Characteristic View of the Project Area Landscape (Oblique Aerial taken from Helicopter)

Linear infrastructure prevalent in Segments 1 and 2 consists of transmission lines, roadways, oil and gas pipelines, and other utility corridors that contribute visible human-made elements to the predominantly agricultural landscape. These industrial elements can be found throughout the Study Area but do not tend to dominate the landscape.

Typical Landscape in Segment I: Oil and Gas Pipeline amid Existing Agricultural Land Uses

Typical Landscape in Segment 2: Linear Infrastructure amid Existing Agricultural Land Uses

Although the majority of the Study Area is composed of low intensity development characterized by agricultural land uses, moderate urban development also exists. Several small towns occur along major roadways. These industrial centers are more populated and more frequent at the eastern and westernmost extent of the Study Area.

Viewer/User Groups

Many factors influence the visual impact of any Alternative Route. The viewer is one of these factors. A viewer is defined as not only the person who is viewing the transmission line but also as the person's expectations, activities, and frequency of viewing the line (USDA Forest Service 1995). Three types of viewers were identified in the Study Area:

- Local Residents—Local residents are those people who live in the area of the proposed transmission line. Residents may view the line from their yards or homes, while driving on local roads, farming, or during other activities in their daily lives. The sensitivity of local residents to the visual impact of the line may be mitigated over time by frequent exposure to existing transmission lines and other dissonant features already within the viewshed.
- Commuters and Travelers—Commuters and travelers are people who travel by the transmission line on their way to other destinations. Typically, drivers have limited views of the transmission line where vegetation or buildings provide screening and where the line crosses high above the road surface. Under these conditions, the visual perception of the line for commuters and travelers is anticipated to be relatively low because they are typically moving and have a relatively short duration of visual exposure

to the line. When new visual features persist in the immediate vicinity or directly parallel to the road over long distances, longer visual exposure can be expected.

- Recreational Users—Recreational users include primarily local residents involved in recreational activities, such as wildlife viewing and hunting at Swan Lake National Wildlife Refuge and in Mark Twain National Forest, sightseeing along the Great River Road Scenic Byway, fishing and boating on USACE reservoirs, and engaging in other recreational uses at state conservation areas. These areas are described in greater detail in **Table 5-17**. For some recreational users, scenery may be an important part of their experience because their activities may include attentiveness to views of the landscape for long periods. Such viewers also may have a high appreciation for visual quality and high sensitivity to visual change.

Scenic Integrity and Visual Absorption

Scenic integrity is the degree by which the landscape character deviates from a natural or naturally appearing landscape in line, form, color, and texture of the landscape. In general, natural and naturally appearing landscapes have the greatest scenic integrity. As human-made incongruities are added to the landscape, scenic integrity diminishes.

Additionally, some landscapes have a greater ability to absorb alterations with limited reduction in scenic integrity. Character and complexity, as well as environmental factors, influence the ability of a landscape to absorb changes. A new transmission line sited next to an existing transmission line provides less contrast and, therefore, can be absorbed into that landscape more readily than a transmission line introduced as a new feature into a previously undeveloped area. Scenic integrity refers to the degree of intactness and wholeness of the landscape character. New transmission and substation facilities are more likely to "blend-in" with surroundings near pre-existing facilities and would be an additive feature to the landscape, instead of a new feature.

Visually Sensitive Features and Recreational Resources within the Segments

Recreational areas are found throughout the Project area and vary from conservation areas to state parks and reservoirs. Table **5-17** details the recreational areas that are located in the vicinity and potentially visible from the Alternative Routes. Recreational areas are organized and described from west to east.

Table 5-17. Visually Sensitive Features and Recreational Resources			
Recreational Resource	**Size**	**Major Recreational Activities**	**Proximity to Alternative Routes**
Segment 1			
Jentell Brees Boat Ramp	42.8 acres	Boat access to the Missouri River	650 feet from Alternative Routes A, B, and C.
Bluffwoods Conservation Area	2,097 acres	Wildlife viewing, camping, and hunting	0.75 mile from Alternative Route C
Pidgeon Hill Conservation Area	396 acres	Wildlife viewing, hiking, and hunting	Adjacent to Alternative Route A
Belcher Branch Lake Conservation Area	372 acres	Boating, fishing, wildlife viewing, and hunting	0.7 mile from Alternative Routes B and C
Agency Conservation Area	94 acres	Fishing, camping, and wildlife viewing	350 feet from Alternative Route A
Hartwell Conservation Area	112 acres	Fishing, camping, and wildlife viewing	0.4 mile from Alternative Routes B and C.
Smithville Reservoir	18,391 acres	Boating, fishing, camping, hiking, birding, swimming, water skiing, biking, horseback riding, golfing, accessing the beach, and hunting	3.5 miles from Alternative Routes B and C
Segment 2			
Bonanza Conservation Area	1,503 acres	Bicycling, bird watching, camping, fishing, boating, horseback riding, and hunting	0.5 mile from Alternative Routes G, H, and I
Bunch Hollow Conservation Area	3,060 acres	Wildlife viewing, camping, hunting, fishing, and boating	0.5 mile from Alternative Routes G, H, and I

Table 5-17. Visually Sensitive Features and Recreational Resources			
Recreational Resource	**Size**	**Major Recreational Activities**	**Proximity to Alternative Routes**
Swan Lake National Wildlife Refuge	10,397 acres	Environmental education, fishing, hunting, interpretation, photography, wildlife viewing	0.5 mile from Alternative Routes G, H, and I
Salisbury Municipal Golf Course	190 acres	Golf	Approximately 100 feet from Alternative Route D
Mussel Fork Conservation Area	2,277 acres	Wildlife viewing, camping, hiking, hunting, fishing, and boating	1.7 miles from Alternative Route I
Thomas Hill Reservoir	9,119 acres	Wildlife viewing, camping, hunting, fishing, and boating	0.6 mile from Alternative Routes G and H; 0.2 mile from Alternative Route I
Helen K. Wiese Conservation Area	100 acres	Canoeing, fishing, and wildlife viewing	1.5 miles from Alternative Routes D, E, and F
Mark Twain Lake and State Park	50,192 acres (reservoir) 1,180 (state park)	32 recreation areas offering: camping; boating; fishing; swimming; hiking; and wildlife viewing	0.7 to 8.5 miles from Alternative Routes F and H; 0.1 to 4.4 miles from Alternative Routes D, E, and G

