/sourcewater/pubs/qrg_ssamap_reg5.pdf.

2 The Safe Drinking Water Act authorizes USEPA "to set standards for maximum levels of contaminants in drinking water, regulate the underground disposal of wastes in deep wells, designate areas that rely on a single aquifer for their water supply, and establish a nationwide program to encourage the states to develop programs to protect public water supply wells (i.e., wellhead protection programs)." (Source: USEPA, www.epa.gov). IDEM is the Indiana governmental agency responsible for water supply protection programs in the state.

throughout the Mitchell Plain. The Mitchell Plain physiographic unit is a karst plain. Much of the unit has dual porosity, whereby dissolution-widened joints and fractures allow rapid transmission of groundwater relative to the bulk volume of the aquifer. The direct hydraulic connection between land surface and the aquifer makes the Mississippian carbonate aquifer highly susceptible to contamination (Schnoebelen et al., 1999). See **Section 5.19.3**, *Groundwater*, for more information on groundwater in the Section 5 corridor.

Groundwater within the more urbanized Bloomington portion of Section 5 has historic water quality issues (scattered exceedances of residential drinking water standards) related to long term commercial and industrial operations, the existing 1970's 4-lane SR 37, readily accessible karst drainage system, and population density. Industrial land use has had a direct effect on water quality within the watershed due to its legacy of industrial waste contamination. Portions of the Section 5 area within Bloomington and Monroe County have had historical exceedances for polychlorinated biphenyls (PCBs) and mercury contamination. Notable historic sources include Lemon Lane Landfill, Bennett's Dump, and former Westinghouse operations where releases from PCB-contaminated capacitors were reported. Reduced groundwater quality is likely within the Clear Creek, Stout Creek, Griffy Creek, and Beanblossom Creek impacted watersheds (see **Figure 4.3-13**).

## Wellhead Protection Areas

Wellhead protection is "protection of all or part of the area surrounding a well from which the well's groundwater is drawn" (www.epa.gov). The Safe Drinking Water Act and the Indiana Wellhead Protection Rule (327 IAC 8.4-1) mandate a protection program for all community public water systems. The program involves delineating a Wellhead Protection Area (WHPA), identifying potential sources of contamination, and creating management and contingency plans for the WHPA. The program also requires communities to implement the plan and report to IDEM how they have protected groundwater resources. A WHPA will vary in size depending on a variety of factors including the goals of the state's protection program and local geological features.

Coordination with IDEM indicates that there is one WHPA in or adjacent to the Section 5 corridor. A non-community WHPA is located near the northern terminus of Section 5 and serves several businesses, residents, and a hotel on Old SR 37 and east of Legendary Hills. Refer to **Figure 4.3-7** for aquifers and groundwater wells.

## Public Water Supply Systems

Five public water supply systems provide drinking water in the Section 5 study area. The Monroe County sources are from Lake Monroe Reservoir while the Morgan County source is groundwater from the White River basin.

The 10,750-acre Lake Monroe is the main source of water in Monroe County and has a watershed drainage area of 441 square miles. The Monroe Water Treatment Plant currently averages pumping 15 million gallons per day (MGD). Public water services that utilize this source in Section 5 include:

- The City of Bloomington Utilities Department
- Van Buren Water Inc.
- Southern Monroe Water Company
- Washington Township Water Corporation

The Martinsville Water Utility is located in Martinsville. This public water supply system provides water to Martinsville and proposed annex portions to the southeast into Section 5. This utility obtains water from groundwater wells in the White River watershed. The Martinsville Water Utility's wells are located over 2-miles north of the Section 5 corridor.

## Private Wells

There are 44 private wells reported to the Indiana Department of Natural Resources (IDNR) within the Section 5 corridor (IndianaMap: http://inmap.indiana.edu/index.html: Water Wells and Boreholes - iLITH Database and IDNR 2012). Additional wells not reported to IDNR are anticipated to exist along the Section 5 corridor. The Bennett's Dump and Lemon Lane Landfill areas have additional private well inventories conducted as part of hazardous waste investigations that are publically available. Refer to **Figure 4.3-7** for aquifers and groundwater wells.

### 4.3.2.2 Wetlands, Lakes, and Ponds

Wetlands are highly important ecosystems that include swamps, bogs, marshes, mires, fens, and other wet areas. The State of Indiana defines wetlands as "areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." Wetlands are often transition areas between upland and deepwater habitats. Wetlands provide a number of important values and functions, including groundwater recharge and discharge, food sources, nutrient recycling, floodwater storage and attenuation, water purification, and habitat for a diverse number of plant and animal species. They can also possess properties that are considered valuable to humans, such as economic considerations, recreational opportunities, and aesthetic pleasure.

Since the time of European settlement, the majority of wetlands across the United States have been filled, dredged, and drained. The United States Fish and Wildlife Service (USFWS) estimated that prior to European settlement Indiana had some 5,600,000 acres of wetlands. Over the past 200 years, Indiana has lost approximately 85% of its wetlands (Dahl, 1990). In a mid-1980s study by the IDNR, Indiana was estimated to have approximately 813,032 acres of wetlands remaining (Rolley, 1991). Of these remaining wetlands, approximately one-third are considered to be so-called "isolated" wetlands (Quinn, 2004). A wetland that is isolated is not subject to regulation under the Section 404 of the CWA; however, isolated wetlands are regulated by the State of Indiana under their Isolated Wetland Law (IC 13-18-22). FHWA requires mitigation of isolated wetlands regardless of USACE jurisdiction.

Among the 50 states, Indiana ranks 4th in proportion of original wetland acreage lost (Dahl, 1990). The vast majority of wetland losses were due to drainage for agricultural use. Because of their important values and large loss, there are several federal and state laws that regulate activities that impact wetlands. The major laws protecting wetlands are the Federal Section 404 Clean Water Act (CWA), Section 401 Water Quality Certification administered by the IDEM and Indiana Water Quality Standards, 327 IAC 2-1, the River and Harbors Act, and IDEM's State Isolated Wetland Law. The IDNR regulates wetlands situated within floodways under the Flood Control Act (IND Code 14-28-11) and impacts below the ordinary high water line of lakes under the Lake Preservation Act (IND Code 14-26-2).

Because of the importance of these aquatic ecosystems, federal policy maintains there should be "no net loss of wetlands." For every acre of wetland that is taken as part of this project, compensatory mitigation will be completed to replace the wetland losses at prescribed ratios.

## National Wetland Inventory (NWI) Wetlands

According to the Indiana Wetland Conservation Plan (1996), the NWI database is the most extensive collection of information on wetland resources in the State of Indiana. In 1974, an inventory of all wetlands in the United States was designed and implemented by USFWS. This inventory was conducted to map the extent and types of wetlands in the country. NWI wetlands were drawn by reviewing existing aerial maps and noting specific wetland areas that appeared to contain wetland characteristics such as dark soil color, ponded water, and/or wetland vegetation. In most cases, these wetlands were not field verified through site-specific delineation protocol.

Specific to Indiana, IDNR, Division of Fish and Wildlife (DFW) entered into a cooperative agreement with USFWS in 1985 to share the costs of mapping Indiana's wetlands. Indiana's NWI maps were produced primarily from interpretation of high-altitude color infrared aerial photographs (scale of 1:58,000) taken from 1980 to 1987 during the spring and fall of each year.

The classification system used within the NWI mapping is defined in *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al., 1979). This classification system was created to define ecological communities that have similar characteristics, to combine appropriately mapped wetlands to aid in resource management, to facilitate wetland area mapping, and to provide a uniform definition of mapped wetland communities. Five major systems are defined in this hierarchical classification program: Marine, Estuarine, Riverine, Lacustrine, and Palustrine. Potential wetland areas identified by the NWI maps include only palustrine systems. Beneath these five broad systems, subsystems, classes, subclasses, and dominance types exist to further define wetlands.

## NWI Wetlands in Section 5

**Figure 4.3-8** shows the locations of the NWI mapped wetlands in the Section 5 study area. All of the NWI mapped wetlands in Section 5 are classified as palustrine wetlands. Each palustrine wetland system was then further classified by the general appearance of the habitat (i.e., emergent, scrub/shrub, forested, unconsolidated bottom, or aquatic bed. Palustrine wetlands are defined as freshwater systems dominated by trees, shrubs, persistent emergents, emergent mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean derived salts is below 0.5%. Palustrine systems traditionally include marshes, fens, forested swamps, bogs, and wet prairies. Palustrine wetlands may be affected by extreme flood conditions and can be isolated areas surrounded by uplands or they can be found at the edge of lakes, rivers, and ponds. **Figure 4.3-9** (in the section below) shows an example of palustrine emergent and forested wetlands in Section 5.

NWI mapping indicates approximately 88.25 acres of wetlands were located within the study area. However, many of these wetlands have been previously impacted by a variety of man-made disturbances including: SR 37, the local road network, urban growth, and agricultural practices, in addition to the natural de-watering of wetland resources due to the karst geology of the region. The wetlands identified and delineated during multiple site visits total approximately 83.18 acres. The breakdown of each wetland type identified within the Section 5 study area is listed with the habitat type descriptions below. The identification, delineation, and analysis of wetlands in the corridor are discussed in detail in **Section 5.19.2**, *Surface Waters*. A *Final Wetland Technical Report* has been prepared for the Section 5 corridor and is located in **Appendix F**, *Final Wetland Technical Report*.

## Palustrine Emergent Wetlands

Palustrine emergent wetlands (PEM) are characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens (Cowardin et al., 1979). The vegetation in emergent wetlands is present for most of the growing season in most years and is typically dominated by perennial plant species. All water regimes are included except subtidal and irregularly exposed (Cowardin et al., 1979). Characteristic plant species include cattails (*Typha* spp.), sedges, rushes (*Carex* spp., *Scripus* spp., and *Eleocharis* spp.), and wetland grass species including rice cutgrass (*Leersia oryzoides*), the invasive reed canary grass (*Phalaris arundinacea*), and common reed (*Phragmites australis*). There were seven PEM wetlands totaling 3.53 acres identified on the NWI mapping within the 2,000-foot corridor. However, 36 PEM wetlands have been field verified within the corridor. These wetlands total approximately 10.34 acres ranging in size from 0.01 to 3.75 acres. All of the project's wetlands were identified and delineated in the field by qualified wetland biologists.

Emergent Wetland

Forested Wetland

**Figure 4.3-9: Palustrine Wetlands in Section 5 Corridor**

## Palustrine Scrub-Shrub Wetlands

Palustrine scrub/shrub wetlands (PSS) are dominated by woody vegetation less than 20 feet (six meters) tall, including shrubs, young trees, and trees or shrubs that are small or stunted because of environmental conditions

(Cowardin et al., 1979). All water regimes except subtidal are possible (Cowardin et al., 1979). Plant species associated with scrub/shrub wetlands include willows (*Salix* spp.), dogwoods (*Cornus* spp), buttonbush (*Cephalanthus occidentalis),* and spicebush (*Lindera benzoin*).

With the exception of aquatic bed wetlands, PSS wetlands are the least common wetland type within the 2,000-foot corridor. Only two PSS wetlands were identified on the NWI mapping, totaling 5.99 acres. However, seven PSS wetlands were field verified within the corridor. These wetlands total approximately 3.41 acres, ranging in size from 0.02 to 1.02 acres.

## Palustrine Forested Wetlands

Palustrine forested wetlands (PFO) are typically located within stream floodplains, and consist of canopy tree species such as maples (*Acer* spp.), eastern cottonwood (*Populus deltoides*), American elm (*Ulmus americana*), pin oak (*Quercus palustris*), and green ash (*Fraxinus pennsylvanica)*. Dominant shrubs and saplings in these resources include box elder (*Acer negundo*) and common elderberry (*Sambucus canadensis*). The herbaceous layer is often sparsely vegetated with species such as nettles (*Urtica* spp.), poison ivy (*Toxicodendron radicans*), and touch-me-nots (*Impatiens* spp.). Palustrine forested wetlands within the project area are generally ranked high for wildlife habitat using the Indiana Wetland Rapid Assessment Protocol (INWRAP) methodology (see **Section 5.19.2.2**, *Methodology [Water Quality Impacts]*). **Section 5.19.2.3**, *Analysis*, provides the INWRAP results.

Many of these forested wetlands, because of their location within the floodplain, also score high for flood and storm water storage. Field reconnaissance has found that forested wetlands are the most common type of wetland in the Section 5 corridor. Twenty PFO wetlands were identified on the NWI mapping, totaling 59.10 acres. However, 21 PFO wetlands were field verified within the corridor. These wetlands total approximately 37.52 acres, and range in size from 0.13 to 31.75 acres. It seems that many of these forested wetlands have been lost by one or more of the anthropogenic or natural disturbances listed previously.

## Palustrine Unconsolidated Bottom

Cowardin et al. (1979) designates ponds or “open water” as palustrine unconsolidated bottom (PUB) features. This resource type includes aquatic habitats with at least 25% cover of particles smaller than stones and a vegetative cover less than 30%. Water regimes are restricted to subtidal, permanently flooded, intermittently exposed, and semi-permanently flooded. Unconsolidated bottoms are characterized by the lack of large stable surfaces for plant and animal attachment (Cowardin et al., 1979). Faunal productivity in these habitats is generally limited due to its unstable and/or lack of substrate needed for aquatic organisms to live, breed, and feed. PUB wetlands are the second most common type of wetland resources found within the study area. Twenty-six PUB features were identified on the NWI mapping, within the 2,000-foot corridor totaling 19.63 acres. However, 43 PUB features were field verified within the corridor. These features total approximately 29.68 acres, and range in size from 0.01 to 7.27 acres.

## Palustrine Aquatic Bed

The palustrine aquatic bed (PAB) classification type includes wetlands and deepwater habitats dominated by plants that grow principally on or below the surface of the water for most of the growing season in most years. Water regimes include subtidal, irregularly exposed, regularly flooded, permanently flooded, intermittently exposed, semi-permanently flooded, and seasonally flooded. Aquatic bed wetlands represent a diverse group of plant communities that require surface water for optimum growth and reproduction. They are best developed in relatively permanent water or under conditions of repeated flooding. The plants are either attached to the substrate or float freely in the water above the bottom or on the surface (Cowardin et al., 1979). Typical rooted plant species include water lilies (*Nymphaea* and *Nuphar* spp.), pondweed (*Potamogeton* spp.), and water knotweed (*Polygonum amphibium*). Common floating vascular plants include duckweeds (*Lemna* spp.) and coon's tail (*Ceratophyllum demersum*). This resource type is considered significant to wildlife habitat, particularly amphibian habitat. Aquatic bed resources also provide flood storage and attenuation, and water quality protection. No PAB wetlands were identified on NWI mapping; however, two PAB wetlands were field verified within the corridor. These features total approximately 2.23 acres and range in size from 0.76 to 1.47 acres. PAB wetlands are the least common type of wetland resources found within the study corridor.

## Farmed Wetlands

According to the *USDA National Food Security Act Manual*, 3rd Edition, September 2000, farmed wetlands are "wetlands that were drained, dredged, filled, leveled, or otherwise manipulated before December 23, 1985, for the purpose of, or to have the effect of, making the production of an agricultural commodity possible, and continue to meet specific wetland hydrology criteria."

All of these criteria must be met before an area can be considered "farmed wetland." If an existing agricultural wetland is not cultivated, i.e., is left fallow, for five years or more, it becomes regulated as a wetland and farming cannot be reinitiated without the proper permits. A review of United States Department of Agriculture, Natural Resources Conservation Service (USDA-NRCS) records in Monroe and Morgan counties revealed there are no areas in the Section 5 corridor that meet the farmed wetland criteria.

### 4.3.2.3 Rivers, Streams, and Watersheds

The United States is divided and sub-divided into successively smaller hydrologic units commonly referred to as "watersheds." The hydrologic units are arranged, from the smallest (cataloging units) to the largest (regions). Each hydrologic unit is identified by a unique hydrologic unit code (HUC). The Section 5 corridor is located wholly within the White River watershed and crosses three, 8-digit HUC watersheds: Upper White River (05120201), Lower

White River (05120202), and Lower East Fork White River (05120208) (see **Figure 4.3-10**).[3]

Specifically, the corridor crosses the watersheds of nine named and many unnamed White River tributaries: Clear Creek, Stout Creek, Griffy Creek, Beanblossom Creek, Bryant Creek, Little Indian Creek, Jordan Creek, Buckner Branch, and Indian Creek. Each of these streams and many of their tributaries have been crossed by SR 37 or by connector routes that comprise the local road network. The Qualitative Habitat Evaluation Index (QHEI) and Headwater Habitat Evaluation Index (HHEI) have been completed on all streams as appropriate. The QHEI/HHEI data and maps are provided in **Appendix M**, *Final Stream Assessment Report.* The identification and analysis of streams in the Section 5 study area are discussed in detail in **Section 5.19.2**, *Surface Waters*.

Characteristics of the streams and their respective watersheds are dependent on their location within the study corridor. **Figure 4.3-11** (see right) provides a visual comparison of the streams in the Section 5 study area.

Griffy Creek

Little Indian Creek

**Figure 4.3-11: Typical Streams in Section 5 Corridor**

3 The U.S. Geological Survey (USGS) delineates watershed using a nationwide system based on surface hydrologic features. This system divides and subdivides the United States into successively smaller river basin/hydrologic units. A hierarchical hydrologic unit code (HUC) is used to identify any hydrologic area. The 8 digit units are generally referred to as sub-basins. The average size of an 8-digit unit is approximately 700 square miles.

In the Mitchell Plateau and Norman Upland physiographic regions of the study area, the headwater portions of the Clear Creek, Stout Creek, Griffy Creek, and Beanblossom Creek watersheds are influenced by karst and a relatively dissected terrain composed of hills and valleys with moderately steep walls and narrow floors. The karst landscape has created spring-fed tributaries and tributaries that sink into underground voids or cave openings, while the rugged terrain and geology contribute to the dendritic drainage patterns exhibited for the headwater tributary streams. These streams are typically deeply entrenched with unstable bed and banks.

The lower portions of the Bryant Creek, Little Indian Creek, and Indian Creek watersheds are located within the Martinsville Hills physiographic region of the study area. The confluence of Indian Creek and Little Indian Creek with the West Fork White River is approximately one mile from the Section 5 corridor, while the Bryant Creek confluence with the West Fork White River is nearly four miles from the study corridor. These streams are characterized by relatively flat and broad flood prone areas. Some of the tributaries of these streams have been straightened into agricultural drainage ways to facilitate agricultural development within these fertile floodplains.

## Surface Water Quality

The watersheds traversed by the study corridor have been previously impacted by a variety of manmade activities including SR 37, the local road network, commercial development, industrial development, single family dwellings, multiple family dwellings, and agricultural development. Some streams and wetlands have experienced naturally de-watering due to the karst topography of the region and are no longer considered jurisdictional by regulatory agencies.

The southern portion of the study area, from approximately Bloomington south, is located within the Lower East Fork White River watershed. Predominant land uses include industrial, commercial, and residential. Industrial land use has had a direct effect on water quality within the watershed due to its legacy of industrial production, hazardous materials usage, solid and hazardous waste generation, and improper handling or disposal.

The Lower East Fork watershed, specifically the Clear Creek sub-watershed, has been impacted by PCBs and mercury contamination. Lemon Lane Landfill, a USEPA Superfund site located at Vernal Pike, is a main source of contamination. The Lemon Lane Landfill accepted PCB-contaminated capacitors from 1958 to 1964 and now continues to leach PCBs into the underlying bedrock; the PCBs enter springs that discharge to Clear Creek, particularly during storm events. Multiple attempts to remediate the Lemon Lane Landfill have been conducted over the past 20 years. This included the installation of a treatment plant at Illinois Central Spring in 2000 as an expanded mitigation effort. Located adjacent to Clear Creek is the Winston-Thomas Treatment Plant. This site served as the City's wastewater treatment plant from 1933 to 1982. PCB-contaminated wastewater, which was received from Westinghouse from 1958 until 1978, affected nearly every component of the treatment plant, as contaminated sludge was pumped into treatment lagoons and sinkholes and spread onto the ground. It was not until 1997 that full remediation of the site began. Cleanup was finished in 1999. This cleanup resulted in significant remediation at the Lemon Lane Landfill Superfund site. Cleanup measures included PCB-contaminated sediment removal in streams and associated stream banks in the Swallowhole and Quarry Springs area and upgrades to the treatment plant at the head of Clear Creek/ Illinois Central Spring (ILCS) to treat up to 6000 gpm of storm flow. Sampling of several springs at the site shows that PCB levels have declined considerably, and in many cases PCBs are undetectable (Viacom, Inc., May, 2002). Additional details of the significant remedial actions undertaken at the Lemon Lane Landfill and Illinois Central Spring are located in **Chapter 5.16.3.2**, *Superfund Sites*.

The study corridor does not cross Clear Creek; however, it does cross the headwater tributaries to Clear Creek, including tributaries to the West Fork Clear Creek. While Clear Creek is still listed on the State of Indiana's Draft 2012 CWA Section 303(d)[4] List of Impaired Waterbodies for unacceptable levels of PCBs, *Escherichia coli* (E. coli), and total mercury, on-going mitigation efforts have been successful in minimizing the amount of PCBs discharged into Clear Creek (Bloomington Environmental Commission, 2006).

The study corridor passes through the Lower White River watershed near Bloomington. This portion of the study area has a mix of land uses ranging from industrial, commercial, residential, forested, and agricultural. The Lower White River watershed, specifically Stout Creek, has been impacted by industrial waste contamination from Bennett's Dump, another USEPA listed Superfund site that is located northwest of the SR 46 interchange. However, Stout Creek, located just west of the study corridor, is not included on the State of Indiana's Draft 2012 CWA Section 303(d) List of Impaired Waterbodies and it is no longer considered impaired for aquatic life use (IDEM, 2012). A new remediation plan for the site was prepared in 2006 to permanently contain PCBs leached from the site (Bloomington Environmental Commission, 2006).

In addition to this industrial legacy, the Lower White River watershed has also been impacted by other waste treatment issues relating to E. coli. Failing septic systems and improper functioning sewage treatment plants are a major contributor to high levels of E. coli in many of Indiana's streams, including the Griffy Creek watershed (a sub-watershed of Beanblossom Creek), and specifically the South Fork Griffy Creek, which is not crossed by the study corridor. Updated by the IDEM in 2012, the South Fork of Griffy Creek is impaired for aquatic life use. Total Maximum Daily Loads (TMDLs) have not been developed yet. The main branch of Griffy Creek crosses the alternatives just upstream from its confluence with Beanblossom Creek; however, it is not listed on IDEM's draft 2012, 303(d) list of impaired streams.

Beanblossom Creek is included on Indiana's Draft 2012 CWA Section 303(d) List of Impaired Waterbodies for unacceptable levels of PCBs. It should be noted that a TMDL has been approved by IDEM. The possibility of E. coli contamination for Beanblossom Creek continues to be a concern.

4 Section 303(d) of the Clean Water Act requires states to identify waters that do not or are not expected to meet applicable water quality standards with federal technology-based standards alone. States are also required to develop a priority ranking for these waters taking into account the severity of the pollution and the designated uses of the waters. Once this listing and ranking of waters is completed, the states are required to develop Total Maximum Daily Loads (TMDLs) for these waters in order to achieve compliance with the water quality standards.

The northern portion of the study corridor is located within the Upper White River watershed. Land use categories include residential and agriculture. Indian Creek crosses the study area at its northern limits and is listed as impaired on the IDEM's Draft 2012, 303(d) List of Impaired Waterbodies for unacceptable levels of E. coli. Little Indian Creek, Jordan Branch, and Bryant Creek of the Upper White River watershed are not included on the State of Indiana's Draft 303(d) List of Impaired Waterbodies.

**Surface Water-Groundwater Interaction**

Areas where surface water and groundwater interact have the greatest potential to serve as sources of groundwater contamination, particularly in losing streams, i.e., a section of a stream in which the water table adjacent to the stream is lower than the water surface in the stream, causing infiltration from the stream channel, recharging the groundwater aquifer and decreasing the stream flow (Freeze/Cherry, 1979). The closer the static water level to the ground surface, the greater potential there is for groundwater contamination.

Monitoring wells are often used to identify and document the interaction between surface water and groundwater. Without such documentation, it would be difficult to classify streams in a given locale as "gaining" or "losing" streams. Monitoring wells were not employed in this Tier 2 study in Section 5; therefore, in the absence of documentation, for purposes of evaluating impacts it is assumed that each stream has the potential to affect groundwater.

In the White River Basin, groundwater generally flows into streams through permeable sediments that line the stream channel. Although groundwater typically discharges to streams, the hydraulic gradient may be reversed in some situations and surface water may flow into the aquifer. Water levels in the White River can rise to a point at which gradients are reversed and surface water seeps into the adjacent sand and gravel aquifers (Schnoebelen et al., 1999).

Water movements through the karst portions of the study area are characterized by rapid subsurface flow through conduits within the bedrock; some of the conduits are caves large enough for people to enter. It is the fast flow nature of water movement and its localization in preferential flow routes that make karst ecosystems especially vulnerable to degradation. There is little opportunity for adsorption, degradation, or other natural processes to cleanse the passing water of contaminants as the water rapidly flows through the preferential flow conduits.

### 4.3.2.4 Floodplains

Floodplains are low lands adjoining the channel of a river or stream that have been or may be inundated by floodwater. They are a critical component of the riparian ecosystem and should be considered an integral part of the stream corridor. The floodplain is considered part of the stream channel, differing from the main channel only in the amount of time it stores and conveys water. Undeveloped floodplains with intact riparian buffers can greatly improve water quality by trapping and storing excess sediment. Vegetated floodplains can effectively filter out impurities from runoff and process organic wastes before entering the river or stream.

A floodplain is defined as the area bordering a stream or river that is susceptible to inundation from any water source. The 100-year floodplain was analyzed for this project. This is the area that possesses a 1% probability (i.e., 1 out of 100) of being flooded in any given year.

Projects that directly cross or are adjacent to a stream or river may impact floodplains to some degree. When a project crosses a stream or river in a perpendicular orientation, it is referred to as a transverse floodplain encroachment. Likewise, when a project is located adjacent to a stream or river it is referred to as a longitudinal floodplain encroachment. See **Figure 4.3-12** for examples of transverse and longitudinal floodplain encroachments.

The Section 5 corridor crosses several 100-year floodplains. These mapped floodplains are located on Federal Emergency Management Agency's (FEMA) recently updated Flood Insurance Rate Map Numbers 1801770015B (Indian Creek and the eastern edge of the White River floodplain); 1801760075B, which includes the confluence of Little Indian Creek, Jordan Creek, and Buckner Branch of Little Indian Creek; 18105C0050D (Bryant Creek); 18105C0131D, which includes the confluence of Beanblossom Creek and Griffy Creek; and 18105C0133D (Stout Creek). With the exception of Little Indian Creek (transverse crossing), Bryant Creek (longitudinal crossing), and Stout Creek (longitudinal crossing), it is difficult to precisely determine if these crossings shall be considered longitudinal or transverse because the floodplain is so broad in those areas. The 100-year floodplains in and near the corridor are shown on **Figure 4.3-13**. These data are from the IDNR digitations of the FEMA maps.

In addition to the FEMA mapped floodplains, other drainage features may have jurisdictional floodplains requiring special design considerations relating to flooding. Impacts to floodplains require various permits, which are described in **Section 5.23**, *Permits*.

### 4.3.3 Ecosystems

Section 5 passes through the Highland Rim Natural Region – **Mitchell Karst Plain Section**, and the Highland Rim Natural Region – **Brown County Hills Section**.

The **Mitchell Karst Plain Section** is characterized by karst topography which consists of sinkholes that drain into underground cavern systems which have formed in the fractured and dissolved limestone. Natural community types associated with this section include cave, sinkhole pond, swamp, flatwoods, remnant barrens, limestone glade, and various upland forest types. The plain is relatively level, and springs and caves are common features as most drainage is underground. The soils are generally well drained silty loams derived from loess and weathered limestone. Near the section's periphery, limestone cliffs and rugged hills are present. The study area is concentrated within karst wetland, sinkhole pond and swamp, and forest communities. Species commonly found to be dominant in the karst wetland communities are swamp cottonwood, pin oak, swamp white oak, red maple, and sweet gum. Sinkhole pond communities normally have open water and marshy borders with cattails, bulrush, bur-reed, spatterdock, buttonbush, swamp loosestrife, bladderwort, and *Carex comosa*. The mesophytic forested communities about the corridor in this section are dominated by white oak, sugar maple, shagbark hickory, pignut hickory, and white ash. The low karst landscape provides a reservoir for water and the few surface streams found (Indian Creek, Clear Creek, and Buck Creek) are formed from medium to high-gradient topographic features.

The **Brown County Hills Section** is characterized by deeply dissected uplands, underlain by siltstone, shale, and sandstone. This landscape is noted for having bedrock near the surface with a thin layer of well drained acid silt loam with minor amounts of loess. The uplands are dominated by oak-hickory and the ravines by mesic species (beech, white oak, sugar maple, and white ash). The terrain is fed by small high gradient ephemeral streams draining from the uplands and medium to low gradient streams in the ravines.

Classification of natural communities within the project corridor into habitat types was completed for Section 5 to facilitate the evaluation of impacts resulting from the upgrade of existing SR 37, a four-lane, divided, limited-access highway. In order to bring the existing transportation facility up to interstate standards, each alternative will include the following elements: addition of travel lanes, strategic placement of interchanges, and the addition of local access roads to facilitate local travel patterns.

The habitat types listed were developed according to the vegetative characteristics of each community as documented during the field investigations conducted during the fall of 2004, the summer of 2005, the spring of 2006, the fall of 2011, and the spring of 2012. **Section 4.3.3.1** summarizes the general characteristics of these habitat types, and **Section 4.3.3.2** identifies the wildlife species that typically rely on these habitat types for food and shelter.

### 4.3.3.1 Habitat Types

The basic characteristics of eleven habitat types within the Section 5 project corridor are briefly described below. These natural habitat types are typical of the Mitchell Karst Plain and Brown County Hills Natural Region sections within which Section 5 is located. Refer to the following figures (**Figure 4.3-14** to **Figure 4.3-24**) for representative photographs of each habitat type.

*Figure 4.3-14: Old Field*

**(1) Old Field** habitat types are agricultural lands that, following managed use, lay fallow for several years, eventually reverting to an assemblage of various native and naturalized grasses and forbs (**Figure 4.3-14**). These areas are in transition from bare ground to forest. At this stage they are overgrown with herbaceous and shrub species. This habitat typically supports a variety of species.


*Figure 4.3-15: Early- to Mid-Successional Forest*

**(2) Early- to Mid-Successional Forest**. Over time, an old field is invaded by shrubs and saplings as succession moves toward a forested habitat. These communities (**Figure 4.3-15)** resemble a later stage of Old Field and habitats usually consist of between 10% and 50% woody plants (seedlings or saplings).


