TABLE 2-7 REPRESENTATIVE SUMMER BIRD SPECIES OCCURRING WITHIN THE STUDY AREA

COMMON NAME	SCIENTIFIC NAME
Painted bunting	*Passerina ciris*
Purple martin	*Progne subis*
Red-eyed vireo	*Vireo olivaceus*
Scissor-tailed flycatcher	*Tyrannus forficatus*
Scott's oriole	*Icterus parisorum*
Summer tanager	*Piranga rubra*
Vermilion flycatcher	*Pyrocephalus rubinus*
Western kingbird	*Tyrannus verticalis*
White-eyed vireo	*Vireo griseus*
Yellow-billed cuckoo	*Coccyzus americanus*
Yellow-breasted chat	*Icteria virens*
Yellow-crowned night-heron	*Nyctanassa violacea*
Yellow-throated vireo	*Vireo flavifrons*

Source: Lockwood and Freeman 2014.

Mammals that may typically occur in the study area are listed in Table 2-8 (Schmidly 2004). The occurrence of each species will be dependent on suitable habitat available with some species, such as bats, migrating through the study area.

TABLE 2-8 REPRESENTATIVE MAMMALIAN SPECIES OCCURRING WITHIN THE STUDY AREA

COMMON NAME	SCIENTIFIC NAME
American badger	*Taxidea taxus*
American beaver	*Castor canadensis*
American perimyotis	*Perimyotis subflavus*
Axis deer	*Cervus axis*
Big brown bat	*Eptesicus fuscus*
Big free-tailed bat	*Nyctinomops macrotis*
Blackbuck	*Antilope cervicapra*
Black-tailed jackrabbit	*Lepus californicus*
Bobcat	*Lynx rufus*
Brazilian free-tailed bat	*Tadarida brasiliensis*
Cave myotis	*Myotis velifer*
Common gray fox	*Urocyon cinereoargenteus*
Coyote	*Canis latrans*
Deer mouse	*Peromyscus maniculatus*
Eastern cottontail	*Sylvilagus floridanus*
Eastern fox squirrel	*Sciurus niger*
Eastern mole	*Scalopus aquaticus*
Eastern red bat	*Lasiurus borealis*
Eastern woodrat	*Neotoma floridana*
Evening bat	*Nycticeius humeralis*
Fallow deer	*Cervus dama*
Feral pig	*Sus scrofa*
Fulvous harvest mouse	*Reithrodontomys fulvescens*

TABLE 2-8 REPRESENTATIVE MAMMALIAN SPECIES OCCURRING WITHIN THE STUDY AREA

COMMON NAME	SCIENTIFIC NAME
Hispid cotton rat	*Sigmodon hispidus*
Hispid pocket mouse	*Chaetodipus hispidus*
Hoary bat	*Lasiurus cinereus*
Hog-nosed skunk	*Conepatus leuconotus*
House mouse	*Mus musculus*
Least shrew	*Cryptotis parva*
Llano pocket gopher	*Geomys texensis*
Merriam's pocket mouse	*Perognathus merriami*
Mexican ground squirrel	*Spermophilus mexicanus*
Nine-banded armadillo	*Dasypus novemcinctus*
North American porcupine	*Erethizon dorsatum*
Northern pygmy mouse	*Baiomys taylori*
Northern raccoon	*Procyon lotor*
Norway rat	*Rattus norvegicus*
Nutria	*Myocastor coypus*
Plains harvest mouse	*Reithrodontomys montanus*
Red fox	*Vulpes vulpes*
Ringtail	*Bassariscus astutus*
Rock squirrel	*Spermophilus variegatus*
Roof rat	*Rattus rattus*
Southern plains woodrat	*Neotoma micropus*
Striped skunk	*Mephitis mephitis*
Texas mouse	*Peromyscus attwateri*
Virginia opossum	*Didelphis virginiana*
Western spotted skunk	*Spilogale gracilis*
White-ankled mouse	*Peromyscus pectoralis*
White-footed mouse	*Peromyscus leucopus*
White-tailed deer	*Odocoileus virginianus*
White-throated woodrat	*Neotoma leucodon*
Woodland vole	*Microtus pinetorum*

Source: Schmidly 2004.

2.6.3 Aquatic Habitat

Mapped wetlands information was incorporated for the study area from the USFWS NWI database (USFWS 2013a). NWI maps are based on topography and interpretation of infrared satellite data and color aerial photographs and are classified under the Cowardin System (Cowardin et al. 1979). NWI wetlands types identified within the study area include freshwater palustrine emergent (PEM), forested/shrub (PFO), ponds (PUB), lacustrine, and riverine. PEM wetlands are primarily associated with depressional areas and along the margins of open water areas. PFO wetlands exist typically in bottomland riparian woodlands near creeks and rivers. Mapped PUB and lacustrine wetlands are typically associated with shallow freshwater stock

ponds and other small impoundments. Riverine areas are associated with the Pedernales River, Blanco River, and perennial creeks. Typically, fluctuations in water levels are experienced throughout the year because of high evaporation rates and rainfall events are required to fill the ponds completely.