General Impacts

As described in Section 1.4, *Project Description*, a combination of lattice and monopole structures may be used for the Project. Visually, lattice structures blend into the background, especially from the middle and bac -ground distances. The lattice design allows the natural colors of the surrounding backdrop to be seen, dissipating the visual intrusion of the transmission line. Monopole structures tend to stand out more on the landscape, compared with lattice structures, and there are typically more monopole structures per mile than lattice structures. In areas where long vistas are possible, the use of monopole structures could lead to greater visible impacts, particularly in areas where a transmission line parallels a roadway.

Generally, short-term effects of transmission line construction could potentially impact public and private facilities. Construction could potentially negatively affect access to recreational

areas by temporarily: 1) blocking access roads, trails, or other facility entrances; 2) closing roads during specific construction activities; 3) disrupting traffic; and 4) creating detours, possibly making access more difficult. Construction could also temporarily impact the rural setting and the scenic integrity of the area due to increased construction-related traffic, noise, dust, brightly colored signage, and the number of people coming to the area. Large cranes and/or helicopters are typically used during the construction of transmission lines, creating an increased temporary disturbance in the visual, aesthetic, and peaceful nature of some areas.

Alternative Route Comparison

Impacts to recreation and visual resources would occur from the visual contrast created by line placement within previously undisturbed landscapes near publicly accessible recreational areas with high scenic integrity. Overall, areas with greater visual impacts include places where the Alternative Routes do not parallel existing transmission lines or roadways in developed areas. Whenever practical, parcel boundaries were selected for siting the line in areas where existing transmission lines were not available or where parcel boundaries were deemed more favorable. The Routing Team sought to align the routes along half section lines, shifting farther from roadways and other areas of high visibility.

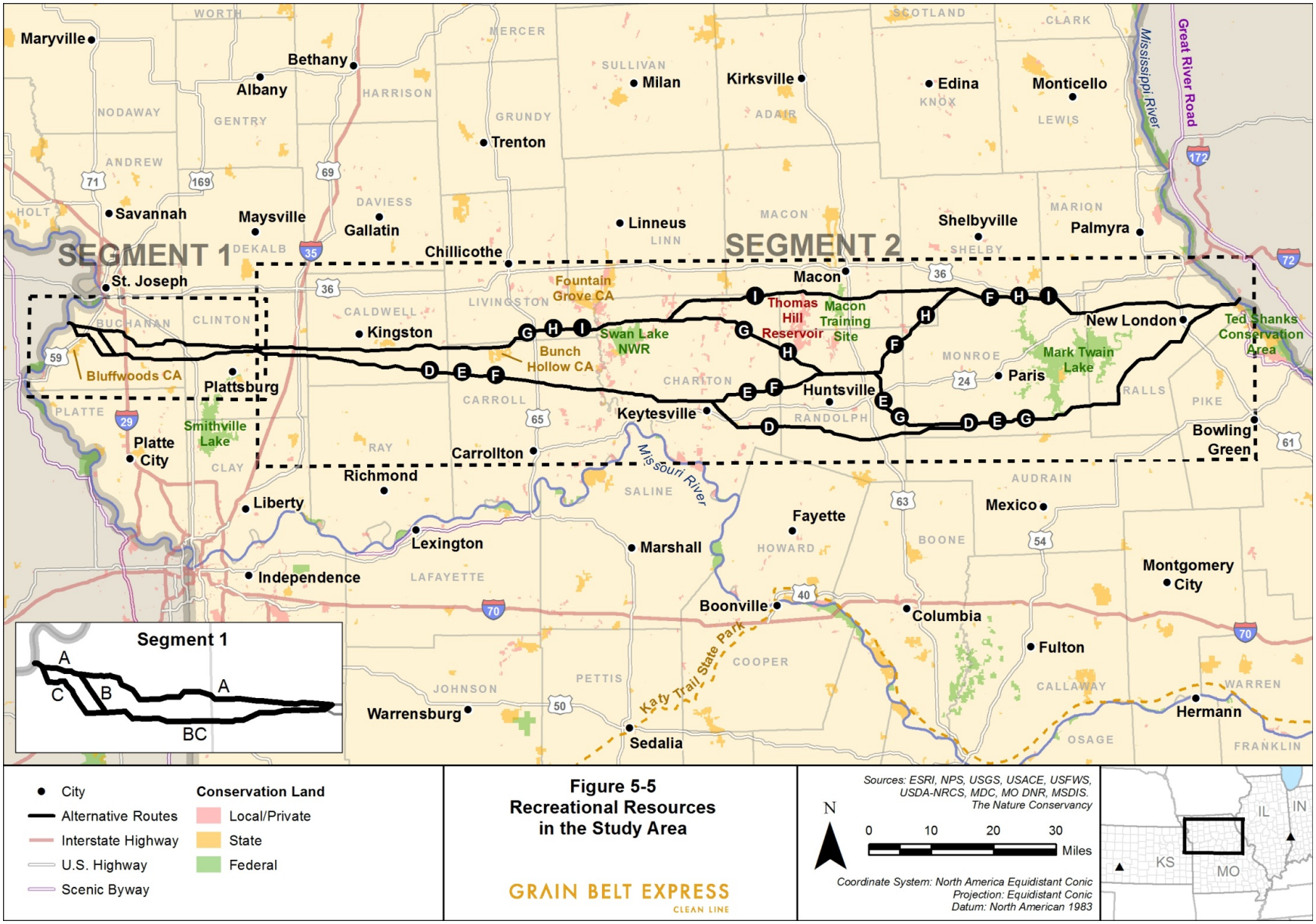
Segment 1

The entire length of Segment 1 is located within 25 miles of the urbanized area of St. Joseph. The main recreational resources in the vicinity of Segment 1 include Bluffwoods Conservation Area, Pigeon Hill Conservation Area, Belcher Branch Lake Conservation Area, and Smithville Reservoir (**Figure 5-5**). None of the Alternative Routes cross these resources; however, Alternative Route A is in close proximity to both Pidgeon Hill and Agency State Conservation Areas.