*Figure 4.3-16: Forest Fragment*

**(3) Forest Fragment** habitat types are generally located between agricultural fields and consist of fencerows, shrubby ditches, and partially forested waterways that lack floodplain **(Figure 4.3-16**). Given the scale and extent of most agricultural landscapes, forest fragments are often the only refuge readily available to wildlife. They represent a unique and valuable habitat type. Because these tree-covered areas are too narrow or too small to meet the USDA definition of forest, they are not considered as upland forest in the analysis of forest impacts in **Section 5.20**, *Forest Impacts.*


*Figure 4.3-17: Mesic Upland Forests*

**(4) Mesic Upland Forests** are often characterized by dense canopy and an understory of shade-tolerant species (**Figure 4.3-17**). Mesic Upland Forests are typically found on north-facing slopes and level ground with moderately moist soils through which water moves slowly, but does not saturate the soil for significant periods of time. These forests, where extensive, assist in regional climate control, as the dense canopy shades forested wetlands and associated creeks and ephemeral streams.

*Figure 4.3-18: Dry-Mesic Forests*

**(5) Dry-Mesic Forests.** One of the most common community types in Indiana, Dry Mesic Forests **(Figure 4.3-18)** are often found on north- and east-facing slopes, as well as the transition from floodplain forests to dry upland forests. The canopy is more open than in a typical mesic upland forest.

*Figure 4.3-19: Mesic Floodplain Forests*

**(6) Mesic Floodplain Forests** occur in lower elevation areas, usually along streams within riparian corridors (Figure 4.3-19). They are often flooded for varying periods of time each year. Wetland habitat types can sometimes be found within forested floodplains.

*Figure 4.3-20: Emergent Wetlands*

**(7) Emergent Wetlands** support erect, largely rooted herbaceous perennial species and permanent water for most of the growing year, during those years of normal precipitation levels (Figure 4.3-20). These wetlands maintain the same appearance each year unless extreme climatic conditions cause flooding or other extreme local changes. Emergent wetlands traditionally include marsh, meadow, and fen.

*Figure 4.3-21: Scrub-Shrub Wetlands*

**(8) Scrub-Shrub Wetlands** support largely woody species less than 20 feet in height (**Figure 4.3-21**). All hydrological regimes are included except sub-tidal. Vegetation includes true shrub species, but also young trees and trees and shrubs that are stunted because of environmental conditions. Scrub/shrub wetlands within Section 5 are broad–leaved deciduous communities consisting of buttonbush, willows, and swamp rose.

*Figure 4.3-22: Forested Wetlands*

**(9) Forested Wetlands** support largely woody species greater than 20 feet in height (**Figure 4.3-22**). They include various hydrological regimes and various layers of vegetation including canopy trees, subcanopy trees, shrubs, and ground layer herbaceous vegetation. The soils usually consist of silty and clayey alluvial materials. Different from swamps, forested wetlands, lack continuous inundation, although repeated flooding is common.

*Figure 4.3-23: Open Water*

**(10) Open Water** habitat types in the Section 5 corridor consist of lakes and ponds, all of which are constructed (primarily for agricultural or residential uses) rather than naturally occurring (**Figure 4.3-23)**.


*Figure 4.3-24: Sinkhole Wetlands*

**(11) Sinkhole Wetlands**. A product of karst topography, these wetlands develop in sinkholes associated with void bedrock strata from the dissolution of limestone. Because they are largely impermeable, many sinkhole wetlands (**Figure 4.3-24**) store rainwater long into the drier seasons.

Approximately 13% of the corridor is agricultural land; however, agricultural areas were not included as a specific habitat type, as these areas typically occur within a matrix of other habitat types and provide little habitat when isolated. Additionally, depending on management intensity or cultivation method, agricultural habitat may vary substantially in structure annually; cultivated agricultural lands are typified by periods of bare soil and harvest as pastures are mowed, hayed, or grazed one or more times during the growing season.

Despite the urban and suburban development and the existing SR 37 highway, approximately 35% of the study corridor is forested, and five of the 11 wildlife habitat types identified within the study corridor are a type of forest habitat. Habitat reduction and fragmentation can affect animal populations that depend on the habitat to such an extent that species diversity can be impaired by isolation and inbreeding and, ultimately, species survival can be threatened. It is anticipated that the upgrade of SR 37 to interstate standards will impact a relatively minimal amount of forested habitat. Detailed analysis of forest and wildlife habitat impacts, as well as measures to minimize impacts to forests and wildlife habitat are provided in **Section 5.18**, *Wildlife Considerations*, **Section 5.20**, *Forest Impacts*, and **Section 7.3**, *Section 5 Mitigation Measures and Commitments.*

### 4.3.3.2 Wildlife

The general characteristics of wildlife species common to the habitat types occurring in the Section 5 study area are identified below.

**(1) Old Field** plant variety provides natural food plots, nesting areas, and shelter for a wide variety of birds, butterflies, and mammals. Forage is available for seed eating birds such as mourning dove and finches; and insects attract wild turkey, eastern meadowlark, and other birds. Rodents feed on the green vegetation and seeds. Predatory birds and snakes, in turn, feed on the rodents. Various grasses and forbs dominate the vegetation: brome grass, orchard grass, foxtail, Queen Anne's lace, goldenrods, milkweeds, teasel, yarrow, and asters.

**(2) Early- to Mid-Successional Forest** communities have an abundance of berry-producing shrubs and brushy cover that provide food and shelter for several species that include white-tailed deer, northern mockingbird, catbird, field sparrow, opossum, cottontail rabbit, and wild turkey.

**(3) Forest Fragments** harbor a variety of plant species and are typically weedy and shrubby. Wildlife species that commonly utilize forest fragments include cottontail rabbit, Virginia opossum, raccoon, white-tailed deer, white-footed mouse, gray squirrel, American robin, blue jay, brown-headed cowbird, and grackle.

**(4) Mesic Upland Forests** are associated with an oak-hickory forest cover type and provide food chain support for many different wildlife species. For example, many bird species such as blue jay and downy woodpecker use these areas and associated wetlands as a source of food, water, nesting material, and shelter. Mammals such as woodchuck, striped skunk, red fox, and white-tailed deer are also common to this habitat type.

**(5) Dry-Mesic Forests** are often dominated by maples and beech; thus, they provide an abundance of food for wildlife. This diverse plant system also provides habitat for many different species of birds, mammals, and amphibians. Typical species using this habitat type include white-tailed deer, gray squirrels, raccoons, Eastern box turtles, skinks, and wild turkeys.

**(6) Mesic Floodplain Forests** provide valuable habitat for birds, mammals, amphibians, reptiles, and insects. The dense herbaceous cover provides nesting grounds for waterfowl. Tree snags and cottonwoods provide food and shelter for many species of songbirds (Sullivan, 1995). Also common to this habitat are the northern cardinal, gray catbird, house wren, eastern mole, raccoon, common muskrat, white-tailed deer, and turtles (Sullivan, 1995).

**(7) Emergent Wetlands** harbor resident and migratory waterfowl including geese, ducks, herons, and other birds. Depending on hydrology levels, emergent wetlands may also provide habitat for muskrat, snakes, frogs, salamanders, turtles, and various beneficial insects and their larvae.

**(8) Scrub-Shrub Wetlands** are characterized by low, multi-stemmed woody vegetation in young or stunted stages of growth, and can be dense and impenetrable or can consist of a mosaic of low woody cover interspersed in herbaceous cover. The low cover provides habitat for Eastern cottontail rabbit, muskrat, snakes, frogs, turtles, and insects and their larvae.

**(9) Forested Wetlands** are often seasonally inundated, which provides an ideal habitat for emergence of spring aquatic life. Representative wildlife dependent upon forested wetlands includes wood ducks, great blue heron, green-backed heron, and swamp sparrow; and other wildlife such as turtles, salamanders, frogs, snakes, mammals, and a variety of insects.

**(10) Open Water** can provide breeding, foraging, and resting habitat for a variety of wildlife species including amphibians, birds, mammals, fish, and insects. Naturalized open water habitats provide spawning sites, nursery areas, feeding sites, and cover for various species of fish.

Maintained open water areas (e.g. stock and detention ponds, flooded gravel pits) do not provide suitable habitat for certain species of fish or other aquatic species.

**(11) Sinkhole Wetlands** are similar to open water habitats, and provide breeding, foraging, and resting habitat for amphibians, birds, and mammals. Although natural open water habitats provide spawning sites, nursery areas, feeding sites, and cover for various species of fish, many man-made features (e.g. stock and detention ponds, flooded gravel pits) do not provide suitable habitat for certain species of fish or other aquatic species.

### 4.3.3.3 Threatened and Endangered Species

Threatened and Endangered Species (TES) are recognized by federal and state agencies as being in danger of extinction or being sufficiently compromised to potentially become endangered at either the local or national level. The assessment of TES is concerned with the preservation and conservation of such species and their sustainability.

The Endangered Species Act of 1973 (ESA) (7 U.S.C. §136; 16 U.S.C. §460 et seq.) provides a nationwide program for the conservation of threatened and endangered plants and animals and the habitats in which they are found. This act prohibits any action, administrative or real, that will result in the taking of a listed species or adversely affecting its critical habitat. In addition, any import, export, interstate, or foreign commerce of listed species is strictly prohibited by the ESA. Specifically, federally listed species are protected under Section 7 of the ESA, which directs all federal agencies to use their existing authorities to conserve TES.

The ESA defines an endangered species as any species which is in danger of extinction throughout all or a significant portion of its range other than a species of the Class Insecta determined by the United States Department of the Interior (USDOI) to constitute a pest whose protection under the provisions of this Act would present an overwhelming and overriding risk to man. In addition, threatened species is defined by the ESA as any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

As previously noted, the ESA prohibits any action that results in the taking of a listed species unless the appropriate permit has been acquired. The term "take," according to the ESA, means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.

Section 8 of the ESA designates management and scientific authority to the USDOI, with the respective functions of each authority to be carried out through the USFWS. The USFWS maintains the list of 433 endangered faunal species, 644 endangered floral species, 167 threatened faunal species, and 150 threatened floral species as of July 3, 2012. Faunal species include birds, insects, fish, reptiles, amphibians, mammals, and crustaceans, while floral species include trees, shrubs, vines, and herbaceous plants such as grasses and forbs (wildflowers).

In addition to the federal law protecting endangered species, many states have enacted similar laws to protect species on a more local level. Title 14, Article 22 of the Indiana Code provides authority for IDNR to protect and properly manage the fish and wildlife resources of Indiana.

This same provision of the Indiana Code also defines an endangered species as any species or subspecies of wildlife whose prospects of survival or recruitment within Indiana are in jeopardy or are likely within the foreseeable future to become so due to any of several factors. These factors include the destruction, drastic modification, or severe curtailment of the habitat of the wildlife; the over-utilization of the wildlife for scientific, commercial, or sporting purposes; the effect on the wildlife of disease, pollution, or predation; other natural or manmade factors affecting the prospects of survival or recruitment within Indiana; or any combination of the aforementioned factors. This definition also includes any species or subspecies of fish or wildlife appearing on the United States list of endangered native fish and wildlife (50 CFR Part 17, Appendix D) or any species or subspecies of fish and wildlife appearing on the United States list of endangered foreign fish and wildlife (50 CFR Part 17, Appendix A).

The Indiana Code (IC 14-22-34-5) defines "take" as harassing, hunting, capturing, killing, or any attempt to harass, hunt, capture, or kill wildlife. In addition, IC 14-22-34-10 provides the IDNR authority to prepare a list of those species and subspecies of wildlife indigenous to Indiana that are determined to be endangered in Indiana, giving the common and scientific names by species and subspecies.

In addition to protections provided by the federal and state endangered species legislation noted above, the Migratory Bird Treaty Act (MBTA) makes it illegal for anyone to take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or the parts, nests, or eggs of such a bird except under the terms of a valid permit issued pursuant to federal regulations (USFWS, 2003). The specific migratory bird species protected by the MBTA can be found in 50 CFR §10.13.

In a final rule issued on July 9, 2007, the USFWS removed the bald eagle from the list of threatened and endangered species established under the ESA. The bald eagle continues to be protected under the Bald and Golden Eagle Protection Act (16 U.S.C. §§668-668d) and the MBTA (16 U.S.C. §§703-712). In particular, the Bald and Golden Eagle Protection Act prohibits the incidental taking of a bald eagle except as allowed by a permit granted by the USFWS.

Bird species were observed during all field survey efforts. Bird species observed were noted to provide a general description of bird diversity in the project corridor. The results are discussed in **Section 5.17,** *Bald Eagles, Federal and State Threatened and Endangered Species.*

An evaluation of impacts on federally listed species has been carried out in consultation with USFWS under Section 7 of the ESA. In Section 7 consultation during the preparation of the Tier 1 EIS, USFWS initially identified six species in the 26-county study area that required evaluation. Of the six species evaluated in the Tier 1 DEIS, USFWS identified three species that may be present in the Action Area for Preferred Alternative 3C. Those three species were the Indiana bat, the bald eagle, and the eastern fanshell mussel.

The Tier 2 biological fieldwork conducted in Section 5 included a pedestrian walkover; cave fauna survey; fish, unionid (freshwater mussel), and crayfish survey; and mist netting for Indiana bats. Four adult male Indiana bats and one lactating female Indiana bat were captured from five mist net sites during the 2004 survey. Two of these five Indiana bats were captured within approximately 1,000 feet of SR 37. Two roost trees were identified greater than two miles from SR 37. No bats emerged from the two trees during emergence counts. In addition, the undersides of 13 bridges were inspected during the night to identify night-roosting bats. No Indiana bats or guano were identified under any of these bridges.

Additional mist netting surveys were completed during the summer of 2005. The 2005 surveys focused around the location of Indiana bat captures where no primary roost trees were identified in 2004. Three mist net sites were surveyed for a total of 12 net nights. One lactating female Indiana bat was captured. The lactating female was radiotagged and successfully tracked to four new roost trees. None of these roosts were located within the project corridor.

Additional mist netting surveys were completed during the summer of 2012. A total of 12 Indiana bats were captured. Transmitters were attached to five Indiana bats, and all were tracked to at least one specific roost. Two adult males were captured and tracked to a total of 3 roost trees. A third adult male was captured and tracked to a batbox near a residence. Two pregnant females were captured and successfully tracked to a total of three roosts. None of these roosts were located within the project corridor.

Based on the fish, unionid and crayfish survey, 46 species of fish representing 11 families were observed in the main streams crossed by the Section 5 corridor. No state or federally listed species were observed. Aquatic habitat appeared better at sustaining aquatic communities in the northern end of the corridor, specifically Bryant Creek, Little Indian Creek, and Indian Creek, all in Morgan County. All of these streams exhibited more diverse and species-rich fish communities than Griffey, Beanblossom, and the North Tributary to Beanblossom creeks.

Based on the cave fauna survey, five troglobitic species were identified in one of the caves in the Section 5 study area, two of which are State-listed Rare Species (cave crayfish [*Orconectes inermis testii*] and Barr's cave amphipod [*Crangonyx barri*]). Another cave revealed 11 troglobitic species including one State-listed Rare (cave crayfish [*Orconectes inermis testii*]), two State-listed Endangered (hidden spring snail [*Fontigens cryptica*] and Mayfield cave beetle [*Pseudanophthalmus shilohensis mayfieldensis*]) and three State-listed Watch List species (Packard’s groundwater amphipod [*Crangonyx packardi*], Bollman’s cave millipede [*Conotyla bollmani*], and Indiana cave springtail [*Sinella alata*]).

The pedestrian walkover encountered no State or Federally listed plants, animals, or habitats.

A description of the methods and results of the surveys conducted for Tier 2 Section 5 are included in **Section 5.17**, *Bald Eagles, Federal and State Threatened and Endangered Species*.

Coordination with USFWS during Tier 2 resulted in the re-initiation of Tier 1 formal consultation for the Indiana bat. Additional information provided by Tier 2 bat surveys prompted USFWS to re-examine the effects of the project as a whole on this species. Current information shows no eastern fanshell mussels within the corridor. Thus, there has been no re-initiation of formal consultation for the eastern fanshell. Because the bald eagle has been delisted, no formal consultation under the ESA would be necessary.

### 4.3.3.4 Managed Lands/Natural Areas

Managed lands and natural areas include forests, recreation areas, natural areas, and other federal and state lands that are managed for conservation, recreation, resource extraction, or other purposes. Some private lands are also considered "managed lands," such as those owned by The Nature Conservancy non-profit group. These areas may also be designated as high quality natural areas or for another specific purpose where they are not necessarily actively managed. These lands may be managed for timber production, wildlife habitat, recreation, education, or other purposes. Federal and state interests exist with many of these lands, including cost-sharing agreements, purchased easements, or property tax reductions. Federal and state funds have been or are being expended on many of these properties.

Some of the federal or state owned managed lands in Southern Indiana include Crane Naval Surface Warfare Center, Hoosier National Forest, Morgan-Monroe State Forest. The Morgan-Monroe State Forest is in the Section 5 study area and is located in both Monroe and Morgan counties.

Privately-owned managed lands include land enrolled in government cost share programs such as the USDA Conservation Reserve Program, the IDNR Classified Forest and Wildlands Program, the USFWS Partners for Fish and Wildlife Program, and others. The Beanblossom Bottoms Nature Preserve is privately owned by the Sycamore Land Trust. This land trust is in the vicinity of but beyond the limits of the Section 5 corridor. During Tier 1 studies, the Preferred Alternative 3C Corridor was selected in part because it avoids this sensitive resource.

#### Morgan-Monroe State Forest

The Morgan-Monroe State Forest is located within the Section 5 Corridor. It encompasses over 25,000 acres in Morgan and Monroe counties. The State Forest was designated in 1929 and is comprised of forested ridges and valleys. The forest offers various family-oriented outdoor activities including picnic shelters; hiking trails; three fishing lakes; primitive camping; and hunting for white tail deer, ruffed grouse, turkey, squirrel, fox, and raccoon during appropriate seasons. Most of the area under State Forest management is listed as public use which can include recreational activities and various timber and wildlife harvesting activities. Based upon communications with forest personnel, the portions of the Section 5 Corridor that abut the Morgan-Monroe State Forest are part of a multiuse management area that includes undeveloped recreation and resource management use. IDNR personnel indicated there are no campgrounds or any mapped/designated recreational trails or wildlife refuges along the SR 37 corridor. The area is managed primarily for timber harvesting and wildlife. This is consistent with the description in the Tier 1 FEIS of the Morgan-Monroe State Forest.

## Local Community Parks and Open Space

Two parcels related to the City of Bloomington's Park and Recreation system are located within the Section 5 corridor: The City of Bloomington owns Wapehani Mountain Bike Park and the addition to the park is owned by the Bloomington Community Park & Recreational Foundation. The City owned parcel is approximately 32.77 acres and the addition is approximately 12.66 acres, for a total of 45.43 acres. The park was established in 1990 and is the first mountain bike park in the state of Indiana. It is located in southwestern Bloomington, adjacent to SR 37, and accessed from Weimer Road and Wapehani Road. The park includes a small lake (formerly a public water reservoir) created by placement of an earthen dam across an unnamed stream, fringe wetlands, woods, springs, sinkholes, and five miles of trail bike trails with minor wooden trail features (bridges, walkways, bike jumps). In addition, the lake receives runoff/storm water from commercial development and the existing SR 37 to the west.

There is a Mill Creek Conservation Easement located directly adjacent to and south of Wapehani Mountain Bike Park. It is privately owned by the Public Investment Corporation, but managed by the City of Bloomington for habitat conservation purposes. The easement does not provide for public use.

Brown's Woods consists of two woodland parcels on either side of Basswood Drive and east of SR 37, in a developing area of the city. These 16.62 acres were donated under a Memorandum of Understanding to the Community Foundation of Bloomington and Monroe County, Inc. (Foundation) to preserve it, in perpetuity, as undeveloped land for the benefit of wildlife, plant communities, and the public. This property is privately owned by the Community Real Estate Holdings, LLC, a holding company for the Foundation. The City of Bloomington Parks & Recreation Department maintains the property as a woodland under a Lease Agreement with the Foundation.[5]

## USDA-NRCS Farm Bill Programs

The USDA-NRCS offers voluntary programs to eligible landowners and agricultural producers to provide financial and technical assistance to help manage natural resources in a sustainable manner. Through these programs, the agency approves contracts to provide financial assistance to help plan and implement conservation practices that address natural resource concerns or opportunities to help save energy, improve soil, water, plant, air, animal, and related resources on agricultural lands and non-industrial private forest land. In Indiana, these programs are administered by the USDA-NRCS Farm Service Agency (FSA) Indiana Office. Among others the USDA-NRCS offers the following two programs:

The Conservation Reserve Program (CRP) is administered through the FSA. Program support is provided by NRCS, Cooperative State Research and Education Extension Service, state forestry agencies, and local Soil and Water Conservation Districts. CRP is a voluntary program for

[5] Personal communications, Renee Chambers with the Community Foundation, January 23, 2013 and March 23, 2013.

agricultural landowners, through which property owners can receive cost-share assistance to establish long-term, resource-conserving covers on eligible farmland. Participants enroll in CRP for 10 to 15 years. The Section 5 corridor includes five properties enrolled in the CRP and one beyond the corridor that could be affected by I-69 alignments.

The Environmental Qualities Incentives Program (EQIP) addresses locally identified problems with natural resources. High priority is given to assistance where agricultural improvements will help meet water quality objectives. EQIP offers contracts that provide incentive payments and cost sharing for conservation practices, such as manure management systems, pest management, erosion control, and other practices to improve and maintain the health of natural resources. No EQIP resources are located within the Section 5 study area.

## IDNR Classified Forest and Wildlands

The Classified Forest and Wildlands Program (CFWP) encourages timber production, watershed protection, and wildlife habitat management on private lands in Indiana. It is administrated by the IDNR. This program is available to landowners with at least 10 contiguous acres supporting a growth of native or planted trees, native or planted grasslands, wetlands, or other acceptable types of land cover that have been set aside and managed for the production of timber, wildlife habitat, and watershed protection. In return for meeting program guidelines, landowners receive property tax breaks, forestry literature, and periodic free inspections by a professional forester while the forest is enrolled in the program.

The lands are eligible for assessment at $1.00 per acre and taxes are paid on that assessment. The owner of Classified Forest and Wildlands does not relinquish ownership or control of his property and the IDNR Division of Forestry does not become connected in any way with ownership of the land. Part or all of the Classified Forest and Wildlands can be withdrawn from classification at any time by completing and recording the withdrawal forms provided by the district forester upon request. When a part of classified forest is withdrawn, the remaining area must be a minimum of 10 acres. If the remaining area is less than 10 acres, the whole tract must be withdrawn. The state forester may also withdraw the land from classification if the requirements of the law are not being met. When withdrawing land from classification, the owner must go to the county assessor and have the assessor complete a report on the real property taxes that would have been paid had the property not been classified.[6]

If IDNR Classified Forest and Wildlands are acquired for the I-69 project, the INDOT appraiser will consider any liability of the property owner may have for back taxes and/or penalties as a factor in the appraisal process. The Section 5 corridor includes eight properties identified as IDNR Classified Forest and Wildlands and one beyond the corridor that could be affected by I-69 alignments.

[6] Division of Forestry, "Indiana Classified Forest and Wildlands program," Indiana Department of Natural Resources, http://www.in.gov/dnr/forestry/4801.htm.

Impacts to the privately-owned, managed land as a result of the project are described in **Section 5.22**, *Managed Lands and Natural Areas*. **Table 4.3-1** provides a summary of managed lands in the Section 5 corridor and features that could be affected by the project. **Figure 4.3-25** illustrates the location of managed lands in the Section 5 corridor. Some overlap of properties and boundaries may exist across managed lands.

**Table 4.3-1: Summary of Managed Lands in Section 5 Corridor**

| Managed Land ID | Resource Name | Resource Class (Ownership) | Approx. Acreage in Section 5 Corridor | Total Acreage of Resource |
|---|---|---|---|---|
| **Local Community Parks and Open Space** | | | | |
| Public-1 | Mill Creek Easement | Private | 1.70 | 1.70 |
| Public-2 | Wapehani Mountain Bike Park | Public | 33.83 | 45.43 |
| Public-3 | Brown's Woods | Private | 11.01 | 11.01 |
| Public-4 | Brown's Woods | Private | 3.57 | 5.61 |
| Public-11 | Morgan-Monroe State Forest | Public | 240.58 | 25,544.81 |
| **Conservation Reserve Program** | | | | |
| CRP-5 | -- | Private | 2.90 | 2.90 |
| CRP-6 | -- | Private | 3.67 | 3.67 |
| CRP-7 | -- | Private | 0.77 | 0.80 |
| CRP-8 | -- | Private | 5.35 | 17.00 |
| CRP-9 | -- | Private | 19.41 | 30.32 |
| CRP-20 | -- | Private | * | 15.85 |
| **IDNR Classified Forest and Wildlands Program** | | | | |
| CFWP-10 | -- | Private | 3.74 | 14.20 |
| CFWP-12 | -- | Private | 16.56 | 105.20 |
| CFWP-13 | -- | Private | 18.60 | 177.15 |
| CFWP-14 | -- | Private | 1.07 | 11.19 |
| CFWP-15 | -- | Private | 24.52 | 24.52 |
| CFWP-16 | -- | Private | 0.65 | 0.65 |
| CFWP-17 | -- | Private | 10.24 | 148.23 |
| CFWP-18 | -- | Private | 2.45 | 41.26 |
| CFWP-19 | -- | Private | * | 46.04 |

*Source: USDA-NRCS, IDNR, City of Bloomington, Monroe County; 2008, 2011, 2012, and 2013.*
**These features would be affected by I-69 alignments, but are not located within the Section 5 Corridor.*

