CHAPTER 2

2 ALTERNATIVES

The selection of alternatives can involve the screening of both alternative project solutions to the transmission problem as well as alternative locations for any facilities which those solutions require. These screenings involve gathering available data regarding the existing transmission system configuration, current and anticipated land uses, cultural features, natural resources, technical feasibility, other siting constraints and economic factors including potential project costs.

The following description of the alternatives begins with features of the construction and operation of a 500-kV transmission line that would be applicable regardless of the location of the line. This general description is followed by descriptions of project alternatives, which include two study area alternatives involving the construction and operation of the proposed transmission line as well as the No Action Alternative, and siting alternatives involving specific corridors within each study area and specific transmission line routes within study area corridors.

2.1 Description of the Proposed 500-kV Transmission Line

2.1.1 Property Acquisition

The new right-of way (ROW) would be 175 feet in width. TVA would obtain easements from landowners for the new ROW consistent with the Federal Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970. The Act applies to federal agencies, states and local agencies receiving federal funds for their projects. It protects the rights of any property owner being displaced due to acquisition of private property for programs to benefit the public.

TVA typically purchases easements from private landowners. TVA realty specialists conduct an appraisal of the property in accordance with accepted appraisal practices. TVA then attempts to purchase the easement from the landowner, frequently offering more than the appraised value to encourage the landowner to voluntarily sell the easement. If an acceptable price cannot be negotiated with the landowner, the amount of compensation may be decided in court in a condemnation case filed by TVA.

The ROW easements give TVA the right to construct, operate, and maintain the transmission line. Fee title for the land within the ROW would remain with the landowner, and the easement would prohibit certain activities such as the construction of buildings within the ROW that could interfere with the transmission line or create a hazardous situation.

Houses or other buildings may have to be purchased by TVA and removed from the ROW. TVA would pay the owner an agreed purchase price; provide a minimum of 90 days to vacate the property; provide a comparable replacement dwelling; and provide the relocation benefits the owner is eligible to receive. TVA also provides counseling and other relocation advisory services, as needed. A comparable replacement dwelling must be:

- Decent, safe, and sanitary;

- Functionally equivalent to the dwelling being removed; and
- Within the owner's financial means.

The property owner will be reimbursed for the cost of moving personal property. In addition, the owner might be eligible for supplemental payments to help relocate into comparable decent, safe, and sanitary replacement housing.

2.1.2 Construction

Right-of-Way Clearing

Because of the need to maintain adequate clearance between tall vegetation and transmission line conductors, as well as to provide access for construction equipment, most trees and shrubs would initially be removed from the entire width of the ROW. Trees outside of the ROW which are tall enough to pass within 10 feet of a conductor if they fell towards the line would also be removed. Equipment used during this ROW clearing includes chain saws, skidders, bulldozers, woodchippers, and/or feller/bunchers. Marketable timber would be salvaged where feasible; otherwise, woody debris and other vegetation would be piled and burned, chipped, or taken offsite. In some instances, vegetation may be windrowed along the edge of the ROW to serve as sediment barriers. Vegetation removal in streamside management zones (SMZs) and wetlands would be restricted to trees tall enough, or with the potential to soon grow tall enough, to interfere with conductors. In rugged terrain, vegetation at the bottom of ravines would be left if there is adequate clearance between it and the conductors.

Structures and Conductors

The proposed line would use self-supporting, galvanized, laced-steel structures. The electrical conductors would consist of three sets of three, 954,000 circular mil aluminum-steel-reinforced cables bundled in a triangular configuration, suspended beneath the structure cross-arms by two 14 foot-long insulators arranged in a "V" shape. The transmission line would be rated at 3000 amperes (A). Smaller diameter ground wires would be placed on the two highest points of the structures to provide lightning protection. In some cases, these ground wires may carry fiber optic or other communication circuits. The structures may also have a second cross-arm added beneath the 500-kV line to support a lower voltage line, allowing additional transmission lines on the same ROW. Tower height will vary with terrain and land use along the route but will normally range between 85 to 125 feet. The distance between structures will vary based on the same factors put will typically be about 1000 feet. Tower foundations are normally a laced-steel grillage, one per leg, buried in the earth. Some towers at points where the line turns an angle will require foundations of reinforced concrete. Figure 2-1 shows a sketch of a typical structure.

Structures which support long spans such as at a river crossing or interstate highway would be substantially taller than typical structures in order to maintain required clearance beneath the conductors. Towers exceeding 200 feet height above ground would require lighting under FAA regulations. This lighting would be either a white strobe light flashing at all times or a combination of the strobe light during daylight hours and a constant red light a night. Aircraft warning spheres would be placed on the highest wires (ground wires) at river and interstate highway crossings and at any other locations where aviation patterns require them.

After ROW clearing, construction would generally progress in the following order:

- Where necessary on sloping terrain, excavation of a level construction pad at structure locations using bulldozers;
- Excavation of foundation or grillage holes using bulldozers, backhoes and, in rocky areas, trackdrills;
- Installation of the foundations and grillages using backhoes, bulldozers and concrete mixers;
- Assembly, on the ground of large portions of the steel structures using boom trucks and forklifts;
- Placement of the assembled structures on the foundations using cranes and boom trucks;
- Hanging of insulators with “pulling blocks” or pulleys attached to allow the new conductors and ground wires to be pulled through;
- Pulling the ground wires and conductors into place and adjusting them to proper tension using bulldozers, reel trailers and tensioning machine;
- Clipping the conductor into place on the end of the insulators;
- Inspection and testing of the line; and
- ROW restoration and clean up using bulldozer and farm tractor.

Prior to installing the conductors, temporary clearance poles would be installed at road and railroad crossings to reduce interference with traffic. A small rope would be pulled from structure to structure through each pulling block. The ropes would be connected to the conductors and ground wires and used to pull them down the line. A bulldozer and specialized tensioning equipment would be used to pull conductors and ground wires to the proper tension. Crews would then clamp the wires to the insulators and remove the pulling blocks. In some areas where access is difficult a helicopter may be used for various tasks including moving of material and personnel, pulling conductor pull-ropes or installation of conductor spacers.

After the line is constructed the ROW would be revegetated using native, low-growing plants species in appropriate areas. Areas such as pasture, agricultural fields, or lawns would be returned to their former condition. Additional applicable environmental quality protection specifications that would be used during ROW clearing and transmission line construction are listed in Appendices B and C and in TVA’s Guide for Environmental Protection and Best Management Practices for Transmission Construction and Maintenance Activities (Muncy 1999).

The transmission line ROW can be used by the landowner for many purposes; however, the construction of permanent buildings, trees that reach the height of the electrical conductors and storage of any flammable material would be prohibited.

Access Roads

Permanent access roads would be needed to allow vehicle access to each structure and other points along the ROW. TVA would obtain the necessary permission to use these

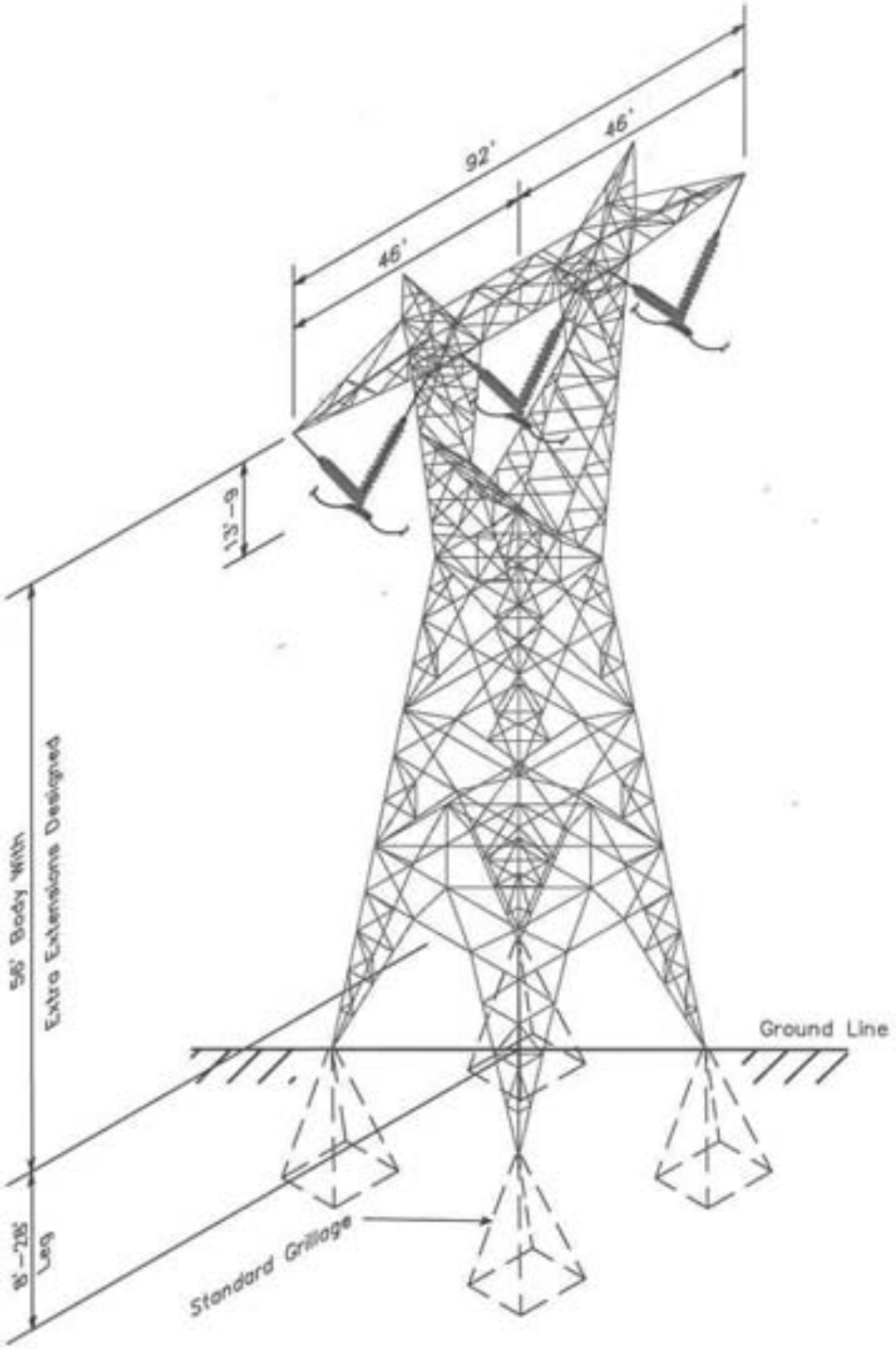

Figure 2-1. Typical 500-kV Transmission Line Structure.

access roads from landowners. Existing roads, some of which may need upgrading, would be used where possible. New access roads would be located on the ROW wherever possible, and designed to avoid severe slope conditions and minimize stream crossings. New access roads would be constructed with bulldozers or equivalent machinery, have a

typical width of about 18 feet, and be surfaced with dirt or gravel. Culverts and other drainage devices, fences, and gates would be installed as necessary. New access roads and disturbed roadside areas would be planted with approved seed mixtures following construction.

Construction Assembly Areas

Construction assembly areas would be required for worker assembly, vehicle parking, and material storage. These areas are usually leased from a private landowner for the duration of the construction period. They are typically 5 to 10 acres in size, relatively flat, previously cleared, and located adjacent to an existing paved road near the transmission line. Depending on site conditions, some grading and installation of drainage structures may be required. The areas would be graveled and fenced, and trailers used for material storage and office space would be parked on the areas. Following the completion of construction activities, all trailers, unused materials, and construction debris would be removed from the site. Other site reclamation activities, including removal of the fence, would be at the discretion of the landowner.

Changes to the Cumberland Fossil Plant Switchyard

An additional bay containing a 3000 A, 50kA SF-6 500-kV breaker would be constructed in the 500-kV switchyard at Cumberland Fossil Plant on the south end of the existing 500-kV bays. If a route is selected which would exit the plant site to the south (i.e., the Cumberland-Montgomery Corridor B route or the Cumberland-Montgomery Corridor D route with the Fossil Plant East alternative alignment), the transmission line would terminate at this bay. No earthwork would be required for this new bay other than that needed to install its supporting foundation.

If a route is selected which would exit the site to the north (i.e., the Cumberland Montgomery Corridor D route with the Fossil Plant West or Fossil Plant Central alternative alignment), an additional length of bus work would be needed inside the switchyard to connect the new bay to a line pull-off structure on the north side of the yard. This alternative would require moving the existing switchyard fence on the west side of the yard but would not require any earthwork other than construction of support foundations for the new bay and new bus work. Environmental quality protection measures that would be used during construction in the switchyard, as well as in substations, are listed in Appendix D.

2.1.3 Operation and Maintenance

Inspection

500-kV transmission lines are inspected by aerial surveillance, using a helicopter, at 6 month intervals and by ground observation every one to two years. These inspections are conducted to locate damaged conductors, insulators, or structures, and to report any abnormal conditions which might hamper the normal operation of the line or adversely impact the surrounding area. During these inspections, the condition of vegetation within the ROW, as well as immediately adjoining the ROW, is noted. These observations are then used to plan corrective maintenance or routine vegetation management.

Vegetation Management

Because of the need to maintain adequate clearance between tall vegetation and transmission line conductors, periodic vegetation management would be conducted along the ROW. This would consist of two different activities: felling of “danger trees” adjacent to the cleared ROW, and control of vegetation with the cleared ROW. Any trees located off the ROW which are tall enough to pass within 10 feet of a conductor or structure (if they were to fall toward the line) are designated as danger trees and would be removed.

Management of vegetation within the cleared ROW would use an integrated vegetation management (IVM) approach designed to encourage low-growing plant species and discourage tall-growing plant species. A vegetation reclearing plan would be developed for each transmission line segment based on the results of the periodic inspections described above. The two principal management techniques are mechanical mowing using tractor-mounted rotary mowers, and herbicide application. Herbicides would be selectively applied from the ground with backpack sprayers or vehicle mounted sprayers, or, for larger areas, particularly in rugged terrain, by broadcast aerial spraying from a helicopter.

Any herbicides used would be applied in accordance with applicable state and federal laws and regulations. Only herbicides registered with the U.S. Environmental Protection Agency would be used. Appendix E contains a complete list of the herbicides and adjuvants (ingredients added to the herbicide solution to increase its effectiveness) currently approved for use by TVA in ROW management. This list may change over time as new herbicides are developed or new information on presently approved herbicides becomes available. The herbicides most commonly used at this time are formulations of glyphosate (trade name Accord) mixed with imazapyr (trade name Arsenal) or ammonium salt of fosamine (trade name Krenite) mixed with imazapyr. Metsulfuron methyl is also occasionally added to the glyphosate or ammonium fosamine mixtures to help control certain species.

