

CHAPTER 3

3. AFFECTED ENVIRONMENT

3.1. Introduction

Chapter 3: Affected Environment succinctly describes the existing condition of the environmental resources and factors of the Williamson County, Tennessee, area that would affect or that would be affected by implementing either Alternative 1 or Alternative 2.

This description of the existing environment in Chapter 3, the description of the activities of Alternative 1: Do Not Build Additional Transmission Line (No Action) in Chapter 2 and the predicted effects of Alternative 1 in Chapter 4 combine to establish the baseline conditions against which the decision maker and the public can compare the potential effects of Alternative 2: Construct Transmission Line.

3.2. Alternative 1 – Do Not Build Additional Transmission Line (No Action)

With no new transmission line constructed by TVA, MTEMC could continue at the current transmission capabilities, which are projected to be exceeded by 2010. Outage rates, measured as the average number of minutes a typical customer experiences in a year, would not improve. In addition, with current growth projections, an overloading of the MTEMC system in western Williamson County is anticipated due to the increasing load demands by ongoing and already planned development. This would result in an increase in system outages, especially at times of high electricity use, and could occur as early as 2004. Further upgrades would have to be implemented at the Henpeck and Grassland Substations. By 2004, a 10 MW load transfer would likely be needed between the Aspen Grove and Grassland Substations to help unload Aspen Grove, and for this, tie in transmission lines would need to be constructed. Additional load transfers between the other MTEMC substations would also need to be made to prolong the capabilities of each of the existing substations. A third bank would be needed at Henpeck, and an additional circuit from the Jingo Substation would be added (Appendix I).

Without a new connecting 161-kV transmission line, MTEMC could decide not build a new substation. In this case, five new circuits or feeder transmission lines would have to be built from MTEMC's existing substations to accommodate the needed load transfers. Because it would be difficult to find five new routes, double and triple circuits would likely be added to some of the existing roadways into the area west of Franklin, which are already used as circuit routes. Having more lines dependent on the existing routes increases the risk of decreased power reliability to the customers. Power reliability would also decrease as the loading increased, making it likely that the area west of Franklin would not have improvements in outage times (Appendix I). This would not be an adequate or reasonable response to the need being addressed by TVA's proposed transmission line. See Section 4.2.

3.3. Alternative 2 – Construct Transmission Line

3.3.1. Terrestrial Ecology

3.3.1.1. Terrestrial Plants

The identified transmission line routes occur within the Nashville Basin Section of the Interior Low Plateau Physiographic Province (Fenneman, 1938). Botanically, the project occurs in the Nashville Basin Section of the Western Mesophytic Forest Region (Braun, 1950). Native forest communities of the Western Mesophytic Region contain a mixture of tree species in the canopy, including a relatively large number of oak and hickory species. In the Nashville Basin, forests on knobs and low hills are characterized by white and red oaks, tulip tree, sugar maple, sweetgum, black cherry, and hackberry. Forests on lower rocky hills and flat areas are characterized by various oaks and hickories, hackberry, winged elm, honeylocust, and redbud. Red cedar is a significant member of most forests in the Nashville Basin and occasionally occurs in nearly pure stands.

The proposed Williamson County project area has a long agricultural history and, more recently, has experienced a rapid increase in population. The population increase is reflected in the increase in urban development, including TDOT's proposed extension of the Mack Hatcher Parkway, the proliferation of residential, commercial, and industrial development, and the nearby recreational developments.

The project lands can be characterized as having three vegetation types: early successional vegetation; bottomland and riparian forests; and mixed deciduous-cedar forests.

Early successional vegetation includes lands maintained in agriculture or associated with residential or commercial development. The vegetation on these lands has been heavily modified by prior land management activities, to the extent that little native vegetation remains. Representative species in these areas include bidens, goldenrod, ironweed, ragweed, sericea lespedeza, Johnson grass, sunflowers, and various asters. Early successional vegetation is predominant on at least 90 percent of all the routes evaluated.

Bottomland and riparian forests typically contain a canopy and subcanopy of native species such as hackberry, sycamore, red maple, white oak, box elder, and ironwood. Giant cane and Chinese privet often characterize the shrub layer of these areas, and vines such as greenbrier and muscadine are also present. Dominant herbaceous groundcover species include knotweed and Nepal grass.

Mixed deciduous-cedar forests contain a mixture of sugar maple, black cherry, tulip tree, and various oak and hickory species in association with eastern red cedar. Along the proposed routes evaluated for this review, these forests show signs of previous clearing and cattle access. These forests are often rocky, with areas of exposed limestone rock scattered throughout the understory. However, cedar glades, areas of extremely shallow soils over exposed limestone bedrock, were not observed along the proposed project routes.

Each of the transmission line alternatives and route segments were surveyed for plant communities of conservation concern. Most of the project lands other than the river crossings are open habitats. The riparian woodlands along the river in the project area are generally more intact, but are very narrow and consist of only marginal strips of trees. They

are not considered of high quality in terms of their plant composition. No plant communities of conservation concern were encountered.

3.3.1.2. Invasive Plant Species

Over 90 percent of the lands along the surveyed routes associated with this project have been subjected to some level of disturbance from agricultural or residential development. As a result, several invasive plant species are present including common periwinkle, Johnson grass, lespedeza, Chinese privet, Nepal grass, Japanese honeysuckle, and multiflora rose.