## Section 4.3 Figure Index

*(Figures follow this index, except as otherwise noted.)*

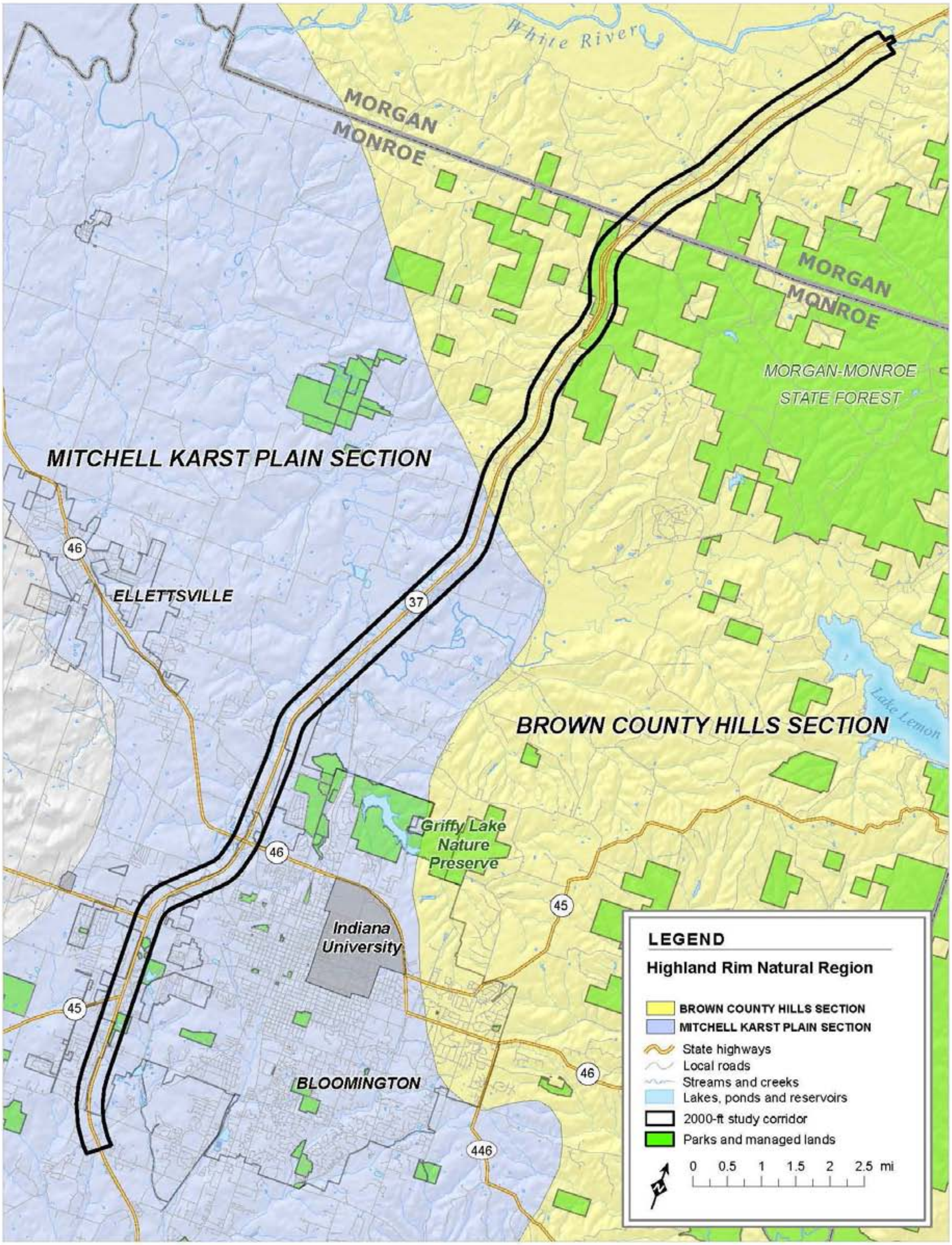



**Figure 4.3-1: Natural Region**

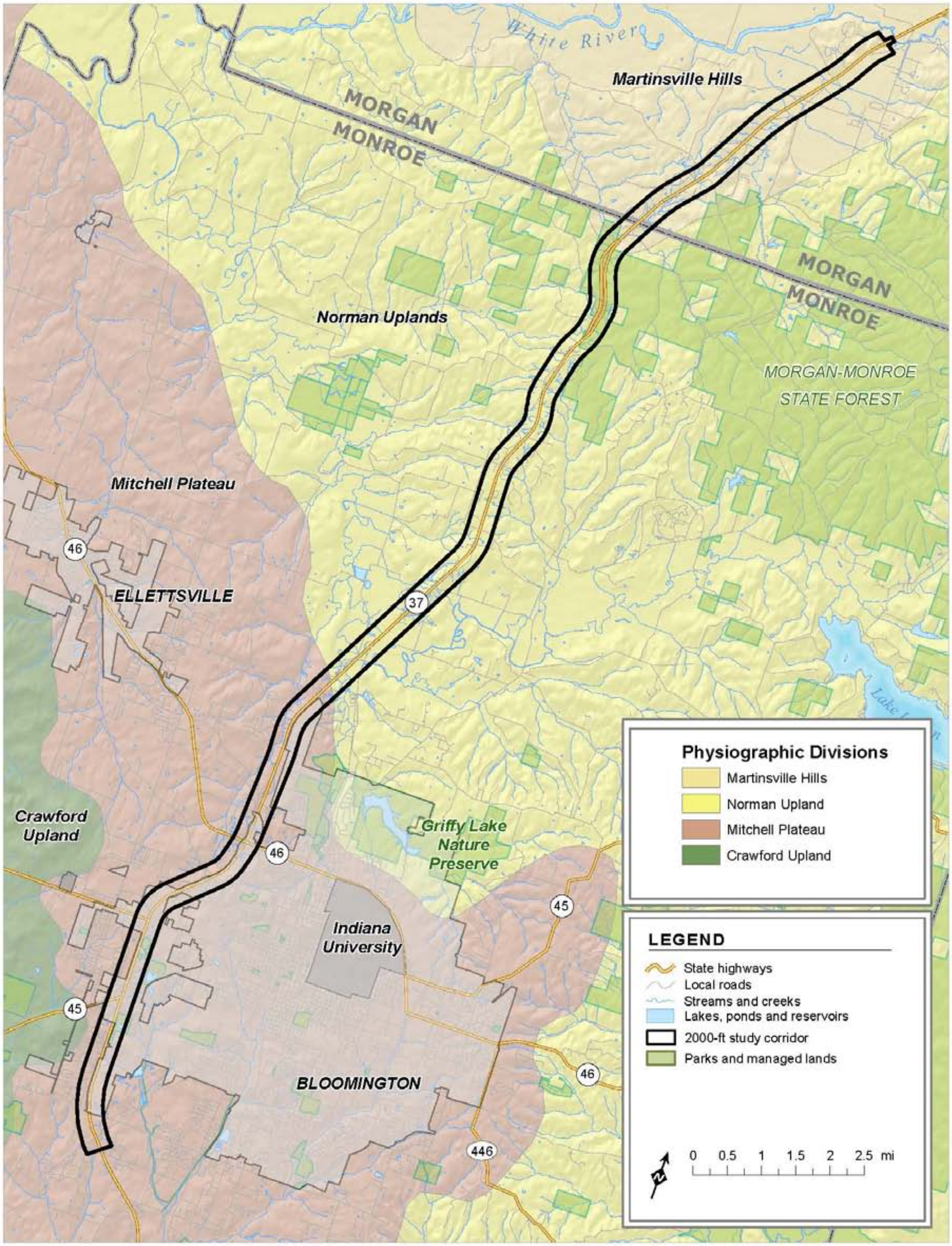



**Figure 4.3-2: Physiographic Divisions**

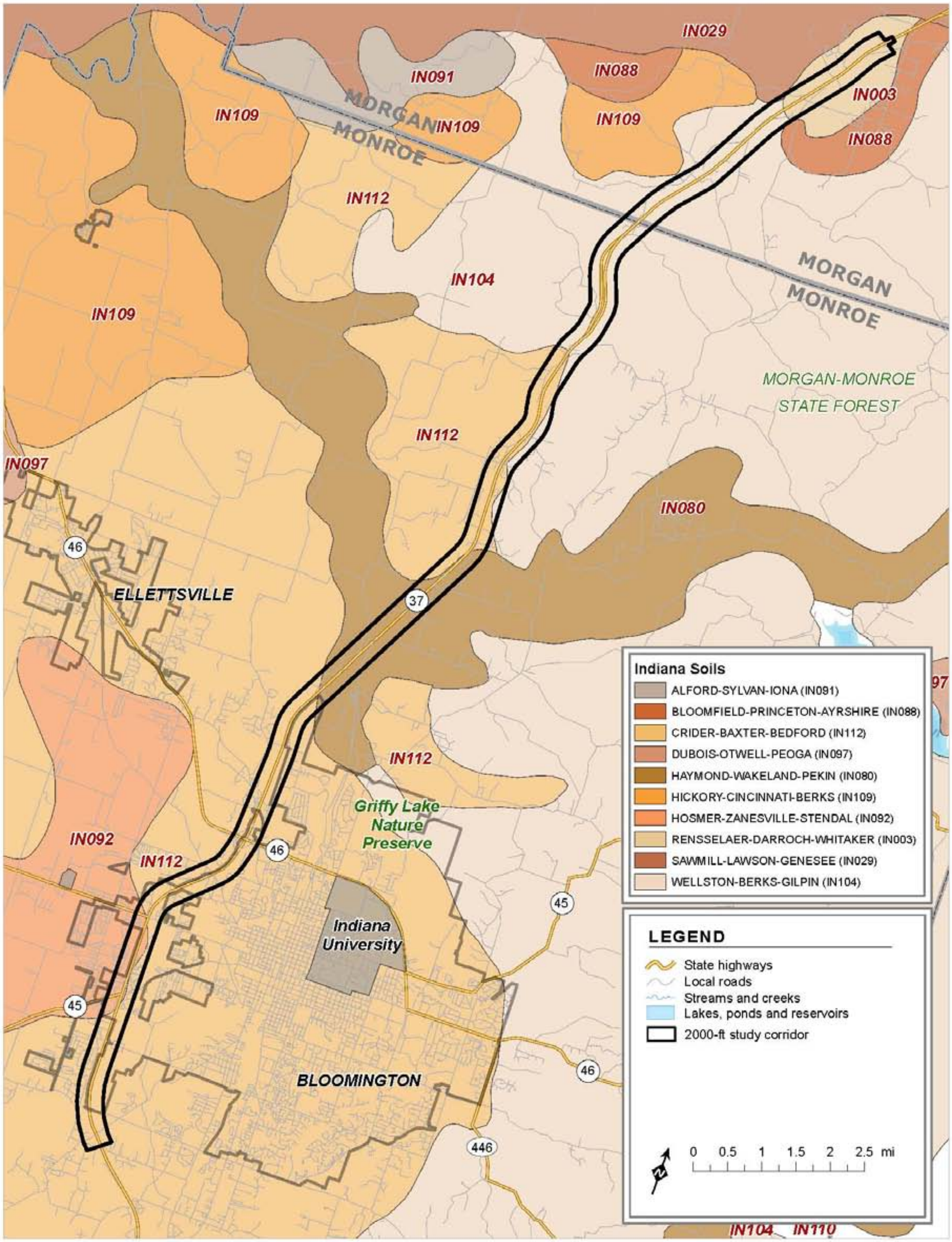



**Figure 4.3-3: Soil Associations**

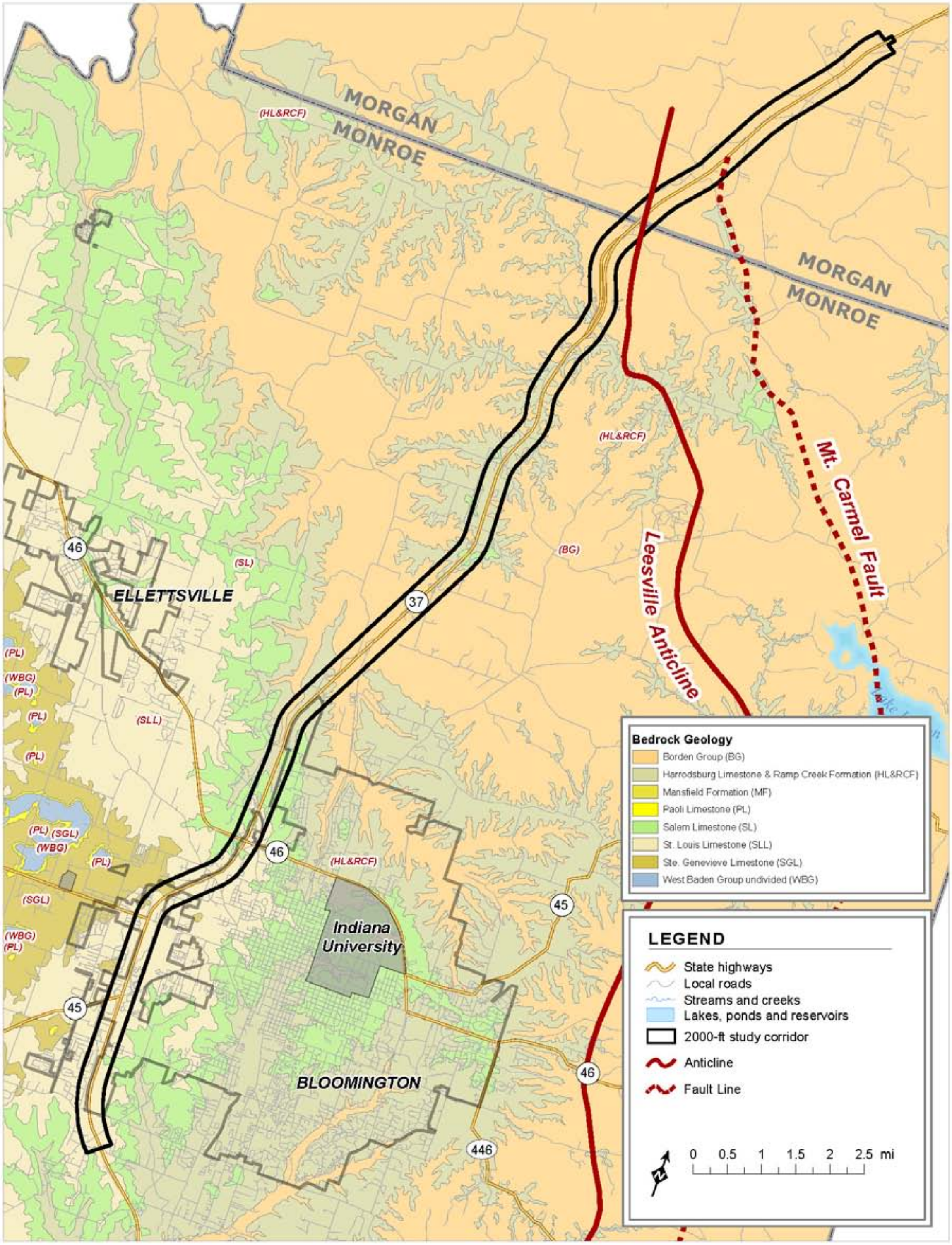



**Figure 4.3-4: Bedrock Geology**

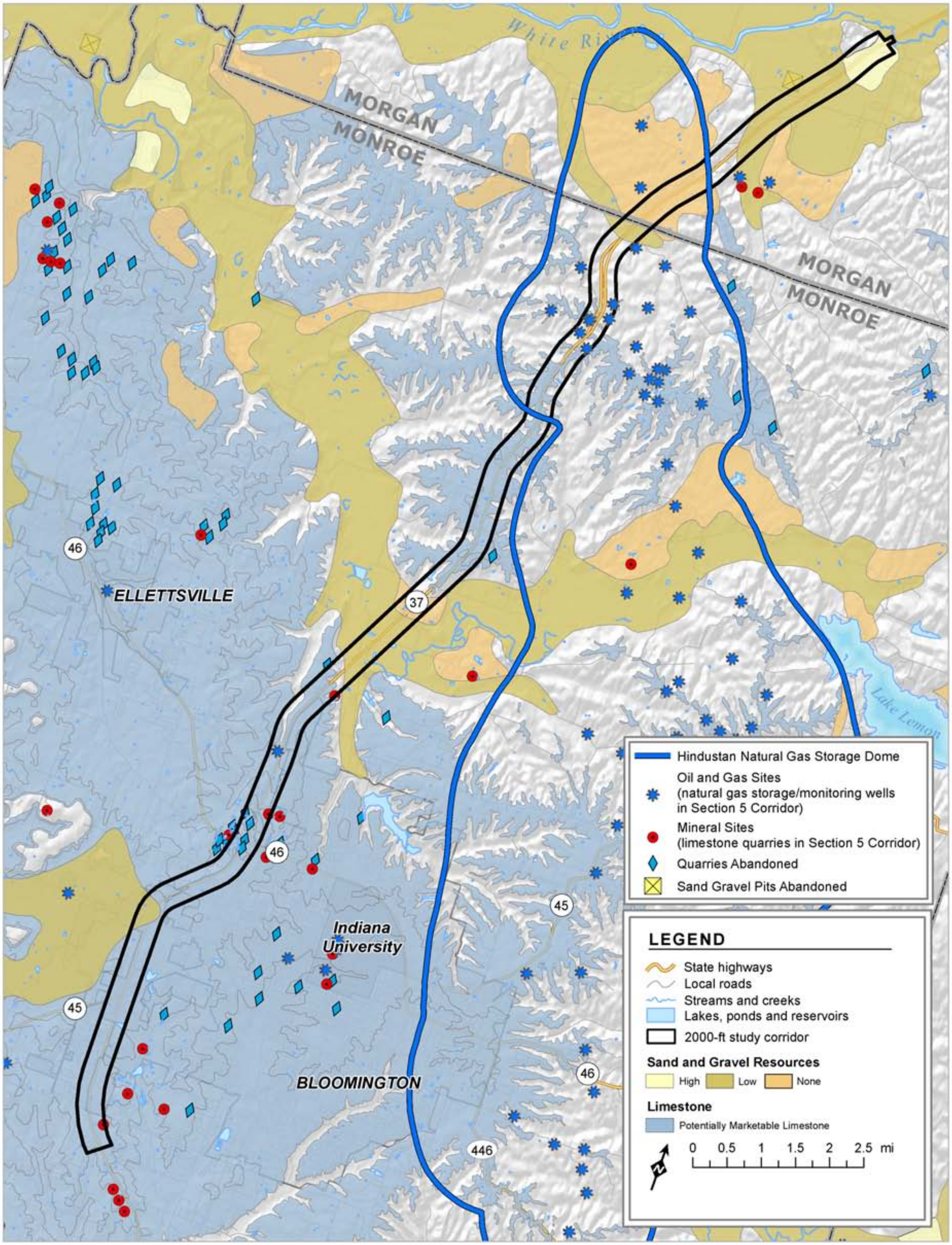



**Figure 4.3-5: Mineral Resources**

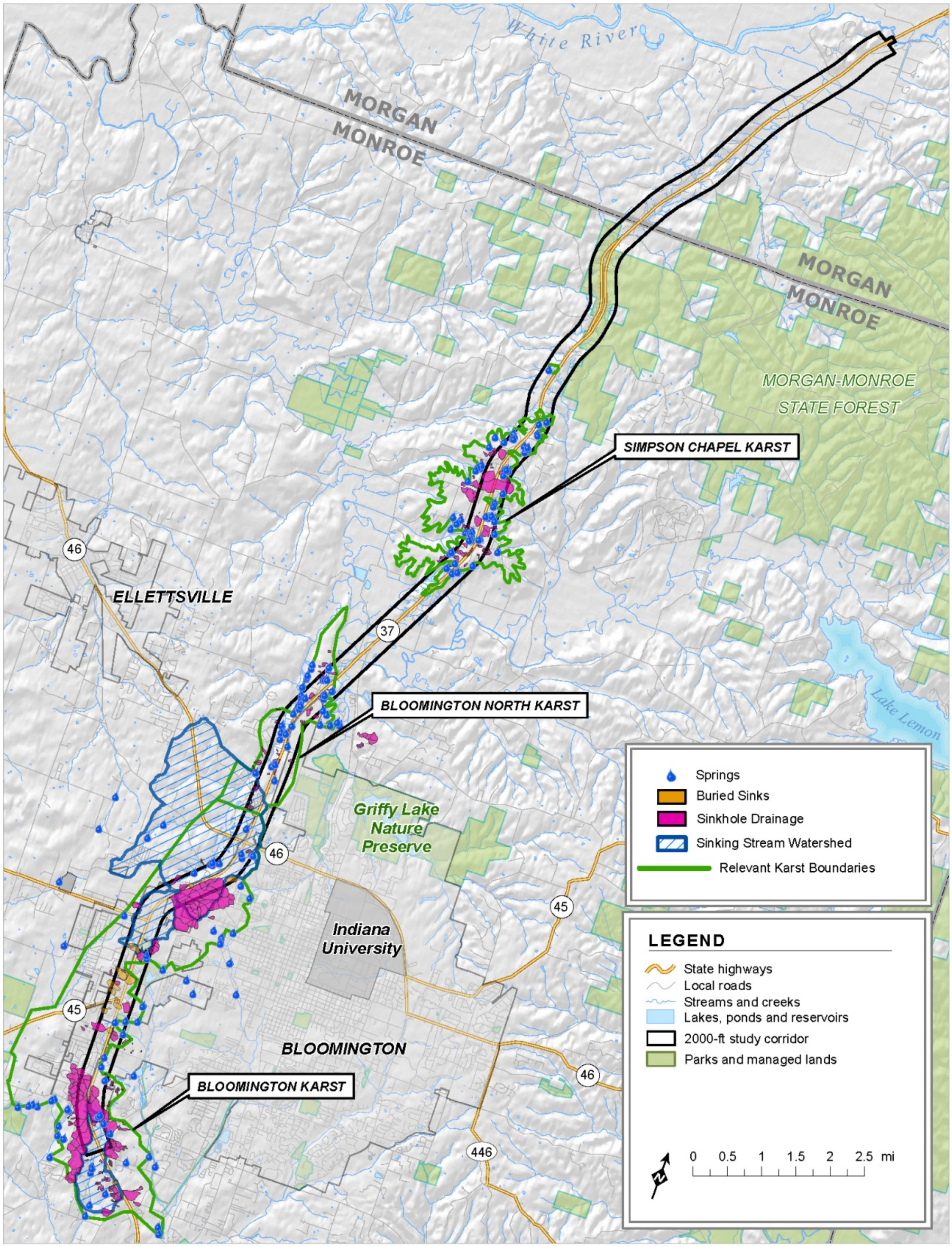



**Figure 4.3-6: Karst Features and Springs**

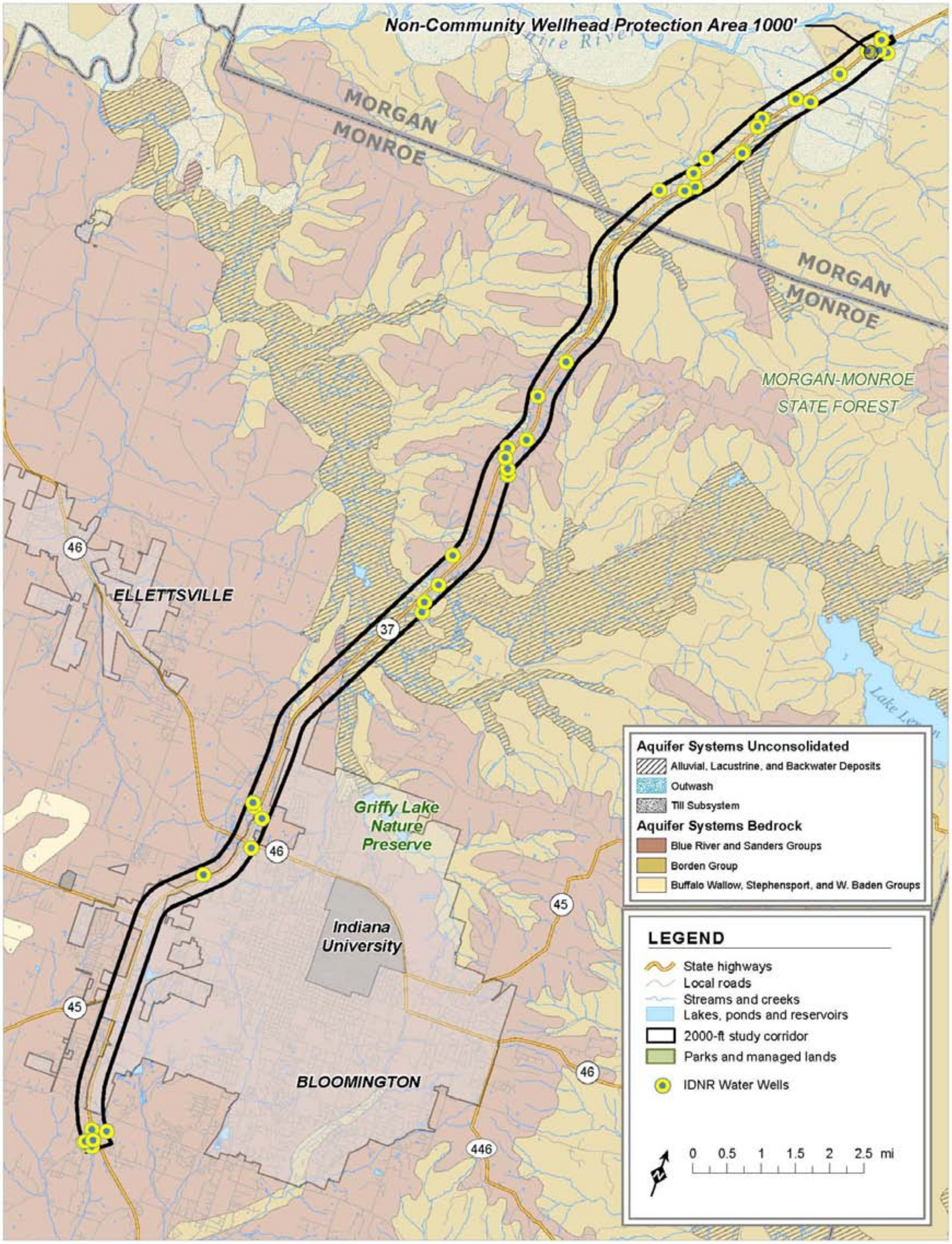



**Figure 4.3-7: Aquifers and Groundwater Wells**

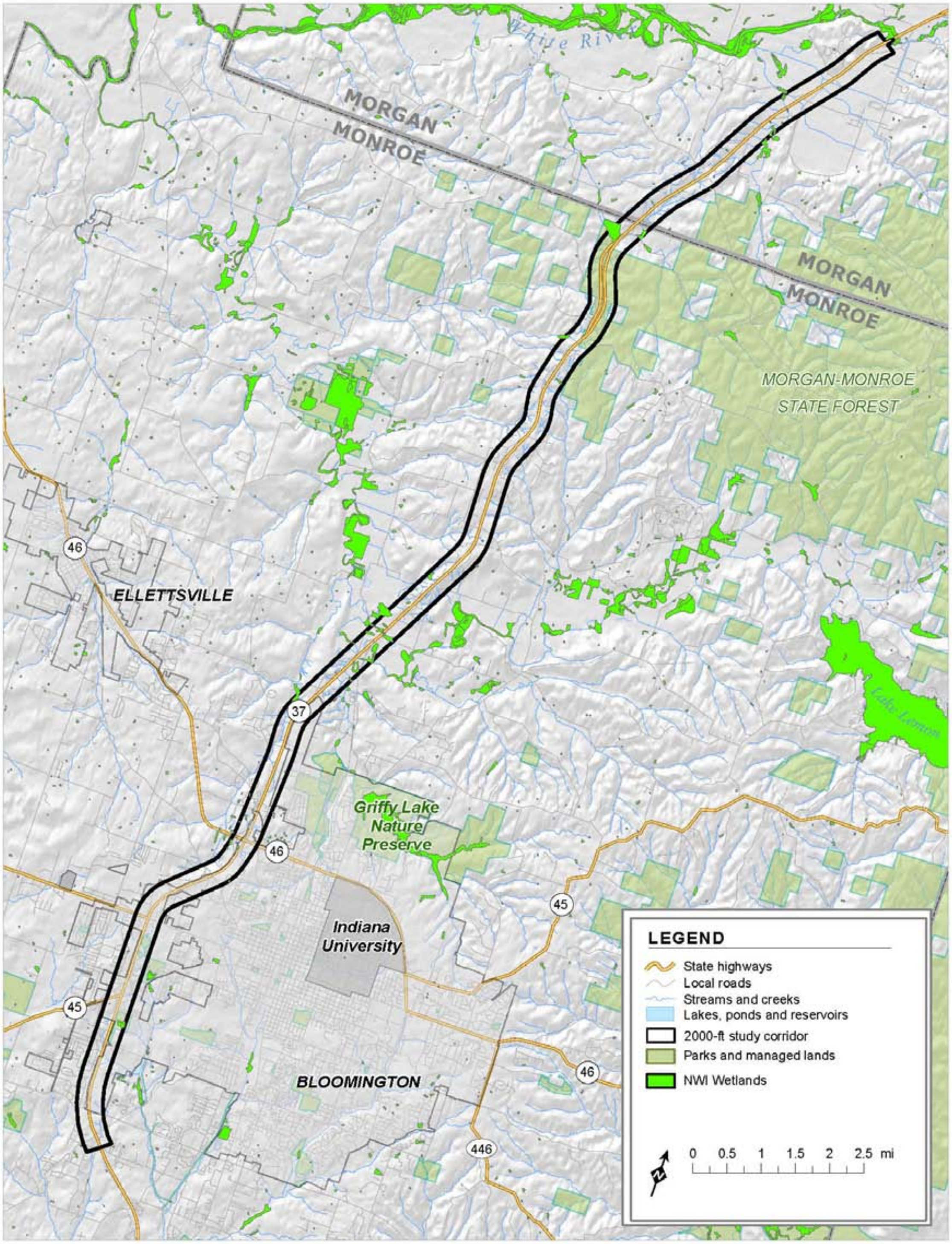



**Figure 4.3-8: NWI Wetlands**

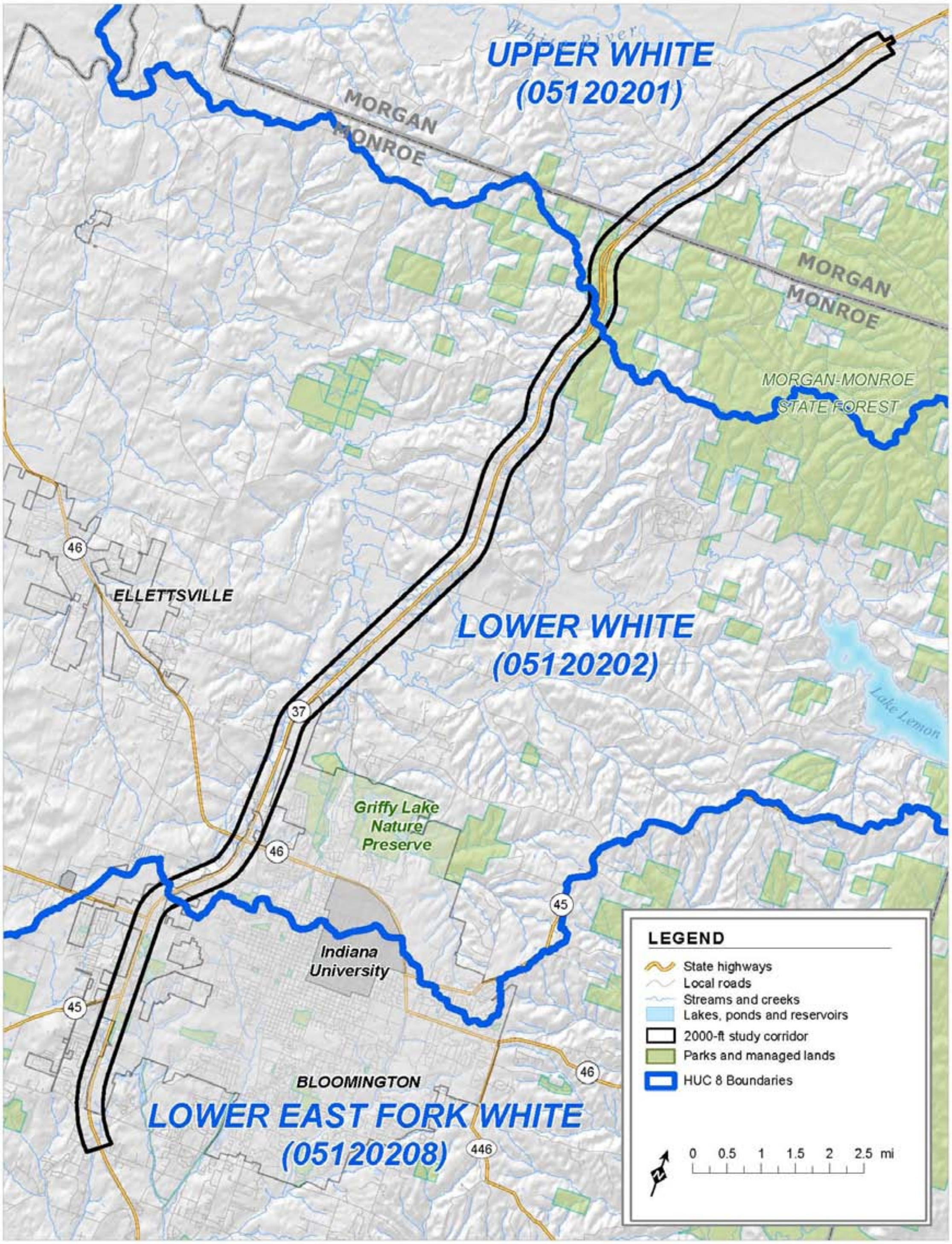
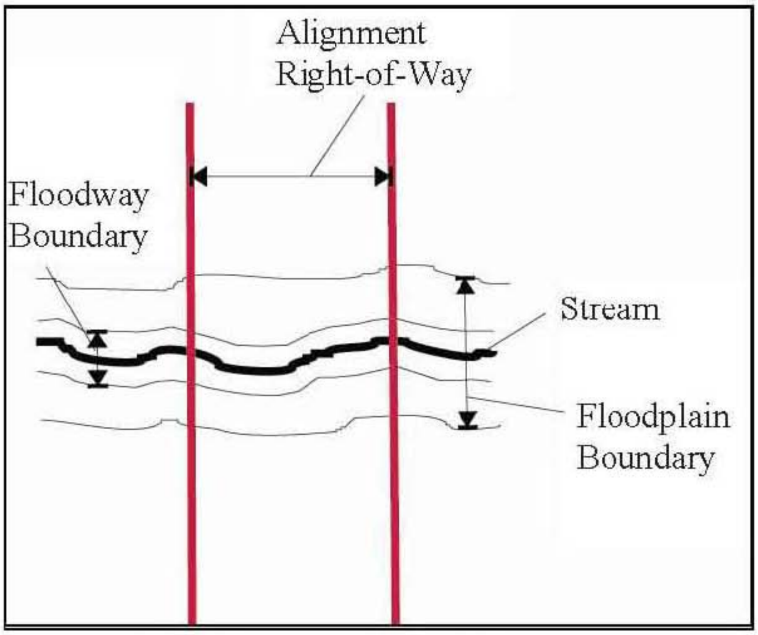
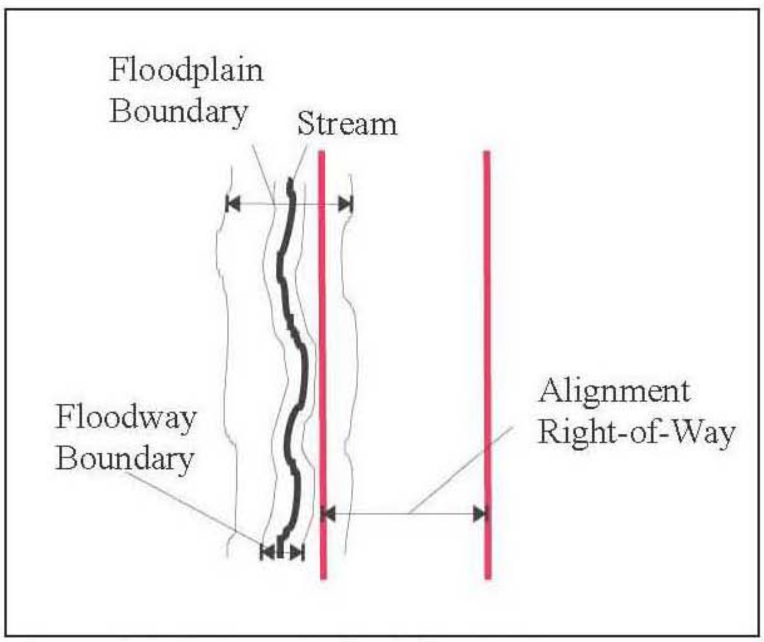