Beginning within the Missouri River floodplain, the Alternative Routes pass through a primarily agricultural landscape characterized by scattered development, including roadways and residential areas. The towns of Agency, Faucet, and Gower are the nearest communities to the Alternative Routes. Stands of forest occur throughout the landscape beyond the floodplain, which is also transected by various roads, utility pipelines, and transmission lines. The presence of infrastructure and associated urbanization throughout the area results in relatively low scenic integrity. Alternative Routes A and B generally parallel the path of Rockies Express/Keystone Pipelines for approximately 5 miles before diverging at Contrary Creek.

Where Alternative Routes A, B, and C cross Highway 371 and Interstate 29, the line will be visible to local residents traveling these roadways. Views would not be available in instances where Alternative Routes are shielded by the presence of vegetation and topography. Alternative Routes in Segment 1 are not anticipated to be highly visible from Smithville Reservoir because of the distance from all Alternative Routes (more than 3 miles). Alternative Route C may potentially be visible to the north of the Bluffwoods Conservation Area, and

Alternative Route A may be visible south of the Pigeon Hill Conservation Area and from the Agency Conservation Area. However, the presence of rolling topography and linear infrastructure, such as roadways and existing transmission lines, would minimize the impacts to these areas created by the Alternative Routes in Segment I. Distant views of Alternative Routes B and C, which would be located 2 miles north of Belcher Branch Lake Conservation Area, may be available.


SEGMENT 1
SEGMENT 2
Maryville
Bethany
Albany
Milan
Kirksville
Edina
Monticello
Trenton
Savannah
Maysville
Gallatin
Linneus
Shelbyville
Palmyra
Chillicothe
St. Joseph
Macon
Fountain Grove CA
Thomas Hill Reservoir
Macon Training Site
New London
Ted Shanks Conservation Area
Kingston
Swan Lake NWR
Bunch Hollow CA
Bluffwoods CA
Plattsburg
Mark Twain Lake
Paris
Huntsville
Keytesville
Bowling Green
Smithville Lake
Platte City
Carrollton
Richmond
Liberty
Missouri River
Mexico
Fayette
Lexington
Marshall
Montgomery City
Independence
Boonville
Columbia
Fulton
Katy Trail State Park
Warrensburg
Sedalia
Hermann
Mississippi River
Great River Road
Segment 1
A
C
B
A
BC
City
Alternative Routes
Interstate Highway
U.S. Highway
Scenic Byway
Conservation Land
Local/Private
State
Federal
Figure 5-5
Recreational Resources
in the Study Area
GRAIN BELT EXPRESS
CLEAN LINE
Sources: ESRI, NPS, USGS, USACE, USFWS, USDA-NRCS, MDC, MO DNR, MSDIS. The Nature Conservancy
N
0 10 20 30
Miles
Coordinate System: North America Equidistant Conic
Projection: Equidistant Conic
Datum: North American 1983
IL
IN
KS
MO

Segment 2

The main recreational resources within Segment 2 include Bonanza and Bunch Hollow Conservation Areas, Swan Lake National Wildlife Refuge, Mussel Fork Conservation Area, Mark Twain Reservoirs, and Mark Twain State Park (**Figure 5-5**).

Alternative Routes D, E, and F begin southeast of the town of Turney and cross Interstate 35 where they generally parallel the Rockies Express/Keystone Pipelines for approximately 78 miles before they diverge just north of Keytesville near State Route 5. The majority of this portion of Segment 2 is composed of agricultural land with scattered residences in a gently rolling landscape. Alternative Routes D, E, or F would not represent a substantial change from the character of the existing landscape, which has already been modified by the presence of existing linear infrastructure in the form of roads, overhead utility lines, and pipelines.

Generally, Alternative Routes G, H, and I are closer to major recreational facilities in the area, increasing the potential visibility to viewers. Beginning southeast of Turney, the routes cross Interstate 35 and several existing transmission lines as they continue eastward toward State Highway 65. Paralleling existing transmission lines typically reduces visual impacts due to the previous visual disturbance. Along this portion of Segment 2, the line may be visible to some recreational visitors at Bonanza and Bunch Hollow Conservation Areas, which are 0.5 and 0.2 mile north and south of the line, respectively. Visitors at Swan Lake National Wildlife Refuge will also likely have views of Alternative Routes G, H, and I to the north of the refuge.

Near Rothville, Alternative Route I departs from G and H and continues northeast to parallel an existing transmission line for approximately 10 miles as it passes roughly 1.7 miles south of the Mussel Fork Conservation Area. Alternative Route I then continues east and passes within 0.2 mile of the northernmost extent of Thomas Hill Reservoir. Alternative Routes G and H pass within 0.6 mile of the southernmost extent of the reservoir, paralleling the path of an existing transmission line. The landscape in this area of Segment 2 is characterized by mature forest and gently rolling topography. Although portions of the line may be visible to visitors within Mussel Fork Conservation Area and Thomas Hill Reservoir, impacts to recreational resources are not anticipated. Views of the line would be intermittent and not detract from the scenic integrity of the area. Moreover, the addition of transmission lines within areas already characterized by infrastructure would not represent a substantial departure from the existing visual character of the area.

Segment 2 passes to the north and south of Mark Twain Lake, the southern portion of which is located as close as 0.1 mile from Alternative Routes D, E, and G. Mark Twain State Park is located within the area designated for the lake and is more than 4.5 miles from any of the Alternative Routes. The distance on either end of the lake, as well as existing topography and vegetation immediately adjacent to the lake, would likely limit views of any Alternative Routes

at this location; therefore, impacts to the recreational resources are not anticipated. Agricultural lands typifying the area surrounding the lake are characterized by open fields and patches of forest with interspersed residential and agricultural land uses. Topography surrounding the lake can be characterized as flat to gently undulating, allowing for some distant views across the landscape.