Perennial and intermittent streams and creeks exist in the study area, and may be prone to flash flooding after heavy rain storms. Perennial aquatic environments may support species of smartweeds and docks (*Polygonaceae*), pennyworts (*Hydrocotyle* spp.), widgeon-grass (*Ruppia* spp.), pondweed (*Potamogetonacae*), and duckweeds (*Lemna* spp.). Emergent wetlands may be located along the edges of ponds and streams during wetter periods and may be comprised of such species as rushes (*Juncus* spp.), spikerushes (*Eleocharis* spp.), sedges (*Carex* spp.), and flatsedges (*Cyperus* spp.) (Chadde 2012a, 2012b). Typical woody plant species in these wetland or riparian areas include American elm (*Ulmus americana*), sycamore (*Platanus* spp.), pecan (*Carya illinoinensis*), eastern cottonwood (*Populus deltoides*), black willow (*Salix nigra*), and rattlebush (*Sesbania* spp). Bottomland/riparian areas were mapped by POWER personnel through aerial photography and topographic map interpretation.

The intermittent flowing streams support aquatic species primarily adapted to ephemeral pool habitats. Because they consist of small headwater drainages, persistent flow is unlikely to be sufficient to support any substantial lotic assemblage. Aquatic species in this habitat are typically adapted to rapid dispersal and completion of life cycles in pool habitats having fine-grained substrates. In streams dominated by scoured, sandy-clay bottoms, accumulations of woody debris or leaf pack provide the most important feeding and refuge areas for invertebrates and forage fish. The softer muddy bottoms generally harbor substantial populations of burrowing invertebrates (e.g., larval diptera and oligochaetes) which can be an important food source to higher trophic levels (Hubbs 1957).

The perennial streams and rivers offer relatively stable water levels and the constant pools and flow facilitate stable population growth. Species with flowing water or pooled area habitat requirements will use the rivers and perennial streams and those adapted for deeper waters will use the lake/pond environments. Most of the stream segments in the study area are too small or ephemeral to offer habitat to larger fish species. With distance downstream, especially in pooled areas, the fish community tends to be heavily dominated by widely distributed sunfish (*Lepomis* spp.) when sufficient water is present (Hubbs 1957). Several species of turtles, snakes and

amphibians are also dependent on perennial surface waters for their habitat requirements. Several of these species will infrequently use terrestrial habitats to migrate from between surface waters, but they primarily use impounded and perennial surface waters.

Ponds located in the study area exhibit variability in terms of their age, drainage, use by livestock, past fish stocking and fertilization history. These aquatic habitats are almost always exposed to full sunlight and do not typically experience the variations in flow as do streams and rivers after heavy rainfall events. Typically, fluctuations in water level are experienced during the summer months because of high evaporation rates and repeated heavy rainfall is required to fill the ponds completely. Periods of extended drought in the region may reduce these seasonal water level fluctuations or dry the pond completely. Bottom materials in these ponds are typically universally silt-sized particles, either naturally occurring or added as a liner to prevent leakage.

2.6.4 Threatened and Endangered Species

For this routing study, emphasis was placed on obtaining documented occurrences of special status species and/or their designated critical habitat within the study area. The documented occurrences of species of concern and/or other unique vegetative communities within the study area were also reviewed. Special status species include those listed by the USFWS as threatened, endangered, proposed or candidate; and those species listed by TPWD as threatened or endangered or rare. POWER requested a GIS data layer of historical known occurrences for listed species and/or sensitive vegetative communities from the Texas Natural Diversity Database (TXNDD 2013, 2014). For the purpose of this study, the TXNDD information is not used as a substitute for a presence/absence survey, but as an indication of previous occurrences within suitable habitat for the species. TXNDD (2013, 2014) data did not indicate any documented federal or state-listed species occurrences within the study area.

Under the Endangered Species Act (ESA), the USFWS maintains a listing of all threatened, endangered, proposed and candidate species for each county (USFWS 2013b). By definition, a threatened species is defined as likely to become endangered within the near foreseeable future throughout all or a significant portion of its range. An endangered species is in danger of extinction throughout all or a significant portion of its range. Candidate species are those that have sufficient information on their biological vulnerability and threat(s) to support listing as

threatened or endangered and are likely to be proposed for listing in the near foreseeable future.

The ESA also provides for the conservation of "designated critical habitat," which is defined as the areas of land, water, and air space that an endangered species needs for survival. These areas include sites with food and water, breeding areas, cover or shelter sites, and sufficient habitat to provide for normal population growth and behavior for the species. The primary threat to threatened/endangered species is the destruction or modification of critical habitat areas by uncontrolled land and/or water development. No USFWS designated critical habitat is mapped within the study area (USFWS 2013c).

Threatened and Endangered Plant Species

County listings for federal/state-listed species were obtained from the USFWS and TPWD (USFWS 2013b; TPWD 2013b). Review of these lists indicated there are no listed federal/state threatened and endangered plant species for Blanco, Gillespie, or Kendall counties. Therefore, none are expected to occur in the study area.

Threatened and Endangered Animal Species

The USFWS Southwest Region Ecological Services (USFWS 2013b) lists only three species (three birds) as federally threatened or endangered for Blanco, Gillespie, and Kendall counties. However, the TPWD's (2013b) Annotated County Lists of Rare Species identifies 22 federally and/or state-listed, threatened, endangered, candidate, and potentially extirpated species (Table 2-9). The TPWD county listing includes the same species that USFWS lists. Although only federally listed threatened or endangered species are protected under the ESA, state-listed species may receive protection under other Federal and/or State laws, such as the MBTA, Bald and Golden Eagle Protection Act (BGEPA), Chapters 67, 68, and 88 of the TPWD Code, and sections 65.171–65.184 and 69.01–69.14 of Title 31 of the Texas Administrative Code. A brief species description life history and habitat requirements are summarized below for each listed species.