**Figure 4.3-10: Study Corridor HUC 8 Watersheds**




**Transverse Floodplain Encroachment**




**Longitudinal Floodplain Encroachment**

**Figure 4.3-12: Types of Floodplain Encroachment**

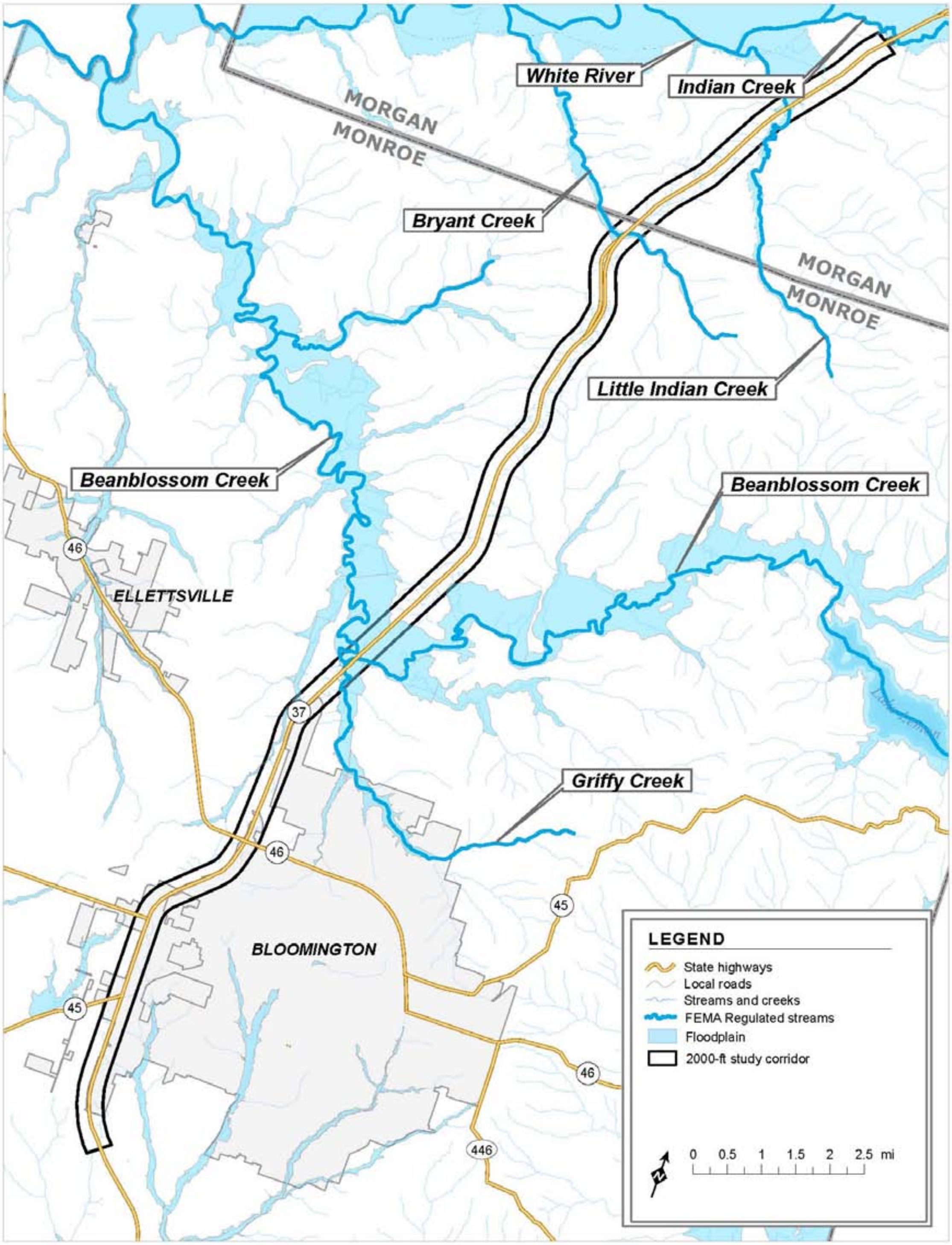



**Figure 4.3-13: Section 5 Study Area Floodplains**

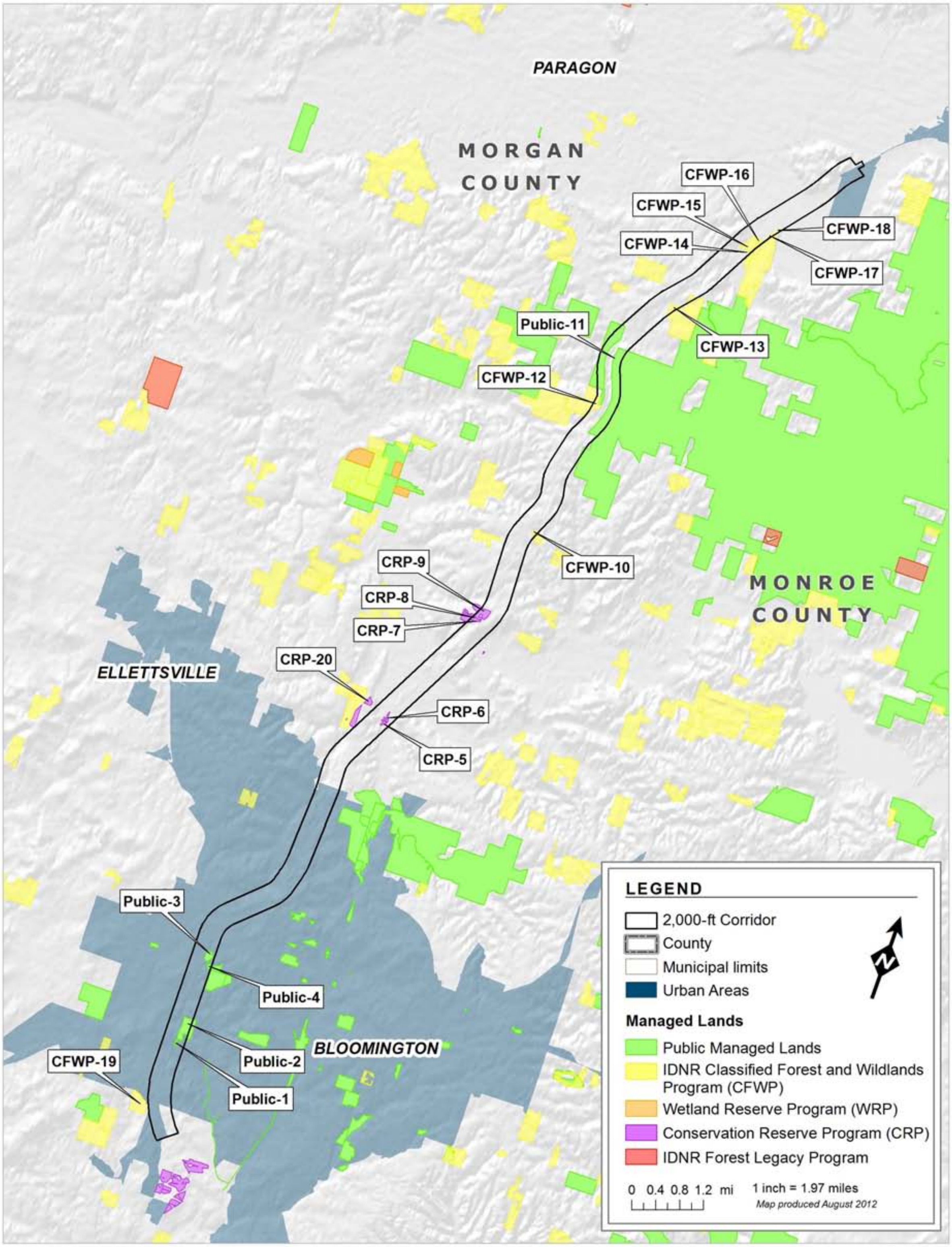



**Figure 4.3-25: Managed Lands in Section 5**

## 4.4 Cultural Resources

Since the publication of the Draft Environmental Impact Statement (DEIS), the following substantive change has been made to this section:

- **Section 4.4.3.2**, *Tier 2 Archaeological Investigations*, was updated to reflect the Phase Ia studies that have been completed.

Section 106 of the National Historic Preservation Act (1966), as amended, and its implementing regulations, 36 CFR Part 800 require the federal government to "take into account" the effects of its proposed actions on historic and archaeological resources before making project decisions. Historic and archaeological sites listed in or eligible for listing in the National Register of Historic Places (NRHP) are afforded protection under federal regulations. Therefore, in this section, a property or archaeological site will only be referred to as "historic" if it is either listed in or eligible for listing in the NRHP.

### 4.4.1 Cultural Overview

The following cultural overview is a synthesis of various sources concerning the cultural periods of south-central Indiana, including the Section 5 Study Area—from prehistoric to historic times. A detailed discussion of these periods is included in the *Phase Ia Archaeological Survey of the Indiana I-69 Evansville to Indianapolis Study, Section 5 (From SR 37 to SR 39), Monroe and Morgan Counties, Indiana, April 13, 2012* (Hinks and Lombardi 2012), prepared for the Tier 2 Section 5 project.

**Table 4.4-1: Cultural Periods and Sub-Periods**

| Cultural Period | Sub Period | Date Range | Cultural Phase | Sample of Diagnostic Artifacts |
|---|---|---|---|---|
| Paleoindian | | 10,000-8000 B.C. | | Clovis, Cumberland, Dalton, Quad, and Plano points |
| Archaic | Early Archaic | 8000-6000 B.C. | | Dalton, Kirk, Thebes, St. Charles, Big Sandy, St. Albans, LeCroy, Pine Tree Corner Notched, Stilwell, and other large side notched and bifurcate points |
| | Middle Archaic | 6000-3500 B.C. | | Raddatz, Stanley Stemmed, Godar, Karnak, Matanzas, and other side-notched points |
| | Late Archaic | 4000-1500 B.C. | French Lick<br>Stalcup<br>Scherschel | Matanzas, Brewerton, Karnak, Ledbetter, McWinney, Lamoka, and Table Rock points |
| | Terminal Archaic | 1500-700 B.C. | Riverton | Trimble, Merom, McWhinney, and Turkey Tail points |

**Table 4.4-1: Cultural Periods and Sub-Periods**

| Cultural Period | Sub Period | Date Range | Cultural Phase | Sample of Diagnostic Artifacts |
|---|---|---|---|---|
| Woodland | Early Woodland | 1000-200 B.C. | Adena<br>Crab Orchard | Gary, Kramer, Dickson, Adena, Motley, Robbins, Turkey Tail, Morgan, and Black Creek points; Marion Thick and Crab Orchard ceramics |
| | Middle Woodland | 200 B.C.–A.D. 600 | Mann<br>Worthington<br>Allison-LaMotte<br>Albee | Snyders, Steuben Stemmed, Lowe Flared Base, Robbins, Chesser Notched, and Bakers Creek points; Crab Orchard, Havana, and Scioto ceramics. Also, clay figurines, copper celts, panpipes, and platform pipes. |
| | Late Woodland | A.D. 600-1200 | Albee<br>Oliver | Madison, Fort Ancient, Levanna, Hamilton, Raccoon Notched, Jack's Reef Corner Notched points; various shell tempered ceramics, and ceramic pipes |
| Late Prehistoric | | A.D. 1200-1650 | Oliver<br>Anderson<br>Smith Valley Complex<br>Caborn-Welborn<br>Mississippian<br>Fort Ancient | Madison, Nodema, and Cahokia points; various shell tempered ceramics; ceramic pipes; and celts. |
| Historic | Colonial and Territorial | Ca. 1650s-1816 | | Late prehistoric and protohistoric Native American artifacts transitioning into increasing use of European-American trade goods. Redware, tin-glazed earthenware, white salt-glazed stoneware, creamware, pearlware, hand-blown bottles, wrought iron nails, etc. |
| | Antebellum and Civil War | 1816-1865 | | Pearlware, whiteware, ironstone, painted and transfer printed ware decoration, redware, yellowware, Albany slipped stoneware, cut nails, blown-in-mold bottles, cylinder glass, porcelain buttons, etc. |
| | Postbellum and 20$^{th}$ century | 1865-present | | Whiteware, white ironstone, transfer printed and decal ware decoration, semi-vitreous "hotelware," Bristol glazed stoneware, cut nails and wire nails, aluminum objects, cylinder glass, flat drawn sheet glass, machine made bottles, plastic, etc. |

**Early Human Occupation.** The earliest known evidence of human occupation in Southwest Indiana includes stone tools and blades, often fluted, of the **Paleoindian** period (prior to 8000 B.C.). As the glacial ice sheets retreated at the end of the last Ice Age, the aboriginal hunters of this time are thought to have followed the huge herds of game into the area along the glacial sluiceways that carved the wide flood plains of today's rivers. These hunters found a cool, humid environment covered with dense forests of hemlock and pine. These forests were inhabited by a myriad of game including mega-fauna such as giant beaver, great elk, caribou, and perhaps woolly mammoths.

In Indiana, the Paleoindian period is divided into two sub-periods. The division of these two sub-periods is based on a general climatic trend from a cooler, moist environment with coniferous forest to a warmer, drier environment with a deciduous forest around 8900 B.C. This warming trend marks a transitional period where there is a change in subsistence patterns away from big game hunting to a more generalized resource procurement strategy. Early Paleoindians were small bands of highly mobile hunter gatherers that moved their camps several times a year, resulting in small, short term, specialized activity sites scattered across the landscape. These small sites are only evident as surface finds of a few scattered lithic artifacts. Larger, more diversified Early Paleoindian sites do occur; these sites typically are situated on terrace and floodplain settings where they could monitor, procure, and process game, or near high quality raw material sources where Clovis groups could manufacture and repair their toolkits. With resources more evenly dispersed, Late Paleoindian groups were less mobile than their predecessors. They practiced a more settled way of life, probably with smaller territories and only seasonal migration. As these groups settled on the landscape, Late Paleoindians inhabited areas not previously occupied by earlier Paleoindian groups. There was a continued use of river valleys and transitional zones along the edges of the till plain, and an increased use of lakes and marshy areas in deciduous forest environments.

As warmer and drier climatic conditions prevailed and the mega-fauna became extinct, the **Archaic** period (8000-1000 B.C.) ensued. The Archaic period spans 7000 years and refers to the archaeological remains of post-Pleistocene hunter gatherers that did not make or use pottery. The change in climatic conditions and available food resources led to dramatic changes in subsistence and settlement strategies, quite different from the Paleoindians. Changes include an increase in population, a growing technological sophistication, a broadening subsistence base, greater residential stability, the establishment of trade networks, and burial ceremonialism. These changes occurred slowly over time between 8000 B.C. and 1000 B.C.

The division of the Archaic period into three sub-periods (Early, Middle, Late) is based on temporal, technological, social, subsistence, and settlement criteria. During the Early Archaic period, the climate warmed, and a boreal (coniferous) forest developed regionally. By the end of the Early Archaic period, this forest had gradually transformed into a mixed deciduous forest, not dissimilar to the modern forest. The coniferous forest that dominated the Early Archaic period typically contained fewer mast foods and game resources than the earlier and later environmental settings. Early Archaic adaptation to the somewhat lower resources generally available during that subperiod tended to encourage the natives to lifestyles of substantial mobility in small groups. This enabled those groups to gather the available food resources in particular areas, then move to other areas to continue that procedure. Given their mobility, Early Archaic groups typically left ephemeral sites on the landscape, with little midden accumulation, and only light scatters of lithic debris on the landscape in Indiana. Accordingly, storage pits and houses from this period are unknown within the study corridor. Early Archaic sites, similar to Paleoindian sites, are often isolated points found in upland areas (Stafford, 1997). Larger sites are in major river valleys, although land surfaces dating from this period often are buried under alluvial sediments.

The Middle Archaic period is often regarded as falling within the Altithermal, a warming and drying trend that expanded prairies eastward. This expansion of grass and herb communities probably affected Middle Archaic settlement and population distributions. Studies from the northern part of the state indicate that by the Middle Archaic there was a decrease in population. Only in areas where there was increased elevation and possibly a different resource base were Middle Archaic sites well represented. In the beginning of the Middle Archaic, groups were highly mobile, a trend similar to Early Archaic period. Towards the end of the Middle Archaic, sites start to contain deep middens, a high diversity of tool types, and burials. These characteristics indicate increased sedentism with intensively occupied sites utilized on a long-term or year round basis. Most of these larger Middle Archaic sites are located along major river drainages.

Late Archaic cultures in eastern North America reflect a continuation of the trend toward greater specialization and adaptation first evident in the Middle Archaic. Adaptation to unique regional environmental conditions resulted in the development of specialized technologies used to exploit locally available plant and animal resources. Compared to previous periods, Late Archaic technology displays an increase in tool types, including a wide range of flaked stone, ground stone, and bone tools used for a variety of specialized extractive and maintenance tasks. The Terminal Archaic is a transitional period between the Late Archaic and the Early Woodland, ranging from 1500-700 B.C.

The process of adaptation to the local environment and further utilization of available resources continued with the introduction of pottery, marking the transition to the Woodland period (1000 B.C. – circa A.D. 1200). Although divided into three sub-periods, the Woodland period has a greater number of cultural phases and spatially discrete recognized societies than previous periods. The three sub-periods are the Early Woodland (1000-200 B.C.), the Middle Woodland (200 B.C.-A.D. 600), and the Late Woodland (A.D. 600-1200). The major distinction between the Woodland and the Archaic periods is the development of ceramic technology and the use of ceramic vessels as part of everyday life. Often associated with this ceramic technology is the development of complex, hierarchical societies in many parts of the Eastern Woodlands. Such societies developed after the adoption of a small number of native plants as cultigens, which began to play an important role in the diet. In addition, the construction of numerous burial mounds and other earthwork features become part of the archaeological record.

Early Woodland subsistence patterns changed little from the Late Archaic period. Hunting and gathering remain the main subsistence strategy, with garden products supplementing the Woodland diet. The disappearance of shell middens indicates that mussels were no longer a major part of the diet. Plant domestication, which began in the Late Archaic, was markedly intensified. Part of this process involved an increase in the exploitation of seeds relative to nuts. Plants cultivated during the Early Woodland in Indiana include the Mesoamerican domesticate gourd, and indigenous weedy annuals such as maygrass, sumpweed, giant ragweed, and possibly erect knotweed, groundnut, and sunflower. Mound construction and burial ceremonialism continued from the Late Archaic gradually increasing in complexity. By the Early Woodland, burial mound complexes became abundant, and mortuary and ritual rites more elaborate.

Middle Woodland settlement systems are similar to their Early Woodland predecessors. In the early Middle Woodland period, groups resided in small, scattered settlements, with ritual spaces, such as burial mounds and earthen enclosures serving as focal points. In the late Middle Woodland period, there is a trend toward nucleation of settlements. Evidence of Middle Woodland subsistence indicates a continuation of a hunting-collecting-fishing strategy from the Early Woodland, with an increase in the exploitation of plant cultigens. During the Middle Woodland, there are changes in the ceramic technology, lithic technology, subsistence, and settlement practices from the Early Woodland.

The Late Woodland period began about A.D. 600 and ended with the onset of Late Prehistoric cultures at about A.D. 1200. This period is seen as less culturally complex when compared to the Middle Woodland period with its burial mounds, decorated ceramics, and exchange networks; and the Late Prehistoric period with its complex cultures, decorated ceramics, and long distance trade networks. The Late Woodland period at times is defined by what it lacks, rather than what it possesses. For instance, large earthworks are no longer constructed; burial mounds in some areas are not as elaborate and serve as general cemeteries; exotic raw materials from trade networks are nearly absent; and craft specialization diminishes. However, the Late Woodland introduces two new traits: the widespread use of the bow and arrow and full-scale, intensive agriculture.

The **Late Prehistoric Period** (ca. A.D. 1200-1650) follows the Woodland and extends to Euro-American contact. The years before European contact is a time when Native Americans shifted to a largely sedentary, agricultural lifeway, started living in nucleated settlements, and established some level of ranked socio-economic organization. There are three main cultural complexes within southern Indiana at this time: Mississippian, Oliver Phase, and Fort Ancient. The Mississippian tradition is present in Southwestern Indiana along the Ohio and Wabash Rivers, and the Fort Ancient tradition is present in the southeastern corner of Indiana (Kellar 1983:60). Little evidence for Mississippian occupation exists within the West and East Forks of the White River valley. In Indiana, Fort Ancient is limited to a narrow area in the Ohio Valley, generally east of Floyd County, and extending northeastward into the Whitewater Valley. It extends southeast and eastward, generally in Ohio Valley region, through much of southern Ohio, northeastern Kentucky, and western West Virginia (Pollack and Henderson 2000:195).

McCullough (2005) provides a good overview of the Oliver Phase attributes, as currently understood. He describes it as a "sedentary, village-dwelling society that settled along the drainages of the east and west forks of the White River between about A.D. 1200 and 1450" (McCullough, 2005:28). Village sites typically were located on sandy-loamy alluvial soils within broad floodplains or on the adjacent terraces. These villages usually were circular and often protected with wooden post stockades and adjacent ditches. There was much reliance on maize agriculture in these villages. Madison projectile points are common at these sites. Where preservation permits, the Oliver village sites typically contain a wide range of bone and antler tools, such as awls, pins, needles, flakers, fish hooks, and some antler socketed projectile points.

Despite the reliance of the Oliver Phase people on maize agriculture, hoe tools rarely are recovered from the sites. Within the villages, much pottery was manufactured and utilized by the residents, typically comprised of a distinctive mixture of Fort Ancient and Great Lakes Impressed pottery styles (McCullough, 2005).

Subsistence practices during the Late Prehistoric Period are more efficient than the Woodland period. This efficiency seems to coincide with the introduction of a new type of maize (probably from Middle America) suited to the environmental conditions of the area. As a result, populations became dependent on maize, beans, and squash. In addition to the cultigens, native plants and animals supplemented the diet, while tobacco was also cultivated at this time.

**Protohistoric Period.** During the 1400s through the 1700s, there was a decline in Native American populations in North America, largely due to a combination of European diseases, famine, and warfare. By 1700, Native American tribes, including the Miami, Potawatomi, Delaware, Wea, Shawnee, Wyandot, Kickapoo, Piankashaw, and Mascoutens, claimed most of Indiana. The Miami in the upper drainage, the Wea in the central drainage, and the Piankashaw in the lower drainage controlled the Wabash River Valley. The Kickapoo occupied the northern and west central portions of the state and the Potawatomi inhabited areas near the Indiana-Michigan border. During the eighteenth century, the Shawnee moved into the Ohio River Valley and the Delaware into the White River Valley. Most of these Native American populations had been displaced by Europeans or competing tribes from their original lands before settling in Indiana. For instance, in 1680, the Miami established themselves in Indiana because of conflicts with the Iroquois over fur trading with the French and English.

**Historic Period Overview.** The first European settlers in Indiana were the French, who established trading posts in the 1700s near the Indian villages of Kekionga (Fort Wayne), Ouiatenon (near Lafayette), and Chippecoke (Vincennes). By the 1740s and 1750s, English interest in the fur trade fueled tensions leading to the French and Indian War. The Treaty of Paris in 1763 gave the British control over Indiana. In 1783, the British lost control of the region to the American Colonists (Parker, 1997). After the Revolutionary War, Indiana was part of the larger Northwest Territory, which extended north of the Ohio River to the Great Lakes and west of the Allegheny Mountains to the Mississippi River.

**Nineteenth and Twentieth Century Euro-American Period**

In 1800, when Ohio applied for statehood, the remaining Northwest Territory became the Indiana Territory. Vincennes served as the capital and William Henry Harrison was the first governor. Between 1801 and 1809, Harrison passed several treaties that acquired the southern part of the state from Native American populations and opened the area for settlement (Parker 1997). Native Americans upset with the loss of their land united under Chief Tecumseh and his brother Tenskwatawa (known as the Prophet). With encouragement from the British, Native American resistance resulted in the Battle of Tippecanoe in 1811. This battle destroyed the Shawnee village in Prophetstown, and subsequently contributed to the War of 1812 (Barnhart and Riker, 1971). The War of 1812 secured stability on the frontier for settlement (Carmony, 1966).

**1816-1850**

During the territorial period, the United States government was in the process of waging war with the various American Indian tribes and/or negotiating a series of treaties with them to open up territory for settlers. Two of these treaties controlled the white settlement patterns in Monroe and Morgan counties. The Fort Wayne treaty of 1809 allowed settlers to occupy approximately two thirds of the area currently defined as Monroe County including Bloomington. Nine years later the remainder of what is now Monroe County as well as that area currently occupied by Morgan County and Martinsville was opened to settlers by the New Purchase Treaty of 1818. (Parker 1997). By 1840, various groups of the Miami and Potawatomi signed treaties that ceded all Native American lands except for small reservations. Even these small reservations did not last because U.S. policy forced remaining Native Americans to move west (Carmony, 1966).

In 1816, Indiana entered the Union with an 1815 population census of 63,897 people. The first capital was Corydon, until it was moved to Indianapolis in 1824. Monroe County was created in 1818, two years after Indiana achieved statehood. Morgan County was founded in 1822, and Martinsville became its county seat in the same year. People living in and coming to the newly founded state went about the business of establishing farms and communities, increasing and improving transportation routes, and developing commerce and industry, all as part of the process of creating a Euro-American civilized place out of the wilderness (Madison, 1986).

The change in the landscape of the Hoosier state and Southwestern Indiana during this era was tremendous. The first settlers wrote of traveling along American Indian traces beneath a dense canopy of virgin forest. The settlers cleared these trees for farming and to build homes and towns. By 1850, road clearing progressed and trains were traveling daily from Madison, Indiana, on the Ohio River, to the capitol city of Indianapolis. That railroad line, the Madison and Indianapolis Railroad, was completed in 1847, and was the first railroad line built in Indiana. Many more lines were constructed over the next decade (Hoover, 1980; Simons and Parker, 1997:9-14).

During 1816 to 1850, the largest number of native-born migrants to Southwestern Indiana came from the Upland South, with smaller numbers from the Tidewater South, the Mid-Atlantic states, and New England. The most dominant group of foreign immigrants came from Germany. African Americans arrived in Southwestern Indiana as fugitive slaves and as free men and women. Slave owners sometimes brought slaves to the territory prior to statehood, even though the Northwest Ordinance, and later the first state constitution, expressly prohibited slavery. Free blacks sometimes settled on farms in rural communities located near a Quaker settlement because of the sect's history of racial tolerance. In Southwestern Indiana, they tended to settle along the rivers. Evidence suggests that blacks and whites were not segregated in Indiana towns even as late as the 1850s. In addition to slaves and free blacks, an unknown number of enslaved African Americans passed through the state to eventual freedom by following the Underground Railroad (Weintraut, *A Measure of Autonomy*, in progress).

Town development first occurred near the area that is now Bloomington, where the township's first land sales took place in 1816. By the end of 1818, the village was inhabited by 30 families and had been designated the county seat (Blanchard, 1884:451; Vlahakis, 1998:34). Outside the village, Monroe County settlers found that the best soil was adjacent to rivers and creeks, and attractive for farming (Hawes, 1989:xv). Morgan County's first settlers, who lived outside the Study Area townships, arrived between 1817 and 1819. In 1822, the village of Martinsville, along the White River, was created in Washington Township and became the county seat (Blanchard, 1884:81-82).

The development of transportation networks would transform the frontier. The construction or improvement of wagon roads in the southern counties, beginning in the 1820s, provided Monroe and Morgan counties with access to developing markets (Cline and McHaffie, 1874:142). Stage lines began operation, including one that initiated service through Bloomington in approximately 1836. Hall (1922:78) states that "One of the most prominent factors in the early life of Bloomington, the really premier project which put Bloomington on the map and advertised the town and this section of the state, was its first stage line."

For much of this era, industry consisted of artisan shops, not the large-scale endeavors associated with factories of the later nineteenth century. Local industry initially focused on transforming raw materials into finished products easily shipped to markets outside their immediate vicinity. In addition, local blacksmiths, tanners, coopers, and millers transformed raw materials for use by local citizens. Hence, agriculture-related industries – distilleries, milling, pork packing – and extractive industries were most prevalent in Southwestern Indiana. In Monroe and Morgan counties, and elsewhere in the region, grist mills and saw mills were among the earliest industrial facilities. The first commercial quarrying in the limestone belt began in 1827 at Stinesville, Monroe County, northwest of Bloomington. The Stinesville quarry, operated by Richard Gilbert, was the first site at which limestone was cut rather than gathered. Despite its attractiveness as a building material, however, Indiana limestone was not quarried extensively during the 1816-1850 period (McDonald, 1995:6-7; Vlahakis, 1998:36).

When Indiana became a state in 1816, the first state constitution called for the sale of proceeds of land from Section 16 in each township to pay for common schools. Although this means of funding education would prove insufficient, some Indiana pioneers began schools as they settled in the fledgling state. Early educational experiences also occurred in homes, where parents taught children to read. In terms of religion, by 1850, Methodist, Baptist, and Presbyterian churches accounted for 1,488, or 73%, of the 2,032 churches in the state (Madison, 1995:99).

**1851-1880**

The period between about 1851 and 1880 is known as the "Civil War era." No event so dominated the history of the Study Area, the entire state, and the nation, as did the Civil War. The period preceding the war was filled with tension and debate over the meaning of nation and republic. The nation was consumed by war news; death tolls staggered the imagination and touched nearly every segment of society. Even Indiana, a state that experienced only a few minor skirmishes within its borders, was focused on its contribution to the war effort. Moreover, the effect of the war was felt beyond the years of the actual conflict (Madison, 1986:194-205).