Typical Agricultural Landscape Southeast of Mark Twain Lake

South of Mark Twain Lake, visible features of the transmission line associated with Alternative Routes D, E, and G would be introduced into an agricultural and forested area and may create new visual disturbances in the area. Steel structures and lines will be visible to residents and motorists travelling along local roadways, however, forest cover throughout much of the area would provide some degree of natural shielding from public vantage points. Recreational uses at the reservoir would be unaffected because of existing forest cover and topography, which would limit views from the reservoir. As a result, impacts associated with recreational uses of the reservior are not anticipated.

5.2.5 Cultural Resources

Archaeological Resources

The Routing Team reviewed the Missouri Cultural Resource Inventory, maintained by the Missouri SHPO, for archaeological sites, architectural resources, and historic properties listed

on the National Register. Prehistoric development within Missouri was heavily influenced by the variation in the natural environments across the state and by the presence of the Mississippi and the Missouri rivers and their associated valleys. Archaeologists have divided the history of human occupation of Missouri into five major periods: Paleoindian Period (circa 12,000 to 8,000 years Before Christ (B.C.); Dalton Period (circa 8,000 to 7,000 years B.C.); Archaic Period (circa 7,000 to 600 B.C.); Woodland Period (circa 600 B.C. to 900 Anno Domini [A.D.]); and Mississippian Period (circa 900 A.D. to post-1700 A.D.)

Evidence of the Paleoindian occupation of Missouri has been confined to isolated fluted projectile point finds generally along major watercourses and interfluvial divides. The Dalton Period coincides with a climactic shift to warmer, drier weather. Coincident with the weather changes, the prehistoric inhabitants of Missouri developed a greater diversity of stone tools suggesting adaptation to a more diverse environment with a variety of natural resources. The Archaic Period is marked by continued technological developments reflecting an increasing reliance on a range of faunal and floral resources. By the latter part of the Archaic Period, the percentage of ground stone tools used within sites had increased, and prehistoric ceramics began to appear.

The Woodland Period within Missouri is marked by an increasing reliance on domesticated plants as a resource, the increasing use and production of ceramic vessels, and the introduction of a complex burial process including the creation of corporate burial grounds and earthen mounds. Trade became increasingly important during the Woodland Period with trade goods featuring prominently in the elaborate burials associated with the Middle Woodland period. These burials are typically referred to as Hopewellian after the Hopewell site in Ohio. The Late Woodland Period experienced a retraction in interregional trade, a diminishment of the elaborate mortuary rituals, and a simplification of ceramic design and motifs.

The Mississippian Period constitutes the most complex period of cultural development within the prehistory of the midwestern United States. This period witnessed the development of ranked societies, an increasing reliance on maize agriculture, the construction of platform and burial mounds, and a revival in long-distance trade. Fortified town and temple complexes dating to this period have been identified in the Mississippi and Missouri River valleys. Initial European contact with the indigenous inhabitants of the Midwest occurs during the Mississippian Period. The Proto-historic tribal affiliations of these groups include the Oneota, Kansa, Missouri, Osage, Sac, and Fox tribes.

By the early nineteenth century, the native population within Missouri had significantly declined. Coincident with the declining indigenous population, a large influx of Euro-American settlers began moving west, following major waterways and intent on cultivating the newly acquired Missouri territory. Eventually these settlers spread across the state, and by the mid-nineteenth century the economy of the state was characterized by farming and industrial centers of

commerce and trade. These communities flourished, creating many of the successful urban centers of industry that continue to shape and define Missouri. Archaeological excavations in many of these city centers and surrounding rural landscapes document the history of urban and rural immigrant communities and the development of an industrial society.

Two archaeological sites have been previously identified within the ROW of the Alternative Routes in Segment 1 of the Project. These sites consist of a Middle Woodland Period habitation site and a Woodland Period habitation site. Approximately 10 previously identified archaeological sites have been identified within 1,000 feet of Segment 1. These sites are predominantly prehistoric habitation or lithic scatter sites. Two previously identified prehistoric sites within Segment 1 also consist of mound/cairn sites. Such sites are generally associated with the Early to Middle Woodland periods. The previously identified prehistoric sites suggest that Segment 1 may be particularly sensitive for Woodland Period archaeological sites, including burial mounds. Historic archaeological sites that have been identified within the vicinity of Segment 1 consist of Antebellum Period commercial/industrial sites and Early Industrial Period habitation sites.

A total of 12 archaeological sites have been previously identified within the ROW of the Alternative Routes in Segment 2 of the Project. These sites consist predominantly of historic period sites, undateable habitations sites, or habitations sites dating to the Early Industrial or Antebellum periods. One Paleo-Indian site has been identified within Segment 2. Approximately 72 archaeological sites have been identified within 1,000 feet of Segment 2. These sites consist of a nearly equivalent number of prehistoric, historic, and unknown archaeological sites. The prehistoric sites consist of habitation sites, lithic scatters, two cemeteries, and two cairn/mound sites. The majority of the prehistoric sites could not be identified with a period of occupation. The proximity of the Missouri River to portions of Segment 2 suggests the potential for Paleo-Indian deposits. Paleo-Indian sites have been associated with major river valleys in Missouri, including the Missouri and Mississippi rivers. In addition, Early to Middle Woodland Period sites, including burial mound sites, have been identified in the Salt and Chariton drainage basins. The portions of Segment 2 that extend through these drainage basins, particularly within Chariton, Randolph, and Monroe counties, are considered particularly sensitive for prehistoric deposits associated with the Early to Middle Woodland periods. The historic archaeological sites identified within the vicinity of Segment 2 consist of Early Industrial and Antebellum Period habitation and commercial/industrial sites.

Architectural Resources

Segment 1 of the Project running through Buchanan County and the west half of Clinton County has few known architectural resources (**Figure 5-6**). Scattered rural farmsteads are the primary architectural resources identified. The farmsteads generally appear to have frame barns and residences or other workshops that have been altered with modern materials.