TABLE 2-9 LISTED THREATENED AND ENDANGERED ANIMAL SPECIES

SPECIES		COUNTY LISTED			LEGAL STATUS	
Common Name	Scientific Name	Blanco	Gillespie	Kendall	USFWS	TPWD
Birds						
Black-capped vireo	*Vireo atricapilla*	X	X	X	E[1]	E[2]
Golden-cheeked warbler	*Setophaga chrysoparia*	X	X	X	E[1]	E[2]
Interior least tern	*Sternula antillarum athalassos*	-	-	X	E[2]	E[2]
Whooping crane	*Grus americana*	X	X		E[1]	E[2]
Bald eagle	*Haliaeetus leucocephalus*	X	X	X	DL[2]	T[2]
Peregrine falcon	*Falco ssp.*	X	X	X	DL[2]	T[2]
Zone-tailed hawk	*Buteo albonotatus*	X	X	X	-	T[2]
Sprague's pipit	*Anthus spragueii*	X	X	X	C[2]	-
Amphibians						
Cascade Caverns salamander	*Eurycea latitans complex*	-	-	X	-	T[2]
Comal blind salamander	*Eurycea tridentifera*	-	-	X	-	T[2]
Reptiles						
Cagle's map turtle	*Graptemys caglei*	-	-	X	-	T[2]
Texas horned lizard	*Phrynosoma cornutum*	X	X	X	-	T[2]
Mammals						
Gray wolf	*Canis lupus*	X	X	X	E/EXT[2]	E/EXT[2]
Red wolf	*Canis rufus*	X	X	X	E/EXT[2]	E/EXT[2]
American Black bear	*Ursus americanus*	X	X	X	T/SA[2]	T[2]
Mollusks						
False spike mussel	*Quincuncina mitchelli*	X	X	X	-	T[2]
Golden orb	*Quadrula aurea*	X	X	X	C[2]	T[2]
Smooth pimpleback	*Quadrula houstonensis*	X	-	-	C[2]	T[2]
Texas fatmucket	*Lampsilis bracteata*	X	X	X	C[2]	T[2]
Texas fawnsfoot	*Truncilla macrodon*	X	-	-	C[2]	T[2]
Texas pimpleback	*Quadrula petrina*	X	X	X	C[2]	T[2]

[1] USFWS (2013b)
[2] TPWD (2013b)
E - Federal and/or State Listed Endangered
T - Federal and/or State Listed Threatened
T/SA – Threatened by Similarity of Appearance (to another listed species)
DL - Federally Delisted
C - Federal Candidate for Listing
EXT – Extirpated

BIRDS

Black-capped Vireo

The black-capped vireo (*Vireo atricapilla*) nests from northern Tamaulipas through west and central Texas and isolated portions of Oklahoma. Populations have declined because of habitat loss/fragmentation from land conversion and brush clearing activities, over-browsing, fire suppression, and brown-headed cowbird nest parasitism (Graber 1961; Campbell 2003). Suitable nesting areas typically consists of a patchy network of dense low shrubland cover with

branches extending to the ground. Shrub sized broad-leaved vegetation will in general cover 30 to 60% or greater of the area and be approximately six feet tall or more (Campbell 2003). Habitat vegetation is typically within early succession stages or located on shallow, poor, or eroded soils which encourage the growth of patchy low shrublands (Graber 1961). The vireo nests from March to July with the young fledging in three to four weeks (Graber 1961; Campbell 2003). It is not uncommon for these vireos to have multiple nesting attempts within one breeding season, building a new nest with each nesting attempt (Graber 1961). Modeling potential black-capped vireo habitat is difficult and generally inaccurate because the land-use history, vegetation heights, and vegetation species composition cannot be accurately identified with aerial imagery or topographical imagery. Pedestrian field surveys may be needed to determine presence or absence of occupied black-capped vireo habitat. This species may occur within the study area as a breeding spring/summer resident, where suitable shrubland habitat is available (Lockwood 2008).

Golden-cheeked Warbler

The golden-cheeked warbler's (*Setophaga chrysoparia*) entire nesting range is confined to habitat in 33 counties located in central Texas, with nesting typically occurring from March - May (Campbell 2003). The warbler migrates to overwinter in southern Mexico and northern Central America. Populations have declined over the past century because of habitat loss and fragmentation from urban development, land conversion, and commercial harvest of mature juniper trees (Campbell 2003). Nest parasitism from brown-headed cowbirds may have also contributed to population declines in some areas (Pulich 1976). The species nests in mature juniper-oak woodland areas with a moderate to high density of mature Ashe juniper trees mixed with deciduous trees creating dense foliage in the upper canopy (Pulich 1976; Campbell 2003). These oak-juniper woodland types are typical in moist areas located along steep sided slopes, drainages and bottomlands, but this species will also occur in upland oak-juniper woodlands on flatter topography (Pulich 1976). For this project, potential golden-cheeked warbler breeding habitat was modeled using three published habitat models, the Loomis Partners (2008), Diamond (2007), and Mathewson et al. (2012). The models identified potential oak-juniper woodland habitats. Data retrieved from these habitat models were mapped using GIS and taken into consideration while developing potential route segments. The models' output varied in conservativeness and initial field reconnaissance observed that larger tracts and areas where at least two models overlap are more conducive to representing potential warbler nesting habitat. Pedestrian field surveys may be needed to determine presence or absence of golden-cheeked

warblers and verify modeled nesting habitat. This species may occur within the study area as a breeding spring/summer resident, where suitable oak-juniper woodland habitat is available (Lockwood 2008).