2.2 Project and Siting Alternatives

The National Environmental Policy Act and its implementing regulations direct that federal agencies commence NEPA reviews early in the planning of proposed actions. To do this, TVA employs a detailed, comprehensive siting process when it plans its transmission line projects. This is an iterative process and takes into account sensitive environmental and cultural resource features that become “constraints” on locating proposed lines. Initially, broad alternative study corridors are identified and line route right-of-ways (ROWs) are eventually located within the study corridor identified for the project. Because transmission line ROWs are actually much narrower than these study corridors, sensitive features that are associated with specific corridors can often be avoided when final line routes are selected. Corridors and discrete line segments are discarded or redirected as analyses proceed. One of the last steps in the line siting process is selecting the exact locations for line structures after a final ROW has been identified and surveyors and construction forces begin work. TVA’s transmission line siting process ensures that decision makers and the public are apprised of potential impacts and their potential significance before this final step.

2.2.1 Project Alternatives

2.2.1.1 Alternative 1 - Cumberland-Montgomery Study Area

This alternative involves the construction and operation of between about 32 and 45 miles of 500-kV transmission line from Cumberland Fossil Plant to the Montgomery 500-kV Substation. An additional bay containing a 3000 A, 50kA SF-6 500-kV breaker would be constructed in the 500-kV switchyard at the Montgomery Substation on the east end of the existing 500-kV bays. No earthwork would be required for this new bay other than that needed to install its supporting foundation.

Six additional 3000 A, 50kA SF-6 500-kV breakers would be installed at the Montgomery Substation to terminate the new line and to create a double breaker bus arrangement which would protect generation at Paradise Fossil Plant. Several new switches would be installed as well as related communication and control equipment. Site grading would be required to install the foundations for this equipment. Adjustments to the substation entrance road and gate may also be made. Environmental quality protection measures that would be used during construction in the switchyard, as well as in substations, are listed in Appendix D.

Minor work on existing communication facilities would be performed at several locations remote from the site. This work would primarily consist of changes or additions of cable connections and will be primarily indoors.

Changes to the Cumberland Fossil Plant switchyard are described above in Section 2.1.2.

2.2.1.2 Alternative 2 - Cumberland-Davidson Study Area

This alternative involves the construction and operation of about 50 miles of 500-kV transmission line from Cumberland Fossil Plant to the Davidson 500-kV Substation. This alternative would also require the installation of an additional 500-kV bay and 3000 A, 50kA SF-6 500-kV breaker at the Davidson Substation. These changes would require excavation for installation of supporting foundations. All activities would occur on existing substation property, and part of the fence surrounding the substation would be relocated to enclose the new bay. Changes to the Cumberland Fossil Plant switchyard are described above in Section 2.1.2.

2.2.1.3 Alternative 3 - No Action Alternative

Under the No Action Alternative, the proposed transmission line would not be constructed. This would result in the risk of loss of electric service in the Middle Tennessee area, which has a total load of over 4000 megawatts. There would also be risk of loss of system stability and risk of damage to generators at Cumberland and Paradise generating plants. In order to minimize the risk of instability, generation would have to be reduced at these plants during some system conditions. This could further exacerbate potential service disruptions in the Nashville area.

2.2.2 Siting Alternatives

Siting Process

The basic steps followed when determining a transmission line route are to:

- define the study area;
- determine corridors within the study area that will minimize potential impacts to cultural and natural features;
- design one or more alternative transmission line routes within the corridor(s);
- gather public input; and
- incorporate public input into the final identification of the preferred transmission line route.

Factors considered during the project siting process include current and anticipated land uses, cultural features, natural resources, technical feasibility, and economic factors including potential project costs.

The study area defined for this project (Figure 1-1) incorporates potential line corridors between Cumberland Fossil Plant and the Montgomery 500-kV Substation, and between Cumberland Fossil Plant and the Davidson 500-kV Substation. TVA produced aerial photography of this large study area and used it to supplement maps in a geographic information system (GIS). Known locations of urban areas, commercial/industrial areas, schools, churches, parks, wildlife management areas and other public lands, wetlands, floodways, streams, ponds, and endangered and threatened species were included on these maps. Information gathered during the initial public scoping for this project was also used in making these maps.

These maps and associated databases were then used to determine and evaluate potential transmission line corridors. The GIS technology enabled simultaneous consideration of the relative impacts of corridors based on a variety of environmental and other factors (referred to as “siting constraints and opportunities”). The potential transmission line corridors described below are the result of this detailed siting process.

Following the release of the DEIS and subsequent public review of the study corridors, TVA planners analyzed the two preferred corridors in more detail and mapped a network of potential line routes within the preferred Alternative 1 Cumberland-Montgomery Study Area Corridors B and D. These potential line routes were reviewed by area residents in a series of eight open houses in June 2003. Approximately 15,000 residents within and adjacent to the two preferred corridors were invited to these meetings, which were also announced in advertised in area newspapers, press releases, and on TVA’s web site. About 3,000 people attended the meetings.

After this round of open houses, TVA planners used the information received from the public as comments on the DEIS and during the open houses, as well as resource information and engineering data, to identify a proposed route within both Cumberland-Montgomery Corridor B and Corridor D. Access roads and construction assembly areas were also identified through this process. The two routes are described in detail in the Cumberland-Montgomery Corridor B and Corridor D descriptions below.

2.2.2.1 Alternative 1 - Cumberland-Montgomery Study Area

Four broad alternate corridors from TVA's Cumberland Fossil Plant to TVA's Montgomery 500-kV Substation were identified (Figure 2-2). The corridors vary in width according to observed siting constraints and opportunities. They overlap in many locations.

2.2.2.1.1 Corridor A

This corridor begins at TVA's Cumberland Fossil Plant switchyard located on the west side of the plant in Stewart County, Tennessee. From this point the corridor goes south, crosses TN 149, and turns east avoiding the developed area north of Erin. The corridor continues east generally following the Montgomery, Houston and Dickson County lines and then turns slightly northeast staying south of the Cunningham community. The corridor continues northeast crossing the Cumberland River about two miles north of the Montgomery-Cheatham County line. To avoid the path of the future State Highway 840, the corridor turns north about a mile west of TN 12 and passes between the Freedonia and Excell communities. As it approaches the existing Davidson-Montgomery 500-kV transmission line, it turns north-northwest and follows a path parallel to the existing transmission line and just east of the city of Clarksville to terminate at the Montgomery Substation. The corridor length is about 45 miles.

2.2.2.1.2 Corridor B

Corridor B is about 37 miles long. From Cumberland Fossil Plant, Corridor B runs south for a short distance and then east. It passes south of Cumberland City to run just north of the Montgomery-Houston County line and around the north side of Cunningham. Near Cunningham, it turns to the northeast and crosses the Cumberland River about six miles north of the Cumberland-Cheatham County line. It joins Corridor A near TN 12 and overlaps it around the east side of Clarksville to the Montgomery 500-kV Substation.

Corridor B Transmission Line Route

From the Cumberland Fossil Plant switchyard, located on the northwest side of the plant complex, this proposed route goes west, south, and then southeast parallel to existing transmission lines for about 1.5 miles (Figures 2-3 – 2-9). It then runs east for about 1 mile, passing south of the Standard Gypsum plant. The route then turns northeast for about 0.7 miles until it crosses TN 149 near its intersection with TN 46. It then turns east for about 6.3 miles, crossing Guises Creek, the Stewart-Montgomery County line, Old Highway 13, Yellow Creek, Tarsus-Shiloh Road, and East Fork Yellow Creek. Shortly before crossing Burney Creek, the route turns slightly northward to run east-northeast for about 6.2 miles across Shiloh Road, Budds Creek and Vernon Creek. The route stays north of Highway 13 until crossing it about 1 mile north of the junction of TN 13 and TN 48 at Cunningham.

Shortly after crossing TN 13, the Corridor B route splits into two and later three alternative alignments. The north alternative (designated as the Cumberland River North alternative in later chapters) runs north of most of Hurricane Creek and the south alternative (designated as the Cumberland River South alternative in later chapters) runs south of most of Hurricane Creek. The alternative alignments cross the Cumberland River and rejoin at the eastern edge of the Cumberland River floodplain.

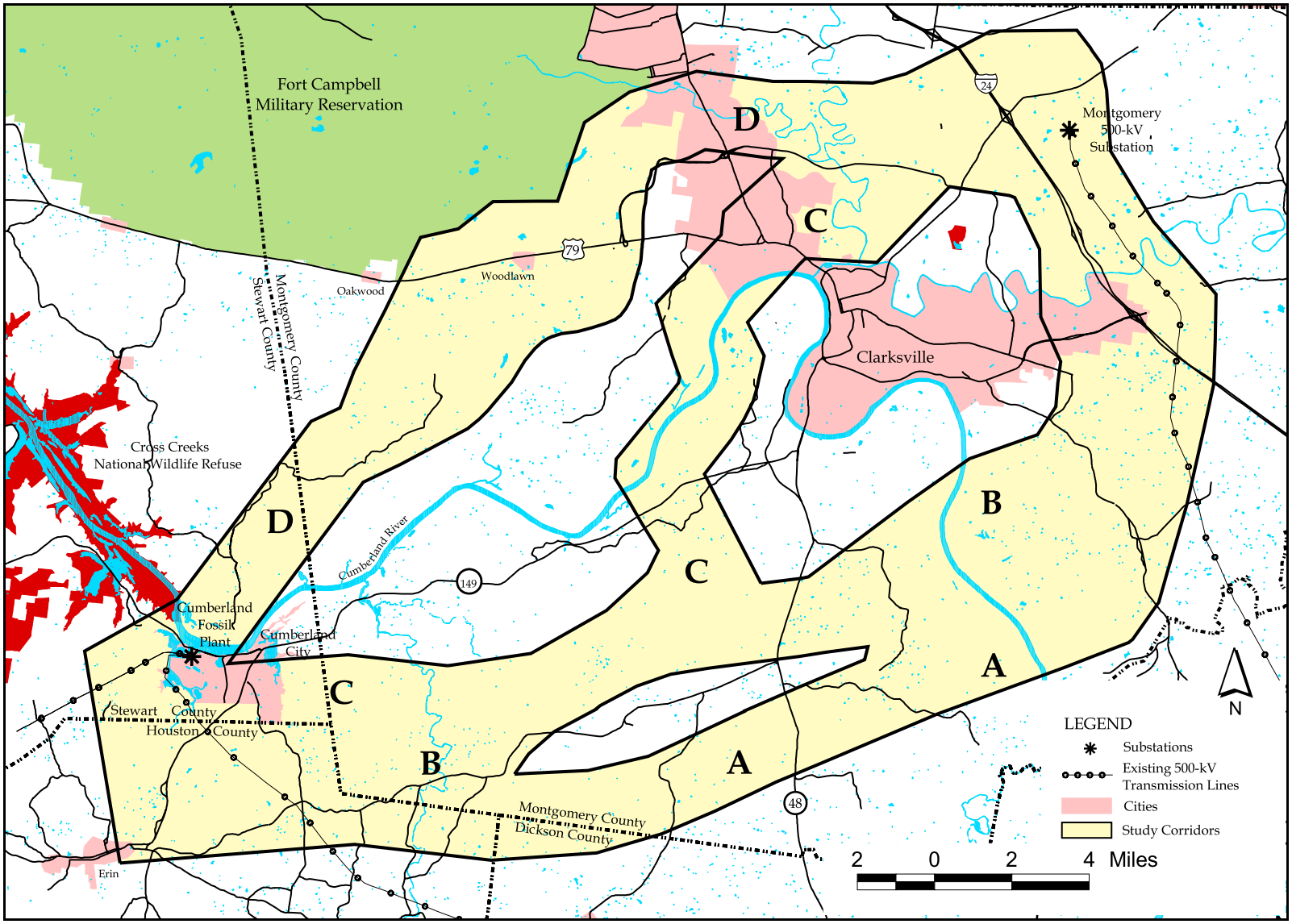

Figure 2-2. The Cumberland-Montgomery Study Area and transmission line corridors.

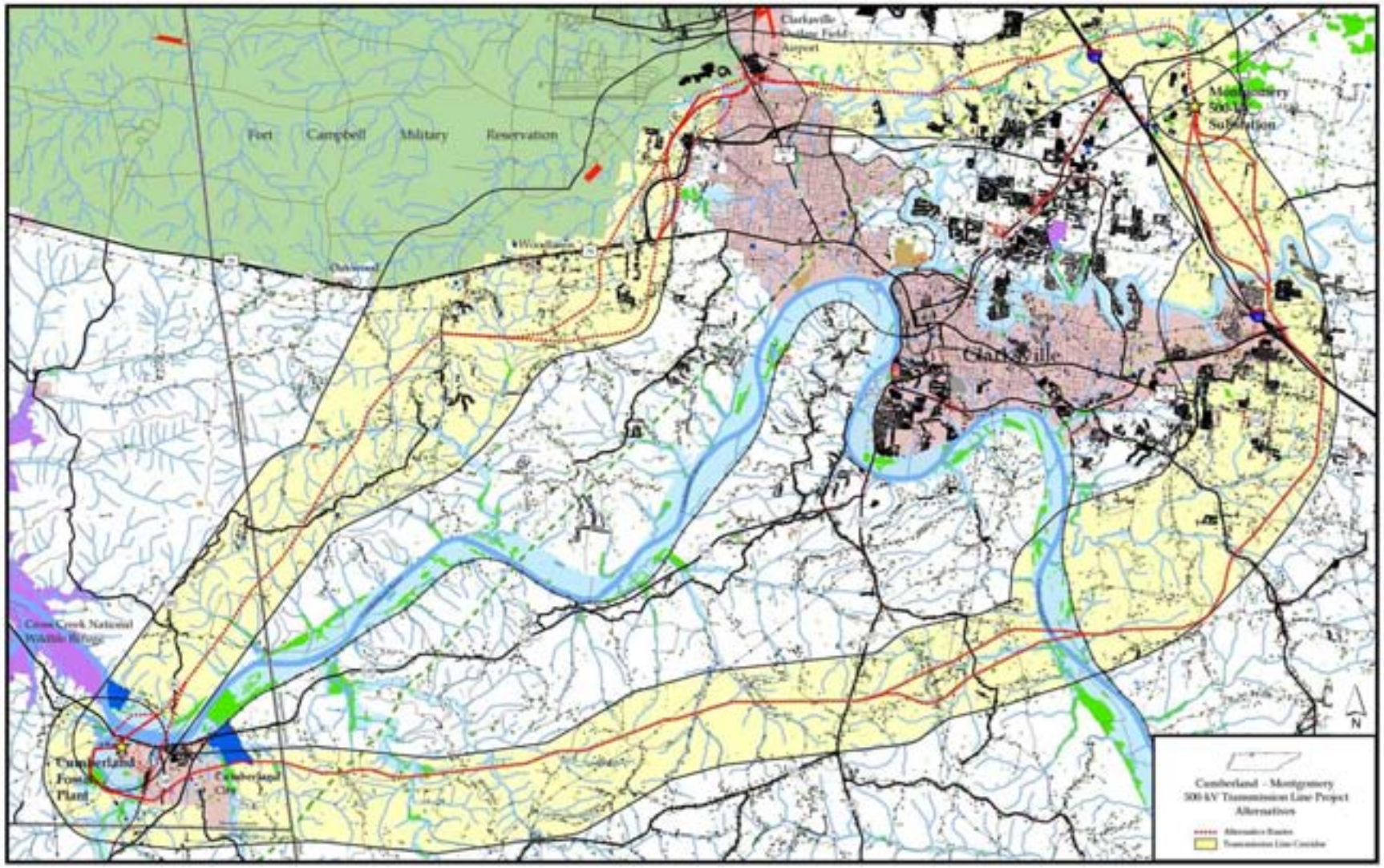

Figure 2-3. The Cumberland-Montgomery Corridor B and Corridor D transmission line routes.