3.3.1.3. Terrestrial Animals

Terrestrial wildlife species found in the project area are generally common and have widespread distributions. No uncommon wildlife communities were observed within the project area during field investigations. Many habitats that occur along the proposed transmission line routes have been previously disturbed and provide limited wildlife habitat, particularly areas that have been impacted by agricultural activities and development. A few woodland habitats exist primarily in areas near stream and river crossings. Wildlife in the project area includes species commonly found in early successional habitats, riparian forests, and mixed deciduous-cedar habitats.

Common amphibians and reptiles found in early successional habitats include American toad, upland chorus frog, and black racer. Birds found in this habitat type include eastern meadowlark, common yellowthroat, field sparrow, and eastern bluebird. Resident mammals include striped skunk, woodchuck, eastern cottontail rabbit, and coyote.

Riparian forests can provide breeding habitats for toads, frogs, and salamanders and a variety of other animal life such as turtles, snakes, and mammals often occur in this habitat type. Amphibians and reptiles found in riparian forests include bullfrog, southern two-lined salamander, common snapping turtle, spring peeper, and northern water snake. Birds that nest here include wood duck, belted kingfisher, Carolina wren, and eastern phoebe. Mammals found here include muskrat, mink, beaver, and raccoon.

Amphibians and reptiles found in mixed deciduous-cedar habitats include Fowler's toad, eastern box turtle, and gray rat snake. Birds commonly found in this type of habitat include red-eyed vireo, downy woodpecker, northern cardinal, and Carolina chickadee. Mammals common to the area include eastern gray squirrel, southern flying squirrel, eastern chipmunk, and white-tailed deer.

Migratory birds that occur in the vicinity likely include herons, hawks, warblers, tanagers, sparrows, and blackbirds. No uncommon assemblages of migratory birds were observed or are expected to occur within the proposed project area.

Invasive terrestrial animals that were observed or are expected to occur in the project vicinity include European starling, house sparrow, and rock dove. None of these species were observed or are expected to occur in unusually high numbers within the project area. Invasive bird species were observed primarily in urban habitats.

3.3.2. Threatened and Endangered Terrestrial Species

3.3.2.1. Plants

The TVA Natural Heritage database indicated that one federally listed and four Tennessee state-listed plant species have been reported from within 5 miles of the proposed transmission line routes (Table 3-1). Further review of the TVA Natural Heritage database revealed that two additional federally and state-listed plant species have been reported from outside of this review radius within Williamson County, Tennessee (Table 3-1). Suitable habitats for the federally listed plant species are discussed below.

Table 3-1. Federally and State-Listed Plant Species Reported From Within 5 Miles of the Proposed Transmission Line Routes and Additional Federally and State-Listed Plant Species Reported From Outside of This Review Radius Within Williamson County, Tennessee

Common name	Scientific name	Federal status	State status
Butternut	<i>Juglans cinerea</i>		THR
Duck river bladderpod	<i>Lesquerella densipila</i>		THR
Eggert's sunflower	<i>Helianthus eggertii</i>	THR	THR
Perideridia*	<i>Perideridia americana</i>		END
Prairie clover*	<i>Dalea foliosa</i>	END	END
Price's potato-bean	<i>Apios priceana</i>	THR	END
Sandwort (water stitchwort)	<i>Arenaria fontinalis</i>		THR

Status abbreviations: END = endangered; THR = threatened

* This species does not have a unique common name; the name listed is regularly applied to more than one member of this genus.

Eggert's sunflower occurs in a variety of habitats ranging from rocky, open, oak-hickory woodlands to barrens and roadsides.

Prairie clover is typically restricted to wet calcareous barrens, moist prairies, or cedar glades. Within the Tennessee River Valley, this species is usually found near a stream or area where seepage from limestone provides seasonal moisture.

Price's potato-bean occurs in open, rocky, wooded slopes and floodplain edges. Sites are usually under mixed hardwoods or in associated clearings where ravine slopes meet alluvial systems.

The species listed in Table 3-1 formed the basis for field surveys conducted during August and September 2001, May 2003, and May 2004. No occurrences of these or other rare plant species were observed on or immediately adjacent to any of the proposed transmission line routes or substations during these surveys.

3.3.2.2. Terrestrial Animals

Field investigations were conducted to determine the potential occurrence of protected terrestrial animals and their habitats in the vicinity of the project area. The TVA Natural Heritage database indicated that no federally listed terrestrial animals have been reported from Williamson County, Tennessee. Sharp-shinned hawks (*Accipiter striatus*) and

cerulean warblers (*Dendroica cerulea*), both listed as in need of management in Tennessee, have been reported from the vicinity.

Sharp-shinned hawks nest in both coniferous and pine-oak woodlands. Mixed deciduous forest and edge habitats within the project area provide suitable habitat for this species.

Cerulean warblers nest in large tracts of mature, moist, deciduous forests. These areas are often on hilly, steep slopes and are characterized by a sparse understory. Due to the absence of large tracts of mature forests and because forest habitats in the project area are highly fragmented, cerulean warblers are not expected to occur there.