Interior Least Tern

The interior least tern (*Sterna antillarum athalassos*) is a subspecies of least tern that nests inland along sand and gravel bars within braided streams and rivers, including the Missouri, Mississippi, Colorado (TX), Arkansas, Rio Grande, and Red rivers. The species is migratory and winters along the Central American coast and northern coast of South America from Venezuela to Northeastern Brazil (TPWD 2014). It is also known to nest on man-made structures (inland beaches, wastewater treatment plants, gravel quarries, etc.). The bird preys on small fish and crustaceans, and forages within a few hundred feet of nesting colony. Breeding begins as early as April and is completed by late August (TPWD 2014). This species is not expected to occur within the study area, except as a rare transient, because of a lack of suitable habitat (Lockwood 2008).

Whooping Crane

The study area is located on the western edge of the primary central migratory corridor within Texas for the whooping crane (*Grus americana*). The primary migration path includes a 220-mile wide corridor that begins at their nesting site at Wood Buffalo National Park in Canada and continues south to their wintering grounds at the Aransas National Wildlife Refuge along the Texas coast. The migratory pathway contains 95% of all confirmed whooping crane stopover sightings, during migration, through spring 2007 (USFWS 2009). Whooping cranes overwinter in Texas from November through March. During migration, they typically fly at altitudes greater than 1,000 feet but will roost and feed in areas away from human disturbance during nightly stopovers. Stopover areas include large rivers, lakes and associated wetlands, playa lakes, pastureland, and cropland (USFWS 2009). This species may occur in the study area as a non-breeding rare migrant (Lockwood 2008).

Bald Eagle

The bald eagle (*Haliaeetus leucocephalus*) was delisted in 2007 by the USFWS, because the population has recovered beyond the ESA criteria for listing. The status of the bald eagle population is currently monitored by USFWS and the species is still protected under the MBTA and the BGEPA. Bald eagles may nest and/or winter in Texas. The bald eagle is found primarily

near rivers and large lakes and will build large nests in tree tops or on cliffs usually near large bodies of water (Campbell 2003). This species may occur within the study area as a winter or nesting summer resident, where suitable habitat exists (Lockwood and Freeman 2014). Some landowners mentioned observing bald eagles near Schumann Lake, including a nest site.

Peregrine Falcon

The peregrine falcon (*Falco peregrinus*) state listing includes two subspecies: American peregrine falcon (*F. p. anatum*) and arctic peregrine falcon (*F. p. tundrius*). Although only the American subspecies is listed as state threatened, both sub-species are listed together because of their similarity of appearance (TPWD 2013b). Both subspecies have been delisted from federal listings because of the recovery of population numbers. The American peregrine falcon inhabits nests in tall cliff eyries and occupies many kinds of habitats during migration, including urban. Stopover habitat during migration may include lake shores and coastlines and the falcon is also a resident breeder in west Texas (Alsop 2002; TPWD 2013b). This species is not anticipated to occur in the study area except as a rare migrant (Lockwood 2008).

Zone-tailed Hawk

The zone-tailed hawk (*Buteo albonotatus*) inhabits arid open country, including open deciduous or pine-oak woodland, mesa or mountain county, often near watercourses, and wooded canyons and tree-lined rivers along middle-slopes of desert mountains. This species nests in various habitats and sites, ranging from small trees in lower desert, giant cottonwoods in riparian areas, to mature conifers in high mountain regions (TPWD 2013b). This species is an uncommon summer resident from the Central Trans-Pecos to the southern Edwards Plateau (Lockwood and Freeman 2014). This species may occur within the study area as an uncommon summer resident or rare winter visitor (Lockwood 2008).

Sprague's Pipit

The Sprague's pipit (*Anthus spragueii)* is a small grassland bird that avoids edge habitats and is strongly associated with native prairies. Land conversion and overgrazing have led to declining populations. The Sprague's pipit overwinters in Texas from September to April. Preferred habitat includes open native upland prairie, well drained grasslands lacking woody cover, and coastal grasslands (Robbins and Dale 1999; TPWD 2013b). The study area lies on the northwestern edge of the pipit's coastal winter range in Texas (Lockwood and Freeman 2014).

This species may occur within the study area, within suitable grassland habitats, as an uncommon non-breeding winter migrant (Lockwood 2008).

AMPHIBIANS

Cascade Caverns Salamander

The Cascade Caverns salamander (*Eurycea latitans*) is a small, aquatic salamander that is pale brown in color, somewhat translucent, and measures over four inches in length. It has only been identified in cave streams/pool and springs in Kendall, Comal, Kerr and Hays counties (Tipton et al. 2012). This species may occur within springs and caves within the study area in Kendall county.

Comal Blind Salamander

The Comal blind salamander (*Eurycea tridentifera*) is another small aquatic salamander that is whitish and/or yellowish in color and it measures nearly three inches in length. This salamander has a relatively large head that extends to nearly one-third of its body length and has dark pink external gills. It has been identified in limestone caves and sinkholes in Comal and Bexar counties (Dixon 2013). This species is not anticipated to occur within the study area.