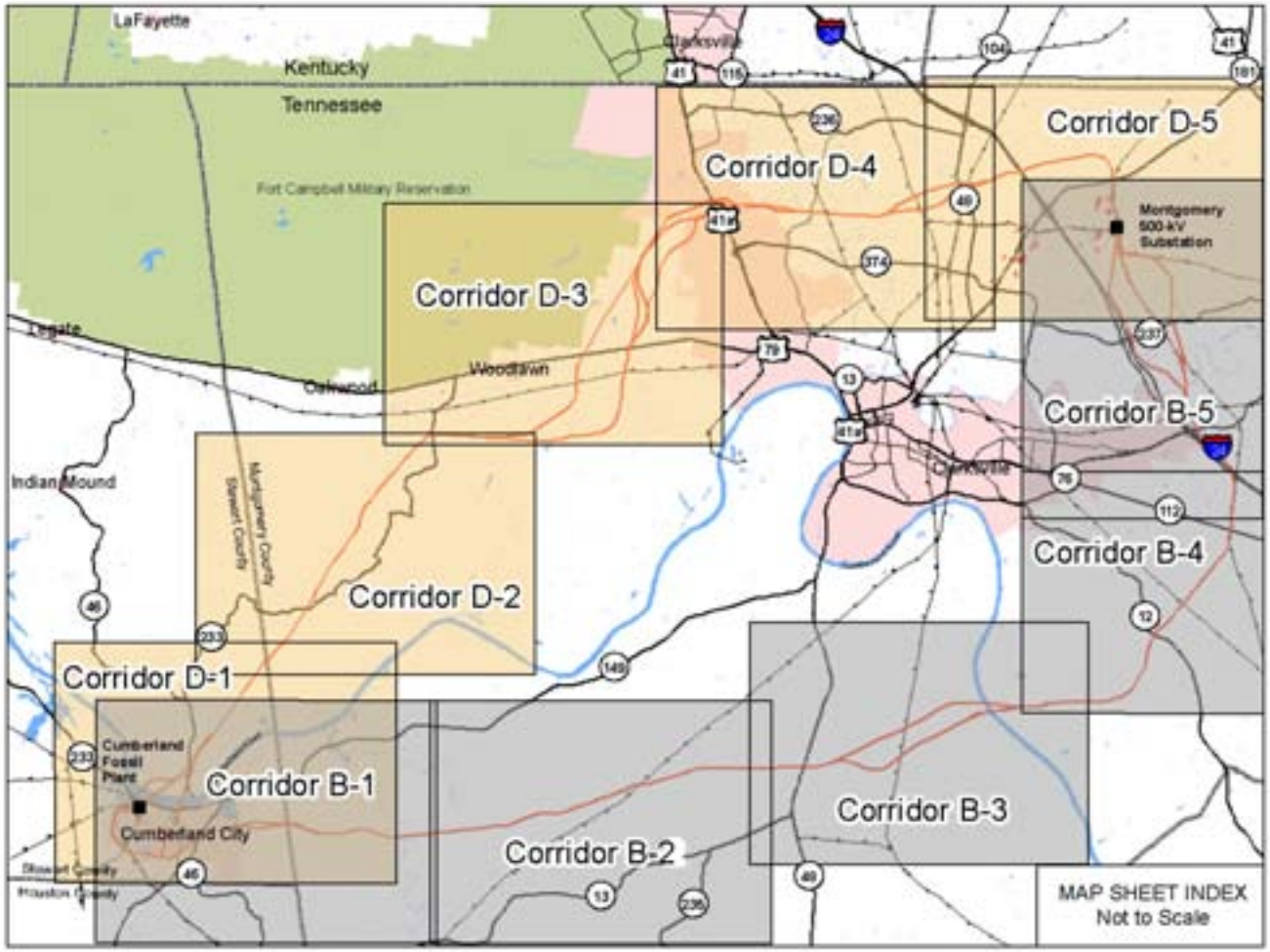

Figure 2-4. Index map of the Cumberland-Montgomery Corridor B and Corridor D transmission line routes.

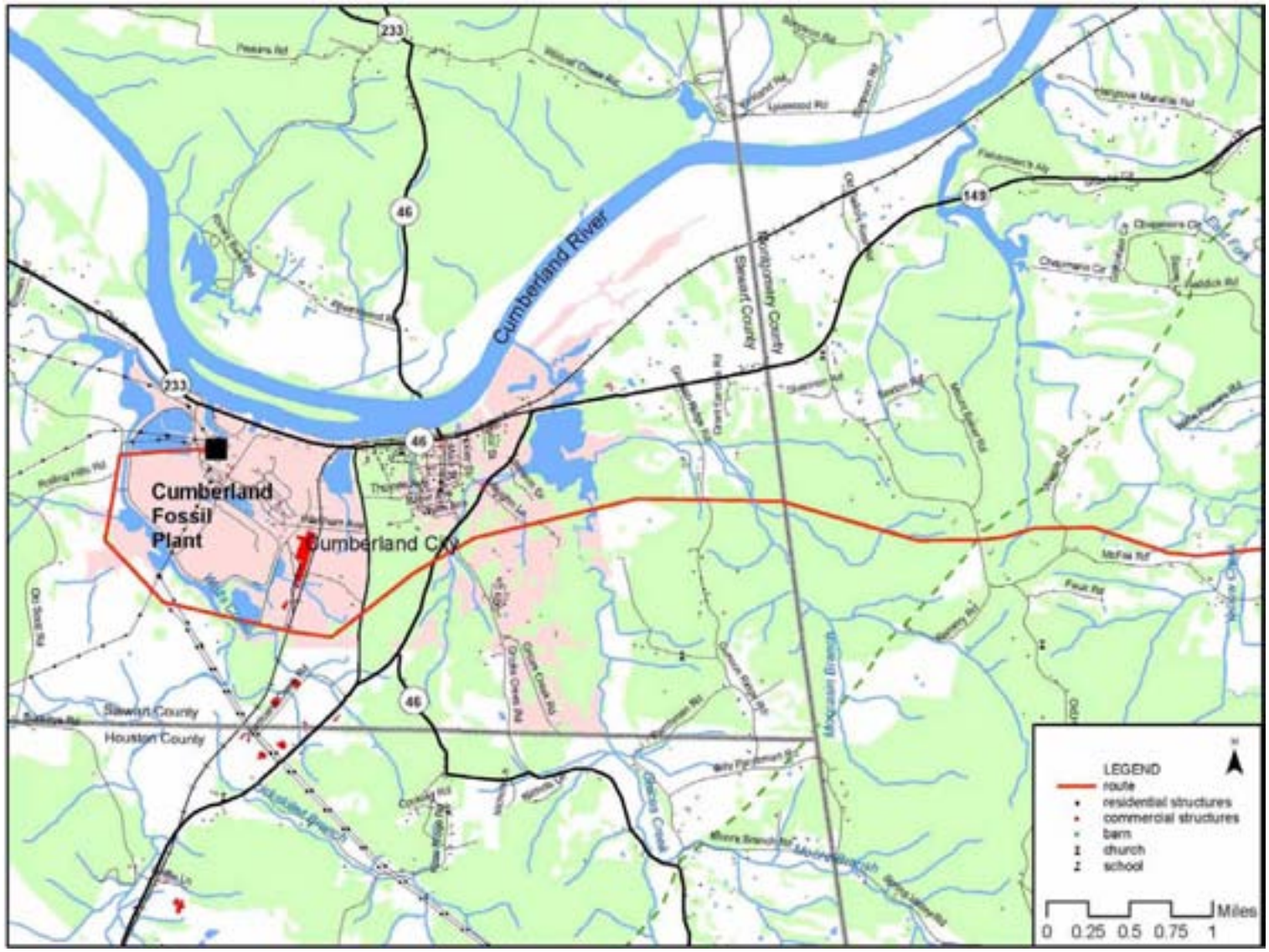

Figure 2-5. The Cumberland-Montgomery Corridor B transmission line route, Part 1.

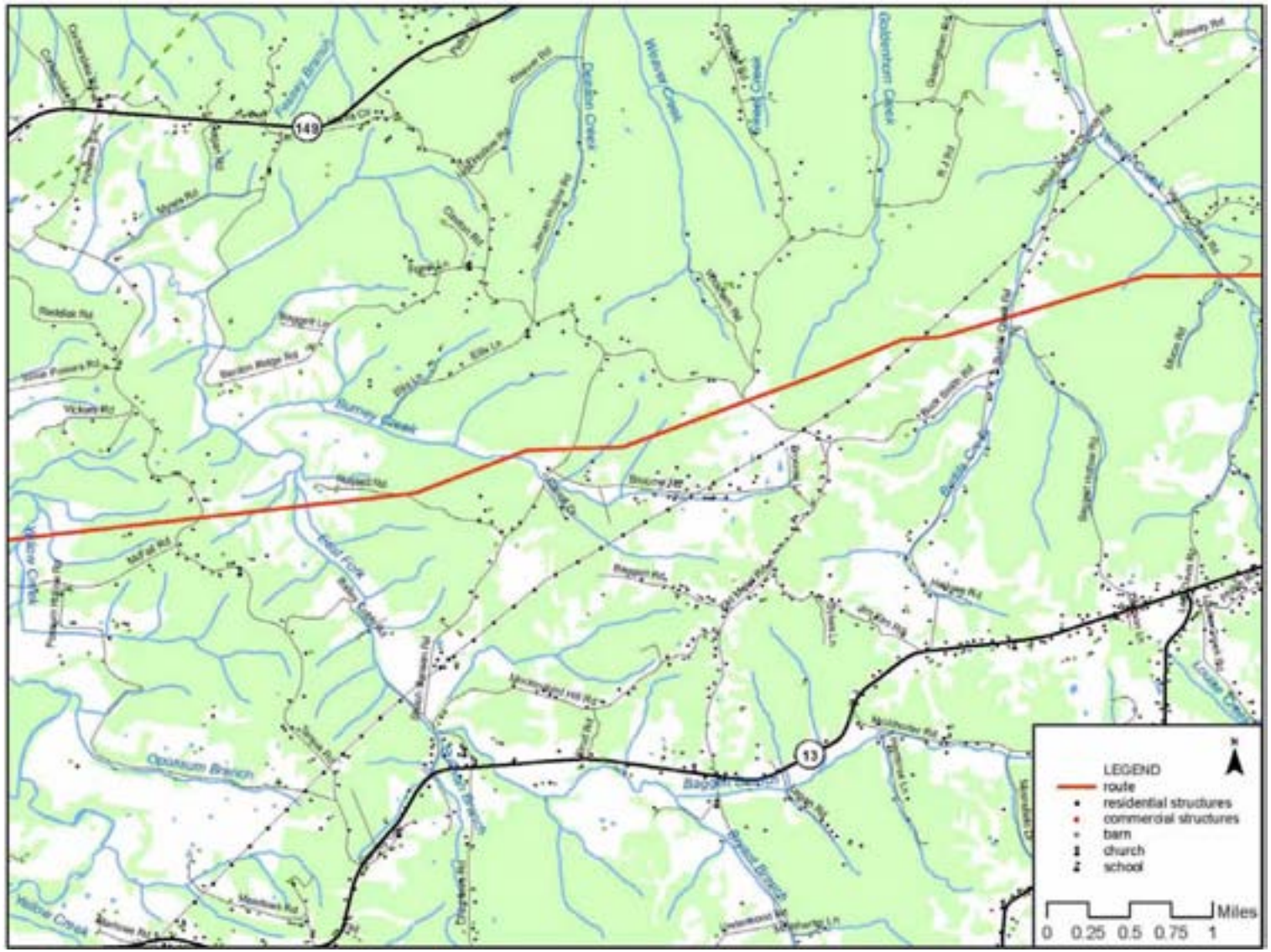

Figure 2-6. The Cumberland-Montgomery Corridor B transmission line route, Part 2.