Southeastern shrews (*Sorex longirostris*), listed as in need of management in Tennessee, may find suitable habitat in moist woodlands along the Harpeth and West Harpeth Rivers. Southeastern shrews prefer moist woodlands with decaying logs or leaf litter, but are also found in more open habitats near water resources.

No other federally or state-listed species or their habitats are expected to occur within the proposed project area.

3.3.2.3. Aquatic Animals

The TVA Natural Heritage database indicated that the tan riffleshell (*Epioblasma florentina walkeri*), a mussel federally listed as endangered and four fish species considered in need of management by the Tennessee Wildlife Resources Agency (TWRA)—redband darter (*Etheostoma luteovinctum*), Tippecanoe darter (*Etheostoma tippecanoe*), smallscale darter (*Etheostoma microlepidum*), and slenderhead darter (*Percina phoxocephala*)—have been reported from the Harpeth River system in Williamson and Cheatham Counties, Tennessee. One additional federally listed species, Nashville crayfish (*Orconectes shoupi*), is reported from Williamson County, but is known only from the Mill Creek system. The one record from the South Harpeth River is considered a “bait bucket” introduction that failed to establish a viable population (United States Fish and Wildlife Service, 1988).

The tan riffleshell and redband darter have not been recently collected from the Harpeth River and are assumed to be extirpated from this portion of their range. The remaining three fish species are all known from relatively recent records in the vicinity of and downstream of the project area and may occur in the project area. The Harpeth River system has been impacted by extensive urbanization, streambed destabilization, and pollution from industry and farming. Mussel species present in this portion of the river are common, tolerant species (Ahlstedt, 2002). No other listed aquatic species are known from the Harpeth River watershed in the vicinity of this proposed transmission line.

3.3.3. Wetlands

Field surveys to determine the presence of wetlands in or adjacent to the Main Corridor Alternative and Alternative Route Segments A, B, and C were conducted during July and August of 2001. Field surveys were conducted on Alternative Route Segment D during May 2003. Field surveys were conducted during May 2004 for both the North Mack Hatcher and South Mack Hatcher Alternatives. No areas meeting established parameters for jurisdictional or nonjurisdictional for wetlands (Environmental Laboratory, 1987; Cowardin, et al., 1979) were identified.

3.3.4. Aquatic Ecology

Streams in the Nashville Basin are characterized by low to moderate gradient and are virtually paved in some areas with expanses of limestone bedrock interspersed with rock rubble riffle areas, silty basins, and some sand and gravel reaches. The limestones freely leach nutrients; consequently, waters are very productive, and algae and rooted vegetation are abundant in streams. Some of these streams sustain tremendous densities of fishes (Etnier and Starnes, 1993). Land use in the vicinity of the proposed right-of-way routes is primarily agricultural and residential.

The proposed transmission line routes would potentially cross Spencer Creek, Harpeth River, and the West Harpeth River, all within the Harpeth River watershed, which drains into the Cumberland River. Both the Harpeth and West Harpeth Rivers are on Tennessee Department of Environment and Conservation's (TDEC) 303(d) list of water-quality-limited streams (see Section 3.3.9 Surface Water).

Etnier and Starnes (1993) identified 62 fish species from the Harpeth River system (Appendix VIII). One additional invasive species (common carp) was seen by TVA biologists during site visits. Sampling conducted by TWRA in 1997 collected 27 fish species at two sites in the Harpeth River. Sampling locations were the Franklin Parks and Recreation Area at river mile 85.0 and Lampkin Bridge Road at river mile 102.3 (TWRA, 1998). TWRA sampled other sites in the lower Harpeth, but information from these two sites is probably more representative of the fish community in the vicinity of the proposed right-of-way. TWRA again sampled the Harpeth River in 1999, but the upper two sites were inaccessible because of low water conditions. At the sites that could be sampled, sport fish catch rates were again low, but those collected appeared robust and healthy (TWRA, 2000). TWRA sampling in September 2001 collected 61 fish species at five Harpeth River sites; two of the sites were below Franklin, one at Franklin City Park, and two were above Franklin (TWRA, 2002). Although not all species known from the Harpeth River drainage would be expected to be present at all sites on the river, most species could be expected to inhabit areas of suitable habitat in the streams within the proposed transmission line right-of-way.

The Nashville District of the USACE collected benthic samples during monitoring from 1997-2000 at two sites (mile 1.0 and mile 16.5). The sampling location at mile 1.0 is not comparable to physical conditions near the proposed right-of-way because of impoundment by Cheatham Reservoir. The site at mile 16.5, although far downstream from the proposed right-of-way, is characterized by wadeable, flowing water conditions. The benthic community at mile 16.5 was indicative of "good" water quality conditions in 1997 and 2000 samples and "very good" conditions in 1998 and 2002. Biological samples were not taken from this location in 1999 and 2001. The diverse benthic assemblage has included high numbers of individuals and many species that are sensitive to less desirable environmental conditions (Pennington and Associates, 1997-2001 and 2003). In 1992, the USACE identified a benthic community at river mile 85 near Franklin, characterized by common occurrence of sensitive taxa and "moderate" levels of species diversity and abundance. Results from two sampling locations downstream of Franklin indicated that recovery from nutrient enrichment was evident in benthic communities below the Franklin site (USACE, unpublished data).