In the postwar world, Hoosiers faced a financial boom and then panic. At the same time, farmers were selling surplus crops and looking for ways to increase production. As one might expect, the Civil War halted most building projects and changed the function of some sites, structures, and buildings to fit wartime needs. Men left widows and children, increasing the need for care by the state and private groups, such as a relief aid society for the benefit of soldiers' families (Madison, 1986).

Railroads became a functional part of the transportation landscape during this era, allowing towns and villages in Southwestern Indiana to grow as centers for importing goods and exporting agricultural surplus, coal, and limestone to regional markets. Track mileage in the state grew from an initial 228 miles in 1850 to 2,163 miles by 1860, and reached 6,471 miles by 1900 (Historic Landmarks Foundation of Indiana, 1987). Although a few short or regional lines were built prior to the Civil War, the major push to build rail lines came in the 1870s and 1880s. Small regional companies made the mining and shipping of coal, and later limestone, a profitable business. By 1880, the major towns in Southwestern Indiana were linked by rail, and the steam railroad was the most important form of contemporary transportation (Phillips, 1968:224). Martinsville gained rail service in 1852-1853, when the Martinsville & Franklin Flat-bar Railroad reached the community (Blanchard, 1884:11, 108). The Indianapolis & Vincennes Railroad was founded in 1865, and was soon built to Martinsville. The New Albany and Salem Railroad was constructed to Bloomington in late 1853. It was renamed the Louisville, New Albany & Chicago Railroad in 1859, and in 1869 became the Louisville, New Albany & Chicago Railway. After the 1851-1880 period, it was reorganized as the Chicago, Indianapolis & Louisville Railway in 1897, and was renamed the Monon Railroad in 1956 (Dozall and Dozall, 1997:31-32; Simons and Parker, 1997:12). Despite the proximity of Bloomington to Martinsville, the two county seats were never directly connected by rail.

Farmhouses gradually underwent a transformation during this era as well. In the 1850s and 1860s, the round-log or hewn-log cabins of the frontier era gave way to hewn-log buildings, some of which were immediately covered with clapboard siding. In other cabins mud nogging was employed to seal the exterior walls between the logs and the cabins were covered, either at the time of construction or later, with clapboards when money allowed. Porches served to shelter entrances and to provide outdoor living spaces in the warm seasons. Toward the end of this era, the lighter and less expensive balloon-frame construction began to be used, especially in additions to the primary log house (Sieber and Munson, 1992:64; field observations). Unfortunately there are few extant examples of complete farmsteads from the years prior to 1880; many were updated during the "golden age of Indiana."

Quarrying in the Indiana limestone belt increased significantly during the 1851-1880 period as a result of the introduction of rail transportation, improved machinery, and increasing demand. The new access to non-local markets resulted in the opening of new quarries and what may have been Monroe County's first limestone mill, the 1855 Watts and Biddle mill west of Stinesville (B.F. Bowen & Co., 1914:364). The methods used to quarry limestone in the stone belt remained essentially the same between the 1820s and the 1870s, when new machinery began to result in significant increases in stone cutting speed and efficiency. The first major advance in quarrying technology in Indiana came in 1875, when John Matthews, a British immigrant stonecutter and quarry owner, acquired a steam-powered stone channeling machine for use in his quarry near Ellettsville, northwest of Bloomington. The channeling machine, used for methodically extracting large blocks of limestone, made black powder and star drills obsolete (B.F. Bowen & Co. 1914:363; McDonald 1995:9, 19-20). The machine has been described as "a small locomotive running on steel rails attached to the quarry floor." The market for limestone grew during the 1851-1880 period, spurred by the stone's strength and malleability, the growth of cities, and the need for fire resistant building materials (Batchelor, 1944:14).

Commerce during this era was highly dependent on transportation and a stable money supply. Transportation was necessary to market products, and with the proliferation of rail lines distant markets were becoming more accessible. Towns grew as centers of trade in this era, since their railroad stations were natural collecting points as farmers brought grain to mills, many of which were located along the track, either for storage, to be ground for local use, or for transport to a distant mill. While at the station, farmers spent money at the local inns and taverns and bought goods from local merchants.

Not until the decade after the Civil War did a building boom occur on main streets across Southwestern Indiana as the railroads brought increased commercial interaction. Merchants displayed their wealth not only through building new commercial structures but also by constructing large homes. In cities and towns across Indiana, fashionable Greek Revival, Italianate, and sometimes Second Empire homes were built during the 1851-1880 period, indicative of the rising middle class. The central business districts of Bloomington and Martinsville each contain more than a dozen commercial buildings that were constructed during the 1851-1880 period. In Bloomington, these buildings are concentrated on West Sixth Street and West Kirkwood Avenue (Heistand, 2004:49-52). In Martinsville, the majority of the 1851-1880 downtown commercial buildings are on East Morgan Street and North Main Street (Davis, 1993:65-68).

In the Study Area, a variety of manufacturing ventures began operation in Bloomington and Martinsville during the 1851-1880 period. The Showers Brothers furniture factory in Bloomington may have been the best-known of the Study Area's manufacturers between the late nineteenth century and the mid-twentieth century. The company, originally a coffin factory called Showers, Hendrix & Kimbley, was founded in Bloomington in the 1860s (Dillon, 1928:5-6; Gilliam, 1985:6, 11). Manufacturing activities at Martinsville included the sawmill of DeTurk, Lewis & Company, which was founded in 1864 near the town's business district and became the largest lumber yard in Morgan County (Stuttgen, 1995:27).

**1880-1920**

The period between about 1880 and 1920 is known as the "golden age." Although this period was not without its ups and downs, generally this was a time of innovation, expansion, and prosperity. Farms grew in size and productivity as machines began to do some of the work of farm families. New ideas were developed in industry, and the economy evolved from one based mostly on agriculture to one with a strong industrial component. Indeed, industrialization became the main force in Hoosiers' lives, but it was not without cost.

As in other areas of Indiana, industrial growth came to the cities, if not always the towns, of Southwestern Indiana. There was an exodus from farms to the cities of Evansville, Terre Haute, Indianapolis, and to a lesser extent, Washington, for employment opportunities. The growing cities in Southwestern Indiana were located not in the center of this region, but on the fringes, and were connected by rail to the world outside (Phillips, 1968:365). In the Study Area, the quarrying industry also spurred economic and population growth in Monroe County. The industry, aided by railroads and the introduction of power equipment, grew significantly during Indiana's golden age. Indiana limestone, found in Monroe and two adjacent counties, became widely used in the construction of buildings throughout the United States (McDonald, 1995).

Much of Southwestern Indiana retained its rural character. In Monroe and Morgan counties, farm families built dwellings in the Italianate, Queen Anne, and Folk Victorian styles, interspersed with the farmhouses of earlier eras. Farmhouses were accompanied by large barns and a multitude of outbuildings needed to house horses, cattle, and farm tools and implements. Privies were also a common feature of the farm landscape.

According to historian Robert Weibe, this era was characterized by a "search for order" (Weibe, 1967); public buildings reflect this. The Columbian Exposition of 1893, which brought the City Beautiful Movement to the fore, exerted little influence over the small towns of Southwestern Indiana, but even there public architecture reflected a desire for order and harmony (Roth, 1980:173-174, 214). This was a time of growing government involvement in the lives of ordinary Hoosiers and government on all levels was much more active and proactive than ever before, as evidenced in the built environment.

The years from 1880 to 1920 were a transitional period in the history of transportation. Railroads and interurban lines commanded passenger traffic. Railroads transported the majority of goods from distant markets. State legislators answered public demands for action on roads in 1917 with the establishment of the Indiana State Highway Commission (Madison, 1986:154; Phillips, 1968). Railroad lines extended to 89 of 92 Indiana counties at the end of the century. In the late nineteenth and early twentieth centuries, railroading in Indiana was characterized by continuing consolidation into large super-regional systems and improvements to existing facilities (Simons and Parker, 1997:21, 27, 42). During this time, however, two new railroad rights-of-way were built through or to Bloomington. The first was a line between Indianapolis and southeastern Illinois that was completed by the Illinois Central Railroad in 1906. The Illinois Central built its passenger terminal a few blocks north of the Bloomington business district (B.F. Bowen & Co., 1914:449-53).

With expansion of the rail system, industry in Monroe and Morgan counties also expanded. The Showers Brothers furniture complex remained a significant component of Bloomington's economy during the 1881-1920 period. Martinsville also experienced industrial expansion in the late nineteenth and early twentieth centuries. Businesses included a bucket factory, the Old Hickory Chair Factory, the Adams Clay Products Company, the Martinsville Brick Company, the Van Camp Packing Company, and the Martinsville Milling Company (Stuttgen, 1995:26-27, 30, 34-35). In 1899, Grassyfork Fisheries, a goldfish hatchery, was founded in Washington Township, a short distance northeast of Martinsville. Grassyfork Fisheries was among the largest businesses of its type in the United States in the early twentieth century (Davis, 1993:60-61). The firm operated an aquarium plant in Martinsville.

The extraction and milling of limestone in Monroe and Lawrence counties increased significantly during the 1881-1920 period, as a result of the introduction of new technologies and machinery, additional railroad construction, the continuing growth of Midwestern and Northeastern cities, and Indiana limestone's increasing share of the building stone market.

**1921-1954**

The Great Depression and World War II defined a generation of Hoosiers in Southwestern Indiana and the world they built. For many, the onslaught of depression was not apparent until the stock market crashed in October 1929. For farmers, however, hard times began much earlier. Agricultural prices had been depressed for nearly a decade before the crash and remained so until World War II helped spend the country into prosperity. Although no unemployment figures were kept, it is generally thought that the jobless rate hovered around 12% in Indiana; in parts of Southwestern Indiana it may have been higher (Hoover, 1980; Madison, 1986).

New construction arose from the "make work" programs of the New Deal era. Thousands of southern Indiana residents benefited from the "alphabet soup" programs of the Roosevelt administration (Hoover, 1980). A school built on Temperance Street in Ellettsville in 1935 in the Tudor Revival style is the only known building constructed in Monroe and Morgan counties as a Works Progress Administration (WPA) project, although there may be others. A wall around Bannekar School in Bloomington bears a plaque indicating that it was constructed as a WPA project. The school itself is not believed to have been built as a WPA initiative.

World War II affected the built environment of Southwestern Indiana as well. Factories geared up for war production and military installations were built. More importantly, both men and women found jobs in war industry. With war's end came the promise of a return to "normal" living—for the most part this meant single-family homes kept by housewives whose husbands earned the entire family income (May, 1988). Indeed, abundance would characterize the post-war world. The post-war building boom was just beginning at the end of this period.

This era marked the growth in air and vehicular traffic and the continued use of railroads, primarily for commercial and industrial purposes. Roads were improved throughout some of Southwestern Indiana where traffic was greatest, but in other areas there was scant improvement. Within the Section 5 Area of Potential Effects (APE), the Indiana State Highway Commission and both Monroe and Morgan counties commissioned the construction of metal as well as concrete bridges in this period. The 1922 Morgan County Bridge No. 161 is a skewed, single-span, closed spandrel, concrete arch bridge that carries two lanes of Old SR 37 over the Little Indian Creek. Morgan County Bridge No. 224, a circa 1925 Warren Pony Truss, carries old State Route 37 over Indian Creek; it replaced an earlier bridge in order to support the heavier loads that were associated with the integration of a former country road into the state road system (Stuttgen, personal communication 30 Jan 2005). A 1946 Warren Pony Truss, Monroe County Bridge No. 913, carries Business 37 over Beanblossom Creek in Bloomington Township.

Old SR 37 was created in the early 1920s, upgrading and linking various local roads to form a regional and interstate north-south highway that was part of what became known as the Dixie Highway, a thoroughfare that extended from Indianapolis to Miami. While the current SR 37 traverses portions of the original Dixie Highway alignment, much of that historic alignment extends along Old SR 37 and other roadways, both east and west of the current corridor (Horvath, 2009; Stuttgen, 1995:57). Even with the growth of the truck industry, railroads remained an important means of moving cargo efficiently and to transport passengers quickly. Spur lines to limestone quarries in the Study Area carried raw and finished materials to the main lines of long-haul railroads (Simons and Parker, 1997).

Although Bloomington experienced little industrial growth in the early twentieth century, the steady production of the Showers plant near the city's center may have compensated for the lack of expansion. In the 1920s, the plant employed approximately 1,500 workers (Madison, 2002:21-22). Showers Brothers was hard hit by the Great Depression, and ended production in Bloomington in the post-World War II period. In 1940, the Radio Corporation of America (RCA) purchased part of the Showers complex. RCA later began to manufacture televisions in the facility (Vlahakis, 1998:38). Other new manufacturers during the 1921-1955 period included the Indiana Willow Products Company, which began to produce furniture in Martinsville in 1937 (Stuttgen, 1995:29). Despite the longevity of these furniture manufacturers, by 1936 Indiana furniture makers were importing wood, when only forty years earlier the state had been one of the largest producers of lumber. Simultaneously, the importance of the lumber industry decreased (Madison, 1995:221-22).

For the Indiana limestone industry, the 1921-1955 period was marked by the introduction of some new machinery and processes, corporate consolidation, and significant fluctuations in demand associated with economic conditions, war, and changing architectural fashions. The construction boom that took place during the first several years of the 1920s increased demand for Indiana limestone. Sales of Indiana limestone, however, dropped 10% in 1930 (Campbell and Brennan, 1999:8-14, 8-17; Steelwater, 2001:8-39). The Depression's effect on the industry was somewhat delayed, because existing contracts kept some quarries and mills active until 1933 or later (McDonald, 1995:39). During the Second World War, comparatively few buildings were constructed of limestone. Demand for limestone decreased again in the 1950s, with the introduction of architectural styles that used little or none of the material (McDonald, 1995:38-40, 42-43). A notable exception was the ca. 1945 development and widespread use of strip ashlar limestone with sawed or split faces in homes and some commercial architecture. This architectural use of limestone became fairly widespread until ca. 1970 (McDonald 1995:45). Another exception was the construction of college buildings and some other private facilities in traditional architectural styles (Steelwater, 2001:8-41).

**1954-1967**

After a period of economic and demographic stagnation during the Depression, World War II ushered in an era of economic prosperity characterized by an unparalleled growth of the middle class. Between the end of World War II and 1970, both Morgan and Monroe counties, as well as their respective government seats, Martinsville and Bloomington, grew steadily (Historic Census

Counts for Indiana Incorporated and Census Designated Places 1900 to 2000). The period 1946 through 1964 is distinguished by an unusually high birth rate, also known as the Baby Boom (Encyclopedia Britannica, 2012, entry "Baby Boom"). At the same time, personal income increased markedly for the lower quintile of the population, and income of factory workers reportedly rose 50% in this period (Chafe, 1990:145; Shultz, n.d., n.p.).

After 1945, homeownership became synonymous with suburbanization. The single-level, horizontally oriented Ranch style house was widely popular, and scientific efficiencies in the use of space in houses of the period caused them to be "machines for living in."[1] By 1960, 30.5% of Americans lived in suburbs (Shultz n.d., n.p.). Like other areas of Indiana and the nation, post-World War II suburbanization was characterized by low-density development, with segregated land uses, which was inherently auto-centric.

The popularity of limestone veneer for the Ranch-style homes and for office and classroom buildings at this time allowed limestone to regain status as a major industry in Monroe County during the 1950s and 1960s. The local quarrying industry was essentially kept alive by the popularization of limestone ashlar in residential construction. By the 1970s, the use of limestone ashlar fell out of favor, and local quarries and stone mills entered another period of decline (McDonald, 1995:45-47). Returning soldiers took advantage of educational opportunities provided by the federal government, so much so that Indiana University, a major employer in Monroe County, underwent a major expansion with the construction of numerous buildings. Many of these are constructed of limestone (Chronology of Indiana University History n.d.). Overall, limestone's resurgence as a building material peaked in 1955 and sales continued to slow through the 1960s (McDonald, 1995).

In transportation, the Federal-Aid Highway Act and the Highway Revenue Act, both of 1956, enabled states to build a system of interstate highways connecting major population centers by covering 90% of the cost (M&H Architecture, Inc., 2007:42). No interstate highways were constructed in the Study Area between 1956 and 1967, and major improvements to State Road 37 did not occur until circa 1970.

In agriculture, between 1959 and 1964, Indiana's total number of farms decreased 16% from 128,160 to 108,082. Most of this number was represented by the demise of the small farm, while the number of large farms actually increased (Tolle, 1966). Industry advances in Monroe County brought the advancement of companies like Radio Corporation of America (RCA, opened 1940) and Sarkes Tarzian, Inc. (1944). These two technology/manufacturing sector employers in Bloomington were internationally known for their respective production of televisions and

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[1] In a 1923 collection of essays titled *Vers une architecture* [published in English in 1927 as *Towards a New Architecture* (London: The Architectural Press)] French architect, Le Corbusier, promoted the idea that "the house is a machine for living in" and was a supporter of mass production methods in housing and modern architectural forms and styles in the 1920s. Le Corbusier was highly critical of the nineteenth and early twentieth century predilection for historicism in architecture. In the United States, it was not until the post-World War II years that modernism was embraced in vernacular domestic architecture.

television tuners. Other manufacturers in the APE during the 1955 to 1967 period were Otis Elevator (1965-2012); General Electric (1967-2009); Westinghouse (1958-present); and Wetterau Foods (1961-1994) (Bloomington (IN) Star-Courier, March 31, 1966; Bloomington (IN) Herald-Times, January 19, 2008; Vlahakis, 48; Eileen Hatfield, Bloomington (IN) Courier-Tribune, July 21, 1968; Laura Lane, "Closing Would Have Its Founder 'Turning Over in His Grave,'" Bloomington (IN) Herald-Times, January 16, 1994).

In the period 1950-1980, Martinsville's economy was supported by several employers that had been established earlier in the century, such as the H.C. Davis woodenware plant (operated 1888 to 1980); Martinsville Milling Company (operated 1903 to 1952); Schnaiter Lumber Company (operated until 1972); Indiana Willow Products Company/Indiana Hickory Furniture Company (1937-1963); Old Hickory Furniture Company (operated 1894 to 1978); Grassyfork Fisheries/Ozark Fisheries (circa 1930 to present); Martinsville Brick Company (operated 1909 to 1975); and Adams Brick Company/Cardinal Clay (operated 1898 to 1982) (Stuttgen, 1995:26-35).

The *Historic Property Report* included in **Appendix N**, *Section 106 Documentation*, provides a detailed discussion of the historical development of Morgan and Monroe counties from 1740–1954. It describes representative types of extant aboveground resources in the Study Area, in addition to resources that existed but that no longer survive. The *Additional Information Report*, which updates the history of Morgan and Monroe counties through the late 1960s, provides an overview of this era (see **Appendix N**, *Section 106 Documentation*). The *Consideration of and Findings regarding Dimension Limestone Resources within the I-69 Section 5 Area of Potential Effects* provides a detailed discussion of the historical development of the limestone industry in the region (see **Appendix N**, *Section 106 Documentation).*

## 4.4.2 Historic Setting

Located in south central Indiana, the Area of Potential Effects (APE) for the above-ground historic resources survey for Section 5 includes a part of south central Morgan County, including a small portion of the City of Martinsville, and a part of the north central half of Monroe County, containing a portion of the City of Bloomington. The Section 5 APE was based on the Tier 1, Section 5, 2,000-foot wide corridor and was further defined through consultation activities between Indiana Department of Transportation (INDOT) and the Indiana State Historic Preservation Officer (SHPO). In general, the APE for the Tier 2, Section 5 corridor is not less than 4,000 feet wide and is centered on current SR 37.

During the initial historic survey in 2004-2005, historians identified 64 properties within the APE that were previously documented in the *Monroe and Morgan County Interim Report*s, the *City of Bloomington Interim Report*, or in the Tier 1 Study. Of the 64 properties, 15 had been demolished. Historians inventoried 40 previously unidentified properties (a total of 104 inventoried properties), 32 of which were rated Contributing or higher in that initial survey. In 2011, historians inventoried 92 additional properties that were either constructed between 1954 and 1967, were located in expanded areas of the APE, or had been previously overlooked. Of these, 7 had been previously identified in the *Interim Reports* (5 Contributing; 1 Non-

Contributing; 1 Demolished), and 85 were rated as Contributing or higher. In 2011, historians found that 6 properties identified during the previous survey had been demolished. Historians reevaluated 5 properties previously thought to be Non-Contributing and found them to be Contributing or higher. In the spring of 2012, the total count of existing resources within the APE was 161 Contributing (or higher), including 44 previously surveyed, and 117 previously undocumented resources.

Refer to **Section 5.13,** *Historic Resource Impacts,* for a description of the APE as it has been defined for this undertaking (a map of the APE is provided in **Figure 4.4-1**, located at the end of this chapter). See **Appendix N,** *Section 106 Documentation*, including the *Historic Property Report* and *Additional Information Report*, for information regarding all properties surveyed.

In addition to the NRHP-listed Daniel Stout House and the Maple Grove Road Rural Historic District, the *Historic Property Report* (2008) identified five properties within the APE that are eligible for listing on the NRHP. These included the Stipp-Bender Farmstead, the Philip Murphy-Jonas May House, the Monroe County Bridge No. 913, the Morgan County Bridge No. 161, and the Morgan County Bridge No. 224. Since the 2008 report was issued, the Philip Murphy-Jonas May House is no longer extant. In addition, the Monroe County Bridge No. 83 has been determined eligible as a result of the INDOT Historic Bridge Inventory (Mead and Hunt 2009), and one property (the Maurice Head House at 4625 South East Lane, in Bloomington) has been determined eligible as the result of the Section 4 Additional Information Survey for recent past properties conducted in the summer of 2009. In 2012, as a result of the *Additional Information Report* and the *Consideration of and Findings regarding Dimension Limestone Resources within the I-69 Section 5 Area of Potential Effects* report, the Indiana Register of Historic Sites and Structures-listed Borland House and Carl Furst Stone Company Quarry was identified as intersecting with the APE. In addition, three historic landscape districts were recommended eligible for listing in the NRHP (Hunter Valley Historic Landscape District, Reed Historic Landscape District, and North Clear Creek Historic Landscape District).

See **Figure 4.4-1**, for the locations of aboveground resources listed on, or eligible for, the NRHP and **Table 4.4-2** for a summary of these aboveground resources. **Table 4.4-2** also lists select properties that were evaluated, but found not to be eligible for the NRHP. See **Section 5.13**, *Historic Resource Impacts,* for additional discussion of these resources.

**Table 4.4-2: Eligibility of Selected Aboveground Properties**

| Survey No. | Property Name | Address | Property Type | County | NRHP Status |
|---|---|---|---|---|---|
| 105-055-25035 | Daniel Stout House | 3655 N. Maple Grove Road | I-House with a Wing Addition, 2-Story | Monroe | NRHP Listed |
| N/A | Maple Grove Road Rural Historic District | Roughly, Maple Grove Road from Beanblossom Creek to SR 46, including the east half of Lancaster Park subdivision | Rural Historic District | Monroe | NRHP Listed |
| NBI No. 5300061 | Monroe County Bridge No. 83 | W. Dillman Road over Clear Creek | Warren Pony Truss (Steel) Bridge | Monroe | NRHP Eligible |
| NBI No. 5300130 | Monroe County Bridge No. 913 | N. State Road 37 Business over Beanblossom Creek | Steel Pony Truss Bridge | Monroe | NRHP Eligible |
| NBI No. 5500125 | Morgan County Bridge No. 161 | North Old State Road 37 over Little Indian Creek | Concrete Bridge | Morgan | NRHP Eligible |
| NBI No. 5500142 | Morgan County Bridge No. 224 | South Old State Road 37 over Indian Creek | Warren Pony Truss Bridge | Morgan | NRHP Eligible |
| 105-115-35055 | Stipp-Bender Farmstead | 5075 S. Victor Pike | I-house/ Italianate stylistic details | Monroe | NRHP Eligible |
| MB18 | Maurice Head House | 4625 South East Lane | Ranch | Monroe | NRHP Eligible |
| Including 105-115-35020, 105-115-35098, and 105-055-35099 | North Clear Creek Historic Landscape District | 4000 and 3600 South Rockport Road, and 2300 West Tapp Road | Mining district | Monroe | NRHP Eligible |

**Table 4.4-2: Eligibility of Selected Aboveground Properties**

| Survey No. | Property Name | Address | Property Type | County | NRHP Status |
|---|---|---|---|---|---|
| Including 105-055-25072 | Hunter Valley Historic Landscape District | Southwest corner of SR37 and SR46 | Mining district | Monroe | NRHP Eligible |
| Including 105-055-25063 | Reed Historic Landscape District | 2950 North Prow Road | Mining district | Monroe | NRHP Eligible |
| 105-115-40050 | Fullerton House | 3540 West Fullerton Pike | I-house | Monroe | Not NRHP Eligible |
| 105-055-90183 | House | 2102 West Vernal Pike | Queen Anne Cottage | Monroe | Not NRHP Eligible |
| S5-1013-008 | Parks/Hedrick House | 3275 North Prow Road | Vernacular farmhouse | Monroe | Not NRHP Eligible |
| MB10/ AD 11 | William R. Polley House | 3030 West Bolin Lane | Ranch House | Monroe | Not NRHP Eligible |
| 105-055-25017 | Farm | 4851 North Kinser Pike | Hall-and-Parlor, 2-Story Log house | Monroe | Not NRHP Eligible |
| MB 56 | Charles Schroeder House | 3746 Oak Leaf Drive | Ranch House | Monroe | Not NRHP Eligible |
| MB 87 | Weimer Lake/ Camp Wapehani | Wapehani Road | Lake/ Park | Monroe | Not NRHP Eligible |
| Monroe 25059 | Griffith Cemetery | SR 37 and Wylie Road | Cemetery | Monroe | Not NR Eligible |
| 105-055-90002 / MB 37 | Frank Miller-Siebolt House | 2015 North Kinser Pike | Bungalow | Monroe | Not NRHP Eligible |
| MB 50 | Tooten-Shiner House | 3555 North Maple Grove Road | Ranch | Monroe | Not NRHP Eligible |
| MB 67 | Thomas L. Brown Elementary School | 500 West Simpson Chapel Road | School | Monroe | Not NRHP Eligible |

**Table 4.4-2: Eligibility of Selected Aboveground Properties**

| Survey No. | Property Name | Address | Property Type | County | NRHP Status |
|---|---|---|---|---|---|
| 109-279-60035 | James Martin House | 3405 Godsey Road | Central-Passage House | Morgan | Not NRHP Eligible |
| 109-279-60048 | Burns Farmstead | 3830 Jordan Road | Gable-Front-and-Wing House and associated farmstead | Morgan | Not NRHP Eligible |
| 109-279-60049 | Forest Maxwell Farmstead | 2165 Liberty Church Road | Farm | Morgan | Not NRHP Eligible |
| MB 54 | Artesian Bowling Alley | 1910 Morton Avenue | Bowling Alley/ Recreational | Morgan | Not NRHP Eligible |
| MB 86 | House | 590 Virginia Street | Ranch House | Morgan | Not NRHP Eligible |

The Daniel Stout House was listed on the NRHP in 1973 and is included as a Contributing resource in the NRHP-listed Maple Grove Road Rural Historic District (1998). Built in 1828, the house is the earliest known extant structure in Monroe County. The house represents early agriculture in Monroe County and is a good example of an early nineteenth-century stone I-House, which historically was expanded. The next oldest properties in the APE have recently been demolished, including the NRHP-eligible Philip Murphy-Jonas May House (c. 1846; demolished between 2005-2011) and a two-thirds I-house with Greek Revival detailing at 1500 West That Road (c. 1850; demolished c. 2006). The Philip Murphy-Jonas May House had collapsed and the building remains removed and stored by the property owner. The two-thirds I-house was demolished by the property owner and a new construction house was built on the lot.

Other properties that date to the settlement period include cemeteries which bear testimony to that era. While cemeteries are generally not eligible for the NRHP, 16 cemeteries meeting the minimum age requirement for consideration were identified in the Section 5 APE. The dates of establishment are not known for all of the cemeteries, but at least 10 of these are pioneer cemeteries established in the first half of the nineteenth century. Interments starting in the twentieth century were noted in 2 cemeteries. None of the cemeteries located within the APE were determined eligible for listing in the NRHP.

Settlement patterns within the vicinity of the Section 5 APE followed the developing overland transportation routes and were influenced by political, industrial and entrepreneurial needs. Martinsville (Morgan County) and Bloomington (Monroe County) developed as their respective county seats. Industrial and quarrying interests helped them establish prominence. Outside of these and other towns, residences associated with family farms were scattered across the rural landscape. Notable early farmsteads throughout the APE include the Hall and Parlor /log structure at 4851 North Kinser Pike, the Stipp-Bender Farmstead, the James Martin Farmstead, the Burns Farmstead, and the Forest Maxwell Farmstead; of these, only the Stipp-Bender farmstead is eligible for listing on the NRHP.

In addition, there are multiple agricultural properties located within the NRHP-listed Maple Grove Road Rural Historic District, which is eligible under Criteria A, B, and C. The district speaks to the themes of exploration and settlement and displays typical Southern Indiana settlement patterns. The district follows the northern branch of Maple Grove Road as it intersects with the west branch of Maple Grove Road, an important nineteenth-century transportation route through Monroe County. The district is located approximately three miles north of Bloomington, and contains "farmstead clusters, a former school, a church and cemetery, as well as expanses of Bluegrass stone walls – some of which line Maple Grove Road – lending a pastoral quality to the landscape." Dating to a slightly later period, the Stipp-Bender Farmstead is an I-House that was constructed in 1876 and embellished with an Italianate-style porch. The house bears testimony to continuing agricultural development in the area. There is a lengthy historic stone wall in the farmstead west of the house.

A large, high quality belt of Salem limestone runs from the northeast to the south central portion of Monroe County. Numerous quarries, mills, and related resources are present throughout the Salem Oolitic Limestone Belt. In the Section 5 APE, several extant and abandoned limestone quarry and mill-related features are evocative of the historic limestone era. Within the Section 5 APE, included in this cluster of features are three identified historic landscape districts: Hunter Valley Historic Landscape District, Reed Historic Landscape District, and North Clear Creek Historic Landscape District. Hunter Valley includes vacant limestone quarries and mills, piles of waste-stone, as well as a patchwork of modern and historic roads and paths. The Reed limestone area contains limestone-related resources, including a modern mill, piles of waste-stone and organized stacks of stone, historic and modern quarry pits (both operating and abandoned), a patchwork of modern and historic roads and paths, and modern and historic machinery and equipment. The North Clear Creek quarry area is an example of a "late-developed pocket" of industrial activity developed by two adjacent quarry companies. The former Carl Furst Stone Company Quarry and the Maple Hill Quarry and Mill are located in this district. The Carl Furst Stone Company property contains quarry pits dating largely from the 1950s to 1960s and displays several small-scale features including outbuildings, derricks, and other related machinery. In contrast, the Maple Hill Quarry contains only one early quarry pit dating from the 1930s and large expanses of quarry pits dating from the 1980s and 1990s. The former Maple Hill Mill (now C&H Mill) largely reflects post-World War II milling techniques, although the mill may date from circa 1930 (Molnar and Belfast 2012).