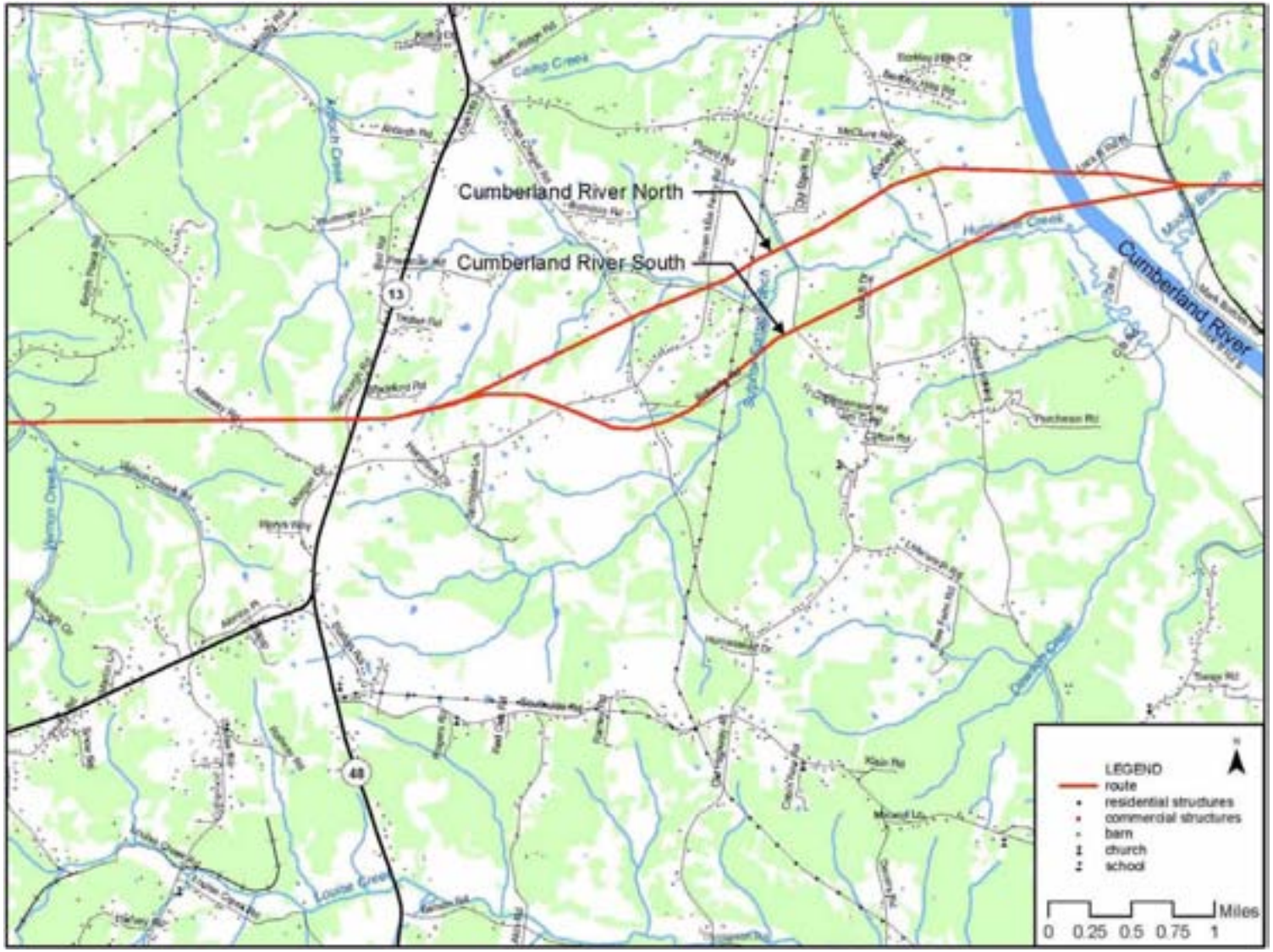

Figure 2-7. The Cumberland-Montgomery Corridor B transmission line route, Part 3.

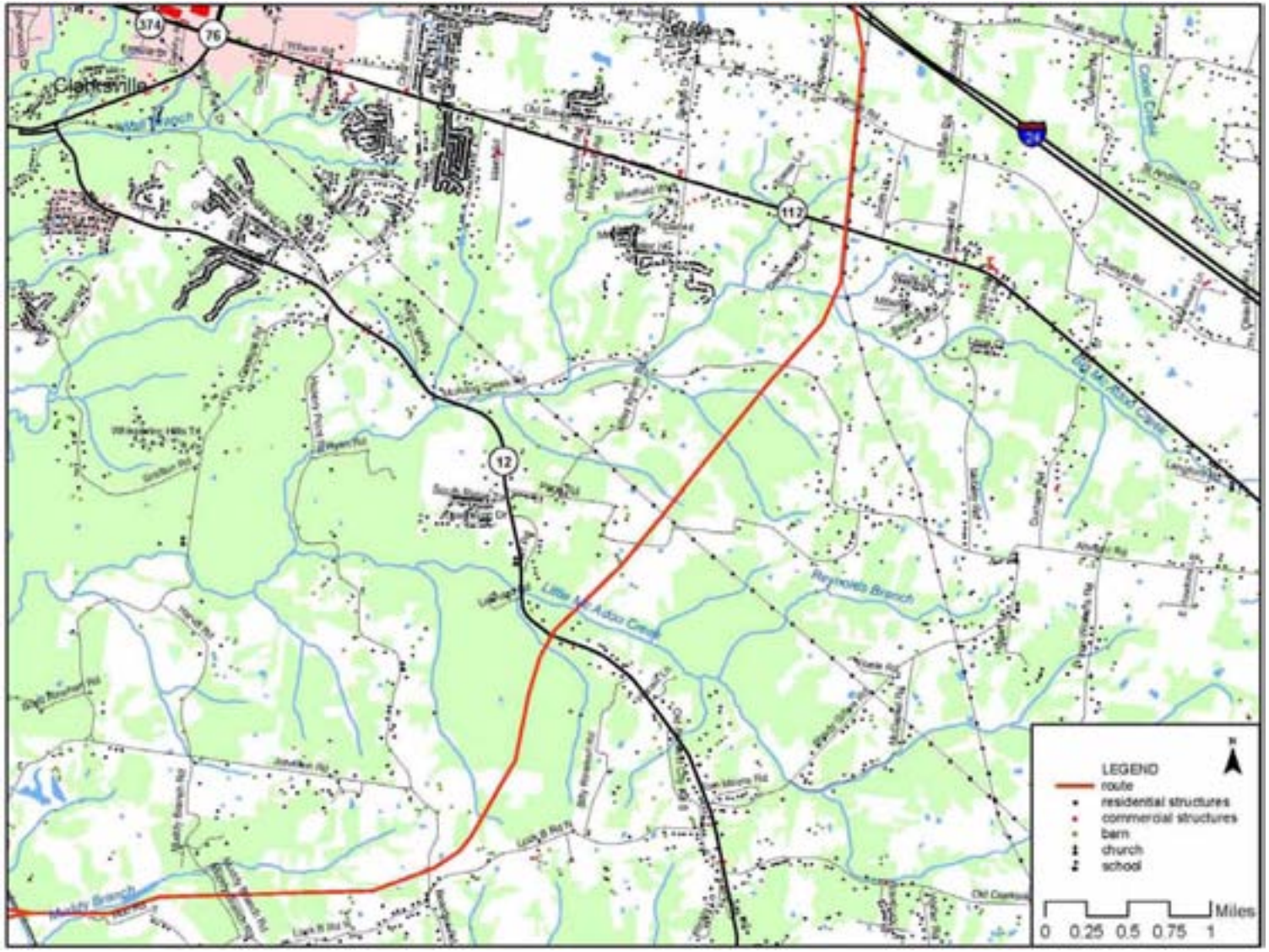

Figure 2-8. The Cumberland-Montgomery Corridor B transmission line route, Part 4.

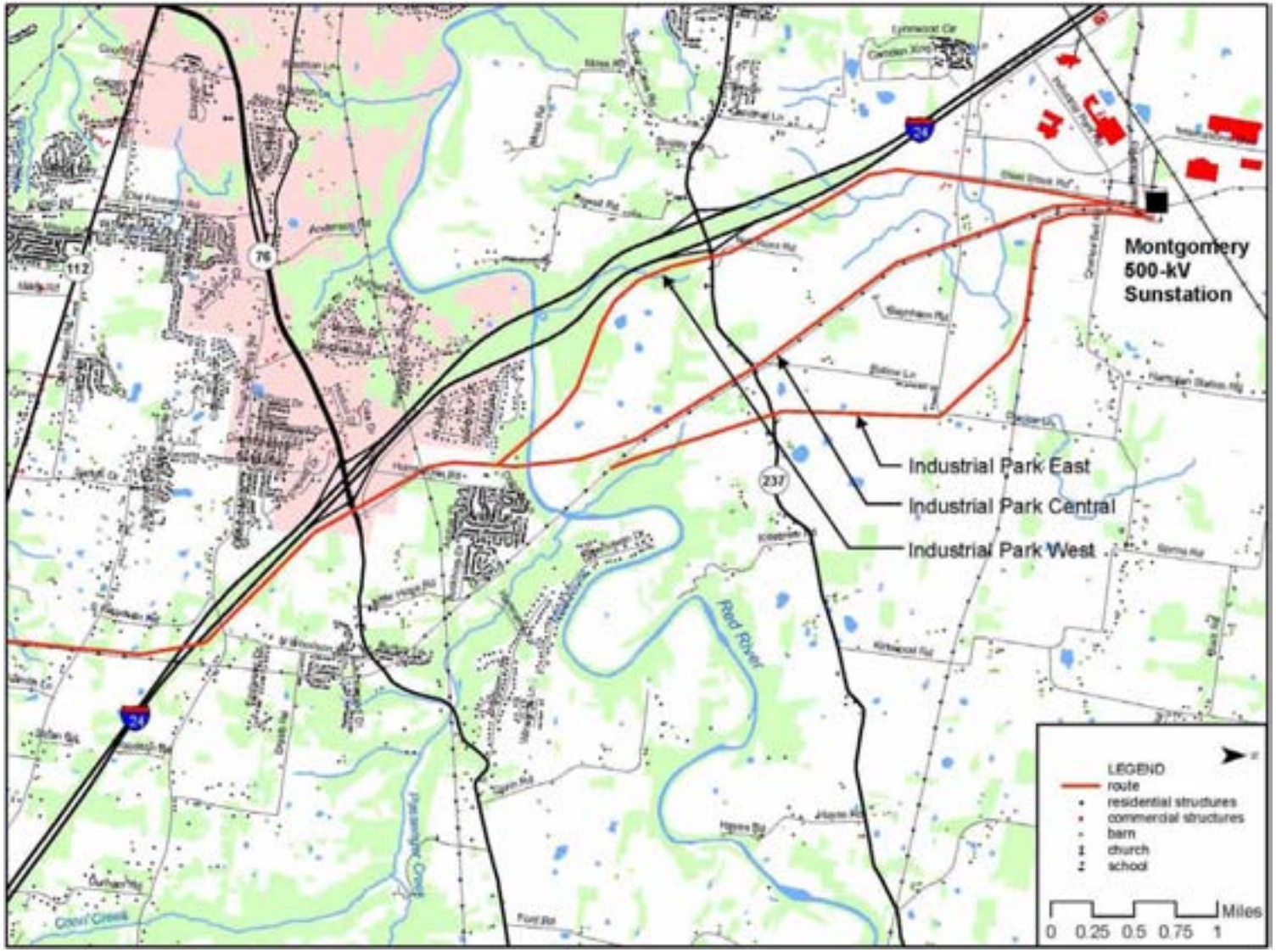

Figure 2-9. The Cumberland-Montgomery Corridor B transmission line route, Part 5.

From the east edge of the Cumberland River floodplain, the Corridor B route goes east-northeast for about 2.1 miles, paralleling and crossing Muddy Branch and passing north of the Hickory Point community and south of McCauley Hill Farm. After crossing Hickory Point Road, it turns northeast for about 3.4 miles, passing north of Freedonia and crossing TN 12 and Shady Grove Road, until it reaches the existing TVA Montgomery-Davidson 500-kV transmission line just south of US 41A. The route then runs north parallel to the west side of the Montgomery-Davidson transmission line for about 1.5 miles. After crossing I-24, the route runs northwest parallel to the north side of I-24 for about 1.2 miles and crosses Trough Spring Road. After crossing TN 76 adjacent to the I-24/Hwy 76 interchange, it turns northward and runs between the Windemeer and Deertrail subdivisions.

Shortly before crossing the Red River, the route splits into two and later three alternative alignments named Industrial Park East, Industrial Park Central and Industrial Park West. The Industrial Park West alignment turns north-northwest to parallel I-24 for about 1.5 miles, crossing TN 237/Rossview Road at its interchange with I-24 and running along the western edge of the Clarksville-Montgomery County Corporate Business Park. It then turns north, crosses Dunlop Lane, and reaches the west side of the Montgomery-Davidson transmission line.

The Industrial Park East and Central alignments overlap as they run north for about 1 mile from just south of the Red River to the west side of the Montgomery-Davidson transmission line. The two alternatives then run northwest parallel to the existing transmission line for about 0.3 miles until they split. The Central alternative alignment continues to parallel the Montgomery-Davidson transmission line for about 2.3 miles until it intersects the other alignments. The East alignment runs north for about 1.4 miles until it reaches Dunlop Lane, where it turns northwest and then west, crosses the Montgomery-Wilson transmission line, and parallels the south side of this line for a short distance before turning north and running parallel to the other alternative alignments on the west side of the existing transmission line. The alternative alignments soon merge and the single route parallels the east side of the Montgomery-Wilson line for about 0.3 miles to the Montgomery 500-kV Substation.

Depending on the combination of alternative alignments, the Corridor B transmission line route would be between 38.12 and 38.94 miles long (Table 2-1)

Table 2-1. Length of right-of-way and associated new or upgraded access roads for the Cumberland-Montgomery Corridor B transmission line route.

Route Segment	Right-of-Way (miles)	Access Roads (miles)
Main Alignment	29.97	16.0
Cumberland River North	4.75	3.1
Cumberland River South	4.79	3.9
Industrial Park East (including shared portion of Industrial Park Central)	4.35	1.6
Industrial Park Central	3.80	1.8
Industrial Park West	4.18	2.1

Access Roads – The selection of the Corridor B route would require the construction of new access roads to structure locations and other parts of the ROW. Depending on the combination of alternative alignments selected, the length of new access roads ranges from about 20.7 to 22.0 miles (Table 2-1). Individual road segments vary in length from a few hundred feet to over a mile.

Construction Assembly Areas – Two construction assembly areas have been identified for the Corridor B route. One area, near the western end of the route, is on a 41 acre tract along Guices Creek Road/TN 46 about 0.8 miles south of junction of Guices Creek Road and TN 149, near Cumberland City. The second area, a 19-acre tract, is at the northeast quadrant of the intersection of US 41A and McAdoo Creek Road near Sango. Both of these tracts are fields with scattered trees and shrubs, and no more than about 10 acres of each tract would be used.