In August 2000, the USEPA sampled benthic macroinvertebrates at three locations on the Harpeth River. These sites were located (1) above Franklin wastewater treatment facility, (2) approximately 300 feet downstream of the facility, and (3) approximately 1500 feet

downstream of the facility. The benthic assemblage at all three sampling locations rated only “slightly impaired” compared to expected conditions in an urban stream of that area. This was based on taxa diversity, taxa abundance, and the presence of Ephemeroptera (mayflies), Plecoptera (stoneflies) and Trichoptera (caddisflies), which are species generally considered to be pollution sensitive (USEPA, 2002).

The Main Corridor Alternative would originate at the Aspen Grove Substation, continue west crossing first Spencer Creek, followed by an intermittent stream, three crossings of the Harpeth River, a wet weather conveyance, a perennial stream, four crossings of the West Harpeth River, a wet weather conveyance, and finally crossing the West Harpeth River again before terminating at MTEM’s Bingham Substation site. This route would also closely follow two reaches of the West Harpeth River.

Alternative Route Segment A would follow the Main Corridor Alternative route until just west of U.S. Highway 431 where it would turn south. It would lie to the east and south of the Harpeth River Baugh Bend reach passing very close to the river, then turn to the west on the north side of Del Rio Pike before rejoining the Main Corridor Alternative route. Alternative Route Segment A would cross one wet weather conveyance and an unnamed, intermittent tributary and eliminate two of the Main Corridor Alternative crossings of the Harpeth River in Baugh Bend.

Alternative Route Segment B would follow the Main Corridor Alternative, but instead of turning south after the third crossing of the Harpeth River, would continue west before rejoining the Main Corridor Alternative route immediately east of the West Harpeth River.

From the point where Alternative Route Segment C would originate from the Main Corridor Alternative, it would cross a perennial stream, three intermittent streams, and a wet weather conveyance before rejoining the Main Corridor Alternative route. Alternative Route Segment C would eliminate four West Harpeth River crossings, but would parallel the West Harpeth River necessitating the clearing of more riparian woodlands.

Alternative Route Segment D would follow the Main Corridor Alternative until just east of U.S. Highway 431, where it would angle northwest. It would cross the Harpeth River on either side of Baugh Bend and then proceed in a westerly direction crossing an unnamed perennial stream and Del Rio Pike before terminating at a proposed West Franklin area substation site (Figure 1-3). This route and substation alternative would eliminate the five West Harpeth River crossings identified for the routes to the Bingham Substation site.

The North Mack Hatcher Alternative would follow the Main Corridor Alternative until immediately west of the second Harpeth River crossing at Baugh Bend. At this point, the route would angle northwest, crossing an unnamed perennial stream before following the same route west as Alternative Route Segment D. This alternative, however, would turn south after crossing Del Rio Pike and cross another small perennial stream before crossing State Highway 96 and entering MTEM’s planned Westhaven Substation site located west of Franklin in the Westhaven Subdivision area (Figure 1-3).

The South Mack Hatcher Alternative would follow the Main Corridor Alternative until a short distance west of the second Harpeth River crossing at Baugh Bend. This alternative would then turn south, cross an intermittent stream, and cross Del Rio Pike before turning west and crossing a small perennial stream. After a short distance, the route would turn south, sharing the North Mack Hatcher Alternative route into the Westhaven Substation site. Both

the North and South Mack Hatcher Alternatives would avoid the five West Harpeth River crossings identified for the transmission line routes to the Bingham Substation site.

3.3.5. Managed Areas

The TVA Natural Heritage database indicated that the proposed transmission line route segments would not be located within or immediately adjacent to any Managed Areas or Ecologically Significant Sites. All of the route alternatives would cross the Harpeth River one to three times. Portions of the Harpeth River downstream of the project area are designated as a Class II (Pastoral) or Class III (Partially Developed) State Scenic River segments. Legislation originally included the entire Harpeth River, but an amendment in 1972 removed the segment in Williamson County from designation. The State Scenic Rivers Program is administered by the TDEC, Division of Natural Heritage. Although the Harpeth River Watershed Association is actively working to acquire designation for additional parts of the river, TDEC currently does not have any plans to include the Williamson County reach near the proposed transmission line crossings.

Two Managed Areas and/or Ecologically Significant Sites are located within 3 miles of the proposed transmission line. Spencer Creek Seep Protection Planning Site is located 1.4 miles north of the alternative route segments. This site consists of 10 acres on a small, wooded hill alongside Hillsboro Road in Williamson County. The area provides habitat for a population of sandwort (*Arenaria fontinalis*), a state-listed threatened plant species. This species is usually found in seeps or limestone creek beds. This population seems to be supported by a low wet spot, which may be the result of a small quarrying effort. Protection Planning Sites are compiled by the Tennessee Protection Planning Committee, a cooperative effort of Federal, state, and private land managers and individuals knowledgeable about the biota of the state.