Transportation-related resources have contributed to the historic setting of Section 5's APE. The original alignment of Old SR 37 comprised a portion of the historic Dixie Highway, which was the first substantive north-south national highway, built ca. 1915-1926. This highway, which extended from Michigan to southern Florida, involved construction and substantive upgrading of nearly 4,000 miles of roadway corridor. As the road developed and became a substantive north-south highway, numerous commercial developments were constructed along the roadway. The functional importance of the Dixie Highway lessened during the 1960s and early 1970s, as the Interstate Highway system developed, replacing Dixie Highway and similar roads such as the Lincoln Highway as key roadways for long-distance travel (Ecker, 2012).

There are four historic bridges in the architectural APE; references are to INDOT's Historic Bridge Inventory: Monroe County Bridge No. 83 (NBI No. 5300061; Non-Select Bridge; W Dillman Road over Clear Creek); Monroe County Bridge No. 913 (NBI No. 5300130; Select Bridge; N State Road 37 Business over Beanblossom Creek); Morgan County Bridge No. 161 (NBI No. 5500125; Select Bridge; N Old State Road 37 over Little Indian Creek); and Morgan County Bridge No. 224 (NBI No. 5500142; Select Bridge; S Old State Road 37 over Indian Creek).

The earliest bridge in the APE (1910), Monroe County Bridge No. 83, was built during the initial period of development or application of standards for its type in Indiana. As such, it represents an important phase in construction. The single-span Warren pony truss bridge's early use of riveting or bolting represents the initial application of a new metal bridge construction technique. By 1922, the Morgan County Bridge No. 161 was constructed as a skewed, single-span, closed spandrel, concrete arch, over the Little Indian Creek. It represents the upgrading and linking of various local roads to form a regional and interstate highway system that became part of the Dixie Highway. Morgan County Bridge No. 224 was completed in 1926 as another skewed, three-span Warren pony truss bridge. It is significant for its location on an important transportation route (Old SR 37, part of the original Dixie Highway), for being the work of an Indiana fabricator (Vincennes Bridge Company), and because extant plans or detailed specifications for the structure exist. Finally, the Monroe County Bridge No. 913, a single-span, steel, Warren polygonal chord pony truss, represents a type that is no longer common. Although it now carries a local road, this example was built in 1946 by the Indiana State Highway Commission.

During the post-war period, residential neighborhoods and subdivisions developed within the project area, especially in and around Bloomington, changing the fabric of the historic setting; now isolated ranch style homes were built along the county roads. The Maurice Head House, determined eligible for listing on the NRHP, is an example of a mid-century Ranch style house with excellent exterior integrity. At the same time, a variety of commercial and community establishments were constructed in the APE vicinity, designed to help meet the needs of the area's growing population. For example, the Thomas L. Brown Elementary School was erected ca. 1967-1968. The expanding commercial development included attempts to meet the area's recreational needs. One example was the ca. 1962 construction of the Artesian Bowling Alley, built in southern Martinsville, just west of where the upgraded current SR 37 would be built a few years later.

## 4.4.3 Archaeological Resources

### 4.4.3.1 Previously Recorded Archaeological Sites

Phase Ia literature review was performed to identify previously documented archaeological sites within the Section 5 corridor. None of the previously documented sites extend beyond Section 5 to overlap with either the Section 4 or the Section 6 corridor. Twenty-four previously documented sites were identified through Phase Ia literature review. Of these, 19 sites are prehistoric, one site is historic, and one site has both prehistoric are historic components. The temporal affiliation of three sites is not recorded on the forms, although it is probable that they are prehistoric sites. Information on previously recorded archaeological resources in the Section 5 study corridor is presented in **Table 4.4-3**.

**Table 4.4-3: Previously Recorded Archaeological Sites in the Section 5 Corridor**

| State Site Number | Site Type | Components | County |
|---|---|---|---|
| **12Mg203** | Prehistoric | Middle Woodland, Late Woodland, Transitional Late Woodland/Late Prehistoric | Morgan |
| **12Mg209** | Prehistoric | Late Archaic, Middle Woodland, Late Woodland | Morgan |
| **12Mo93** | Prehistoric | Early Archaic, Late Archaic, Early Woodland | Monroe |
| **12Mo110** | Unidentified | Unknown | Monroe |
| **12Mo149** | Prehistoric | Unassigned | Monroe |
| **12Mo156** | Prehistoric/Historic | Unassigned Prehistoric, Historic | Monroe |
| **12Mo269** | Historic | Late $19^{th}$ to $20^{th}$ Century | Monroe |
| **12Mo418** | Prehistoric | Unassigned | Monroe |
| **12Mo426** | Prehistoric | Early and Late Archaic | Monroe |
| **12Mo439** | Prehistoric | Middle Archaic, Late Archaic, Middle Woodland | Monroe |
| **12Mo463** | Prehistoric | Unassigned | Monroe |
| **12Mo476** | Prehistoric | Early Archaic | Monroe |
| **12Mo477** | Prehistoric | Unassigned | Monroe |
| **12Mo478** | Prehistoric | Unassigned | Monroe |
| **12Mo666** | Prehistoric | Unassigned | Monroe |
| **12Mo667** | Prehistoric | Unassigned | Monroe |

| | | | |
|---|---|---|---|
| **12Mo668** | Prehistoric | Unassigned | Monroe |
| **12Mo670** | Prehistoric | Unassigned | Monroe |
| **12Mo671** | Prehistoric | Early Archaic | Monroe |
| **12Mo672** | Prehistoric | Unassigned | Monroe |
| **12Mo673** | Prehistoric | Unassigned | Monroe |
| **12Mo771** | Unidentified | Unknown | Monroe |
| **12Mo772** | Prehistoric | Unassigned | Monroe |
| **12Mo773** | Unidentified | Unknown | Monroe |

The previously recorded sites were primarily recorded through cultural resources management projects undertaken for transportation, local utilities projects, and the Indiana University database enhancement projects. The literature review documented 32 previous archaeological surveys in the Section 5 Study Area.

#### 4.4.3.2 Tier 2 Archaeological Investigations

As part of the Tier 2 investigations, the archaeological APE in substantive portions of Alternatives 4 and 5 were investigated in 2006-2007 through shovel probing, surface collection/survey, and visual inspection as outlined in the "Guidebook for Indiana Historic Sites and Structures Inventory-Archaeological Sites." The 2006-2007 archaeological investigations focused on Alternatives 4 and 5 since those were the active study corridors during the period of survey. Because Alternatives 6, 7, and the DEIS Preferred Alternative 8 were developed later in 2011-2012, additional Phase Ia investigations were completed for the APE of these alternatives that were not previously surveyed during the 2006-2007 investigations. These Phase Ia investigations identified 41 archaeological sites in 2006-2007; identified 41 sites in June-August 2012; identified one (1) site in November 2012; and facilitated preliminary NRHP evaluations and recommendations for those sites.

The results of the 2006-2007 and the 2012 archaeological surveys and studies are summarized in **Section 5.14**, *Archaeology Impacts*, and documented in technical reports submitted to the SHPO (Hinks and Lombardi 2012; Hinks, Lombardi, and Seymour 2012; and Lombardi and Seymour 2013). Summaries of the Phase Ia archaeological investigation reports are provided in **Appendix N**, *Section 106 Documentation.*

All recommended additional archaeological investigations, Phase Ia, Phase Ic, Phase II, and if necessary Phase III archaeological work for sites within the APE will be conducted, as provided for in the Section 106 Memorandum of Agreement (MOA) for this project (provided in **Appendix N**, *Section 106 Documentation*).

## Section 4.4 Figure Index

*(Figure follows this index.)*

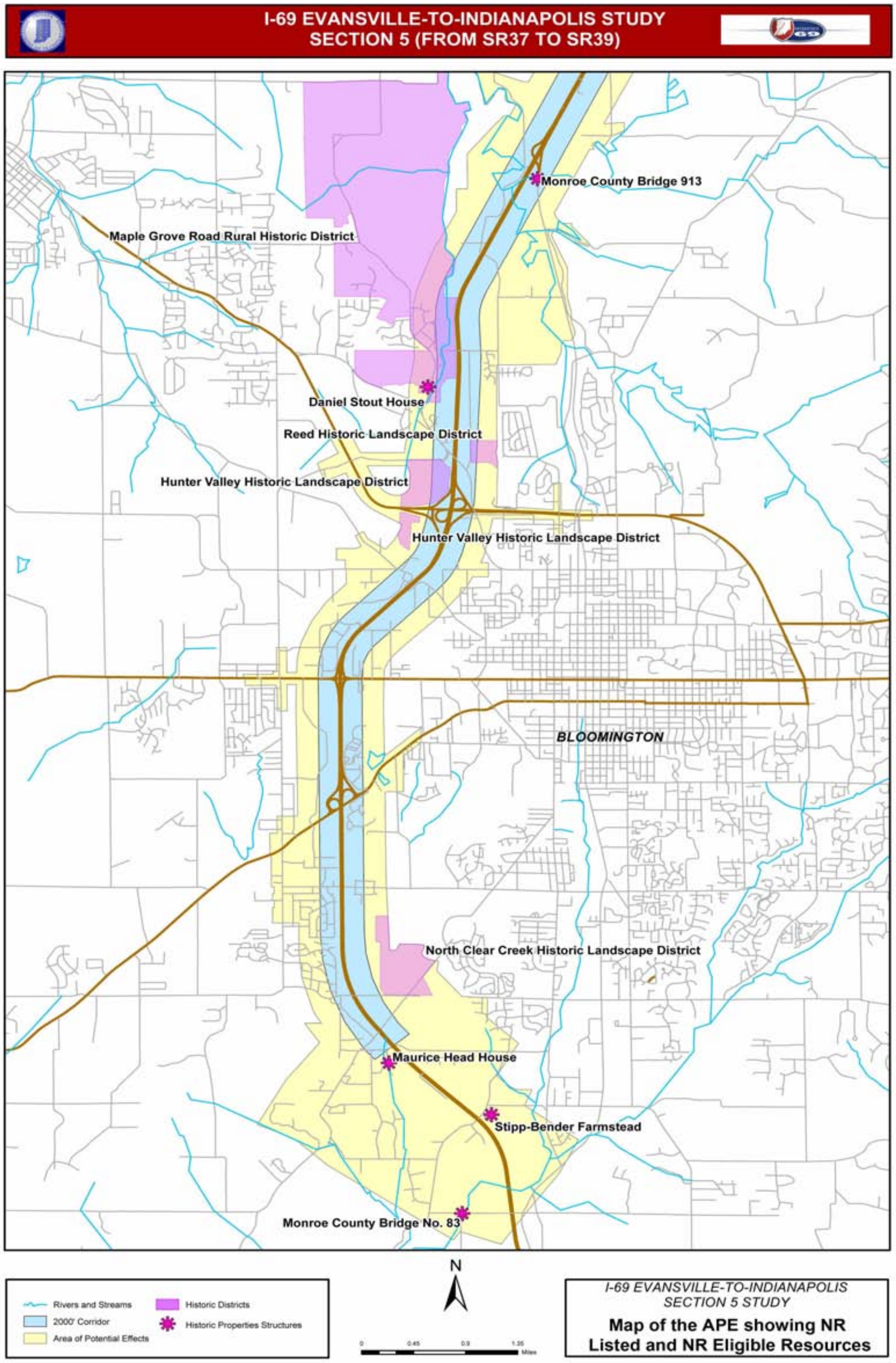


**Figure 4.4-1: Map of the APE showing NRHP Listed and NRHP Eligible Resources (Sheet 1 of 2)**

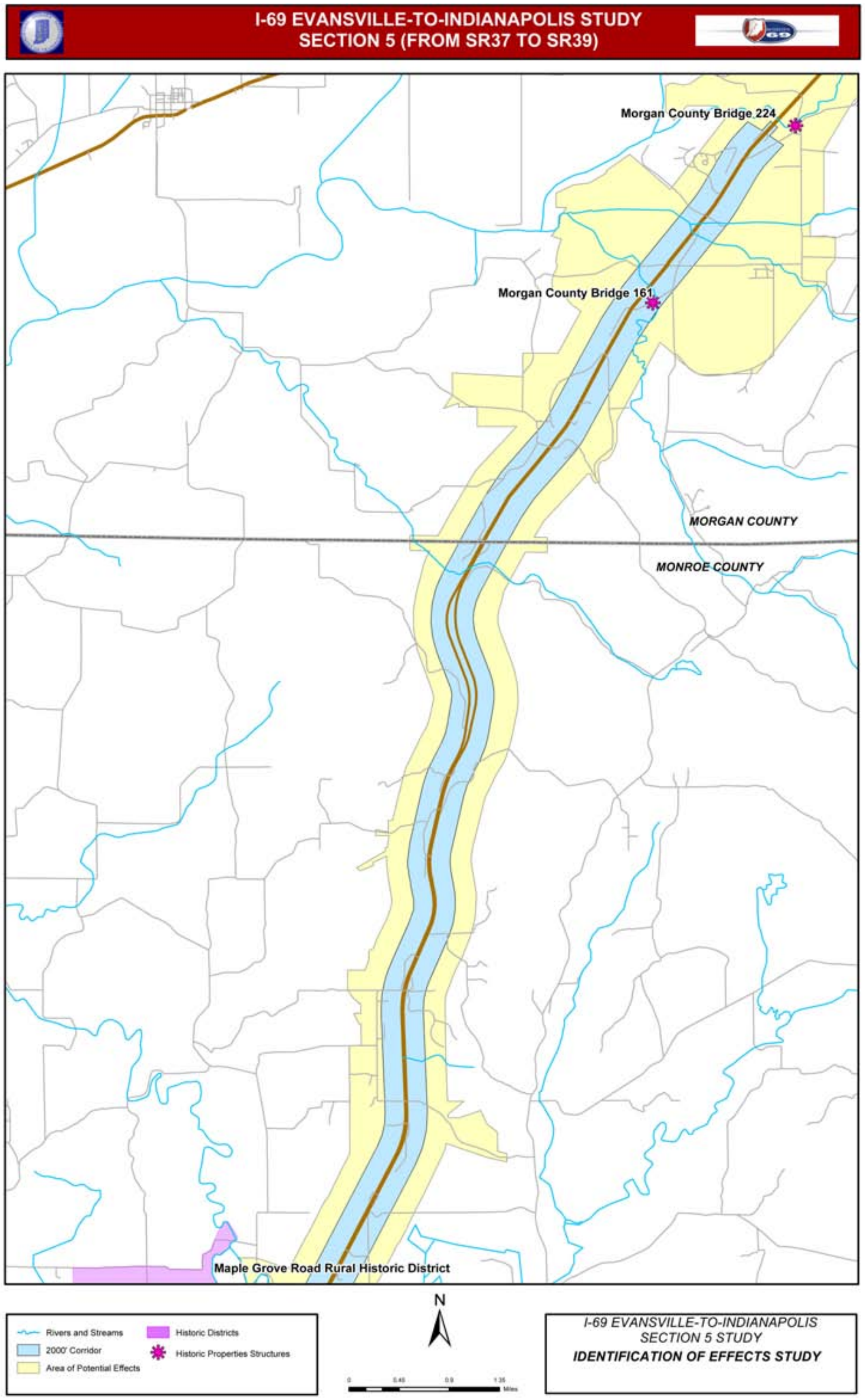


**Figure 4.4-1: Map of the APE showing NRHP Listed and NRHP Eligible Resources (Sheet 2 of 2)**

## *4.5 Hazardous Materials*

For purposes of this section, Preferred Alternative 8 that was identified in the Draft Environmental Impact Statement (DEIS) will be referred to as "Alternative 8." The Preferred Alternative for the Final Environmental Impact Statement (FEIS) will be referred to as the "Refined Preferred Alternative 8."

Since the publishing of the DEIS, the following substantive changes have been made to this section:

- The sites the Indiana Department of Environmental Management (IDEM) identified in a March 2013 survey located in the vicinity of the 2,000-foot Section 5 corridor were incorporated into previously gathered data sets.

- The Hoosier Energy facility previously listed on the DEIS **Table 4.5-1**: Section 5 Potential Hazardous Waste Sites, was elevated to a "Site Reviewed for Additional Analysis" (see **Section 4.5.2.1** and **Section 5.16.3.1,** *UST and LUST Sites*).

- A former gas station (Former Amoco Unit # 10116) was added to the **Section 4.5, Table 4.5-1**: "Section 5 Potential Hazardous Waste Sites" and as a "Site Reviewed for Additional Analysis" in **Section 5.16.3.1,** *UST and LUST Sites*.

- Additional details regarding remediation action and protection outcome for the Bennett's Dump site description from the August 2012 United States Environmental Protection Agency (USEPA) Third Five-Year Review Report for the Bennett Stone Quarry (USEPA, 2012).

### 4.5.1 Introduction

Hazardous waste sites are regulated by the Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response Compensation and Liability Act (CERCLA). During the Tier 2 process, the locations of permitted and non-regulated hazardous waste sites have been identified. The Indiana Department of Transportation (INDOT) Potential Hazardous Waste Site Assessment Form was used during the Tier 2 Environmental Impact Statement (EIS) process. Known or potential waste sites are identified and located on a map showing their relationship to the alternatives under consideration. If a known or potential hazardous waste site is impacted by an alternative, information about the site, the potential involvement, impacts and public health concerns of the affected alternative(s) and the proposed mitigation measures to eliminate or minimize impacts or public health concerns are discussed. Government databases used for identification of potential sites include:

1. **CERCLIS** (Comprehensive Environmental Response, Compensation and Liability Information System) - The USEPA CERCLA listing tracks sites that have come to USEPA's attention as having potential for releasing hazardous substances into the

environment. CERCLIS listings contain sites listed on the National Priorities List (NPL) and sites that have been proposed for possible inclusion to the NPL.

2. **NPL** (National Priority List) - USEPA's NPL is a subset of the CERCLIS database. The NPL includes sites designated under the Superfund Program.

3. **NFRAP** (USEPA Comprehensive Environmental Response, Compensation, and Liability Information System Archived Sites - No Further Remedial Action Planned) - Sites listed in this database are those for which, to the best of USEPA's knowledge, assessment has been completed and no further remedial action is planned. These sites are considered no longer eligible for inclusion on the NPL.

4. **RCRIS TSD** (USEPA Resource Conservation and Recovery Information System Treatment, Storage, and Disposal Facilities) - This database lists facilities that treat, store, or dispose of hazardous wastes.

5. **RCRIS COR** (USEPA Resource Conservation and Recovery Information System Corrective Action Sites) - The USEPA CORRACTS database identifies hazardous waste handlers undertaking corrective action as directed by USEPA under RCRA.

6. **RCRIS GEN** (USEPA Resource Conservation and Recovery Information System Large and Small Quantity Generators) - This database contains listings for sites that generate hazardous waste or meet other RCRA requirements.

7. **ERNS** (USEPA Emergency Response Notification System) - The USEPA ERNS serves to store information on releases of oil and hazardous substances into the environment. The USEPA National Response Center is the origin of the data included in ERNS listings.

8. **State Sites** - IDEM list of all hazardous waste inventory sites as maintained by the Office of Land Quality.

9. **SWL** (State Solid Waste Landfill List) - The IDEM database listing of landfills and transfer stations as maintained by the Office of Land Quality.

10. **REG UST** (State Registered UST Listing) - The IDEM database listing of all registered underground storage tanks (USTs) as maintained by the Office of Land Quality, Underground Storage Tank Section.

11. **Leaking UST** - The IDEM database listing of all leaking USTs as maintained by the Office of Land Quality, Leaking Underground Storage Tank (LUST) Section.

Basic information regarding locations and types of hazardous waste sites were gathered throughout the corridor that was selected in the Tier 1 Record of Decision (ROD). This corridor is generally 2,000 feet wide, but is narrower in some areas and broader in others. The following steps were taken as part of the Tier 2 studies through March 2013:

- IDEM data sets provided in the shapefiles were verified as current, and new data was obtained from IDEM as necessary to reasonably update the files.
- A detailed review of the IDEM site files was performed in 2005 and of the IDEM Virtual File cabinet (http://www.in.gov/idem/4101.htm) in 2012 for sites identified in the database which are located within the project corridor or within the American Society of Testing and Materials (ASTM) standard practice search radius of the project corridor. USEPA, public health department, local emergency management agencies (EMA), local emergency planning committee (LEPC) and other sources as appropriate, were contacted if there were any known hazardous waste sites located within the project corridor or within the search radius for the project corridor.
- An environmental database report was obtained from Environmental Data Resources, Inc. (EDR) of Milford, Connecticut. The EDR Report provides a search of federal and state records for sites within search distances from the 2,000-foot Section 5 corridor as specified in ASTM Standard E-1527-05. The report provides a list of sites identified in the records searched, maps showing the locations of these sites in relation to the corridor, and detailed site reports of National Priority List (NPL) Superfund sites identified in the search radii. A copy of the 2004 and 2012 EDR Radius Map Reports for Section 5 is provided in **Appendix H**, *Hazardous Materials Report*.
- Windshield field surveys, supplemental to the Geographic Information System (GIS) shapefiles and the EDR report, were conducted within the corridor in order to identify other potential hazardous waste sites that might affect a proposed alignment(s).
- The March 2013 IDEM supplied tables and map locations of IDEM identified sites in the vicinity of the 2,000-foot Section 5 corridor were also reviewed and incorporated into the data set.

### 4.5.2 Potential Hazardous Waste Sites

Potential hazardous waste sites (sites with recognized environmental conditions) within appropriate ASTM search distances from the 2,000-foot corridor were reviewed, identifying their corresponding government databases and most recent facility types, names, and street addresses (circa 2012). **Table 4.5-1** summarizes specific sites and **Figure 4.5-1** shows these sites as well as sites identified during field checks. (See **Section 5.16**, *Hazardous Waste Sites*, for details about sites that received additional analysis.)

## Table 4.5-1: Section 5 Potential Hazardous Waste Sites within 1,000 feet of the Project

| Data Source | | Distance From: | | Name / Address | Facility Type |
|---|---|---|---|---|---|
| Facility ID (s) | Database | Corridor | Pavement | | |
| S105103518 | Indiana Spills | Within | Within | SR 37 N & Wayport Rd, Bloomington | Roadway |
| IND985029511<br>IND985029503 | FINDS | Within | Within | INDOT Bridge 37 55 3106,<br>1.07 Miles S SR 39, Martinsville | Roadway |
| IN Spill 199711130<br>UST: 24696 | Indiana Spills, UST | Within | Adjacent | Sam's Club #6437<br>3205 W. SR 45, Bloomington | Gas Station |
| Field Observations | n/a | Within | Adjacent | Sturgis Auto Salvage,<br>2810 W Hensonburg, Bloomington | Towing and Savage Yard |
| IND984869016<br>1007093289<br>IND984903930<br>1000187532 | RCRIS-SQG | Within | Adjacent | INDOT Sub-District<br>2965 N Prow Rd, Bloomington | Highway Maintenance |
| IND062802574<br>199309045<br>UST 15250<br>LUST 199308536 | CERC-NFRAP.<br>LUST/UST,<br>Indiana Spills | Within | Adjacent | Hoosier Energy<br>7398 N SR 37, Bloomington | Electric Distribution and Transformer Repair |
| LUST: 8907521<br>UST: 15707 | LUST/UST | Within | Adjacent | Former Johnson Oil Bigfoot #071<br>7340 N Wayport, Bloomington | Gas Station |
| IN Spill<br>200412202 | Indiana Spills | Within | Adjacent | Bloomington Auto Parts<br>7650 N. SR 37, Bloomington | Auto Salvage Yard |
| Field Observations | n/a | Within | Adjacent | Dolitch Crane Service<br>Crescent & West 17th, Bloomington | Crane |
| UST 1109<br>LUST 9005505 | LUST/UST | Within | Adjacent | Former Amoco #10116<br>SR 48 And SR 37, Bloomington | Gas Station |
| UST 5470<br>U003951370 | UST | Within | Adjacent | Former Marathon Unit 2572<br>2572 / 2850 W. 3rd St, Bloomington | Former Gas Station |
| Field Observations | n/a | Within | Adjacent | C&H Stone<br>1500 Rogers Road, Bloomington | Limestone Mill |
| UST 11903<br>IN Spill 199711132<br>LUST 200609521 | LUST/UST,<br>Indiana Spills | Within | Adjacent | Hanna Trucking / United Rentals /<br>Dave Omara Contractor Inc.<br>2520 Industrial. Dr, Bloomington | Contractor Yard |
| UST: 24686 LUST<br>200410510<br>INR000109512 | LUST/UST,<br>RCRIS-SQG | Within | Adjacent | Coca Cola<br>1701 Liberty Dr, Bloomington | Bottling Facility |
| 1010563995<br>INR000121814 | RCRIS-SQG | Within | 100 ft | Aspen Dental<br>330 N Jacob Drive, Bloomington | Dental Office |
| FINDS<br>110012115709 | FINDS | Within | 100 ft | Star Of Indiana<br>8111 N SR 37, Bloomington | Vacant |
| Field Observations | n/a | Within | 100 ft | DNR / State Police<br>1500 Packing House, Bloomington | State Police Post |
| UST: 5039<br>110011987939 | UST, FINDS | Within | 150 ft | Kmart #7402<br>3175 W 3rd St, Bloomington | Commercial |
| UST: 24249 | UST | Adjacent | 200 ft | Whitehall Marathon #245 / Kiel Brothers Oil Company<br>3324 W 3rd St, Bloomington | Gas Station |
| EPA/RCRIS:<br>INR000005850 | RCRIS-SQG | Adjacent | 400 ft | Payless Cashways 0248<br>2100 Liberty Dr., Bloomington | Commercial |
| Field Observations | n/a | Within | 500 ft | Murphy USA New Gas Station /<br>Murphy USA #UT<br>3311 W SR 45, Bloomington | Gas Station |
| IN SWRCY<br>S109949526 | Solid Waste | Within | 500 ft | Bloomington High School North<br>3901 N Kinser P ke, Bloomington | School |

= Superfund Site - Reviewed for Additional Analysis
= Site Reviewed for Additional Analysis (see **Section 5.16**, *Hazardous Waste Sites*)

**Table 4.5-1: Section 5 Potential Hazardous Waste Sites within 1,000 feet of the Project**

| Data Source | | Distance From: | | Name / Address | |
|---|---|---|---|---|---|
| 1004700428<br>INR000019620 | RCRIS-SQG | Within | 500 ft | Pep Boys<br>3160 W. Susan Dr, Bloomington | Commercial |
| Field Observations | n/a | Within | 600 ft | Reed Quarries Inc.<br>2950 N Prow Road, Bloomington | Quarry |
| UST: 17449<br>RCRISINR00001509 | UST, RCRIS-SQG | Adjacent | 900 ft | UPS<br>1700 Liberty Dr, Bloomington | Shipping |
| IN Spill: 200108085 | Indiana Spills | Adjacent | 900 ft | 2001 Hunter Rd, Bloomington | Roadway |
| 010317657<br>INR000117481 | RCRIS-SQG | Within | 900 ft | Feree Cabinet<br>2356 Industrial Park, Bloomington | Manufacturing |
| Field Observations | n/a | Adjacent | 1000 ft | New Wal-Mart<br>3585 W SR 45, Bloomington | Commercial |
| IND981799505,<br>UST 18624<br>LUST199302519<br>UST: 18624 | LUST/UST | 1200 ft | 1000 ft | Penske Truck<br>2212 S Yost Ave, Bloomington<br>Bloomington | Shipping |
| EPA/RCRIS:<br>INR000005256 | RCRIS-SQG | 1200 ft | 1000 ft | Former MAACO Auto Painting<br>1901-2170 or 2207/2707 S YOST AVE | Vacant |
| EPA/RCRIS:<br>INR000104836 | RCRIS-SQG | Adjacent | 1000 ft | Schulte Corp/ Now PTSs Corporation<br>2000 Liberty Dr, Bloomington<br>Bloomington | Shipping;<br>Commercial |
| IN Spills: 199708062 | Indiana Spills | Adjacent | 1000 ft | Former Je Crider<br>1900 Liberty Dr, Bloomington | Equipment Staging |
| EPA: IND980794341<br>7500018 | NPL-Superfund | Adjacent | 1000 ft | Lemon Lane Landfill<br>Lemon Lane, Bloomington | Solid Waste Disposal |
| UST: 24498 | UST | Adjacent | 1000 ft | Neidigh Construction<br>2220 W Vernal Pk, Bloomington | Contractor Yard |
| EPA: IND006418651<br>7500010 | NPL-Superfund | Adjacent | 1000 ft | Bennett's Stone Quarry<br>SR 37 and SR 46, Bloomington | Solid Waste Disposal |
| Field Observations | n/a | Within | 1000 ft | BG Hoadley Quarries Inc<br>3600 S. Rockport, Bloomington | Quarry |

= Superfund Site – Reviewed for Additional Analysis
= Site Reviewed for Additional Analysis (See **Section 5.16**, *Hazardous Waste Sites*)

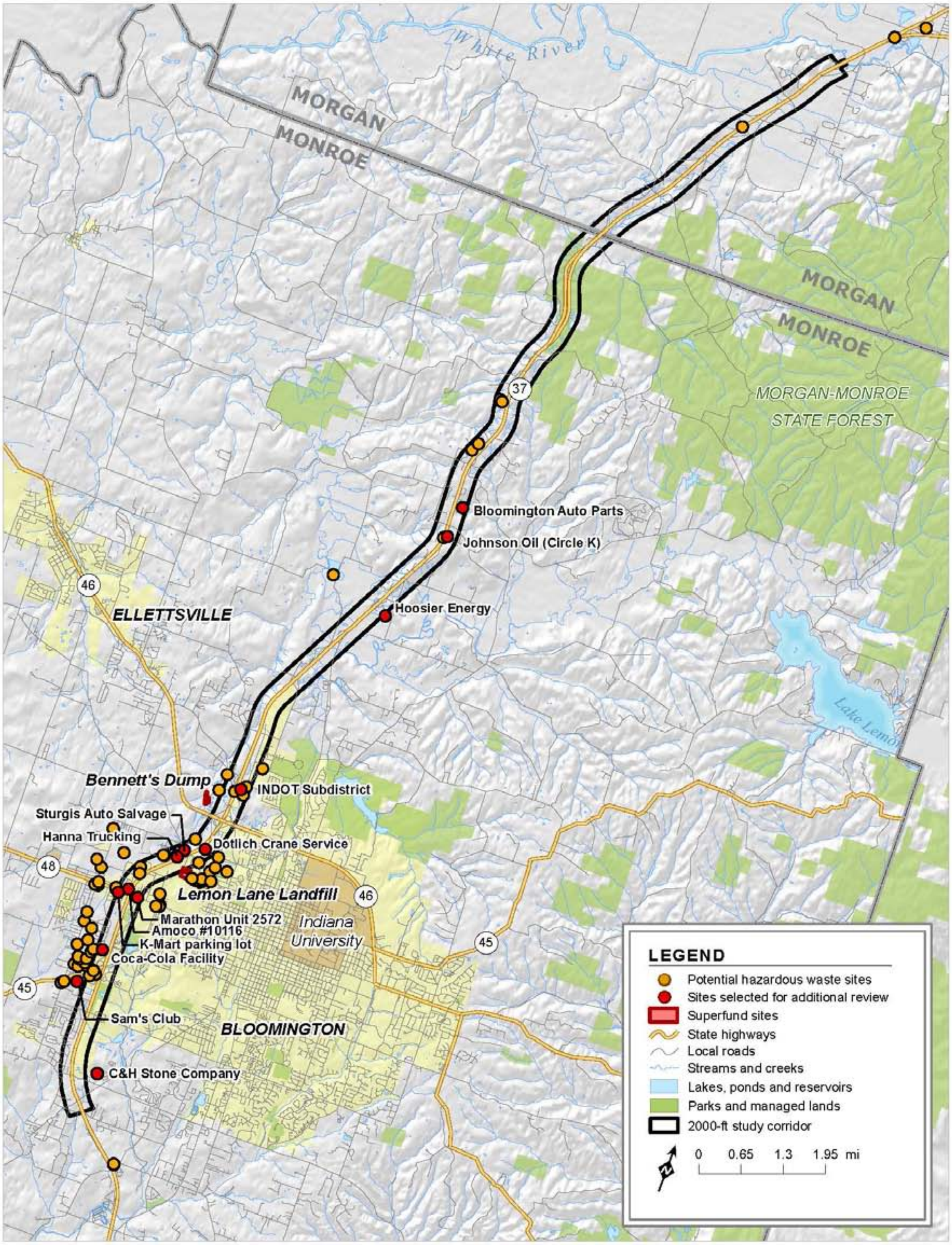


**Figure 4.5-1: Potential Hazardous Waste Sites in the I-69 Section 5 Study Area UST and LUST Sites**

#### 4.5.2.1 Sites with Current or Past USTs and/or LUST Incidents

Seven of the sites with recognized environmental conditions which received additional review are listed in IDEM records as having current or past USTs and/or LUST incidents. These Hazardous Materials (HM) sites are described in the following paragraphs:

- **Sam's Club (HM-2) –** Sam's Club #6437 at 3205 W. SR 45 in Bloomington, is located adjacent to existing SR 37 right-of-way at the southwest quadrant of the existing SR 37 and SR 45/2nd Street interchange. According to IDEM records, a 2003 UST notification listed the installation of three 20,000 gallon gasoline tanks. Operations were noted in 2004, and a minor spill (5 gallons) of motor oil and water affected the sanitary sewer water in 1997. The USTs are located in the northeast portion of the property just west/adjacent to a canopy-covered fueling center. An automotive maintenance bay was observed on the south side of retail building. The UST installation was relatively recent and no releases have been identified at the site in IDEM records; however, due to the close proximity of the active USTs to the Section 5 corridor, the Sam's Club facility was included for further assessment (see **Chapter 5.16** and **Appendix H**, *Hazardous Materials Report*).