2.2.2.1.3 Corridor C

The western end of this corridor overlaps Corridors A and B. It soon follows portions of existing transmission lines beginning with the Cumberland-Davidson 500-kV line until reaching the Johnsonville Fossil Plant-Clarksville 161-kV line near Yellow Creek and the community of Ellis Mills. It follows the general path of this line to the northeast until reaching the Budds Creek area. At Budds Creek it turns north-northwest to the south side of the Cumberland River. It then turns northeast to follow the Cumberland River and the CSX Railroad to the zinc plant near the Briarwood community. At the zinc plant the corridor turns north and runs parallels to the river in the vicinity of several existing transmission lines to the northwest side of Clarksville. It crosses US 79 in the New Providence area, crosses the lower reaches of the West Fork Red River, and crosses the 101st Airborne Division Parkway. It continues to the northeast and east parallel to existing transmission lines across TN 48, I-24, and US 79 to the Montgomery 500-kV Substation. Corridor C is about 41 miles long.

2.2.2.1.4 Corridor D

From the switchyard on the west side of Cumberland Fossil Plant, Corridor D runs to the northeast across the Cumberland River, TN 233, and Blooming Grove Creek to US 79. It then runs east and northeast, partly on the Fort Campbell Military Reservation, past the community of Woodlawn. It stays to the north of Purple Heart Parkway/TN 374 and crosses US 41A near Ringgold. It passes south of Clarksville Outlaw Field Airport and along the north side of 101st Airborne Division Parkway. It continues east, partially overlapping Corridor C, crosses I-24, and turns south to cross US 70 east of I-24. It then enters the Montgomery 500-kV Substation from the north. Corridor D is about 32 miles long.

Corridor D Transmission Line Route

This route has three alternative alignments as it leaves the Cumberland Fossil Plant (Figures 2-3, 2-4, 2-10 – 2-14). The west alternative (Fossil Plant West) and the central alternative (Fossil Plant Central) begin at a common point at the switchyard on the northwest side of Cumberland Fossil Plant and then immediately split before crossing the Cumberland River. Fossil Plant West runs northwest parallel to an existing transmission line, crosses TN 233, and then turns northeast to cross the Cumberland River. Fossil Plant Central runs directly northeast from the plant across TN 233 and the Cumberland River. The Fossil Plant West and Fossil Plant Central alternative alignments join near the northern edge of the Cumberland River floodplain. The third alternative alignment, Fossil Plant East,

overlaps the Corridor B transmission line route described above as it leaves the plant switchyard until it crosses the railroad at the southeast corner of the plant property. At that point, it turns north-northeast to parallel the east side of the railroad. It continues in this direction and crosses TN 149 near its intersection with TN 233. The route then crosses the Cumberland River and continues in the same direction to cross Wilson Hollow Road and TN 46 at their southern intersection. It then merges with the main Corridor D route. The unique section of the Fossil Plant East alignment is called the North-South Connector in some project planning documents and correspondence.

The main Corridor D route then runs northeast for about 8.9 miles, passing east of the Throckmorton community and crossing Wildcat Creek, the Stewart-Montgomery County line, Marshall Creek, and TN 233 just west of Needmore. It then crosses Blooming Grove Creek and Cooper Creek. As it approaches TN 233 southwest of Woodlawn, it turns east for about 1.4 miles. After crossing Bartee Branch, it splits into two alternative alignments.

The western alternative (Woodlawn West) crosses Moore Hollow Road and then runs northeast for about 3.6 miles, crossing Old Dover Road and US 79 and staying west of 101st Airborne Parkway. It terminates a short distance north of La Fayette Road.

The eastern alternative (Woodlawn East) continues to run east for about 2.1 miles, crossing Moore Hollow Road and Ogburn Chapel Road. It then turns north and crosses York Road and then US 79 a short distance east of its intersection with 101st Airborne Parkway. After crossing US 79, it turns to the northeast, passes east of a large wooded wetland, and turns northwest and then north as it crosses the Parkway. A portion of the route in this area was realigned during the planning phase to avoid impacting an endangered species. After crossing the Parkway, it runs along the western edge of a Clarksville Public School site and rejoins the Woodlawn West alternative just north of La Fayette Road.

During its ongoing electric power system studies, TVA has recently identified the need for a new 161-kV transmission line to improve reliability in western Montgomery County. This system need is separate from that of the proposed 500-kV transmission line. The nearest source of adequate power supply for the new 161-kV line is the Montgomery 500-kV Substation. Current proposals under study for this new transmission connection include a new 161-kV transmission line connecting the Montgomery 500-kV Substation to the existing line serving Fort Campbell's Screaming Eagles Substation. The Screaming Eagles line would then be connected to a new switching station to be built southwest of Fort Campbell. If Corridor D were selected as the preferred route for the 500-kV transmission line, a portion of it would be built with taller structures which would accommodate both a 161-kV line and the 500-kV line. These structures would be used on most of the 12 mile section of line nearest the Montgomery Substation. At the western terminus point of this 12-mile section of the Corridor D route, the 161-kV line would leave the Corridor D route and continue west, on a new, independent route for about 2 miles, entering the Fort Campbell reservation and intersecting the existing Screaming Eagles line. The 161-kV transmission line would leave the 500-kV line ROW near the angle point immediately north of Kay Road. The route for the remaining 2 miles of the 161-kV line has not yet been determined.

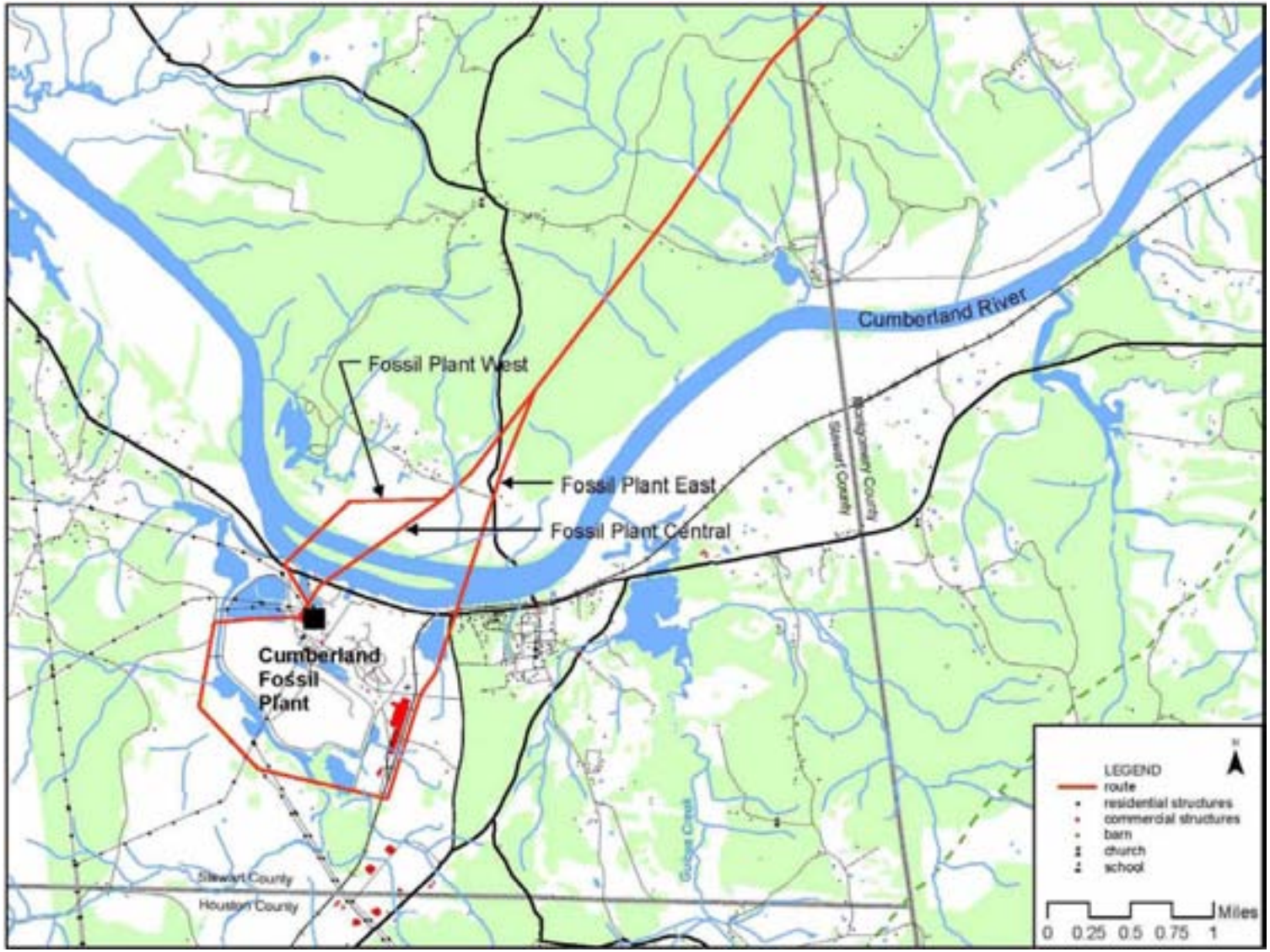

Figure 2-10. The Cumberland-Montgomery Corridor D transmission line route, Part 1.

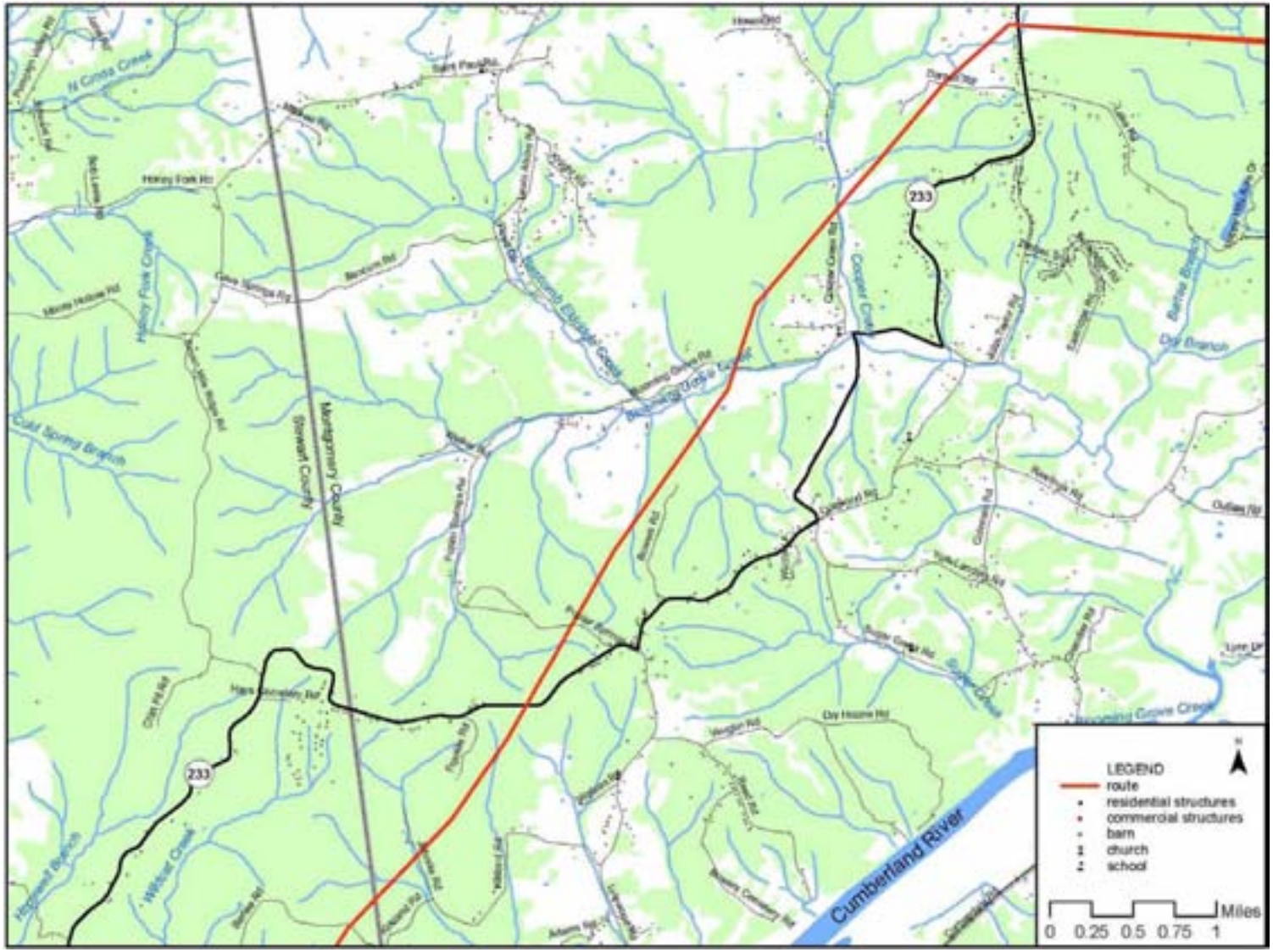

Figure 2-11. The Cumberland-Montgomery Corridor D transmission line route, Part 2.