REPTILES

Cagle's Map Turtle

The Cagle's map turtle's *(Graptemys caglei)* range is limited to the Guadalupe and San Antonio river basins, inhabiting the Guadalupe, San Antonio and San Marcos rivers and affiliated tributaries. This turtle uses brush piles along river and stream banks to bask in the sun to help regulate body temperature. The females are larger than the males, averaging up to seven inches in diameter, while the males can grow up to five inches in diameter (Dixon 2013). This species may occur within the study area where suitable habitat exists (Dixon 2013).

Texas Horned Lizard

The Texas horned lizard (*Phrynosoma cornutum*) populations have decreased because of land use conversions, collection, habitat loss, and increased fire ant populations. The lizard inhabits open, arid to semiarid regions with sparse vegetation. During winter inactivity periods, this species may burrow 6 to 12 inches underground within brush/rock piles or abandoned animal burrows. The horned lizard forages primarily on the red harvester ant (*Pogonomyrmex*

barbatus), but also consumes grasshoppers, beetles, and grubs (Dixon 2013; Henke and Fair 1998). This species may occur within the study area where suitable habitat exists.

MAMMALS

Gray Wolf

The federally-listed endangered gray wolf (*Canis lupus*) was formerly known throughout the western two-thirds of the state inhabiting forests, brushlands, and grasslands (Schmidly 2004). However, the species is now considered extirpated from the state of Texas and occurrence of this species within the study area is not anticipated.

Red Wolf

The red wolf (*Canis rufus*) historically occurred throughout the eastern half of the state in forests, brushlands, and prairies (Schmidly 2004). Changes in land-use and over hybridization with the coyote (*Canis latrans*) are thought to have extirpated the red wolf from Texas (TPWD 2013b). This species is not anticipated to occur within the study area.

American Black Bear

The black bear (*Ursus americanus*) is listed because of similarities to the Louisiana black bear (*Ursus americanus luteolus*), a federally-listed threatened subspecies. The black bear is a stocky, large, omnivore with black to cinnamon brown fur (TPWD 2013b). Preferred habitat in Texas includes bottomland hardwoods and large tracts of inaccessible forested areas (TPWD 2013b). The American black bear historically inhabited large tracts of forest and woodland throughout Texas, and was once thought to be extirpated from the state. In recent years sightings have increased near the Chisos Mountains in west Texas and the Texas Panhandle from bears dispersing from Mexico and New Mexico (Schmidly 2004). This species is not anticipated to occur within the study area, because of a lack of suitable habitat.

MOLLUSKS

The false spike mussel (*Quadrula mitchelli*) inhabits surface waters in the Rio Grande, Guadalupe, Colorado and Brazos river systems, in substrates varying from mud through mixtures of sand, gravel and cobble (Howells et al. 1996). The golden orb (*Quadrula aurea*) is an orange colored freshwater mussel that inhabits lentic and lotic sandy, gravely, and muddy aquatic areas along the Guadalupe, San Antonio, Lower San Marcos, and Nueces river basins (TPWD 2013b). The smooth pimpleback (*Quadrula houstonensis*) occurs in the Colorado,

Brazos, and San Jacinto river basins and occupies mixed mud, sand, and fine gravel bottoms, within very slow to moderately flowing waters. The Texas fatmucket (*Lampsilis bracteata*) inhabits moderately flowing waters with sand, mud, gravel, or broken bedrock substrates within the Colorado and Guadalupe river basins. The Texas fatmucket is also intolerant of impoundments. The Texas fawnsfoot (*Truncilla macrodon*) occurs in the Colorado and Brazos river basins and resides in sand, gravel, or sandy-mud bottoms, in moderately flowing waters (Howells et al. 1996; TPWD 2013b). The Texas pimpleback (*Quadrula petrina*) is a freshwater mussel that inhabits slow muddy, gravelly and sandy areas within slow moving waters of the Colorado and Guadalupe river basins. All of these mollusk species may occur within Colorado and/or Guadalupe river basins, and may occur within the study area where suitable aquatic habitats exist.

Rare Species and Sensitive Vegetation Communities

While not regulated, TPWD (2013b) and TXNDD (2013, 2014) data also list rare species and sensitive vegetation communities. TPWD generally recommends consideration for these species and avoidance of the listed vegetation communities when routing linear utility corridors. However, these data do not preclude the potential for each species to exist within the study area. Only a species specific survey could delineate potential suitable habitat and determine the presence or absence of a special status species. For a discussion of TPWD listed rare species, please refer to the TPWD letter in Appendix A. Review of the TXNDD (2013, 2014) data list one sensitive vegetation community within the northern portion of the study area, the Rush-Sedge series. TXNDD (2013, 2014) report also indicated the occurrence of hill county wild mercury (*Argythamnia aphoroides*) and the Blanco River Springs salamander (*Eurycea pterophila*) within the southern portion of the study area. These species locations were mapped as routing constraints.