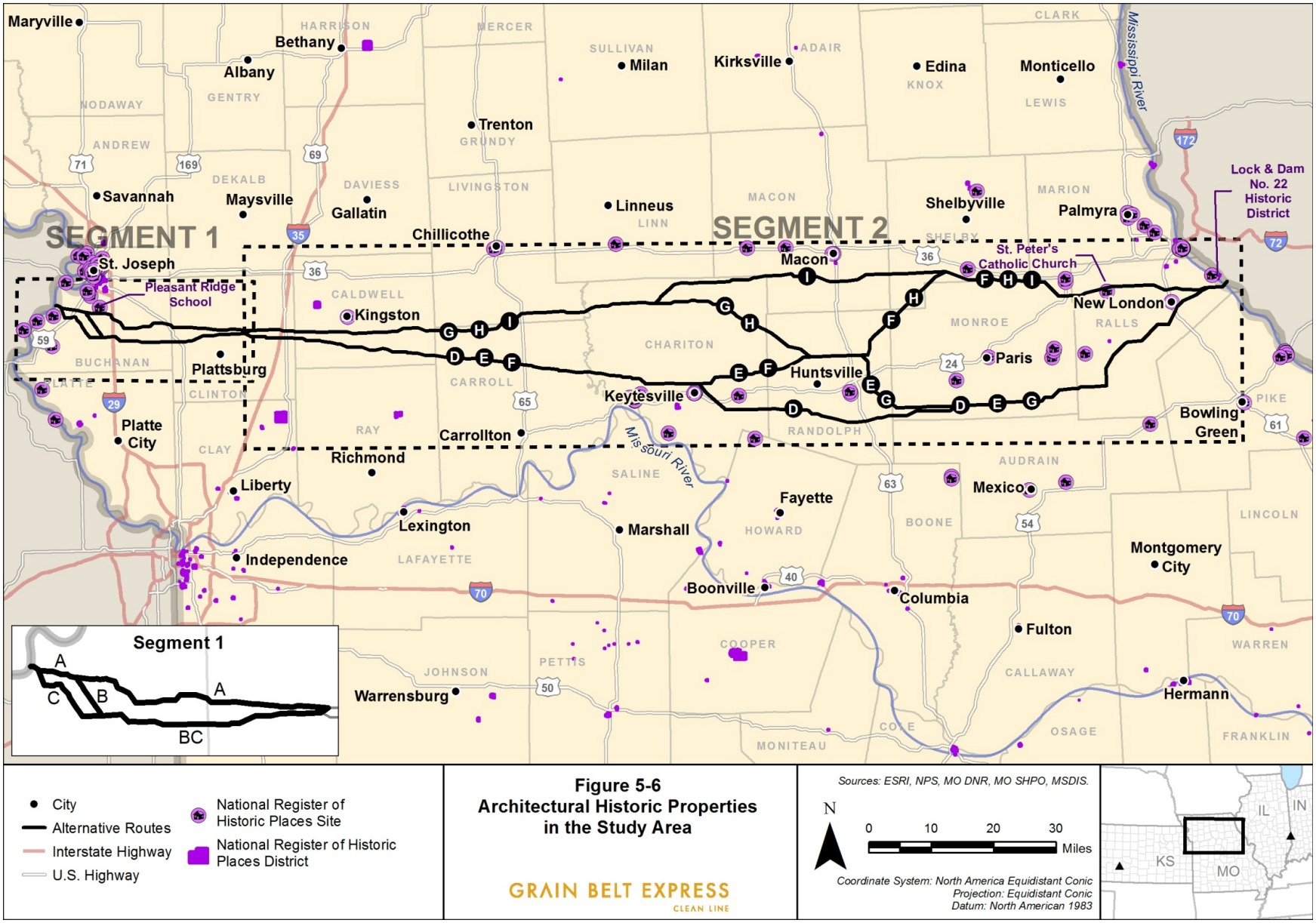
Towns located within or near Segment 1 include St. Joseph, Plattsburg, Agency, Faucett, Turney, and Gower.

Segment 2 consists of the east half of Clinton, Caldwell, Carroll, Livingston, Chariton, Macon, Randolph, Shelby, Monroe, and Ralls counties (**Figure 5-6**). These counties are likely to include rural farmsteads, residences, commercial buildings, cemeteries, churches, bridges, and schools. All of the counties are part of a 13 to 17 county area known as Little Dixie. Settlers in this area came from the upper south states of Kentucky, Virginia, and Tennessee in addition to immigrants from Germany. There is a strong antebellum influence in the folk architecture of these counties. The principal architectural types that dominate the recorded architectural resources in Chariton County are frame single-pen, double-pen hall-and parlor, central-hall, and I-houses. Schools and churches in some areas are constructed of brick and are generally two stories high. A couple of significant concrete form block houses are located within Chariton County. These structures in the Study Area tend to be in various states of disrepair or ruin. The farmsteads within the Study Area also follow folk types and styles. Numerous Civil War skirmish sites are documented throughout central Missouri. No known sites are located in the Study Area, but there could be undocumented sites and/or cemeteries. The towns located near or within Segment 2 are discussed in **Table 5-15**. The hamlet of Wein, in Chariton County, could be eligible as a rural historic district.

General Impacts and Mitigation

Transmission lines tend not to have significant indirect impacts on archaeological resources, which are usually located entirely below the ground surface. However, some sites have surface expression, such as burial mounds, effigies and intaglios, stone circles or alignments, foundations and walls, and cemeteries. The new transmission structures might detract from the setting or feeling of a site, particularly if the significance of the site relates in part to a sense of wildness, openness, primitiveness, or sacredness. Whenever possible, adverse impacts on identified sites would be avoided by strategically locating access roads, staging areas, and structures.