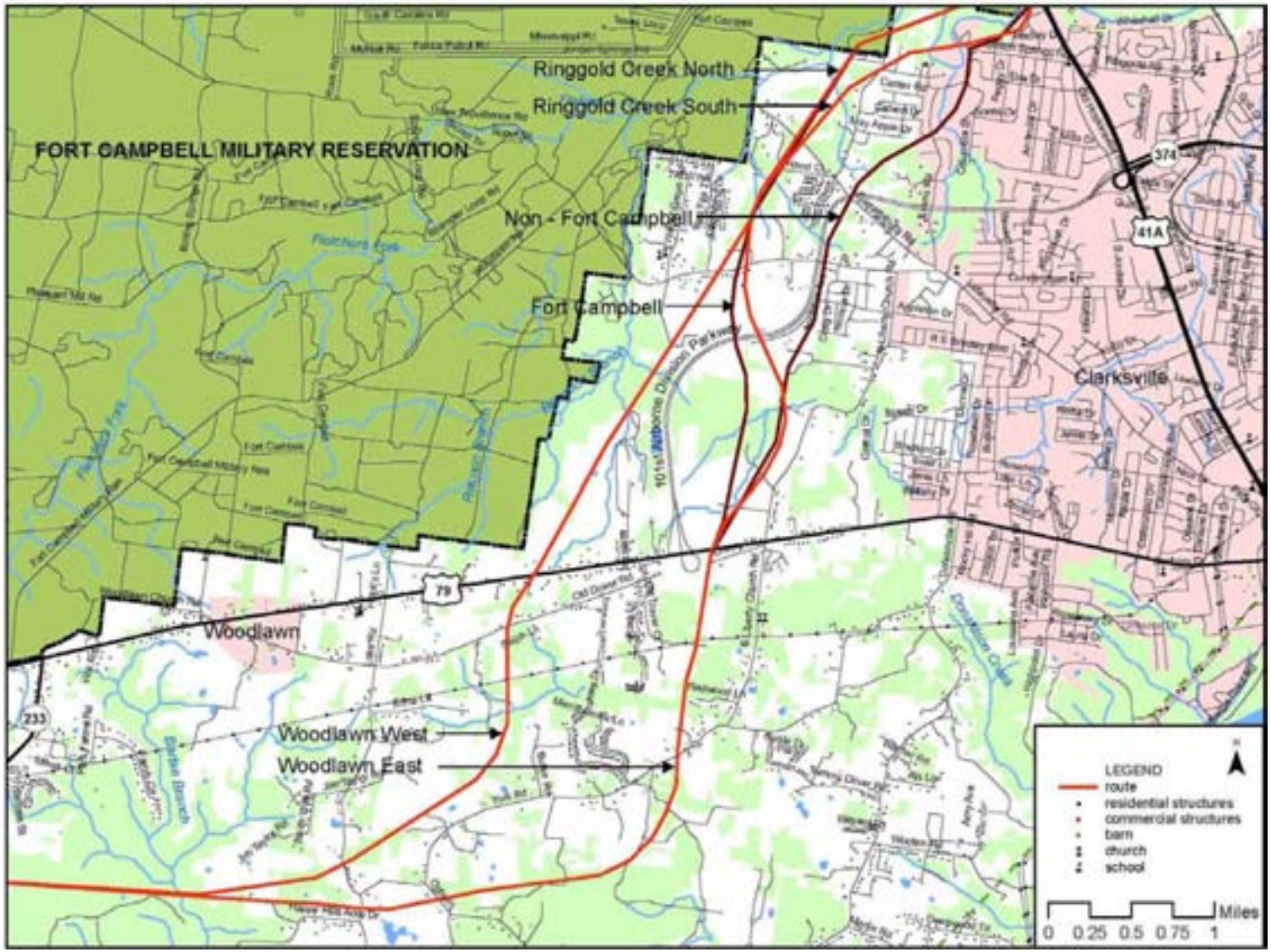

Figure 2-12. The Cumberland-Montgomery Corridor D transmission line route, Part 3.

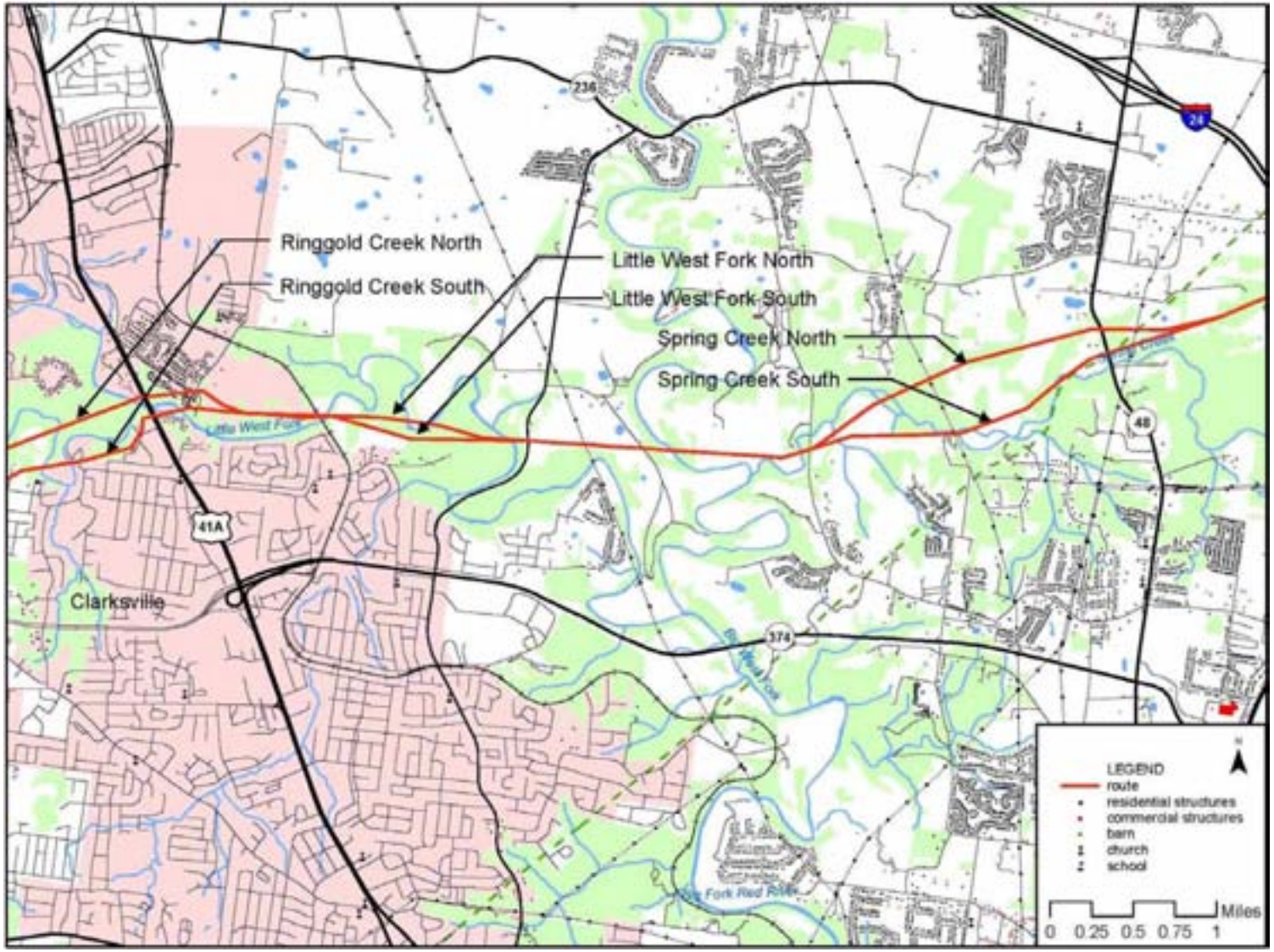

Figure 2-13. The Cumberland-Montgomery Corridor D transmission line route, Part 4.

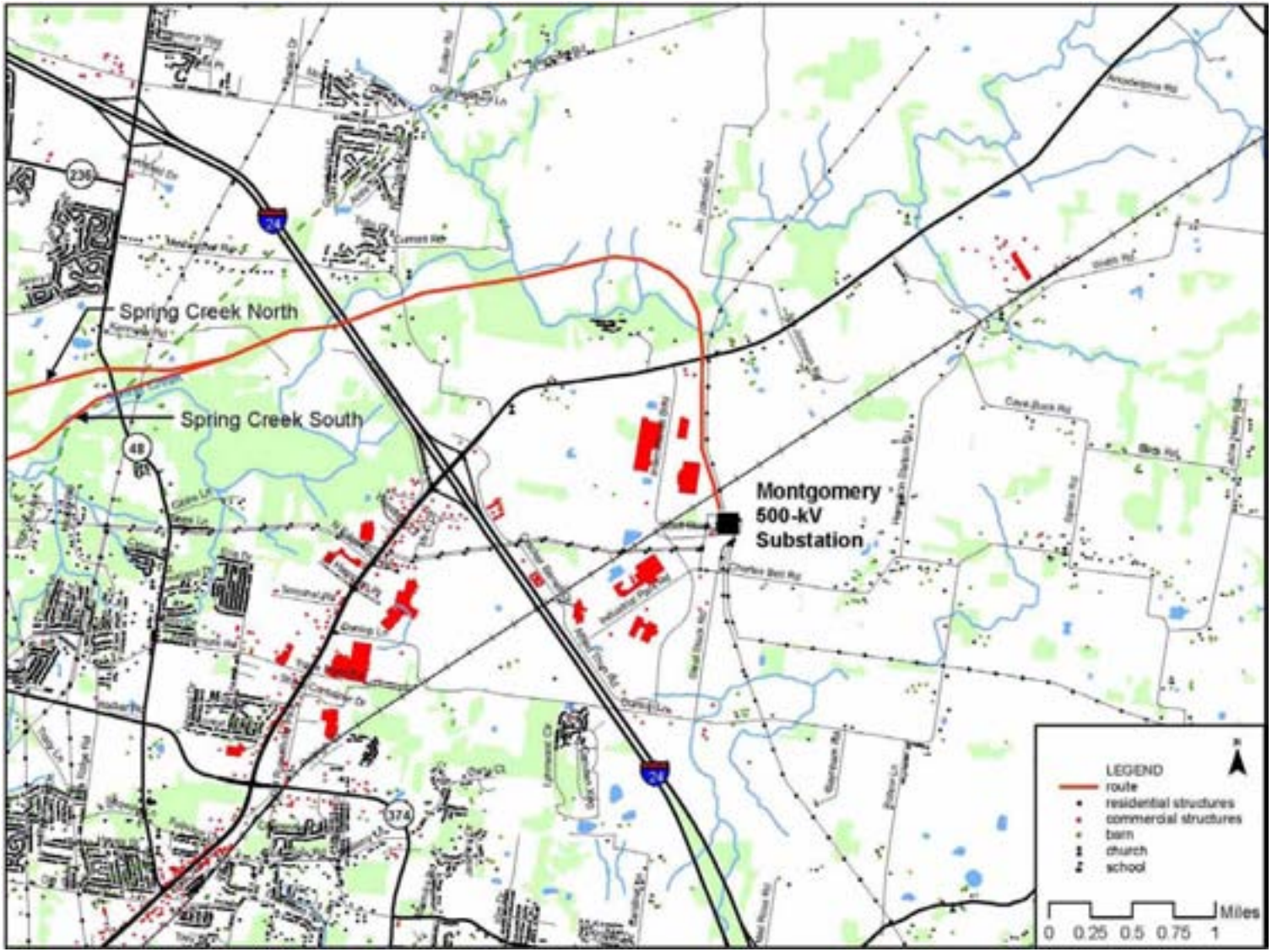

Figure 2-14. The Cumberland-Montgomery Corridor D transmission line route, Part 5.

The proposed route soon diverges again into two alternative alignments. The Fort Campbell alternative runs northeast for about 1.6 miles before turning eastward. It then crosses the Fort Campbell Reservation in two locations, the second of these being a short distance north of the US 41A bridge over Little West Fork Creek. The second alternative alignment, the Non-Fort Campbell alignment, runs east and south of the Fort Campbell alignment to stay off of the Army reservation. It crosses US 41A just south of the Little West Fork Creek bridge and rejoins the other alignment just east of US 41A. At its crossing of US 41A and Little West Fork Creek, the potential future 161-kV transmission line underbuild described above would be removed from the 500-KV transmission line structures and be on its own structures just north of the 500-kV line.

The Corridor D route again splits into two alternative alignments a short distance east of US 41A. One alternative alignment, Ringgold Mill North, crosses US 41A north of the Little West Fork bridge and the other alternative route, Ringgold Mill South, crosses US 41A south of the Little West Fork bridge. Both of these alternative routes cross a small area of the Fort Campbell Reservation. After crossing US 41A and passing near the Ringgold Mill historic site, the two alternative routes merge and the proposed route runs eastward for about 0.6 mile, north of the Little West Fork and across the abandoned railroad. After crossing the Little West Fork, it again splits into two alternative alignments, Little West Fork North and Little West Fork South. The southern alignment continues east to pass just south of a large bend in the Little West Fork. The northern alignment crosses the lower portion of this large bend.

After merging near the crossing of Peaches Mill Road, the Corridor D route continues east for about 6 miles. This stretch crosses the West Fork once and crosses Spring Creek several times. It also crosses Needmore Road, TN 48, and I-24 near the bridge over Spring Creek. About 1.6 miles east of I-24, the route turns south, crosses US 79, and then runs parallel to the west side of the existing Paradise-Montgomery 500-kV line for about 0.9 miles through the industrial park on existing ROW to the Montgomery 500-kV Substation.

Depending on the combination of alternative alignments, the Corridor D transmission line route would be between 31.81 and 37.72 miles long (Table 2-2)

Access Roads – The selection of the Corridor D route would require the construction of new access roads to structure locations and other parts of the ROW (Table 2-2). Depending on the combination of alternative alignments selected, the length of new access roads ranges from about 15.2 to 19.8 miles. Individual road segments vary in length from a few hundred feet to over a mile.

Construction Assembly Areas – Two construction assembly areas have been identified for the Corridor D route. One area is on a 49-acre tract on south side of US 79 about 0.3 miles west of the intersection of US 79 and TN 233 west of Woodlawn. The second area, a 33-acre tract, is on north side of US 79 about 1 mile east of I-24 at the eastern end of the route. Both of these tracts are fields with sparse vegetation, and no more than about 10 acres of each tract would be used.

2.2.2.2 Alternative 2 - Cumberland-Davidson Study Area

Two broad alternate corridors from TVA's Cumberland Fossil Plant to TVA's Davidson 500-kV Substation have been identified (Figure 2-7). The corridors vary in width according to observed siting constraints and opportunities, and overlap at each end.

Table 2-2. Length of right-of-way and associated new or upgraded access roads for the Cumberland-Montgomery Corridor D transmission line route.

Route Segment	Right-of-Way (miles)	Access Roads (miles)
Main Alignment	14.67	9.6
Fossil Plant West (includes shared portion of Fossil Plant Central north of Cumberland River)	1.38	0.9
Fossil Plant Central	1.03	1.2
Fossil Plant East (includes shared portion of Corridor B route)	5.31	1.8
Woodlawn East	8.31	2.2
Woodlawn West	7.21	1.6
Fort Campbell North	4.77	1.1
Fort Campbell South	4.46	1.3
Ringgold North	0.69	0.7
Ringgold South	0.59	0.8
Little West Fork North	1.22	2.0
Little West Fork South	1.23	0.6
Spring Creek North	2.63	0.7
Spring Creek South	2.64	2.1

2.2.2.2.1 Corridor A

Corridor A exits the switchyard on the west side of Cumberland Fossil Plant and goes south and southeast along the same general path as the existing Cumberland-Davidson 500-kV Transmission Line. It crosses TN 149 and TN 13 and runs eastward just south of the Montgomery, Houston and Dickson County lines. It passes to the north of Slayden and Cumberland Furnace. In the vicinity of Rock Springs Road and the communities of Rock Springs and Coaling, it turns southeast to cross TN 49, the Harpeth River near Collier Bend, and TN 250. It then turns slightly eastward and crosses through the southern portion of Cheatham Wildlife Management Area (WMA). After crossing TN 249 east of the Cheatham WMA, it intersects the Davidson-Montgomery 500-kV Transmission Line and turns south to follow the line across US 70, the Harpeth River, and I-40 into the Davidson 500-kV Substation. Corridor A is about 50 miles long.