The Natchez Trace Parkway is located 1.5 miles northwest of the Bingham Substation site, 4.3 miles northwest of the West Franklin area substation site, and 4.6 miles northwest of the Westhaven Substation site. This National Park features a two-lane highway that follows a historic route from Nashville, Tennessee, to Natchez, Mississippi. The parklands preserve important examples of natural and cultural heritage. The National Park Service strives to provide quality recreational and educational experiences for visitors through various outdoor activities and interpretive programs organized along the parkway.

3.3.6. Recreation

From an area just west of the existing Aspen Grove Substation to the western terminus of the existing Mack Hatcher Parkway, numerous existing recreation facilities occur along the north side of Mack Hatcher Parkway. These facilities include Legends Golf Club, The Fairways Golf Course, formal recreation facilities affiliated with Battle Ground Academy, and tennis, soccer, picnicking, walking, and other facilities associated with Judge Fulton Green Park and Recreation Complex. There is an existing transmission line along the north side of Mack Hatcher Parkway and just south of each of these facilities. West of the existing Mack Hatcher Parkway, there are no developed public recreation facilities along the proposed alternatives, Main Corridor, North Mack Hatcher, South Mack Hatcher or Alternative Route Segments A, B, C, and D. Information provided by Williamson County Parks and Recreation indicated there are no plans for development of public recreation facilities along the proposed transmission line corridors. Some informal recreation occurs in the project area, including a small amount of recreational boating, primarily with canoes, on

the Harpeth and West Harpeth Rivers. In addition, some low density, dispersed outdoor recreation such as hunting probably occurs in the project area.

3.3.7. Floodplains

The proposed transmission line rights-of-way for the Main Corridor and North and South Mack Hatcher Alternatives and for Alternative Route Segments A, B, C, and D would cross the identified floodplains of the Harpeth River, West Harpeth River, and Spencer Creek, along with other minor floodplain areas in Williamson County and Franklin, Tennessee. The alternative Bingham, Westhaven, and West Franklin area substation locations proposed by MTEMC would not be located within the 100-year floodplain. A portion of the existing Aspen Grove Substation (also owned by MTEMC) is located within the 100-year floodplain and floodway of Spencer Creek. The 100-year flood elevation at this location (Spencer Creek mile 1.75) would be 650.0 feet above mean sea level.

3.3.8. Groundwater

The project area is underlain by Ordovician aged aquifers in the Interior Low Plateaus Physiographic Province. These carbonate rocks, which are primarily limestone with some dolostone, are the principal aquifers in large areas of central Tennessee and are part of the Central Basin aquifer system. The Ordovician rocks are exposed in the central part of this area and lie beneath Silurian, Devonian, and younger rocks on the perimeter of the area. The carbonate rock aquifers consist of almost pure limestone and minor dolostone and are interlayered with confining units of shale and shaly limestone. The middle Ordovician, Stones River Group contains the most important carbonate-rock aquifers in the project area. The calcareous siltstones of the middle Ordovician Nashville Group yield small volumes of water, but these units are not considered principal aquifers. The lower Ordovician Knox Group is a major aquifer where dolostone contains fresh water. In a large area in central Tennessee, the upper parts of these aquifers contain fresh water and underlie a thin layer of Mississippian limestone and/or the Chattanooga Shale of Mississippian and Devonian age (Lloyd and Lyke, 1995).

Precipitation is the primary source of recharge in the Interior Low Plateaus Province. Most of the precipitation becomes overland runoff to streams, but some percolates downward through soil to the underlying bedrock. In the consolidated rocks, however, most of the water moves through and is discharged from secondary openings, such as joints, fractures, bedding planes, and solution openings. As a result, groundwater discharge from springs is common throughout the Interior Low Plateaus Province. The volume of solution openings in the Ordovician limestones is estimated to be less than 0.5 percent of the total rock volume (Lloyd and Lyke, 1995).

The yields of wells completed in the carbonate aquifers vary considerably throughout the area. This variability is caused primarily by large variations in hydraulic properties over short distances in the aquifers. The yields of wells completed in the carbonate rock aquifers commonly range from 5 to 20 gallons per minute and can exceed 300 gallons per minute. Spring discharge also is extremely variable and can vary greatly at a spring from season to season and from year to year. Most of the groundwater withdrawals from these aquifers are for public-supply, domestic and commercial, and agricultural uses. A small amount is withdrawn for industrial and mining uses (Lloyd and Lyke, 1995).

The quality of the water in the carbonate aquifers in the Ordovician rocks is considered hard and contains high concentrations of dissolved solids, chlorine, and iron. However, these

concentrations are equal to or less than USEPA's secondary maximum contaminant levels for drinking water. The quality of the water generally is adequate for domestic use, or it can be treated and made adequate for most uses. Contaminated and turbid waters are common problems for the users of water from the carbonate aquifers in Ordovician rocks. The thin soil and residuum and the presence of solution features such as sinkholes, swallow holes, and solution-enlarged fractures allow water from the land surface to recharge the aquifer directly and rapidly. Contaminated and sediment-laden waters can then spread through a system of interconnected solution openings that can eventually reach wells and springs (Lloyd and Lyke, 1995).

3.3.9. Surface Water

The proposed project drains to the Harpeth River and its tributaries, including the West Harpeth River and Spencer Creek, in the Cumberland River Basin. Precipitation in the area averages about 47 inches per year, with the wettest month in March at 4.8 inches and the driest month in October at 2.6 inches. Streamflow runoff varies with rainfall and averages 21 inches per year. The average annual streamflow runoff is about 1.5 cubic feet per second per square mile of drainage area. Mean annual air temperature is about 59 degrees Fahrenheit.