Impacts on archaeological properties may be physical and/or visual, depending on the type of site. Visual impacts, such as those described for architectural historic properties, can occur where the physical setting, location, or feeling contributes to the significance of the resource. Frontier military posts or homesteads, battlefields, historic trails, cemeteries, burial mounds, or landforms that are identified as sacred places are some examples. Adverse physical impacts can include ground disturbance by excavation to construct transmission line support structures and


SEGMENT 1
SEGMENT 2
Maryville
Bethany
Albany
Milan
Kirksville
Edina
Monticello
Mississippi River
Trenton
Savannah
Maysville
Gallatin
Linneus
Chillicothe
Shelbyville
Palmyra
Lock & Dam No. 22 Historic District
St. Joseph
Pleasant Ridge School
Kingston
Macon
St. Peter's Catholic Church
New London
Plattsburg
Huntsville
Paris
Keytesville
Bowling Green
Platte City
Carrollton
Richmond
Missouri River
Liberty
Fayette
Mexico
Lexington
Marshall
Independence
Montgomery City
Boonville
Columbia
Fulton
Warrensburg
Hermann
Segment 1
A
C
B
A
BC
City
Alternative Routes
Interstate Highway
U.S. Highway
National Register of Historic Places Site
National Register of Historic Places District
Figure 5-6
Architectural Historic Properties in the Study Area
GRAIN BELT EXPRESS
CLEAN LINE
Sources: ESRI, NPS, MO DNR, MO SHPO, MSDIS.
N
0 10 20 30
Miles
Coordinate System: North America Equidistant Conic
Projection: Equidistant Conic
Datum: North American 1983
IL
IN
KS
MO

substations, compression and/or rutting by heavy machinery, grading/constructing access roads, pulling stumps, material storage, or surface collection of artifacts by construction crew persons.

Impacts on architectural historic properties would be primarily visual, created by the construction of new structures where none exist, the addition of a second transmission line next to an existing transmission line corridor (generally a lesser impact), and clearing of forested land. Impacts would vary based on local relief, height of existing vegetation, and any intervening recent development. Any physical impacts on architectural historic properties would be avoided, where possible, by strategically locating access roads, staging areas, and structures.

Alternative Route Comparison

A review of archaeological resources from the Missouri SHPO identified several recorded archaeological sites along the Project ROW, including all of the Alternative Routes (MSHPO 2013). Generally, archaeological resources are only a concern when located within the ROW and can usually be spanned or avoided, eliminating any impacts.

A review of the National Register from the Missouri National Register files was completed for each segment. Spatial information was collected on all previously identified architectural and archaeological resources within 0.25, 0.5, and 1 mile of each Alternative Route. A review of the National Register shapefiles from the Missouri SHPO identified three National Register-listed properties within 0.5 to 1 mile of the Alternative Routes.

Segment 1

Alternative Routes A and B each have one archaeological resource within the ROW and several resources within 1,000 feet (see **Table 5-18**). Alternative Route C has the fewest resources within the ROW and within 1,000 feet. It should be noted that the Rockies Express/Keystone pipelines had an extensive archaeological survey completed as part of the environmental permitting required for those projects. Therefore, more resources may be associated with the pipeline parallel because the adjacent area was previously surveyed for cultural resources. Other areas of the state lack previous surveys, therefore, resources may still be present but have not been located. Alternative Route C does not parallel existing infrastructure and most likely lacks the same survey intensity that has been conducted along the pipeline.

Table 5-18. Archaeological Resources for Alternative Routes in Segment 1			
	A	**B**	**C**
Resources within the ROW[1]	1	1	-
Resources within 1,000 feet[2]	6	5	1

[1]The ROW is 100 feet on either side of centerline.

[2]Resources are measured from the centerline of the Alternative Routes.

The National Register-listed Pleasant Ridge School was identified approximately 1 mile from Alternative Route A. Alternative Routes B and C do not have any National Register-listed resources within 1 mile of the centerline.

Segment 2

A total of 12 archaeological resources are located within the ROW for Alternative Routes in Segment 2 (**Table 5-19**). Alternative Routes D and E have the greatest number of previously identified archaeological resources, with 12 and 11 archaeological resources, respectively. As noted for Segment 1, the Rockies Express/Keystone pipelines underwent extensive archaeological survey prior to their construction. Therefore, although it may appear that more resources are located along these Alternative Routes, it is likely a reflection of the extensive surveys completed for those projects.

Table 5-19. Archaeological Resources for Alternative Routes in Segment 2						
	D	**E**	**F**	**G**	**H**	**I**
Resources within the ROW[1]	12	11	8	4	1	2
Resources within 1,000 feet[2]	44	48	43	23	18	18

[1]The ROW is 100 feet on either side of centerline.

[2]Resources are measured from the centerline of the Alternative Routes.

Two National Register-listed sites are located within 1 mile of the Alternative Routes in Segment 2. The National Register-listed St. Peter's Catholic Church is approximately 3,000 feet from Alternative Routes F, H, and I. The Lock and Dam No. 22 Historic District is approximately 1.4 miles from all Alternative Routes and is also listed on the National Register.

5.3 Engineering

Converter Station

As discussed in Section 1.4.3, three converter stations would ultimately be constructed for the Project. The first converter station would take the power generated from the wind farms in southwest Kansas and convert it to DC electricity. The intermediate converter station would be located in Ralls County, Missouri, and would convert DC electricity back to AC for distribution in the electric grid. The final converter station would be located near the Sullivan Substation in Indiana and would also convert DC electricity back to AC for distribution in the electric grid.

The location of the intermediate converter station, which depends on the final alignment of the Proposed Route, would be near Ameren's Maywood-Montgomery 345 kV Line transmission line. This transmission line would connect the converter station to the surrounding grid. Grain Belt Express would work with landowners near the Proposed Route to determine a suitable location for the converter station. Several potential converter station locations were considered near the Alternative Routes in the vicinity of the Ameren transmission line. Ideal converter station locations include areas outside of floodplains and wetlands with relatively flat topography, close to major roads or highways and railroads, and sufficient enough space to accommodate the 40- to 60-acre site. The construction and maintenance of the converter station requires paved roads and railroads to move transformers and other heavy pieces of equipment.