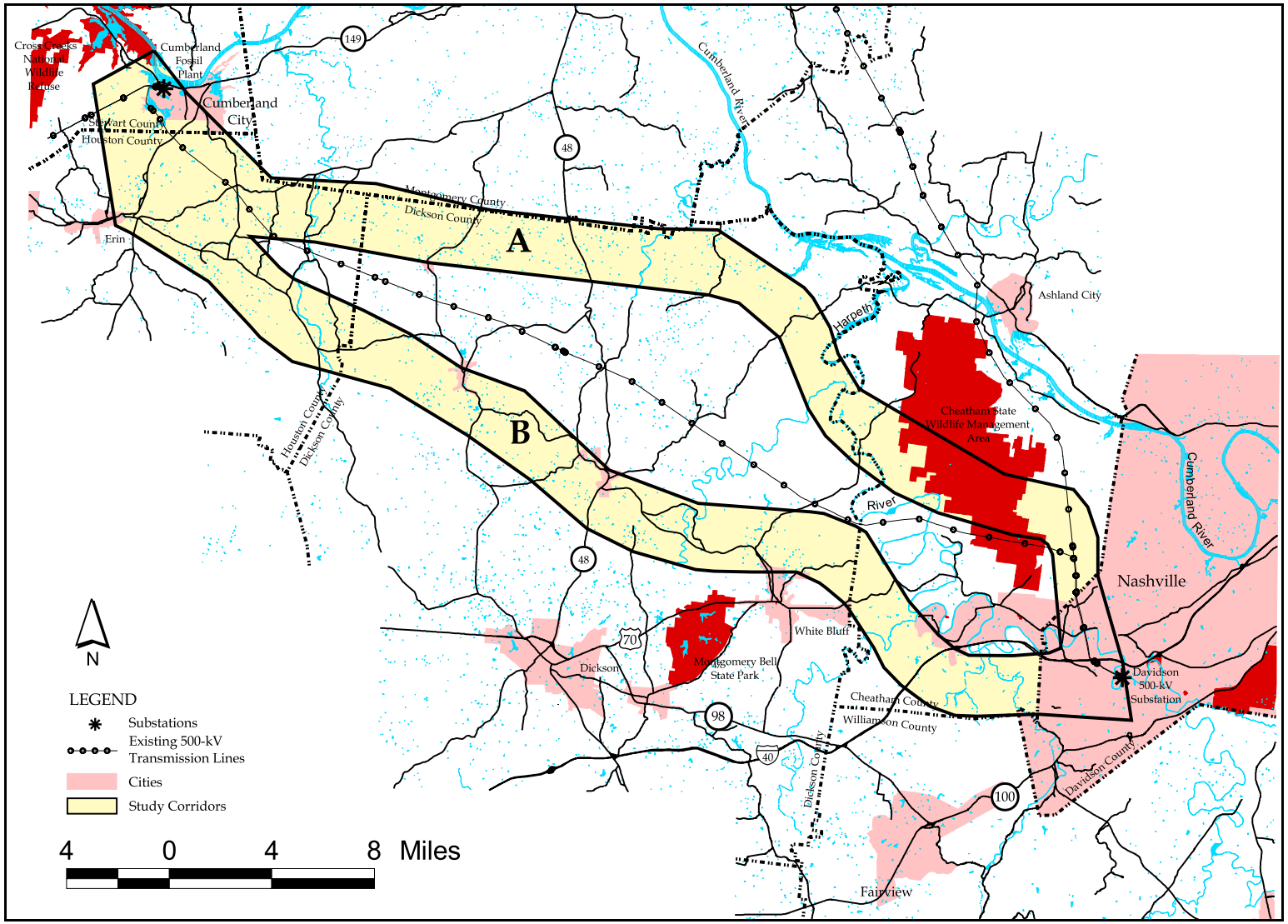

Figure 2-15. The Cumberland-Davidson Study Area and transmission line corridors

2.2.2.2.2 Corridor B

Corridor B exits the switchyard on the west side of Cumberland Fossil Plant and then turns south to partially overlap Corridor A. It passes to the east of Erin and then turns to the southeast towards Vanleer and Charlotte. It passes south of these two communities and then turns eastward as it crosses Jones Creek. Corridor B then crosses TN 250 north of White Bluff and before crossing the Dickson-Cheatham County line, it turns to the southeast. It crosses US 70 and Turnbull Creek. After crossing I-40, it turns to the east to cross Brush Creek and the South Harpeth River and terminate at the Davidson 500-kV Substation. The total length of Corridor B is about 51 miles.

2.3 Alternatives Considered But Eliminated From Further Consideration

2.3.1 New Switching Station and Transmission Line

TVA briefly considered an alternative involving constructing a new 500-kV switching station in Humphries County, Tennessee and a 500-kV transmission line from the switching station to the Davidson 500-kV Substation. The switching station would be built near and connected to the existing Johnsonville–Davidson 500-kV transmission line. The new 500-kV transmission line would be at least 40 miles long and built on new ROW.

This alternative would have the additional costs and potential impacts of a new 500-kV switching station. Detailed transmission system studies showed that this alternative would not adequately meet the project need. This alternative was eliminated from further consideration.

2.3.2 Load Management/Conservation

A major objective of this project is to maintain transmission system reliability. Reliability is related to system loads as well as system configuration and external factors such as weather, catastrophic events and events on adjoining systems. In addition, the proposed project addresses a present risk to maintaining the current level of service; this risk will increase as system loads increase in the future.

The risk to maintaining service to the greater middle Tennessee area is partially load dependent and could, therefore, be affected by load reduction. However, under present conditions, it would be necessary to decrease current peak loads by at least 4000 MW to maintain acceptable voltage levels. A 2002 study conducted by Pacific Energy Associates for TVA assessed a number of demand-side management options. This study showed that the maximum peak load reduction achievable within a 2 year period, using a number of demand-side management options, was expected to be about 187 MW throughout the TVA system and about 37 MW in middle Tennessee. Achieving an on-peak reduction of 4000 MW in middle Tennessee through demand-side management is therefore not feasible. Additional information on demand-side management efforts by TVA and area power distributors is presented in Appendix H.

Conservation and load management would not fully address the system stability issues that are an objective of the proposed action. These risks can only be decreased by addition of another high capacity transmission line in the area. The load management/conservation alternative was eliminated from further consideration.

2.4 Comparison of Alternatives

2.4.1 Alternative Study Areas and Corridors

The alternative study areas and corridors were evaluated on the basis of four areas of comparison: potential impacts to natural features, potential impacts to land uses, potential impacts to cultural features, and engineering attributes. Economic issues, especially those related to project costs, are directly and indirectly incorporated into this evaluation. This evaluation was partially based on an enumeration of characteristics of the project area (Table 2-3). Data used in this enumeration included the number of houses, the number of churches, forested area, the number of areas of steep slopes, wetland area, and 24 other attributes. Many of these attributes capture potential environmental impacts. The raw numbers in this table were converted to numerical scores using standard statistical methods. The overall scores for each of the six corridors were then computed and the alternatives and corridors were ranked by overall desirability. The Cumberland-Davidson study area rated lower in most categories, in large part because of the longer length of the corridors it contained.

2.4.1.1 Engineering Attributes

The number of transmission line crossings and railroad crossings is similar in the two study areas. The Cumberland-Montgomery corridors would require more primary road crossings, and the total number of road crossings would be larger for the Cumberland-Davidson corridors. The number of pipeline crossings is also larger for the Cumberland-Davidson corridors. A substantial amount of work would be required in the Cumberland Fossil Plant switchyard regardless of the alternative selected. A new bay would not be required at the Montgomery Substation. A new bay and associated earthwork would be required at the Davidson Substation.

2.4.1.2 Natural Features

Because of their longer length, the area of new ROW would be about 20% larger for the Alternative 2 Cumberland-Davidson corridors than for the Alternative 1 Cumberland-Montgomery corridors. The Cumberland-Davidson study area is more heavily forested than the Cumberland-Montgomery study area, and impacts of forest clearing during transmission line construction would be considerably greater in the Cumberland-Davidson corridors. Impacts to wildlife populations would consequently also likely be greater in the Cumberland-Davidson corridors. Both alternative study areas contain identified plant communities of conservation concern.

While selection of either alternative study area would result in several stream crossings; the Cumberland-Davidson study area contains more streams supporting endangered or threatened species, more Nationwide Rivers Inventory streams, and a State Scenic River. Wetlands are present in both study areas, and, based on aerial photo interpretation, comprise 0.1% or less of each corridor. The proportion of wetland area is highest in Cumberland-Montgomery Corridors A and D, and lowest in Cumberland-Montgomery Corridor C and Cumberland-Davidson Corridor B. Because of the size and configuration of the wetlands, potential impacts within the Cumberland-Montgomery study area would probably be greatest for Cumberland-Montgomery Corridor D and least for Cumberland-Montgomery Corridor C. There appears to be little difference in potential wetland impacts between the two Cumberland-Davidson corridors.

Table 2-3. Summary of selected attributes of Alternative Study Areas and Corridors.

	Cumberland-Montgomery				Cumberland-Davidson	
	A	B	C	D	A	B
Engineering Attributes						
Length (Miles)	45	37	41	32	50	51
Road Crossings - Primary	3	5	7	4	3	2
Road Crossings - Secondary	8	5	8	4	12	17
Pipeline Crossings	1	1	2	1	6	7
Transmission Line Crossings	7	6	8	5	7	5
Railroad Crossings	2	2	3	2	2	2
Natural Features						
Total Area (acres)	54300	48389	53115	44057	65339	66532
Forested Area (acres)	25096	20109	22908	17825	39432	40296
Open Water (acres)	757	934	1237	719	882	812
Floodplains (acres)	4637	5637	8061	4028	6083	4860
Sensitive Steam Crossings[1]	2	2	1	1	3	4
River Crossings		1	2	2	3	2
Major Stream Crossings	1	1	1	1	3	4
Wetland Area (acres)	539	409	376	382	529	424
Endangered & Threatened Species Populations	3	11	15	31	6	8
Caves	1	3	6	6	3	3
Managed Areas[2] (acres)		11717	8070	8219	11151	13200
Land Use						
Apartment Buildings	12	21	47	79	5	18
Schools	2	13	5	17	5	5
Houses	2570	2815	2722	2749	1910	2891
Barns	115	142	260	142	990	1222
Poultry Barns	2	3	3	6	0	0
Commercial & Industrial Bldgs.	125	152	275	153	86	184
Parkland (acres)	35	27	27	57	145	179
Cultural Features						
Historic Properties on NRHP[3]	8	8	9	7	11	8
Historic Properties Eligible or Potentially Eligible for NRHP[3]	123	125	89	80	108	110
Churches	13	17	22	18	19	26
Cemeteries	44	32	36	10	395	54

	Cumberland-Montgomery				Cumberland-Davidson	
	A	B	C	D	A	B
Recreation Areas (acres)	46	142	46	131	59	107

[1]Streams supporting endangered or threatened species
[2]Includes wildlife refuges, wildlife management areas, natural areas
[3]NRHP – National Register of Historic Places

Endangered, threatened or otherwise sensitive species are known from both alternative study areas and all corridors. The number of previously reported populations of listed species is generally larger in the Cumberland-Montgomery corridors.

Both alternative study areas and all corridors contain areas managed for natural resource conservation such as state natural areas, wildlife refuges, and wildlife management areas. The potential for impacts to these areas varies greatly because of the arrangement of the areas and because of the compatibility of a new transmission line with their different management objectives. Within the Alternative 1 Cumberland-Montgomery Study Area, the potential for impacts to managed areas is probably greatest in Corridor D. Within the Alternative 2 Cumberland-Davidson Study Area, the potential for impacts is probably greatest in Corridor A because of the presence of Cheatham WMA.

2.4.1.3 Land Use

Land use varies in the two alternative study areas and associated corridors and includes urban, suburban, and industrial development, forestry, and agriculture. The Cumberland-Montgomery corridors have a higher proportion of urban/suburban development than the Cumberland-Davidson corridors, and consequently, higher densities of apartment buildings, houses, and commercial and industrial buildings. Commercial land use is highest for Cumberland-Montgomery Corridor C and lowest for Cumberland-Davidson Corridor A. Parks make up a very small proportion of each study area and corridor. Two large special use areas are the Cheatham WMA located along Cumberland-Davidson Corridor A and Fort Campbell Military Reservation, part of which is included in Cumberland-Montgomery Corridor D.

No additional land would be required for project activities at the Cumberland Fossil Plant, the Montgomery 500-kV Substation, or the Davidson 500-kV Substation.

2.4.1.4 Cultural Features

Based on available records, the number of historic properties (archaeological sites and historic architecture) listed on the National Register of Historic Properties (NRHP) varies little among the alternative study areas and corridors. Cumberland-Montgomery Corridor A contains the most identified archaeological sites and Cumberland-Montgomery Corridor D and Cumberland-Davidson Corridor B contain the fewest. Cumberland-Montgomery Corridors C and D contain the fewest historical properties eligible or potentially eligible for the NRHP. The differences among the alternative study areas and corridors in the number of churches and acreage of recreation areas is relatively small. Cumberland-Davidson Corridor A contains considerably more cemeteries than the other corridors.

2.4.1.5 Preferred Alternative Study Area and Corridors

The major differences between the two alternative study areas are related to the length of their associated corridors and the general level of urban/suburban development. The Cumberland-Montgomery corridors are shorter and have a higher level of urban/suburban development. The Cumberland-Davidson corridors are more heavily forested and potential impacts to several natural features are greater in this study area. The Cumberland-Davidson Corridor A would cross the Cheatham WMA, and the Cumberland-Montgomery Corridor D could cross a portion of Fort Campbell. A transmission line in one of the Cumberland-Montgomery corridors, because of the shorter length, would be less expensive to construct and operate than a line in a Cumberland-Davidson corridor.

A statistical analysis of the data in Table 2-1 was conducted to quantitatively rank the corridors. Based on the results of this analysis, as well as other factors less easily quantified (e.g., aesthetics), the final ranking of the corridors, from most preferable to least, is a follows: Cumberland-Montgomery D, B, C and A, followed by Cumberland-Davidson B and A. Based on this evaluation, TVA identified its preferred alternative in the Draft EIS as Alternative 1 – the Cumberland-Montgomery Study Area. Within this study area, the preferred corridors were identified as B and D.