The Harpeth River in Davidson County (about 20 miles downstream of the project) is designated a State Scenic River because of its outstanding scenic and recreational value. It is threatened by development in Franklin and Bellevue. However, the segment of the river within Williamson County is not designated as a Scenic River. The Harpeth River from mile 68.3 to 79.0 (downstream of the project area) and the West Harpeth River are classified by the state (TDEC, 2002) for domestic and industrial water supply, fish and aquatic life, recreation, irrigation, and livestock watering and wildlife. The Harpeth River from mile 79.0 to 85.2 and Spencer Creek are classified for fish and aquatic life, recreation, irrigation, and livestock watering and wildlife. This section of the Harpeth River is also classified for industrial water supply.

Forty-six percent of the streams in the Harpeth River watershed fully support their designated uses. Twenty-one percent are partially supporting, and four percent are not supporting their uses due to severe pollution. Twenty-nine percent of the streams have not been assessed. Siltation and habitat alteration are the leading pollutants (TDEC, 2002). The West Harpeth River in the project vicinity is on the 2002 state 303(d) list as partially supporting designated uses due to low dissolved oxygen from pasture grazing. The Harpeth River in the project vicinity is listed as partially supporting designated uses due to organic enrichment/low dissolved oxygen from urban runoff/storm sewers and major municipal point sources (TDEC, 2004).

3.3.10. Visual

The physical, biological, and cultural features of an area combine to make the visual landscape character both identifiable and unique. Scenic integrity indicates the degree of unity or wholeness of the visual character. Scenic attractiveness is the evaluation of outstanding or unique natural features, scenic variety, seasonal change, and strategic location. Where and how the landscape is viewed would affect the more subjective perceptions of its aesthetic quality and sense of place. Views of a landscape are described in terms of what is seen in foreground, middleground, and background distances. In the foreground, an area within 0.5 mile of the observer, details of objects are easily distinguished in the landscape. In the middleground, normally between 1-4 miles from the

observer, objects may be distinguishable, but their details are weak and they tend to merge into larger patterns. Details and colors of objects in the background, the distant part of the landscape, are not normally discernible unless they are especially large and standing alone. The impressions of an area's visual character can have a significant influence on how it is appreciated, protected, and used. The general landscape character of the study area is described in this section with additional details in Section 4.3.10.

The proposed transmission line route segments would pass through a variety of central Tennessee countryside. The existing landscape character ranges from urban development, closest to the Aspen Grove Substation, to rolling pastoral. Scenic attractiveness and scenic integrity are moderate.

The Main Corridor Alternative would begin at the existing Aspen Grove Substation and follow west along the north side of the existing Mack Hatcher Parkway, a heavily traveled thoroughfare. Steel and wooden utility poles occupy the northern portion of the right-of-way near the Aspen Grove Substation.

The Main Corridor Alternative would then continue west adjacent to TDOT's proposed Mack Hatcher Parkway extension and cross U.S. Highway 431 before twice crossing the Harpeth River at Baugh Bend. The transmission line would turn due south about 1000 feet across open pastureland before turning west again for about 6000 feet, turning north about 1000 feet, and then west again. To the west, the Main Corridor Alternative traverses low, flat-lying areas with extensive cultivated lands and open pastureland. Five minor crossings of the West Harpeth River would be required prior to reaching the Bingham Substation site near Leipers Fork. There are several existing laced steel transmission structures near these crossings. After the last West Harpeth River crossing, the Main Corridor Alternative would terminate at MTEMC's Bingham Substation site.

Alternative Route Segment A would turn south from the Main Corridor Alternative after crossing U.S. Highway 431 immediately north of the Rebel Meadows Subdivision. It would follow the east side of the Harpeth River approximately 0.5 mile before turning west, south of Baugh Bend and connecting to the Main Corridor Alternative route or the proposed Alternative Route Segment C further to the west.

Alternative Route Segment B would originate from the Main Corridor Alternative route west of Rebel Meadows Subdivision and north of Del Rio Pike. Approximately 1000 feet west of the second Harpeth River crossing at Baugh Bend, Alternative Route Segment B would begin, continuing west for about a mile before reconnecting to the Main Corridor Alternative route west of Del Rio Pike. This road is lightly traveled by automobile and has few homes near the proposed route. There are many wood and steel utility poles within the existing right-of-way in the area.

Alternative Route Segment C would deviate westward from the Main Corridor Alternative approximately 1.3 miles west of the West Harpeth River. Then, turning south and traveling for approximately 0.7 mile, this route would pass across open countryside over a variety of topographic changes ranging from relatively flat to mildly sloping. The route would turn west and parallel Boyd Mill Pike for 1.5 miles, terminating on the south bank of the West Harpeth River and connecting to the Main Corridor Alternative route. Barns, a few residences, White Cemetery, and a proposed Westhaven Subdivision and golf course are in this area.