Alternative Routes D, E, and G intersect the Maywood-Montgomery 345 kV transmission line at the same location. This area is flat and consists of agricultural fields. The town of Center is located approximately 1 mile east of the Maywood-Montgomery 345 kV transmission line. Despite the proximity to the town, few residences are located west of Center near the area of the existing transmission line, and parcel sizes in this area are generally large. State Highway 19 is parallel to the Alternative Routes and provides a suitable road for hauling heavy equipment. In addition, a railroad is located approximately 20 miles south of the intersection of the Alternative Routes and the existing transmission line, near the town of Bowling Green.

Alternative Routes F, H, and I all intersect the Maywood-Montgomery 345 kV transmission line at the same location. This area is generally characterized as moderately sloped with flat agricultural fields. Residential density in this area is low, but several residences are scattered throughout the area. There are also several large tracts of forest that are associated with drainages. Most roads in this area are gravel roads. State Highway H is the major paved road in the area and is located approximately 1mile east. A railroad is located approximately 2 miles north of the Alternative Routes, although the closest rail station may still be several miles further away in Monroe City, which is the closest town to the converter station area.

Both areas have suitable locations for the converter station. However, more potential sites are located near the Alternative Routes D, E, and G. The flat topography and nearby highway are both benefits to siting the converter station in this location, in addition to the larger parcel sizes, which are ideal for the 40- to 60-acre site.

5.3.1 Transportation

Local and county roads are the dominant mode of transportation throughout the Study Area; however, two interstates (Interstate 29 and Interstate 35) cross north-to-south through the Study Area. There are also numerous private and public airfields used for municipal, agricultural, and recreational activities. The Routing Team avoided crossing directly over all public and private airfields; however, all Alternative Routes do fall within an estimated obstruction zone. The estimated obstruction zones were calculated using the same requirements as the Federal Aviation Administration (FAA) approximated notification zone requirements (Code of Federal Regulations, Title 14, Part 77 Subpart B). Many of the larger towns and cities in the Study Area are connected by railroads, several of which are crossed by Alternative Routes in both segments.

General Impacts and Mitigation

Numerous U.S. highways, state highways, and county and local roads transect the Study Area. Highways and roadways can be spanned with the transmission line and impacts are generally minimal. During construction, it may be necessary to close portions of roads to allow the stringing of the conductor over the road. Coordination with the Missouri Department of Transportation would occur for all highway crossings associated with the Project. Similarly, the crossing of rail lines results in minimal impacts, although coordination with railway operators would be necessary during construction of the railway crossings.

Generalized notification zones for public and military airports and heliports are determined per FAA regulations (Code of Federal Regulations, Title 14, Part 77, Subpart B). The generalized zones are designed to identify potential flight obstructions and are based on the projected height of structures and the airport runway length. Impacts from structures located within a notification zone can be mitigated by lighting or marking the structure or by situating the new structure adjacent to an existing obstruction (such as an existing transmission line or tree line). Similar generalized notification zone buffers were considered around verified private airfields to avoid negatively impacting their operations, even though these regulations do not apply to private airfields.

Alternative Route Comparison

Segment 1

All of the Alternative Routes in Segment 1 cross Interstate 29, two U.S. highways, and two state highways (**Table 5-20**). U.S. highways crossed by all three of the Alternative Routes

include Highways 169 and 59. State highways crossed by all three Alternative Routes include State Highways 33 and 371. All Alternative Routes cross the same number of railroads and U.S. and state highways. No impacts to transportation are expected from any of the Alternative Routes.

Table 5-20. Transportation Infrastructure Crossed by Alternative Routes in Segment 1

	A	B	C
Public airfields (miles of FAA Notification Zones crossed)	-	-	-
Private airfields (miles of estimated obstruction zone crossed)	3.5	5.9	4.8
Railroad crossings	1	1	1
Interstate crossings	1	1	1
U.S. highway crossings	2	2	2
State highway crossings	2	2	2

No public airfields are located in close proximity to any of the Alternative Routes in Segment 1 (**Figure 5-7**). All three Alternative Routes are within the estimated notification zone for private airfields, based on the notification zone as calculated by the runway length and the average height of structures (**Table 5-21**).

All three Alternative Routes are within the 15,000-foot estimated obstruction zone for the private Booze Island Airport. The Alternative Routes' crossing of the Missouri River is approximately 12,800 feet from the end of the unimproved runway surface. Any impacts from the Alternative Routes on the operation of Booze Island Airport would be assessed as part of the FAA Part 77 notification.

All three Alternative Routes are within the estimated 7,500-foot obstruction zone for a private landing strip. Alternative Routes A and B are approximately 3,100 feet from the northern end of the landing strip. After the aircraft are above the tree cover, which is approximately 100 feet from the northern end of the landing strip, impacts to the operation of the airfield from Alternative Routes A and B would not be anticipated. Alternative Route C is approximately 5,400 feet from the southern-most end of the landing strip, and at this distance, impacts to the operation of the airfield are not anticipated.