2.4.2 Cumberland-Montgomery Transmission Line Routes

The proposed Cumberland-Montgomery Corridor B route would require a new ROW between 38.12 and 38.94 miles long, depending on the alternative alignments under consideration. The differences in ROW length among the various combinations of alternative alignments are small, as reflected in the small difference in potential ROW lengths. The proposed Cumberland-Montgomery Corridor D route would require a new ROW between 31.81 and 37.72 miles long. The majority of the difference in the length of the ROW is accounted for by the Fossil Plant alternative alignments (shortest with Fossil Plant Central and longest with Fossil Plant East) and the Woodlawn alternative alignments (shortest with Woodlawn West and longest with Woodlawn East).

Chapter 4 of this EIS presents a detailed comparison of the anticipated environmental impacts of constructing and operating the proposed transmission line on the Cumberland-Montgomery Corridor B and Corridor D routes. The analyses in Chapter 4 conclude that there would be little to no impact, and negligible difference between the Corridor B and Corridor D routes as well as among the various alternative alignments of each route, to the following resource areas:

- floodplains;
- recreation;
- some socioeconomic metrics including population, employment, housing, government revenues and property values; and
- electric and magnetic fields.

For the remaining resource areas discussed in Chapter 4, there are identifiable differences in potential impacts between the Corridor B and Corridor D routes, as well as among the various alternative alignments of each route. These differences are summarized in Table 2-4.

Table 2-4. Summary of differences in potential impacts between the Cumberland-Montgomery Corridor B and Corridor D transmission line routes.

Resource area	Feature	Corridor B	Corridor D
Groundwater	Sinkholes in ROW	9-18*	15-21
	Transmission structures in sinkholes	0-3	6-8
Surface Water	Streams listed on 303(d) list as not supporting use classifications	6	4-5
Vegetation	Forest within ROW	ca. 387 acres	ca. 338-399 acres
Vegetation and Wildlife	Forest fragmentation – tracts > 1,000 acres fragmented	5	2
	Forest fragmentation –largest tract fragmented	2563 acres	6653 acres
Wildlife	Heron colonies affected	0	1-2
Aquatic Ecology	Perennial stream crossings	37-39	28-41
	Intermittent stream crossings	8-10	15-19
	Trout stream crossings	1	0
	Forested stream crossings	33-35	38-44
Endangered and Threatened Species	Federally listed species adversely affected	0	0
	State-listed species adversely affected	1 – blue scorpion-weed	0
Wetlands	Total wetland area affected	21.7-23.2 acres	5.6-11.1 acres
	High quality forested wetland area affected	4.5-6.2 acres	4.1-5.2 acres
Managed Areas	Managed areas and ecologically significant sites adversely affected	1 – Marks Slough	0
Land Use and Prime Farmland	Area of new ROW	ca. 809-826 acres	ca. 675-800 acres
	Prime farmland in ROW	180-201 acres	219-272 acres
	Building relocations	1	6-28
Visual Resources	Areas with reduced Scenic Value Class	1 – between Vernon Creek and TN 13 north of Cummingham	0
Cultural Resources	NRHP listed or eligible sites affected	1 – an historic house	1 – Ringgold Mill Complex
	NRHP listed or eligible sites adversely affected	0	1 – Ringgold Mill Complex, from Ringgold South alternative alignment
Socioeconomics/Environmental Justice	Census block groups with poverty rate higher than state average	2	1

Resource area	Feature	Corridor B	Corridor D
	Census block groups with nonwhite population higher than state average	0	5

*Ranges of numbers are due to differences between alternative alignments.

2.5 The Preferred Alternative and Route

As described above in Section 2.4.1.5, TVA identified its preferred alternative in the Draft EIS as Alternative 1 – the Cumberland-Montgomery Study Area. TVA also identified Cumberland-Montgomery Corridors B and D as its preferred corridors. These remain TVA's preferred alternative and corridors. Following the release of the Draft EIS and the consideration of public comments on it, TVA developed several potential transmission line routes in Cumberland-Montgomery Corridors B and D. After public review of these potential routes, TVA further refined them to the Corridor B and Corridor D routes and alternative alignments described above in Sections 2.2.2.1.2 and 2.2.2.1.4. TVA then conducted detailed field investigations of the routes and the results of these investigations are described in detail in Chapters 3 and 4 and summarized above in Section 2.4.2.

Based on the results of these investigations, as well as results of engineering analyses and cost and safety considerations, TVA has identified the Corridor B (southern) route with the Cumberland River South and Industrial Park Central alternative alignments as the preferred route. Many of the environmental attributes that were used in making this decision are listed above in Table 2-4. Additional factors, including those specific to the Corridor B Cumberland River South and Industrial Park Central alternative alignments, are listed below in Table 2-5.

Table 2-5. Additional attributes of the preferred Cumberland-Montgomery Corridor B route and the Corridor D route.

Attribute	Corridor B with Cumberland River South and Industrial Park Central alignments	Corridor D
Line length (miles)	38.5	~36.1
Right-of-way (acres)	817	~766
Floodplain (acres)	87	99
Stream crossings		
Wetlands (acres)	23.2	5.6-11.1
Forested wetlands (acres cleared)	6.2	4.1-5.2
Land parcels affected	164	167
Residential relocations	1	6-28
Apartments within 300 ft.	0	2
Houses within 300 ft.	8	53
Commercial establishments within 300 ft.	0	5
Barns within ROW	1	4

Compared to the northern Corridor D route, the preferred southern Corridor B route would:

- Avoid aviation safety issues at Fort Campbell that would result from the adjacent tall transmission structures, as well as the risk to the reliability of the TVA line from heavy nearby air traffic;
- Require only one residential relocation and result in reduced impacts on planned and future residential and commercial development;
- With the exception of the area near I-24, including the Clarksville-Montgomery County Corporate Business Park, have less impacts on land use;
- Have fewer road crossings, fewer crossings of other transmission lines, and, on average, longer spans between structures; and
- Require fewer aircraft warning devices and their associated maintenance requirements and visual impact.

The preference for the Cumberland River South alignment over the Cumberland River North alignment is primarily based on land use concerns. The south alignment would avoid ongoing residential development and land suitable for additional future development along the Cumberland River North alignment. In addition, the north alignment would have crossed a large agricultural area with extensive underground drainage. Transmission line construction in this area would have been very difficult and could have long term impacts on the ongoing agricultural operations. The south alignment would also have fewer stream crossings (6 versus 8), but require more clearing of forest (47 versus 28 acres) and of forested wetlands (2.0 versus 0.3 acres).

The preference for the Industrial Park Central alignment over the Industrial Park East and Industrial Park West alignments is based on cost and land use factors and was coordinated with the Clarksville-Montgomery County Industrial Development Board. The central alignment parallels an existing 500-kV transmission line on property owned by the Industrial Development Board. It is slightly shorter than the other alternative alignments and therefore somewhat less expensive. By paralleling the existing transmission line, it would minimize land use conflicts within the industrial park.

2.6 Mitigation Measures

NEPA and its implementing regulations require that an EIS identify appropriate and reasonable mitigation measures for the adverse impacts potentially resulting from a proposed action. Mitigation measures are actions that could be taken to avoid, offset, reduce, or compensate for adverse impacts to the environment.

The line siting process is itself structured to avoid or reduce potential environmental impacts. Throughout the process of planning the transmission line, TVA has taken many steps to avoid and minimize potential environmental impacts. The Alternative 1 (Cumberland-Montgomery) Corridors B and D were identified as TVA's preferred alternatives in the DEIS in part because of their environmental aspects. Avoidance of environmental resources such as wetlands, endangered and threatened species, and cultural resources was an important factor during the detailed planning of the Alternative 1 Corridor B and D routes and several changes in the routes were made for this reason. This section describes other potential mitigation measures that TVA may implement; it also notes whether or not TVA proposes to implement the potential mitigation measures. After

issuance of the FEIS and the selection of the alternative to be implemented, TVA will identify those mitigation measures it chooses to implement in its Record of Decision for this action.

Under either action alternative, TVA would use stringent Best Management Practices (BMPs) during all construction and maintenance activities in order to minimize erosion and sedimentation and their effects on water quality. TVA would also minimize many environmental impacts by adhering to the conditions in Appendices B, C, and D. TVA would also categorize affected streams and apply the corresponding protective measures as described in Appendix F.

Potential mitigation measures to reduce potential impacts to groundwater include the following:

1. For the Alternative 1 (Cumberland-Montgomery) Corridor B route, herbicides would not be applied aerially along the ROW between a point about 0.4 miles northeast of Highway 12 (at proposed transmission line structure 136) and the Montgomery 500-kV Substation. The use of fertilizers would also be avoided or minimized in this area.

2. For the Alternative 1 Corridor D route, herbicides would not be applied aerially along the ROW between a point just east of Highway 233/Lylewood Road (at proposed transmission line structure 54/9A) to one-half mile west of I-24 (at proposed transmission line structure 139/92A). The use of fertilizers would also be avoided or minimized in this area.

In order to reduce the potential impacts and to enhance the benefits of ROW clearing and maintenance for rare plant communities, the following potential mitigation measure has been identifired for both action alternatives:

3. The globally rare Kentucky–Tennessee Big Barrens plant community is a prairie-related community that historically was much more abundant than is currently the case. It occurred most frequently on the Pennyroyal Plain and was dependent on occasional wildfires to keep it open. Many example of this community type have been lost through conversion to agricultural uses, and through reforestation following suppression of wildfires. ROW clearing can result in the re-establishment of this rare plant community. Three to four years after construction of the transmission line, TVA would have a botanist or plant ecologist inspect the portions of the constructed power line which traverse the formerly forested section lying in the Pennyroyal Plain. The purpose would be to document any re-established occurrences of plant communities of conservation concern, especially the Kentucky-Tennessee Big Barrens.

In order to reduce the potential for spread of invasive plant, the following potential measure has been identified for both action alternatives:

4. The potential for the spread of invasive plants during construction and maintenance activities is high where populations of such species are well established or are in high densities. Although TVA would not plant known species of invasive plants on the new ROW, minimization of spread of known concentrations is an important aspect of the proposed action. In the third growing season after completion of the

transmission line, TVA botanists or ecologists would search for concentrations of invasive plant species in the ROW and, if any concentrations are found, would provide maintenance personnel with maps showing the locations. Mowing equipment would be cleaned immediately before leaving these areas. Cleaning of the equipment would be by physical removal of plant materials from tractors, mower decks, blades, and mounting hardware.

In order to avoid disruption of nesting activities by great blue herons, the following measure has been identified for the Alternative 1 – Cumberland-Montgomery Corridor D transmission line route:

5. Construction activities in these areas would be restricted to the period between mid-July and December at colonies along the Corridor D Fossil Plant East alternative alignment in the vicinity of Cumberland City Ferry and the main Corridor D route at West Fork Creek.

In order to ensure that potential impacts to high quality forested wetlands are insignificant, compensatory mitigation would be provided for if Alternative 1 – Cumberland-Montgomery Route B or Route D is selected. Compensatory mitigation measures include, but are not limited to:

- The purchase of credits in an existing mitigation bank (which includes forested wetlands) within the USGS Hydrologic Unit (HU) for the project area or an adjacent Cumberland River HU.
- Forested wetland restoration in or adjacent to the project HU, either implemented by TVA or through an in-lieu-fee agreement with a state agency or private conservation organization.

Wetland acreages that would be mitigated are as follows:

6. For Cumberland-Montgomery Route B, 3.8 acres of high quality forested wetlands mitigated at a 1:1 ratio.

7. For Cumberland-Montgomery Route D, 2.5 acres of high quality forested wetlands mitigated at a 1:1 ratio.

Depending on the line route ultimately selected, TVA proposes to implement mitigation measures 1 or 2, measure 5, and measure 6 or 7. It proposes to partially implement measure 4 by not using invasive species during revegetation activities. TVA is not proposing to implement the remaining provisions of measure 4, or to implement measure 3.

CHAPTER 3

3 AFFECTED ENVIRONMENT

This chapter describes aspects of the natural environment and human environment that may be affected by the alternatives. Each section in this chapter describes a particular resource. Aspects of the natural environment are described first, followed by aspects of the human environment.

Following the identification of Alternative 1 Corridors B and D as TVA's preferred alternatives for the proposed transmission line, field studies and other detailed analyses of the transmission line routes within each of these corridors, as well as of other potentially affected areas including access roads and construction equipment laydown areas, were conducted. The findings from these studies are described below along with more general descriptions of the study areas and corridors.

3.1 Groundwater

The project area is underlain by the Highland Rim aquifer system which is part of the Interior Low Plateaus Physiographic Province. The Highland Rim aquifer consists of flat lying carbonate rocks of Mississippian age. Locally the formations that make up the Highland Rim aquifer are the Monteagle Limestone, the Ste. Genevieve Limestone, the St. Louis Limestone, the Warsaw Limestone, and the Fort Payne Formation (Lloyd and Lyke 1995). The bedrock formations weather to form a thick chert regolith, which stores and releases groundwater into fractures and solution openings in the bedrock (TDEC 2002a).

The carbonate rocks that form the Highland Rim aquifer are typical of karst systems. The term karst refers to carbonate rocks (limestone and dolostone) in which ground water flows through solution-enlarged channels and bedding planes within the rock. Karsts are characterized by sinkholes, springs, disappearing streams, and caves, as well as by rapid, highly directional groundwater flow in discrete channels or conduits. Because of the connections between surface and underground features, water in karst areas is not distinctly surface water or ground water.

Karst systems are readily susceptible to contamination as the waters can travel long distances through conduits with no chance for natural filtering processes of soil or bacterial action to diminish the contamination. "Mature" or well developed karst is particularly susceptible to contamination, and some karst in the project area is considered to be mature. In unconfined or poorly confined conditions, karst aquifers have very high flow and contaminant transport rates under rapid recharge conditions such as storm events (TDEC 2002a). Consequently, the groundwater sources in karst aquifers considered most vulnerable to contamination are those that are under the direct influence of surface water.

The hydraulic characteristics of the Mississippian aquifers present in much of the project area can vary greatly over short distances. These large differences are reflected in the yield and specific capacity of wells completed in the limestone aquifers and the discharges of springs that issue from these aquifers. The yields of wells completed in the Mississippian aquifers commonly range from 5 to 50 gallons per minute, and maximum yields range from a few hundred to, rarely, several thousands of gallons per minute.