- **Coca Cola Bottling Facility (HM-3)** - The Coca Cola bottling facility, at 1701 Liberty Drive, is located adjacent and west of the existing SR 37 right-of-way, just north of the SR 45/2nd Street interchange. According to available IDEM records, three USTs were installed at the facility in 1987; the owner reported UST removals in 2003, which were confirmed with a 2006 No Further Action (NFA) letter from IDEM. The reported UST locations and low levels of petroleum in soil samples indicated a low potential for encountering contamination. While groundwater was not encountered during the investigation, the former USTs reported location is within the estimated drainage area of 2-acre sinkhole that extends under site's parking lots, as identified during the I-69 karst studies (see **Section 5.21**, *Karst Impacts*). Based upon the higher elevation of the site, migration potential via karst conduits, other buried sinkholes at the lower elevation of the SR 37 and SR 45/2nd Street interchange, and the potential for groundwater contaminate migration into the Section 5 corridor, the Coca Cola facility was included for further assessment (see **Chapter 5.16** and **Appendix H**, *Hazardous Materials Report*).

- **Kmart Parking Lot (HM-4) -** The Kmart #7402 parking lot, at 3175 W. 3rd Street, is located adjacent to the west border of existing SR 37 right-of-way, just south of the SR 45/3rd Street interchange. According to available IDEM records, one UST located on the east side of the property was listed as "Permanently out of Service" for 1990. However, due to the limited sampling and analysis at the time of closure and the close proximity of the former UST to the Section 5 corridor, further review was recommended (see **Chapter 5.16** and **Appendix H**, *Hazardous Materials Report*).

- **Former Amoco Unit #10116 (HM-5)** - The former Amoco Unit 10116 at 3100 W. 3rd Street was located adjacent to the northwest of the SR 37 and SR 48/3rd Street interchange right-of-way, just north of an access road and 3rd Street. Five USTs were reported closed in 1989 at the former gas station (one 10,000 gal. and two 8,000 gal. with gasoline, one 6,000 gal. diesel, and one 550 gal. waste oil tanks). Contaminated soils were removed and groundwater contaminant levels were decreasing prior to the IDEM agreement for no further action in 1997. Due to the close proximity of the former elevated groundwater contamination to the Section 5 Corridor, further review was recommended (see **Chapter 5.16** and **Appendix H**, *Hazardous Materials Report*).

- **Former Marathon Unit #2572 (HM-6)** - The former Marathon Unit 2572 at 2850 W. 3rd Street is located adjacent to and east of SR 37 right-of-way, just north of 3rd Street. Three 8,000-gallon gasoline and a 550-gallon waste oil USTs were reported "Permanently out of Service" at the former gas station. No sampling or assessment was reported. Due to the close proximity of the former USTs to the Section 5 corridor and lack of closure and sample data, further review was recommended (see **Chapter 5.16** and **Appendix H**, *Hazardous Materials Report*).

- **Hanna Trucking/United Rentals (Currently Dave Omara Contractor Inc. / HM-8)** - The Hanna Trucking facility, also known as United Rentals, at 2520 Industrial Drive, is located adjacent to the west of existing SR 37 right-of-way, just southwest of the SR 37/Vernal Pike intersection. According to available IDEM records, two USTs were "Permanently out of Service", with one 10,000 gallon diesel and one 2,000 gallon gasoline removed in 2006. A NFA letter was issued in 2010 following site remediation that removed approximately 800 tons of contaminated material. A spill report, oil drums, and oil water separator were also reported during a 2006 site visit and document review. Due to the amount of removed material, the inability to collect groundwater samples, and the potential for contamination to migrate beyond the investigation area in a karst area, this site was recommended for further review (see **Chapter 5.16** and **Appendix H**, *Hazardous Materials Report*).

- The **Hoosier Energy (HM-13)** facility is at 7398 N. SR 37, located adjacent to the east side of existing SR 37 right-of-way between Walnut Street and Sample Road. During closure of 5 USTs in 1993, low levels of soil contamination were reported. The site was considered discontinued/low priority by IDEM in May 1995, based upon low residual but inaccessible soil contamination. These USTs were replaced with four USTs currently in operation that include a 10,000 gallon gasoline tank; a 4,000 gallon diesel tank, a 550 gallon waste oil tank at the maintenance garage, and a 550 gallon diesel UST for an emergency backup generator at the electrical distribution center. No comments were noted in the February 2013 IDEM UST inspection. Two 2,500 gallon above ground storage tanks (ASTs), 55 gallon drums, and over 100 transformers containing transformer oil (on secondary containment) are also located at the transformer service and maintenance facility. Due to the proximity of the former/active USTs, ASTs, and staging/servicing of numerous transformers to the Section 5 corridor, further review was recommended (see **Chapter 5.16** and **Appendix H**, *Hazardous Materials Report*).

- **Johnson Oil Bigfoot #071 (aka BP Circle K / HM-14)** - The Johnson Oil Bigfoot service station (currently operated by BP Circle K), at 7340 N. Wayport Road, is located adjacent to the east of the existing SR 37 right-of-way, just south of the SR 37/Sample Road intersection (**Figure 4.5-1**). A Phase II site investigation indicated low levels of soil contamination when the three petroleum USTs were closed in 1989. These USTs were replaced with five USTs currently in operation and include: two 8,000 gallon tanks containing gasoline; one 12,000 gallon tank containing gasoline; one 8,000 gallon tank containing diesel fuel; and one 4,000 gallon tank containing kerosene. Due to the close proximity of the former and active USTs to the Section 5 corridor, further review was recommended (see **Chapter 5.16** and **Appendix H**, *Hazardous Materials Report*).

### 4.5.2.2 RCRIS Sites

One potential hazardous waste site reviewed for additional analysis is listed in the USEPA RCRIS GEN database:

- **INDOT Sub-district (HM-12)** - The INDOT Sub-district, at 2965 Prow Road, is located adjacent to the east side of the existing SR 37 right-of-way, just north of the Arlington Road overpass. The INDOT Sub-district site is listed as a conditionally exempt small quantity generator. A 500-gallon used oil tank and several 55-gallon drums of oil and hydraulic fluid were observed. The site currently operates as a roadway maintenance facility with repair and salt vehicles, and has storage and maintenance buildings. While historic petroleum storage quantities have been minor, due to the close proximity of the facility to the Section 5 corridor, further review was recommended (see **Chapter 5.16** and **Appendix H**, *Hazardous Materials Report*).

### 4.5.2.3 Other Hazardous Waste Sites of Concern

In addition to the sites listed on state and federal environmental databases, four additional hazardous waste sites warranting detailed study were determined through windshield surveys and interviews:

- **Sturgis Auto Salvage (HM-9)** - Sturgis Auto Salvage lot, at 2810 W. Hensonburg Road, is located approximately 200 feet west of the existing SR 37 right-of-way, just north of the SR 37/Vernal Pike intersection. Observed at the site were automobile salvage operations, a 600-gallon used oil tank, and 55-gallon drums containing motor oil. An adjoining former auto service/painting facility may be of concern for paint and other chemicals. Given the long history of petroleum storage and salvage operations and the close proximity of the facility to the Section 5 corridor, further review was recommended (see **Chapter 5.16** and **Appendix H**, *Hazardous Materials Report*).

- **Bloomington Auto Parts (HM-15)** - Bloomington Auto Parts, at 7650 N. SR 37, is located adjacent to the east side of existing SR 37 right-of-way, north of Sample Road. The site includes significant and wide-spread salvage operations and automotive storage, and 55-gallon drums containing motor oil were observed during the field inspection. An IDEM inspection report noted that several truck-loads of contaminated soil were removed in 2004, and that the facility has been under enforcement action as a result of compliance violations noted during inspection of the facility in 2007. Violations included open dumping of waste tires, oil from stored engines, refrigerants, soil contamination, storm water plans and monitoring. With the long history, large area, intensity of salvage operations, and close proximity of the facility to the Section 5 corridor, further review was recommended (see **Chapter 5.16** and **Appendix H**, *Hazardous Materials Report*).

- **Dotlich Crane Service (HM-10)** - The facility is located northwest of the intersection of Crescent Road and West 17th Street. Cranes and other related equipment are parked in a gravel lot at the facility. One 550-gallon AST containing diesel fuel and no secondary containment was located at the facility. Due to the site's likely inclusion in all of the alternatives, potential for extensive intrusive construction activities (such as rock cuts, pier or footings excavation), and the close proximity of the facility to the Section 5 corridor, further review was recommended (see **Chapter 5.16** and **Appendix H**, *Hazardous Materials Report*).

- **C & H Stone (HM-1)** - The facility is located at 4000 S. Rockport Road on the north side of Fullerton Pike northwest of the intersection of Fullerton Pike and Rockport Road. The site has been in operation since the 1930s and reportedly included a blacksmith forge, boilers, coal piles, steam powered cranes, locomotives, limestone quarrying, and milling, both truck and railroad shipping, various fuel tanks, lubricants, heavy equipment staging, operations, and maintenance, bulk material storage, settling ponds and water withdrawal points. Cranes, heavy equipment, and other related equipment are parked in various gravel lots at the facility. Several 55-gallon drums of hydraulic fluid as well as 300 and 500-gallon gasoline and diesel ASTs and no secondary containment were noted at the facility. While the alternatives impacts are located upgradient along Fullerton Road and south of both current mill operations and former quarrying, this site warranted additional review due to the long history of operations and the close proximity of the facility to the Section 5 corridor (see **Chapter 5.16** and **Appendix H**, *Hazardous Materials Report*).

### 4.5.2.4 Superfund Sites

There are two NPL (Superfund) sites located in the vicinity of the Section 5 2,000-foot corridor: Lemon Lane Landfill and Bennett Stone Quarry. The two sites were found to have released polychlorinated biphenyls (PCBs) contamination into local soil, karst/bedrock, groundwater, and streams, which are currently undergoing remediation (source control, hydraulic control, and groundwater treatment). The sites are considered "Areas of Special Concern" to the Section 5 Study Area based on the possibility that water drainage from an improved roadway could interfere with current or future remediation activities overseen by IDEM.

- **Lemon Lane Landfill (HM-7)** - Lemon Lane Landfill is located southeast of the intersection of SR 37 and Vernal Pike in Bloomington, Indiana (**Figure 4.5-1**). The Lemon Lane site is a former 10-acre municipal landfill that accepted both municipal and industrial waste material. The site is located adjacent to the Section 5 corridor, approximately 1,000 feet from existing SR 37 pavement.

The Lemon Lane Landfill was operated as a sanitary landfill from the late 1930s to 1964 and included PCB contaminated capacitors, materials, and other industrial wastes According to USEPA documents, from about 1958 until 1964, a large number of electrical capacitors containing PCBs were dumped at the site. From 1958 until 1964, PCBs were released from many of the electrical capacitors when metal scavengers broke open the capacitors to reclaim internal metal capacitor parts. Labels found on the capacitors linked the PCB contamination to the Westinghouse Electric Corporation, now doing business as CBS, as required by a 1985 Consent Decree between USEPA and CBS et al.

Source removal and encapsulation remedial measures have been completed at the former landfill site and included: Phase II Assessments and delineation; excavation and offsite landfill disposal of 80,087 tons of PCB contaminated material; offsite incineration and disposal of 4,402 capacitors; consolidation of 40,000 cubic yards of landfill material to an approximately 9 acre area; isolation of this landfill material via installation of a landfill cap; and, perimeter drainage, security fencing, and a stormwater retention pond. The cleanup of areas outside the landfill boundary was to a high occupancy/residential standard of 2 ppm PCBs (on average) to the north (toward Vernal Pike), east and west (toward SR 37) sides of the site. The cleanup along the southern side toward the CSX railroad was to industrial standards. Potential exposure to landfill related soil contamination (in excess of construction worker standards) is minimal based upon the upgradient, higher elevation, and 1,000-foot separation from existing SR 37 and all of the alternatives, and the completion of on-site soil remedial actions to residential standards.

Additional remedial actions address surface water and groundwater from the Superfund site that drain to the Illinois Central Spring (ILCS) via conduits developed in the karst. Due to elevated PCB concentrations, the PCB impacted water discharging from ILCS is captured and treated prior to release to surface water. While attempts were made to treat all of the water discharged from the ILCS, the treatment plants treatment rate (1,000 gallons per minute via carbon adsorption) and storage capacities have been exceeded during historic peak flows. The highest PCB results were associated with these peak flows and threatened sediment and water quality in the receiving stream. Recent additions at the plant have added an additional 5,000 gallon per minute treatment capacity. The combined treatment systems are expected to treat nearly 100% of the ILCS spring water and prevent 99.9% of the PCB mass from entering the receiving stream is planned.

The current alignment of SR 37 is along the northwestern edge of the previously reported ILCS recharge area, from the CSX railroad north to between Vernal Pike and West 17$^{th}$ Street. Subsequent karst investigations for the Section 5 corridor have revised the recharge area and show that a smaller portion of existing SR 37 is in the ILCS recharge area, approximately 1,200 feet south to 1,200 feet north of the Vernal Pike intersection (see **Section 5.21**, *Karst Impacts*).

- **Bennett Stone Quarry (aka Bennett's Dump / HM-11)** - The Bennett Stone Quarry site consists of a parcel owned by Ledge Wall Quarry LLC (former Star Quarry Inc.) and covers about four acres of the parcel located northwest of the current SR 46/SR 37 interchange and west of the Section 5 corridor (approximately 1,000 feet from the existing SR 37 pavement). While existing SR 46 and SR 37 are upgradient of the Bennett's Dump site, the Section 5 alternatives are over 1,400 feet to the east of the site boundary.

According to USEPA documents, the site was formerly a limestone quarry pit that had been filled with various waste materials including demolition debris, household wastes, and electrical parts. Property adjacent to the site was used for limestone cutting and quarry operations. A large number of electrical capacitors containing PCBs were dumped at the site during the 1960s and 1970s. In early 1984, Bennett's Stone Quarry was added to a list of sites to be included in the Consent Decree negotiations with CBS and USEPA. The 1998 USEPA ROD Amendment selected a cleanup remedy that included excavation and incineration of PCB-contaminated material, sediment removal from Stout Creek, and long-term groundwater monitoring. Low levels of PCB contamination were identified at five springs: Mound Spring, Middle Spring, Mid-North Spring, North Spring, and Rusty Spring that discharge to the adjoining Stout Creek. CBS conducted Phase II Assessments and investigations for groundwater, hydrogeology, and karst geology at the site.

Remedial actions have included the excavation and off-site treatment/disposal of 37,913 tons of PCB contaminated soils and materials, installation of a passive drain system to allow upgradient abandoned quarry pits and waste stone areas to drain directly to Stout Creek, thereby bypassing residual contaminates at the dump site, and limited sediment removal and bank stabilization along Stout Creek. The remedy for the source control area has been implemented with confirmation sampling showing residual PCBs in soils below the site cleanup level of 25 ppm. The remedy for groundwater has not been completely implemented, since low levels of PCBs continue to be detected at onsite springs. While recent data by USEPA indicated that the PCB mass discharging into Stout Creek is being reduced by over 80% with the installation of the passive quarry drain, evaluation of a collection trench and/or water treatment plant are under consideration. Institutional controls for the Bennett's Dump site have not been finalized because the final remedy has not been completely implemented (USEPA, 2012).

## Section 4.5 Figure Index

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## *4.6 Air Quality*

Since the publication of the Draft Environmental Impact Statement (DEIS), it has been decided that a hotspot analysis will be conducted in Morgan County for fine particulate matter ($PM_{2.5}$). This is further discussed below.

The Clean Air Act (CAA) and the 1990 CAA Amendments (CAAA) require the United States Environmental Protection Agency (USEPA) to establish National Ambient Air Quality Standards (NAAQS) for pollutants that are considered to be harmful to the public health and environment. USEPA set forth standards for six principal pollutants – particulate matter (PM), sulfur dioxide ($SO_2$), carbon monoxide (CO), ozone, nitrogen dioxide ($NO_2$), and lead. When levels of pollutants do not exceed the standards, an area is considered in attainment of the NAAQS. An area that does not meet the NAAQS for one or more pollutants will be designated by the USEPA as a "nonattainment area." Areas that were formerly in nonattainment and now meet the NAAQS may petition redesignation to attainment. The State must submit, and USEPA can approve, a maintenance plan which covers a 10-year period. These are called "maintenance areas" and the CAA calls for the State to update the maintenance plan for another 10 years for a total period of 20 years. Under the CAA, each state is required to establish a plan to achieve and/or maintain the NAAQS in nonattainment and maintenance areas. This plan is known as the State Implementation Plan (SIP).

The CAAA linked transportation funding to air quality actions. Specific requirements aimed at transportation may include vehicle inspection and maintenance, reformulated fuels, alternative-fuel vehicles, and transportation control measures (TCMs). Federal funding is available for certain projects that benefit air quality.

The Federal Highway Administration (FHWA), in consultation with Indiana Department of Environmental Management (IDEM), USEPA, and Indiana Department of Transportation (INDOT), is responsible for determining transportation conformity in nonattainment and maintenance areas for the transportation-related pollutants: ozone, $NO_2$, PM, and CO. Though separate from the NEPA process, the conformity regulations likewise require INDOT to assess the potential air quality impacts of transportation projects on the human environment.

Two notable differences exist between the project level air quality requirements under NEPA and those under the CAA. First, NEPA applies to Federal projects regardless of location whereas the CAA applies to projects within specifically identified nonattainment, maintenance, or attainment areas. Second, NEPA and its implementing regulations provide limited detail on the direction and criteria for conducting project level air quality analyses whereas the CAA and its implementing regulations provide substantial detail. A common element to project level analysis under both NEPA and the CAA is that the criteria pollutants of the CAA are applied to both for considering potential air quality issues. The corresponding NAAQS for these pollutants are applied as the criteria for evaluating proposed projects and actions.

The Section 5 corridor is located in Monroe and Morgan counties. Monroe County is in attainment for all NAAQS, and thus, conformity requirements do not apply. Morgan County is in nonattainment for the $PM_{2.5}$ (1997) standard, is a maintenance area for 8-hour ozone (redesignated to maintenance October 19, 2007) and in attainment for all other NAAQS pollutants.

Because of the maintenance designation for ozone and nonattainment designation for $PM_{2.5}$, Section 5 of I-69 project (Section 5, Morgan County) is subject to the transportation conformity requirements found in 40 CFR Part 93 as amended. These requirements are met in part by inclusion of this rural portion of I-69 in the Indianapolis Metropolitan Planning Organization's (IMPO) regional emissions analysis for the long range transportation plan and transportation improvement program.

The Indianapolis MPO adopted the *2035 Long-Range Transportation Plan: 2012 Amendment* that includes the approved Section 5 project corridor and corresponding "Air Quality Conformity Determination Report," dated July 23, 2012.[1]

In addition to demonstrating conformity in nonattainment and maintenance areas for the NAAQS at the regional-level, transportation conformity requirements may also require project-level hotspot analyses for CO and/or PM in nonattainment and maintenance areas for CO and/or PM. Section 93.109(b) of the federal conformity rule lays out the requirements for project-level conformity determinations. It specifies that interagency consultation is required to determine whether a project meets the criteria that would require a hotspot analysis. Since Morgan County is in nonattainment of the $PM_{2.5}$ standard, interagency coordination was initiated during a conference call on August 23, 2012, with state and federal agencies involved in the project planning process. The interagency call included an overview of the project and identified additional data needs to support future decisions. Additional interagency consultation group (ICG) meetings were held April 19, 2013, April 29, 2013, and May 23, 2013 to discuss the need for a quantitative PM2.5 analysis for I-69 Section 5 and methodologies to be used for this analysis. It was noted that the project is located in a PM2.5 nonattainment area (Morgan County) with an increase in the number of diesel vehicles expected in future years. The ICG agreed that a project level hot-spot analysis would be conducted for I-69 Section 5 although the group did not conclude that the project was a Project of Air Quality Concern. For further information, please refer to **Section 5.9.3.2**, *$PM_{2.5}$*, in the Methodology section. Under NEPA, CO and MSATs were also analyzed. A CO project level analysis was performed. A detailed analysis of MSAT emissions is not required.

**Section 5.9**, *Air Quality*, describes the methodology and results of the air quality analysis conducted for Section 5 at both the regional level and the project level.

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[1] Indianapolis Metropolitan Planning Organization, "Indianapolis Metropolitan Planning Area, Air Quality Conformity Determination Report, 2035 Long-Range Transportation Plan: 2012 Amendment & 2012-2015 Indianapolis Regional Transportation Improvement Program," Indianapolis Metropolitan Planning Organization, Madison County Council of Governments, Indiana Department of Transportation, July 23, 2012, http://www.indympo.org/Plans/Documents/2035LRTP_2012Amendment_Final.pdf (last accessed May 8, 2013).

## 4.7 Highway Noise

Since the publication of the Draft Environmental Impact Statement (DEIS), the following substantive change has occurred to this section:

- **Figure 4.7-2** was corrected to show the noise field measurement locations.

Typically, a widening of an existing highway facility results in slightly higher noise levels in the design year when compared to existing conditions. This is usually a result of two factors: predicted natural traffic volume growth from the existing year to the design year; and vertical/horizontal modifications, interchange improvements, and induced traffic volumes (if applicable) that result from building the new facility.

Noise generally is defined as unwanted sound. Vibrational energy causes pressure variations in elastic media such as air or water; the human ear perceives these pressure variations as sound and can discern different levels of loudness as the intensity of the pressure variations fluctuate. These pressure differences are commonly measured in decibels (dB). A level of zero decibels corresponds to the lowest limit of a typical person’s audibility, while a level of 140 decibels represents the threshold of pain.

Since the hearing sensitivity of the human ear is non-linear with respect to frequency, a weighting scale (“A-weighted” scale) is used to define how loud a sound is for all frequencies. Therefore, sound levels measured using the A-weighted scale are often expressed as dBA. For the purposes of this study, all references to sound levels reflect dBA measurements. In addition, all referenced noise levels represent exterior levels only. Noise measurements were not conducted in the interior of buildings or other structures.

For reference purposes, **Figure 4.7-1** shows common outdoor and indoor sound levels from various everyday sources. Figures are located at the end of the chapter.

The *INDOT Traffic Noise Analysis Procedure* (2011) describes the Indiana Department of Transportation’s (INDOT’s) implementation of 23 CFR 772, Procedures for Abatement of Highway Traffic Noise and Construction Noise. Noise monitoring procedures established by the Federal Highway Administration (FHWA) in *Highway Traffic Noise: Analysis and Abatement Guidance* (2011), provide for conducting noise analyses using the Leq noise descriptor. The hourly Leq is defined as the equivalent, steady state sound level, which, in a given period of time (one hour), contains the same acoustical energy as the time-varying sound level during the same time period. Generally, a 3-dBA Leq change is the average minimum change necessary to be perceived by most people, a 5-dBA Leq change is considered noticeable, and a 10-dBA Leq change is considered to be twice or half as loud. The Leq noise descriptor is used in this study because of its ease to monitor and compare with FHWA's noise abatement criteria (NAC) standards.

Within and near the Section 5 corridor, the roadway that serves as the primary source of highway noise is SR 37 (future I-69). Cross-streets that contribute varying degrees of vehicular noise to the total sound level environment include Fullerton Pike, Tapp Road, the SR 45/2nd Street interchange, the SR 48/3rd Street interchange, the SR 46 interchange, Kinser Pike, Walnut Street, Sample Road, and Paragon Road. The measured ambient sound levels along SR 37 range between the low 50s dBA Leq(h) and the high 60s dBA Leq(h). See **Figure 4.7-2** for noise meter locations.

A residential, school, church, or park land use, for example, experiences highway noise impact if the design year build alternative predicted sound level approaches or exceeds 67 dBA Leq(h), with 66 dBA Leq(h) defined as being the approach criteria level at these locations. A substantial noise increase impact is also experienced if there is an increase in design year build noise levels of 15 dB(A) over the existing condition. **Section 5.10,** *Highway Noise*, describes the methodology and results of the noise impact analysis conducted for Section 5.