Alternative Route Segment D would originate from the Main Corridor Alternative after crossing U.S. Highway 431 and would turn northwest approximately 0.28 mile, terminating to the southwest across Del Rio Pike approximately 0.5 mile at a West Franklin area substation site (Figure 1-3). There are few homes in the immediate area. Traffic is light along this section of Del Rio Pike.

The North Mack Hatcher Alternative would begin at the existing Aspen Grove Substation and initially follow the Main Corridor Alternative route. Beginning south of TDOT's proposed northern route for the Mack Hatcher Parkway extension and west of the Harpeth River, the route would continue northwest turning to the south across open pastureland west of Del Rio Pike. Terrain is flat to gently sloping, and there are few homes in the area. Open pasture views as seen along local roads range from 0.25-1.0 mile, depending upon viewer location. Traffic is moderate to light along Del Rio Pike. The transmission line route would connect to the proposed South Mack Hatcher Alternative approximately 0.5 mile west of Del Rio Pike and north of Old Charlotte Pike. Crossing State Highway 96, the transmission line would terminate at MTEM's planned Westhaven Substation site. Scenic attractiveness is common. Scenic integrity is low.

The South Mack Hatcher Alternative would begin at the existing Aspen Grove Substation and initially follow the Main Corridor Alternative route. Approximately 0.5 mile west of Del Rio Pike and north of Old Charlotte Pike, the transmission line would turn south toward State Highway 96 connecting with the North Mack Hatcher Alternative route into MTEM's planned Westhaven Substation site. Traffic along State Highway 96 is moderate to heavy. Scenic attractiveness and integrity is similar to the environment described under the North Mack Hatcher Alternative.

3.3.11. Cultural Resources

The Central Basin of Tennessee has been an area of human occupation for the last 12,000 years. In this area, prehistoric chronology is generally broken into five broad time periods: Paleo-Indian, Archaic, Gulf Formational, Woodland, and Mississippian (Walthall, 1980; McNutt and Weaver, 1985). Prehistoric land use and settlement patterns vary during each period, but short- and long-term habitation sites are generally located on floodplains and alluvial terraces along rivers and tributaries. Specialized campsites tend to be located on older alluvial terraces and in the uplands. In the seventeenth and eighteenth centuries, the Shawnee had settlements in the area, but they were repeatedly forced out by the Creeks and Cherokee, who claimed Middle Tennessee as hunting territory. The first permanent occupation of the area by Europeans, European Americans, and African Americans occurred in the eighteenth century. Williamson County was formally created in 1799. The county's economy relied upon the success of its agricultural industry that was built solidly upon the production of food crops such as grains and meat rather than the more lucrative cotton and tobacco. The economy remained largely agriculturally based through the 1960s when residential and commercial development associated with the growth of Nashville began moving into the area (Ezell, 2001).

Section 106 of the NHPA requires Federal agencies, including TVA to: (1) consider the effect of its actions on historic properties and (2) allow the Advisory Council on Historic Preservation an opportunity to comment on the action. Section 106 involves four steps: (1) initiate the process; (2) identify historic properties; (3) assess adverse effects; and (4) resolve adverse effects. This process is carried out in consultation with the State Historic

Preservation Officer (SHPO) of the state in which the undertaking occurs and with other consulting parties, including federally recognized Native American tribes.

Archaeological sites, historic sites, and historic structures are evaluated in terms of their ability to meet the Criteria for eligibility for the NRHP. Sites can be considered eligible for the NRHP if they meet at least one of the following criteria:

- *Criterion A (Event)* - Association with one or more events that have made a significant contribution to the broad patterns of national, state, or local history
- *Criterion B (Person)* - Association with the lives of persons significant in the past
- *Criterion C (Design/Construction)* - Embodiment of distinctive characteristics of a type, period, or method of construction; or representation of the work of a master; or possession of high artistic values; or representation of a significant and distinguishable entity whose components may lack individual distinction
- *Criterion D (Information Potential)* - Properties that yield (or are likely to yield) information important in prehistory or history

Currently, there are 130 properties listed in the NRHP in Williamson County. Ten of these properties are within the project's Area of Potential Effects (APE). TVA determined the APE for the project to be those lands upon which the new transmission line and infrastructure would be placed and those areas within 0.5 mile from which it would be visible.

3.3.11.1. Archaeological and Historic Sites

Archival research was conducted to identify all documented historic properties within the APE. Six previously recorded archaeological sites were identified: 40WM16, 40WM96, 40WM268, 40WM270, 40WM271, and 40WM294. All of these previously recorded sites were found with the exception of 40WM16. It was determined, in consultation with the Tennessee SHPO, that this site had been destroyed during the construction of Mack Hatcher Memorial Parkway and an adjacent sports complex. Three Phase I archaeological surveys were conducted for the proposed Main Corridor Alternative and alternative route segments to determine if the proposed project would potentially affect any identified or unidentified historic properties (Ezell, 2001; Barrett, 2003; TRC, 2004). Six newly recorded sites were identified within the APE from these surveys: 40WM298, 40WM299, 40WM300, 40WM301, 40WM302, and 40WM309. Appendix IX lists each property, its NRHP status, and potential effects from the project. In addition, geomorphologic testing was conducted by a geoarchaeologist to identify locations within the APE with the potential for deeply buried archaeological deposits. Several locations were identified that exhibited either high or very high potential for deeply buried deposits. These locations would be subject to further testing to identify archaeological deposits should pole or structure locations fall within those areas.