2.7 COMMUNITY VALUES

The term "community values" is included as a factor for the consideration of transmission line route certification under Section 37.056(c)(4)(A-D) of the Texas Utilities Code. The PUC-CCN application requires information concerning the following items which may reveal community values:

- Public meeting or public open house
- Approvals or permits required from other governmental agencies

- Brief description of the area traversed
- Habitable structures within 300 feet of the centerline of the proposed project
- FAA registered airports, private airstrips, and heliports located in the area
- Irrigated pasture or croplands utilizing center-pivot or other traveling irrigation systems

In addition, POWER also evaluated the proposed project for community values and resources that might not be specifically listed by the PUC, but that might be of importance to a particular community as a whole. The term "community values" is not formally defined in PUC rules. However, in several dockets the PUC and Staff have used the following as a working definition: the term "community values" is defined as *a shared appreciation of an area or other natural resource by a national, regional, or local community*. Examples of a community resource would be a park or recreational area, historical or archeological site, or a scenic vista (aesthetics). POWER and LCRA TSC mailed consultation letters to various local elected and appointed officials and hosted a public open house meeting to identify and collect information regarding community values and community resources.

2.8 HUMAN DEVELOPMENT

The study area is comprised of numerous political jurisdictions and land uses. Land use data was collected from a variety of federal, state, and local sources and was organized into the following categories:

- Existing Land Use (Urban/Developed and Agricultural)
- Existing Linear Facilities and Other Features
- Transportation Facilities
- Aviation Facilities
- Communication Towers
- Parks and Recreation Areas

2.8.1 Existing Land Use

Existing land uses were placed into the following categories: urban/developed, agriculture, industrial, and transportation features. The primary sources of land use information were obtained from interpretation of aerial photographs, USGS topographical maps, and reconnaissance surveys.

Habitable Structures - The PUC definition of a habitable structure was used for this routing study. The PUC's Substantive Rule 25.101(a)(3) defines a habitable structure as "structures normally inhabited by humans or intended to be inhabited by humans on a daily or regular basis. Habitable structures include, but are not limited to, single-family and multi-family dwellings and related structures, mobile homes, apartment buildings, commercial structures, industrial structures, business structures, churches, hospitals, nursing homes, and schools." Habitable structures were identified using aerial photograph interpretation and reconnaissance surveys from public points of view. Locations of the habitable structures are depicted on Figures 4-3 and 5-1, and the distances from each route centerline is presented in Table 5-6.

Urban/Developed – The urban/developed classification represents concentrations of surface disturbing land uses, which include habitable structures and other developed areas characterized with low, medium, and high intensities. The various levels of development include a mix of residential, commercial, and/or industrial land uses.

Developed Low, Medium, and High Intensity areas were identified using aerial photograph interpretation and reconnaissance surveys. These classifications are described below:

- **Developed Low Intensity** areas typically include rural settings with single-family housing units.
- **Developed Medium Intensity** areas typically include single-family housing units that are grouped in residential subdivisions and may include peripheral commercial structures.
- **Developed High Intensity** includes highly developed areas where people reside or work in high numbers. Examples include apartment complexes, row houses and commercial/industrial parks. Areas with the highest concentration of development are typically located within or near the towns and communities in the study area.

Schools – The study area is located within the following four school districts: Blanco Independent School District (ISD), Comfort ISD, Fredericksburg ISD, and Johnson City ISD. Only one school, Stonewall Elementary School in Stonewall, was identified within the study area. Stonewall Elementary School is within the Fredericksburg ISD (TEA 2013).

Conservation Easements - A conservation easement is a restriction property owners voluntarily place on specified uses of their property to protect natural, productive or cultural features. The

property owner retains legal title to the property and determines the types of uses to allow or restrict. The property can still be bought, sold, and inherited, but the conservation easement is tied to the land and binds all present and future owners to its terms and restrictions. Conservation easement language will vary as to the individual property owner's allowances for additional developments on the land. The land trusts facilitate the easement and ensure compliance with the specified terms and conditions.

A review of numerous non-governmental groups (e.g., the Nature Conservancy, Texas Land Conservancy) that are land trusts for conservation easements within the Central Texas Region indicated five conservation easements within the study area. Properties with conservation easements are shown on Figure 4-3.

The Blanco River Easement is owned by the Nature Conservancy and located in the southern portion of the study area, in the community of Lindendale on FM 1888 in Kendall County. This easement is one of two easements owned by the Nature Conservancy with the name of Blanco River Easement. The goal of the easement is to conserve the diversity of life in the Blanco River Valley, with particular concern for rare plants species, animal species, and aquatic resources (Nature Conservancy 2013). The easement covers approximately 665 acres and the existing LCRA TSC Kendall-Mountain Top 138-kV transmission line (T342) crosses the conservation easement land which is owned by Chris Hale.

The Bexar Land Trust, Inc. DBA Green Spaces Alliance of South Texas has an easement located on property owned by Bank of America, N.A. in the southern portion of the study area, east of FM 1376 in Kendall County. The easement covers approximately 454 acres and is also crossed by the existing LCRA TSC Kendall-Mountain Top 138-kV transmission line (T342).

The Hill Country Land Trust has three easements located in the northern and western portions of the study area, all within Gillespie County. The first easement is located on property owned by Kunz Farm and Ranch Limited Partnership on Barrett Road south of US Hwy 290 and covers approximately 133 acres. The second easement is located on property owned by Terese Hershey on the Hershey Ranch south of FM 1623 at Hershey Ranch Road and covers approximately 1,561 acres. The third easement is located on property owned by Ramona and Bruce Laboon southeast of Grapetown Road and covers approximately 357 acres (HCLT 2013).