## Section 4.7 Figure Index

*(Figures follow this index page.)*

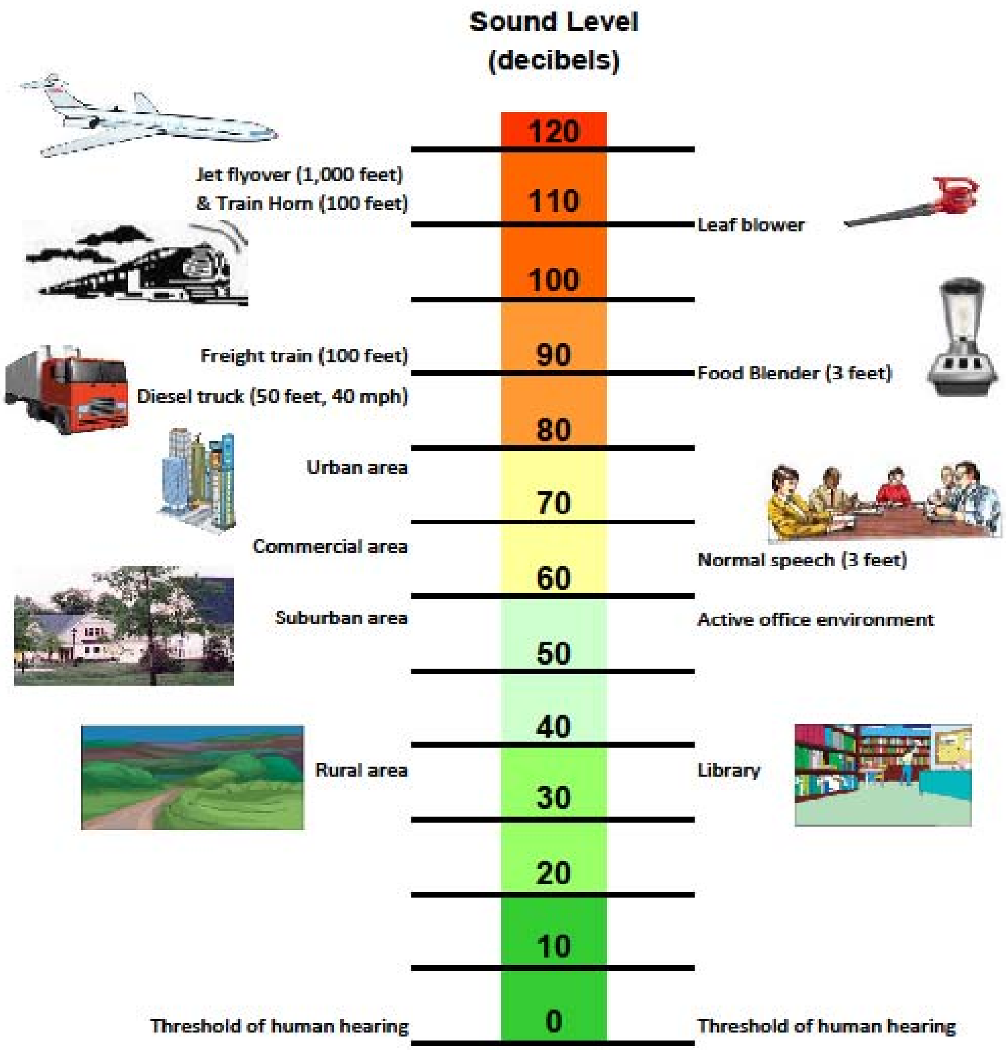


**Figure 4.7-1: Common Outdoor And Indoor Noise Levels**
***Source:*** *Adapted from ADOT Common Outdoor and Indoor Noise Levels, 2011, IDOT Highway Traffic Noise Assessment Manual, Common Sound Levels, 2011 and Caltrans, Technical Noise Supplement, Traffic Noise Analysis Protocol. October 1998, Michael Baker Corporation.*

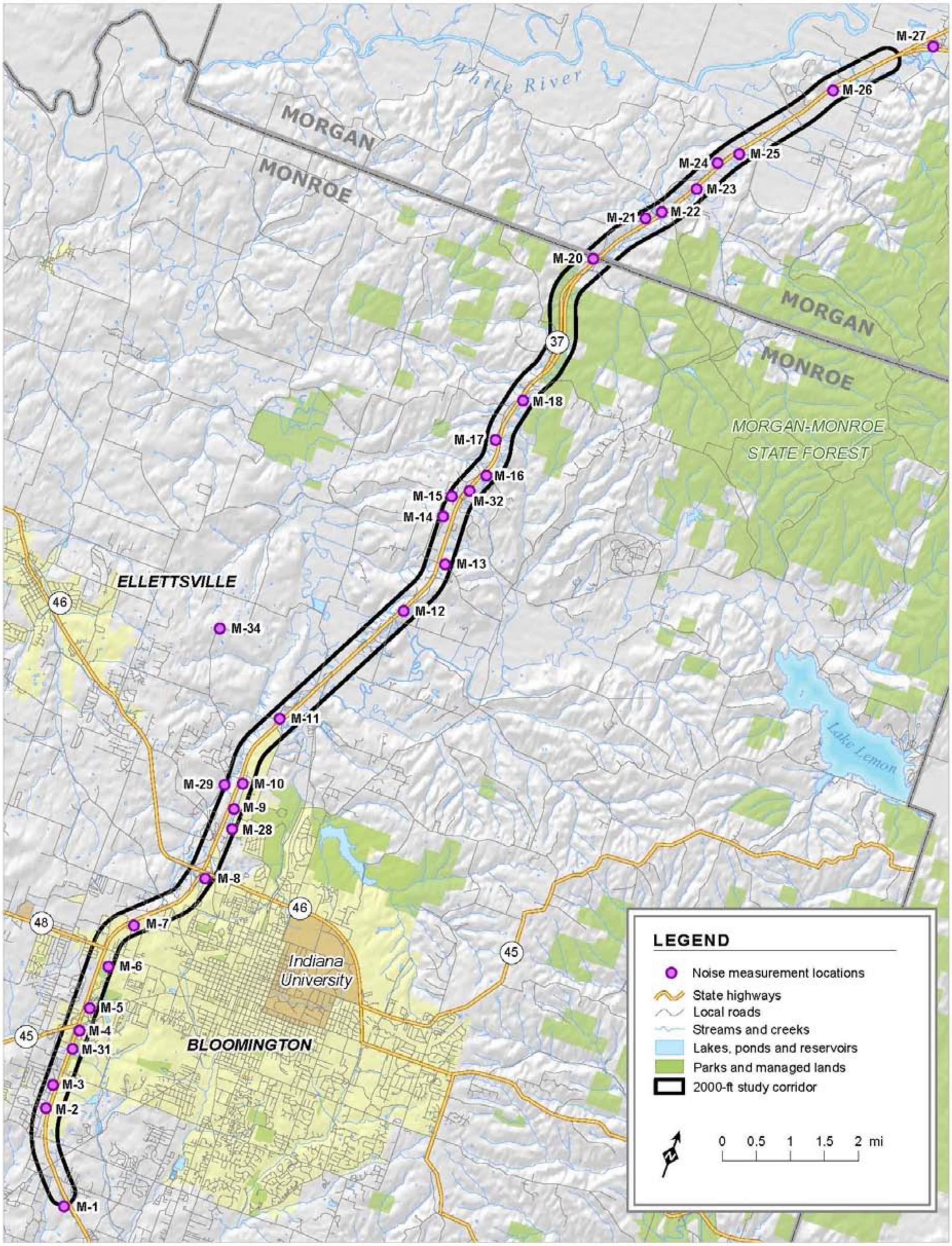


**Figure 4.7-2: Noise Measurement Locations (Index Map)**

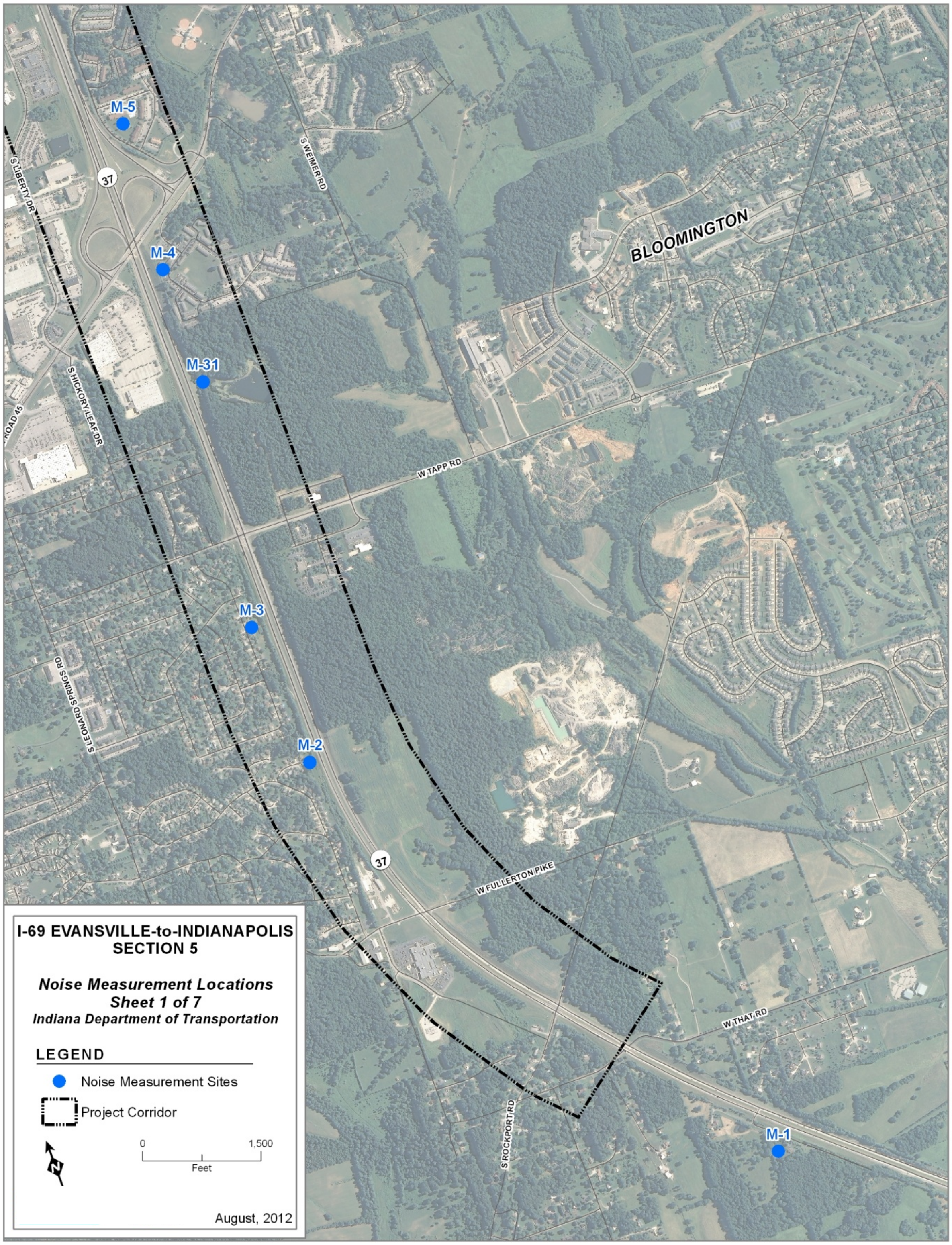


**Figure 4.7-2: Noise Measurement Locations (Sheet 1 of 7)**

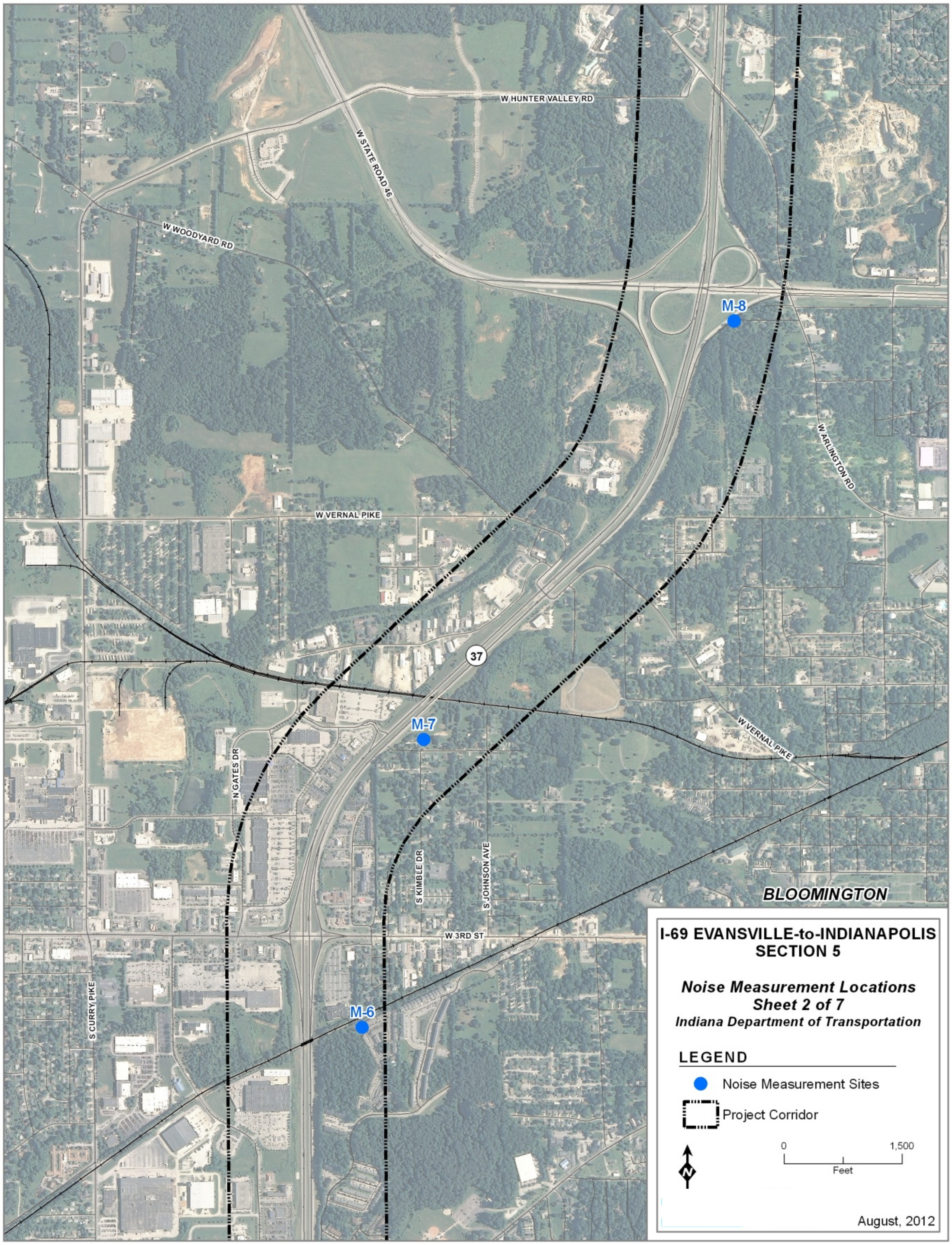


**Figure 4.7-2: Noise Measurement Locations (Sheet 2 of 7)**

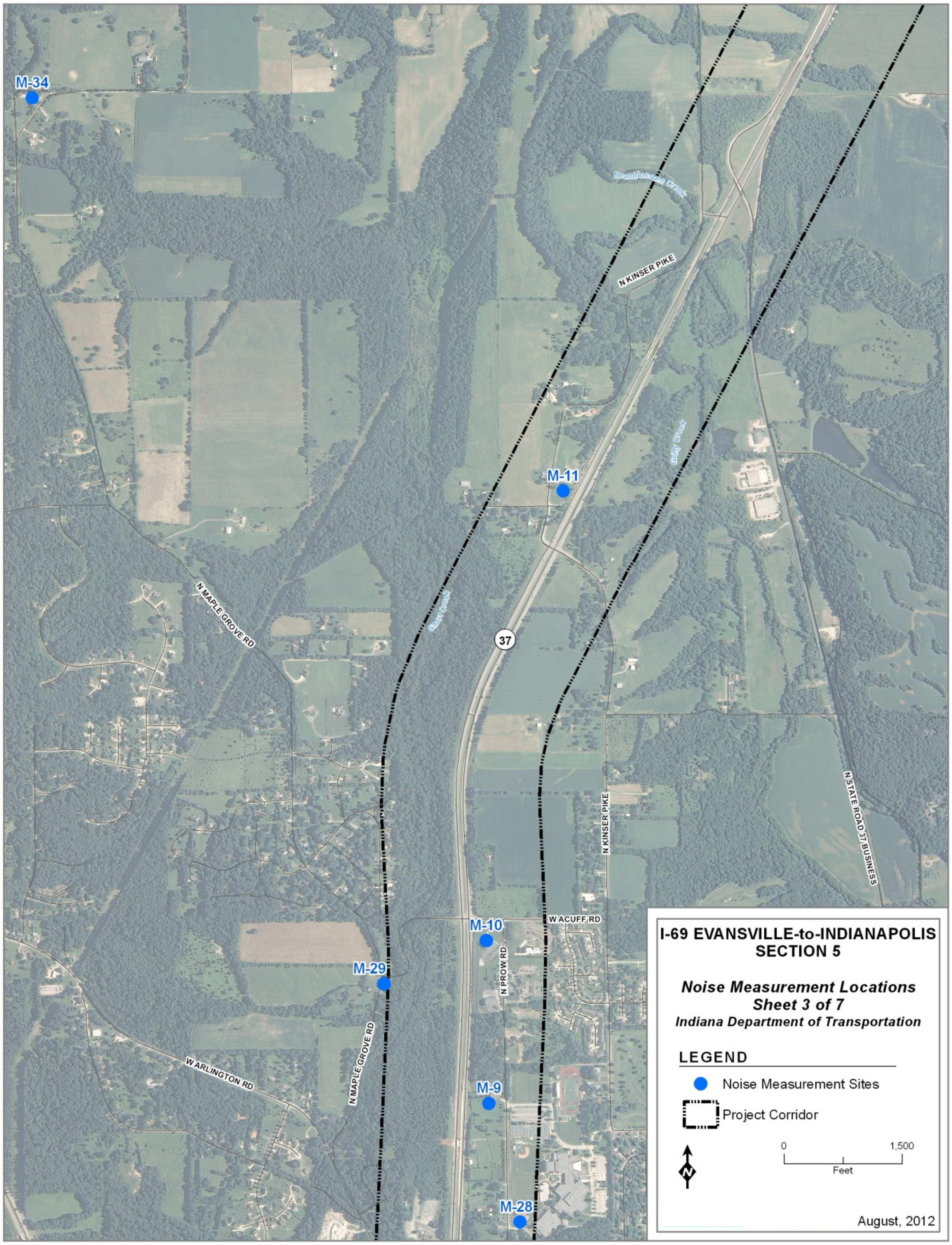


**Figure 4.7-2: Noise Measurement Locations (Sheet 3 of 7)**

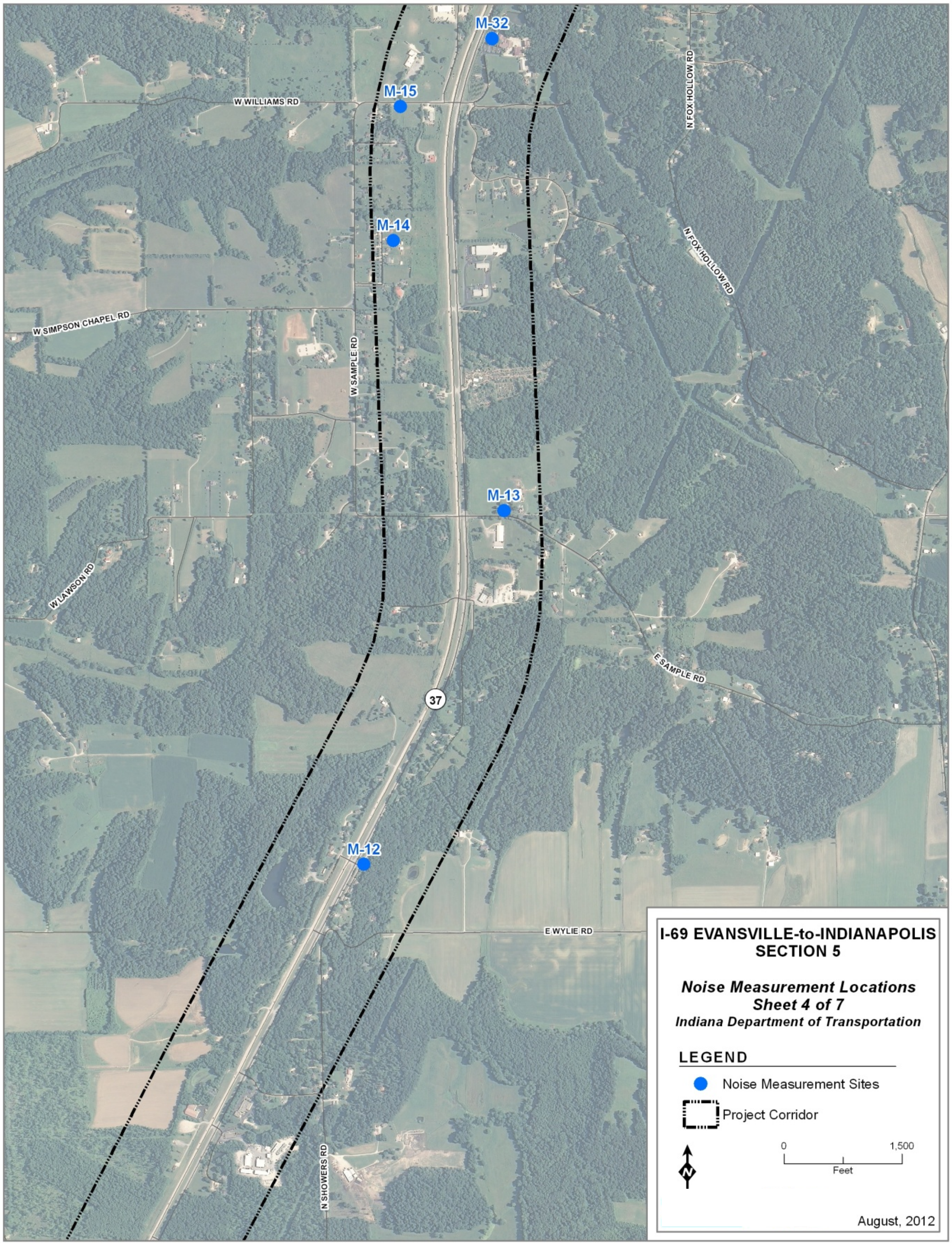


**Figure 4.7-2: Noise Measurement Locations (Sheet 4 of 7)**

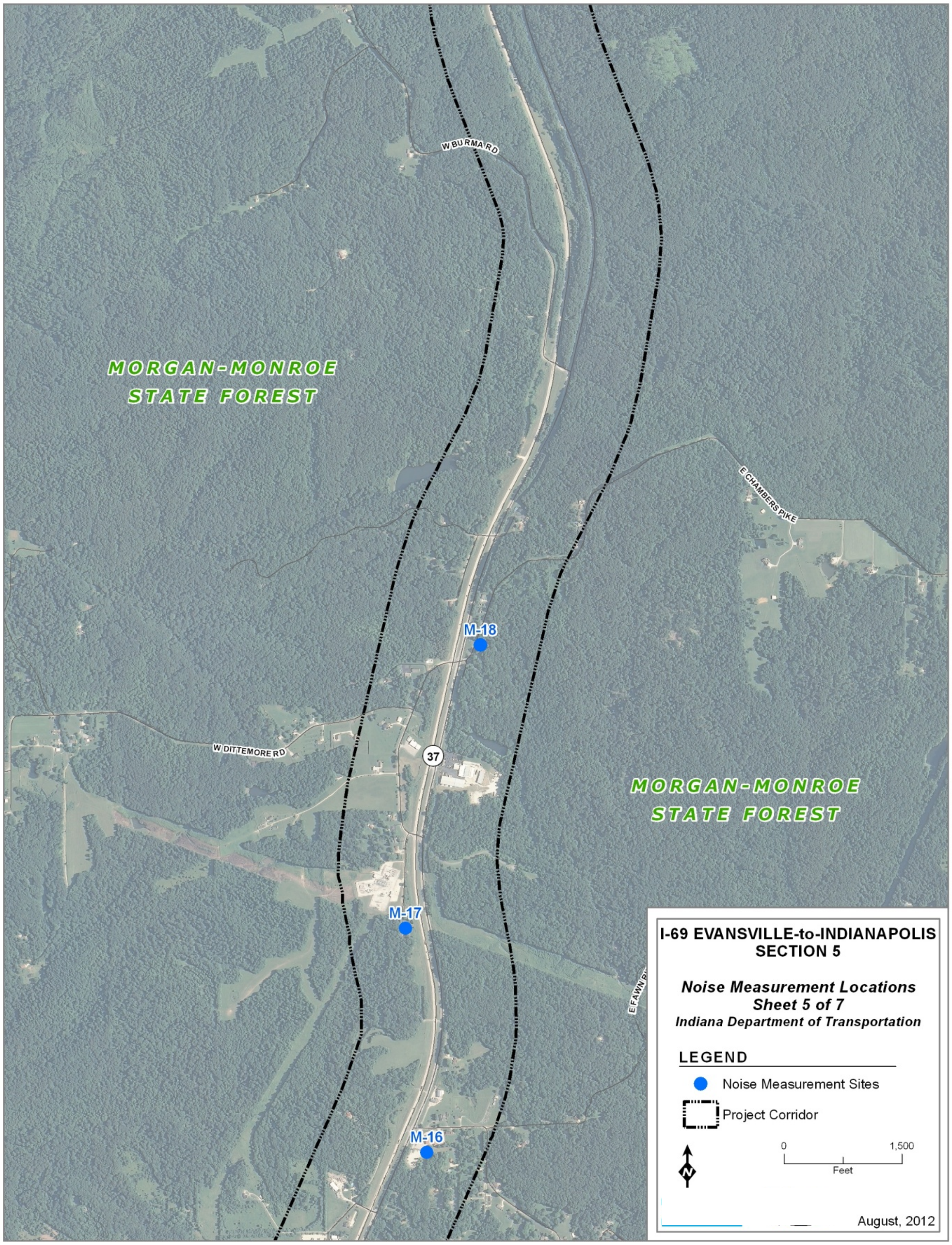


**Figure 4.7-2: Noise Measurement Locations (Sheet 5 of 7)**

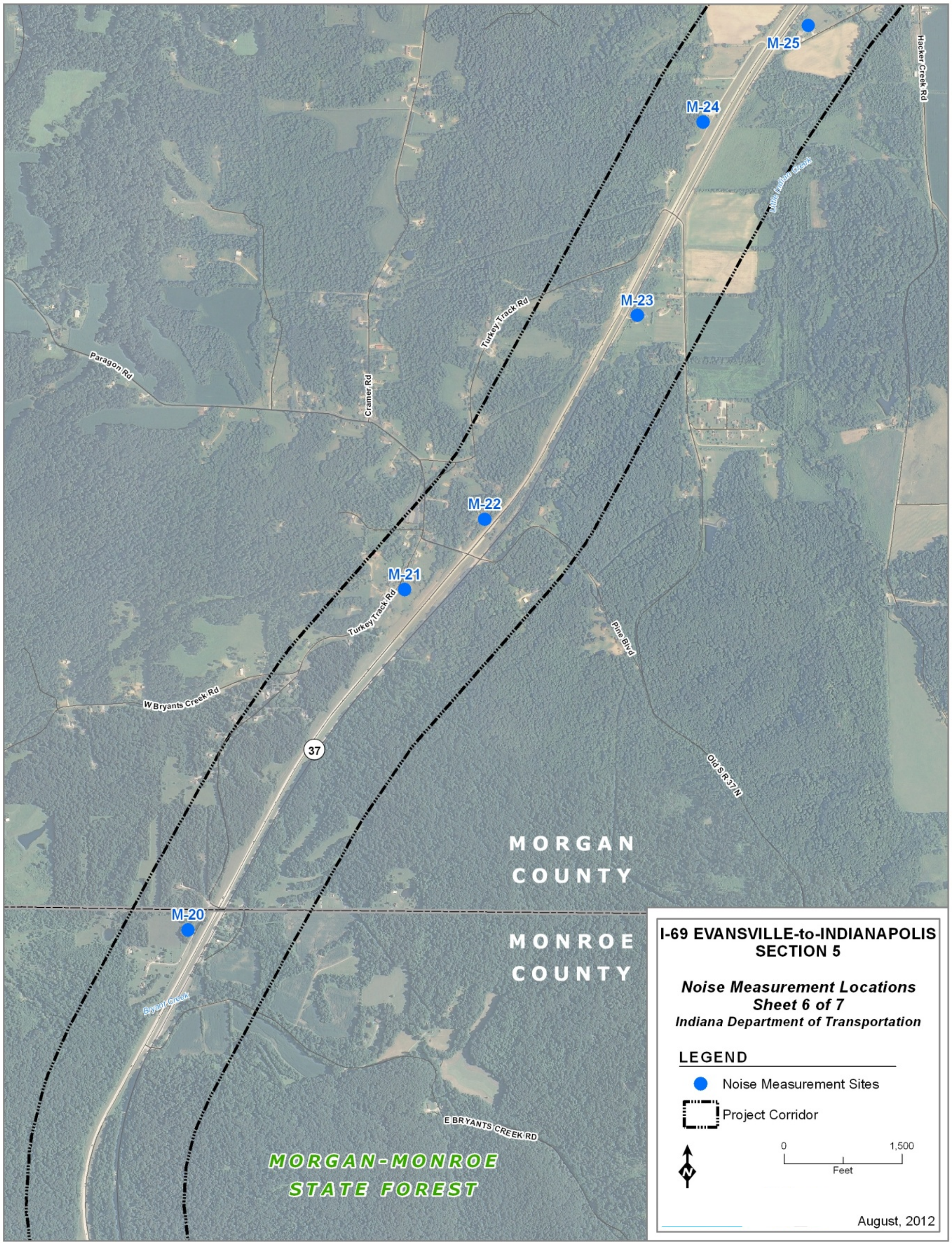


**Figure 4.7-2: Noise Measurement Locations (Sheet 6 of 7)**

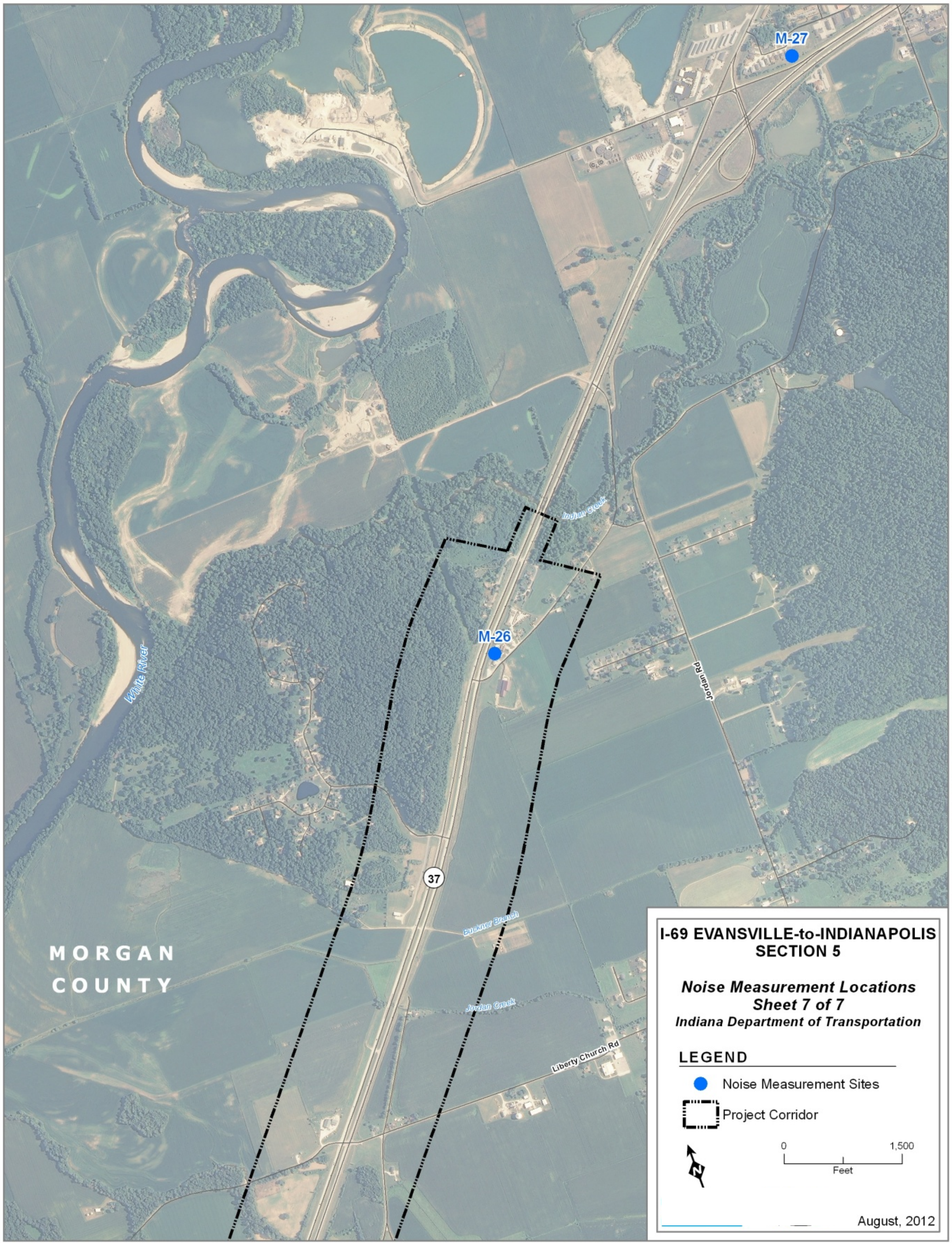


**Figure 4.7-2: Noise Measurement Locations (Sheet 7 of 7)**