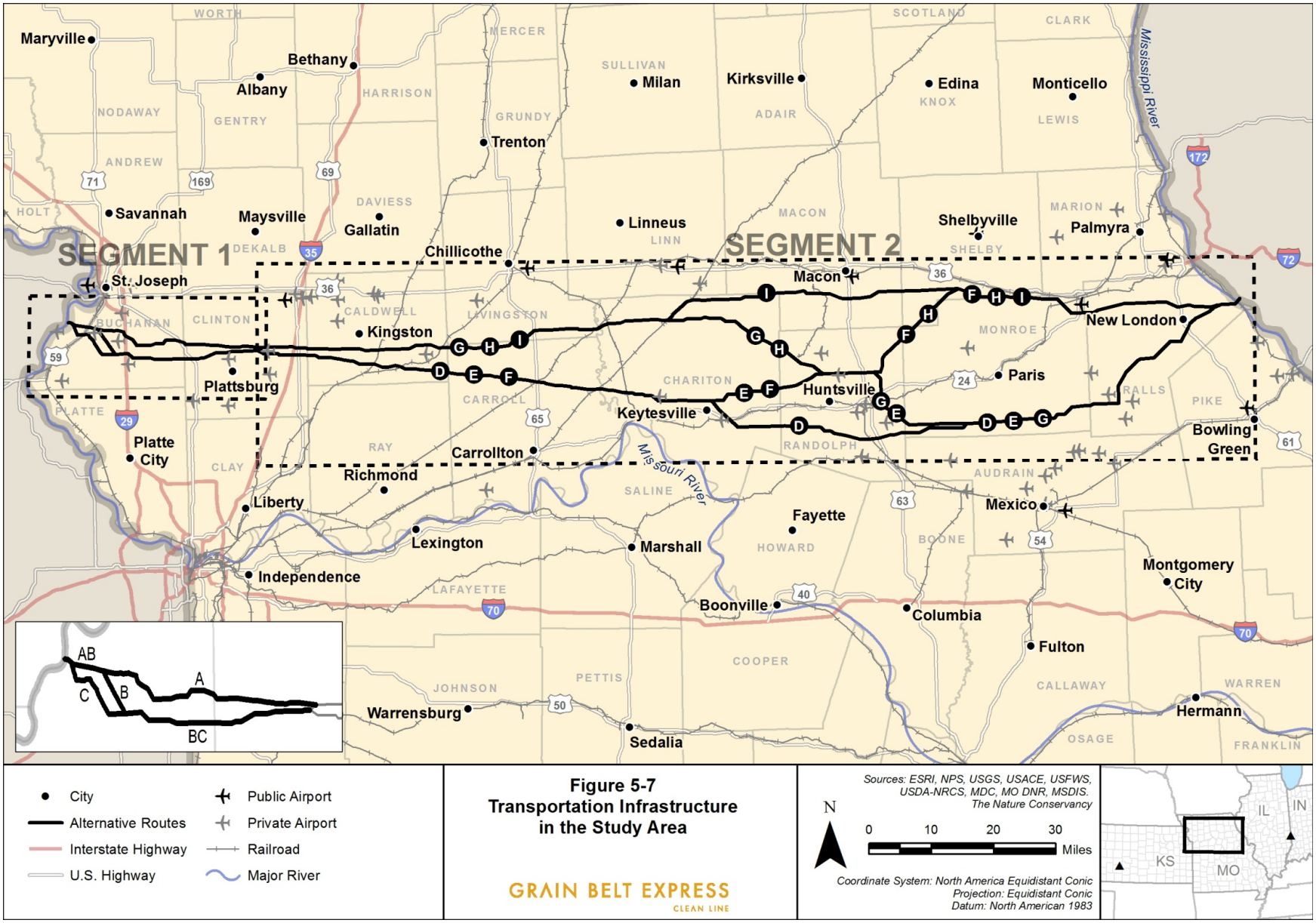

SEGMENT 1
SEGMENT 2
Maryville
Bethany
Albany
Milan
Kirksville
Edina
Monticello
Trenton
Savannah
Maysville
Gallatin
Linneus
Shelbyville
Palmyra
Chillicothe
St. Joseph
Macon
New London
Kingston
Plattsburg
Paris
Huntsville
Keytesville
Bowling Green
Platte City
Carrollton
Richmond
Liberty
Mexico
Fayette
Lexington
Marshall
Independence
Montgomery City
Boonville
Columbia
Fulton
Warrensburg
Sedalia
Hermann
Mississippi River
Missouri River
NODAWAY
WORTH
GENTRY
HARRISON
MERCER
GRUNDY
SULLIVAN
SCOTLAND
CLARK
KNOX
ADAIR
LEWIS
ANDREW
DAVIESS
DEKALB
LINN
MACON
SHELBY
MARION
HOLT
BUCHANAN
CLINTON
CALDWELL
LIVINGSTON
MONROE
PLATTE
CHARITON
CARROLL
RALLS
PIKE
RAY
CLAY
RANDOLPH
AUDRAIN
SALINE
HOWARD
BOONE
LAFAYETTE
COOPER
JOHNSON
PETTIS
CALLAWAY
WARREN
OSAGE
FRANKLIN
AB
A
C
B
BC
City
Alternative Routes
Interstate Highway
U.S. Highway
Public Airport
Private Airport
Railroad
Major River
Figure 5-7
Transportation Infrastructure
in the Study Area
GRAIN BELT EXPRESS
CLEAN LINE
Sources: ESRI, NPS, USGS, USACE, USFWS, USDA-NRCS, MDC, MO DNR, MSDIS. The Nature Conservancy
N
0 10 20 30
Miles
Coordinate System: North America Equidistant Conic
Projection: Equidistant Conic
Datum: North American 1983
IL
IN
KS
MO

Table 5-21. Public and Private Airstrips in Segment 1							
Alternative Route	**Airfield Name**	**Ownership**	**Runway Type**	**Runway Length (feet)**	**Distance from Alternative Route**	**Orientation of Runway**	**Orientation of Alternative Route from Runway**
A, B, C	Booze Island Airport	Private	Grass	3,260	12,840 feet from the northern end of the runway to Alternative Routes A, B, and C	NE–SW	Perpendicular
A, B, C	Unnamed	Private	Grass	1,470*	3,120 feet from the northern end of the runway to Alternative Routes A and B; 5,390 feet from the southern end of the runway to Alternative Route C	N–S	Perpendicular (A, B), Perpendicular (C)
B, C	Farris	Private	Paved	2,100	8,450 feet from the northern end of the runway to Alternative Routes B and C	N–S	Perpendicular (8,450 feet) Parallel (6,970 feet)

B, C	Plattsburg Airpark	Private	Paved (deteriorated)	2,100	4,730 feet from the northern end of the runway to Alternative Routes B and C	N–S	Perpendicular
A	Unnamed (Clinton County)	Private	Grass	1,650*	4,700 feet from the northwestern-most end of the runway to Alternative Route A	NW–SE	Perpendicular

*Runway information was not available from FAA and was measured using aerial imagery.