The following are the proposed alternative route segments considered under Action Alternative 2 - Construct Transmission Line. For the locations of these alternative routes, see Figures 1-2 and 1-3.

Main Corridor Alternative: Sites 40WM96, 40WM270, 40WM271, 40WM294, 40WM299, 40WM302, 40WM309 are all prehistoric sites located within the main corridor. Only one site, 40WM271 was determined eligible for listing in the NRHP in consultation with the

Tennessee SHPO (Ezell, 2001). Several areas within this route were identified as having a high to very high potential for buried archaeological deposits.

Alternative Route Segment A: No sites were identified within Alternative Route Segment A (Ezell, 2001). However, there were segments of this route identified as having a very high potential for buried archaeological deposits.

Alternative Route Segment B: Sites 40WM294, 40WM299, 40WM309 are all prehistoric sites located within Alternative Route Segment B. None of these archaeological sites were determined eligible for listing in the NRHP in consultation with the Tennessee SHPO (Ezell, 2001). In addition, this alternative also has segments identified as having a very high potential for buried archaeological deposits.

Alternative Route Segment C: Sites 40WM268, 40WM298, 40WM300, 40WM301 are located within Alternative Route Segment C. None of these archaeological sites were determined eligible for listing in the NRHP in consultation with the Tennessee SHPO (Ezell, 2001). This alternative also has segments identified as having a very high potential for buried archaeological deposits.

Alternative Route Segment D: No previously recorded archaeological sites are located within the APE of this segment (Barrett, 2003). No new sites were identified during the survey of this segment. No areas were identified that had a potential for buried archaeological deposits.

Proposed West Franklin Area Substation Sites Associated with Alternative Route Segment D: Preliminary investigation of the APE for the proposed substations associated with Alternative Route Segment D identified no archaeological resources. A Phase I survey would be conducted if this location were selected.

North Mack Hatcher Alternative: This alternative route segment is co-located with TDOT's proposed northern extension of the Mack Hatcher Parkway (State Route 397) (Thompson and Associates, 2004). One previously recorded site is located within the APE of this proposed segment: 40WM301. This site was determined not eligible for listing in the NRHP in consultation with the Tennessee SHPO (Ezell, 2001). No new sites were identified within the North Mack Hatcher Alternative (TRC, 2004).

South Mack Hatcher Alternative: This alternative route segment is co-located with the proposed southern extension of the Mack Hatcher Parkway (Thompson and Associates, 2004) and would be TVA's preferred route, along with the eastern portion of the main corridor, for the proposed transmission line. One previously recorded site is located within the APE of this proposed segment: 40WM294. This site was determined not eligible for listing in the NRHP in consultation with the Tennessee SHPO (Ezell, 2001). No new sites were identified within the South Mack Hatcher Alternative route segment (TRC, 2004).

3.3.11.2. Historic Structures

The project area is rich in historic architectural and agricultural resources. Surveys of the proposed right-of-way areas and visual APE identified 29 individual properties and 1 historic district that are located within the viewshed of the Main Corridor Alternative and the alternative route segments (Karpynec, 2003a; 2003b; TRC, 2004). Appendix IX lists each property, its NRHP status, and potential effects from the project.

Twelve properties are considered contributing resources to the Harpeth River Historic District (HRHD): WM-53, WM-54, WM-55, WM-56, WM-57, WM-59, WM-982, WM-992, WM-993, WM-994, WM-996, and WM-1150. The effects of each alternative are summarized in Table 3-2. This district encompasses approximately 2495 acres and was identified and evaluated under Section 106 by TDOT for the proposed extension of the Mack Hatcher Parkway. The Tennessee SHPO and TDOT determined in consultation that the HRHD is eligible for listing on the NRHP on January 8, 2003. The HRHD is recommended eligible under NRHP Criterion A for its agricultural significance to the region and Criterion C for the concentration of historic structures in the area. Characteristics of the district that qualify it for listing include:

- The historic prosperity of farming in the area is still represented in the 2000 acres of the district that remain in cultivation or woodlands
- The presence of numerous pre-1955 agricultural structures important to the area's agricultural heritage
- A collection of preserved historic structures including six dwellings that pre-date the Civil War

Table 3-2 Comparison of Alternative Route Segment Effects on Harpeth River Historic District and other Historic Structures

Alternative	Miles of TL through HRHD	No. of HRHD Structures Visually Affected	No. of HRHD Structures Adversely Affected	All Historic Structures Visually Affected	All Historic Structures Adversely Affected	Substation within HRHD	Co-location with SR 397
Main Corridor	3.2	5	1	11	1	No	No
Segment A	3.2	3	0	9	0	No	No
Segment B	2.8	5	1	11	1	No	No
Segment C	2.6	2	1	8	1	No	No
Segment D	1.2	3	0	8	0	Yes	No
N. Mack Hatcher	2.5	3	0	8	0	No	Yes
S. Mack Hatcher	2.5	3	0	8	0	No	Yes

HRHD = Harpeth River Historic District

N. = North

No. = Number

S. = South

TL = Transmission Line