Agriculture – Agriculture is a significant segment of the economy throughout Texas, and the study area counties have active agricultural sectors. According to the USDA National Agricultural Statistics Service's 2012 Census of Agriculture, the total market value for agricultural products sold for the three study area counties was $77,814,000, an increase of 43% over the 2007 market value. Livestock sales accounted for the majority of agricultural sales in all three study area counties. The number of farms in the study area counties increased from 3,905 in 2007 to 4,026 in 2012 (an increase of 3%). Detailed agricultural information for the study area counties is provided in Table 2-10.

TABLE 2-10 AGRICULTURE

COUNTY	TOTAL MARKET VALUE OF AGRICULTURAL PRODUCTS			DISTRIBUTION OF PRODUCTS (2012)		NUMBER OF FARMS		
	2007	2012	Change	Crop Sales	Livestock Sales	2007	2012	Change
Blanco County	$18,167,000	$19,144,000	5%	47%	53%	888	792	-11%
Gillespie County	$28,586,000	$46,140,000	61%	25%	75%	1,853	1,847	0%
Kendall County	$7,632,000	$12,530,000	64%	17%	83%	1,164	1,387	19%

Source: USDA 2012

2.8.2 Existing Linear Facilities and Other Features

Based on the Texas Utilities Code Section 37.056(c) and the PUC Substantive Rule 25.101(b)(3)(B)(i-iii), paralleling or utilizing existing compatible ROWs and other features are areas that should be considered as areas of opportunity when selecting route alternatives for new transmission lines. Existing compatible ROWs include electrical transmission lines, distribution lines, railroads, pipelines, and roadways. Other features include parcel lines or other natural or cultural features. An abandoned pipeline ROW, several roadways and parcel lines were considered as potential paralleling opportunities. Data sources used to identify existing electrical transmission lines include utility company and regional system maps, Ventyx data (2013), aerial imagery, USGS topographical maps, additional available planning documents, and field reconnaissance. Transmission lines identified include LCRA TSC's Kendall to Mountain Top 138-kV transmission line oriented in a northeast to southwest direction in the southern portion of the study area and serves as the end point for the project. Distribution lines are prevalent throughout the developed portions of the study area; however, these features were not mapped or inventoried. An abandoned pipeline was identified through the north central portion of the study area oriented in a northwest to southeast direction. Although this pipeline has been removed, a portion of the former pipeline ROW was considered to be a reasonable routing corridor. No active, operating oil or gas pipelines were identified within the study area.

2.8.3. Transportation Facilities

Federal, state, and local roadways were identified using TxDOT county transportation maps, Texas Natural Resource Information System (TNRIS) data, and field reconnaissance surveys. The roadway transportation system within the study area includes US Hwy 290, a major roadway. The roadway transportation within the study area also includes the following FM roads: FM 1376, FM 1623, and FM 1888. Numerous county and local roads (paved and unpaved) were also identified.

The TxDOT's "Project Tracker" which contains detailed information by county for every road/highway project which is or could be scheduled for construction was reviewed to identify any state roadway projects planned within the study area. The TxDOT Project Tracker indicates that there are two roadway projects in Gillespie County that are located within the study area. No other roadway projects were identified in the remaining two counties. The two projects in Gillespie County include construction of approximately three miles of center turning lanes on US Hwy 290 (TxDOT 2013).

No railroads were identified within the study area.

2.8.4 Aviation Facilities

Air facilities reviewed included public and private airports, airstrips, airfields, and heliports. A review of the San Antonio Sectional Aeronautical Chart (FAA 2013a) and review of the FAA database (FAA 2013b) were used to identify FAA registered facilities. No FAA registered public or military airports were identified within the study area. No FAA registered public or military airports were identified outside of but within 10,000 or 20,000 feet of the study area boundary.

Also, no FAA registered public heliports were identified within the study area or outside of but within 5,000 feet of the study area boundary (FAA 2013b).

In addition, review of USGS topographic maps, aerial photograph interpretation, and field reconnaissance surveys were used in an attempt to identify private airports and airstrips within or near the study area. Three private airports, BurgAERO, Headwaters, and Otte, were identified within the study area and three additional private airports, Kennedy Ranch, LBJ Ranch and Redstone Ranch, were identified outside of but within 10,000 feet of the study area

boundary. Also no private heliports were identified within the study area or outside of but within 5,000 feet of the study area boundary (FAA 2013b).

The Stonewall VHF Omnidirectional Range / Tactical Aid to Navigation (VORTAC) ground based air navigation aid was identified within the study area. This is a radio navigation system that broadcasts a navigational signal and transmits continuously in the VHF and UHF frequency range (FAA 1986) (see Table 2-11). Locations of these areas can be found on Figures 4-3 and 5-1, and distances from centerlines are presented in Table 5-6.

TABLE 2-11 AIRPORT AND AVIATION FACILITIES AND RUNWAY LENGTHS

AIRPORT/FACILTIES	USE	APPROXIMATE DISTANCE TO STUDY AREA (FEET)	ESTIMATED RUNWAY LENGTH (FEET)*
Within the Study Area			
Stonewall VORTAC	Public	Within	N/A
BurgAERO	Private	Within	2,260
Headwaters	Private	Within	4,400
Otte	Private	Within	1,730
Outside the Study Area			
Kennedy Ranch	Private	1,925	3,500
LBJ Ranch	Private	1,356	6,291
Redstone Ranch	Private	3,275	2,700

*Source: FAA 2013b; POWER Aerial Photo and USGS Interpretation.

2.8.5 Communication Towers

Review of the Federal Communication Commission (FCC) database (FCC 2012) indicated that no AM radio transmitters are located within the study area. There are also no AM radio transmitters located outside of but within 10,000 feet of the study area boundary (FCC 2012).

The FCC also indicated that there are 10 FM radio transmitters/microwave towers/other electronic installations located within the study area (FCC 2012). These towers are scattered throughout the study area. There are also three FM radio transmitters/microwave towers/other electronic installations located outside of but within 2,000 feet of the study area boundary (FCC 2012).

2.8.6 Parks and Recreation Areas

The PUC recognizes parks and recreational areas as those owned by a governmental body or an organized group, club, or church. Federal and state databases and county/local maps were

reviewed to identify any parks and/or recreational areas within the study area. Field reconnaissance surveys were also conducted to identify any additional park or recreational areas.

National/State/County/Local Parks - One national historical park was identified within the study area. The Lyndon B. Johnson – LBJ Ranch District is located north of US Hwy 290 and east of Stonewall, Texas. The park tells the story of our 36th President. The park also offers a tour of the Texas White House and ranch (NPS 2013a).

There is one state park identified within the study area. The Lyndon B. Johnson State Park and Historic Site is also located north of US Hwy 290 and east of Stonewall, Texas. The park offers a visitors center, nature trails, botanical exhibit, wildlife enclosures, picnicking, fishing, swimming and tours of the Sauer Beckmann Living History Farm (TPWD 2013c). Also adjacent to the state park is the Gillespie County Safety Rest Area which offers covered picnic tables and restroom facilities.

No local or county parks were identified within the study area. The community of Stonewall has one school recreational area located adjacent to Stonewall Elementary School. Additional recreational activities such as hunting and fishing might occur on private properties throughout the study area, but are not considered to be open to the general public.

Wildlife Viewing Trails - Review of the TPWD Great Texas Wildlife Trails Heart of Texas – West indicates that there are no driving loops and no wildlife viewing sites within the study area (TPWD 2013d).

Finally, hunting on private land also provides significant recreational opportunities within the study area. Private landowners often lease to the public for these activities through commercial and private hunting leases, while other are more informal (i.e., landowners and guests hunting on their own property). Game hunted within the study area counties includes white-tailed deer, turkey, quail, dove, feral hog, squirrel, raccoon, bobcat, coyote, fox, and several exotic game species.

Additional recreational activities such as hunting and fishing may occur on private properties throughout the study area, but are not considered to be open to the general public.

2.9 SOCIOECONOMICS

The study area covers approximately 146 square miles in Blanco, Gillespie, and Kendall counties. This section presents a summary of economic and demographic characteristics for these three counties and describes the socioeconomic environment of the study area. Literature sources reviewed include publications of the U.S. Bureau of the Census (USBOC) and the TWDB.

2.9.1 Population Trends

All three counties within the study area experienced a population increase between 2000 and 2010. Kendall County saw the greatest population increase of the study area counties at 41%, while Gillespie County experienced the smallest population increase at 19% between 2000 and 2010. By comparison, population at the state level increased by nearly 21% during the same decade (USBOC 2000 and 2010).

According to TWDB projections, all three of the study area counties are projected to experience population growth during the next 30 years. Blanco County's population is projected to increase by 12% and Gillespie County's population is projected to increase by 17% between 2010 and 2020. The largest population increases for the next three decades from 2010 to 2040 are projected to occur in Kendall County at 51%, 31%, and 20%, respectively. By comparison, the population of Texas is expected to experience population increases of 18%, 14%, and 12% over the next three decades, respectively (TWDB 2011b). Table 2-12 presents the past population trends and projections for Blanco, Gillespie, and Kendall counties and for the state of Texas. Other data sources, such as the Texas Office of State Demographics, show similar trends.

TABLE 2-12 POPULATION TRENDS

	PAST		PROJECTED		
STATE/COUNTY	2000	2010	2020	2030	2040
Texas	20,851,820	25,145,561	29,650,388	33,712,020	37,734,422
Blanco County	8,418	10,497	11,756	13,487	15,002
Gillespie County	20,814	24,837	29,117	30,861	30,861
Kendall County	23,743	33,410	50,283	65,752	78,690

Source: USBOC 2000 and 2010; TWDB 2011b.

2.9.2 Employment

The civilian labor force (CLF) in all three of the study area counties increased from 2000 to 2011 with the corresponding population growth. Kendall County's increase in CLF of 45% (5,051 people) was the largest of the study area counties, while Gillespie County saw the smallest increase in CLF at 27% (2,613 people) from 2000 to 2011. By comparison, the CLF at the state level grew by 22% (2,132,288 people) over the same time period (USBOC 2000 and 2011). Table 2-12 presents the CLF for the study area counties and the state of Texas for the years 2000 and 2011.

Between 2000 and 2011, all of the study area counties experienced an increase in their unemployment rates. Blanco County experienced the largest increase in the unemployment rate, from a low of 2.9% in 2000 to a high of 6.2% in 2011. Gillespie County experienced the smallest increase from 3.7% to 3.8% in the unemployment rate. By comparison, the state of Texas also experienced a small increase in the unemployment rate over the same time period. The state's unemployment rate increased from 6.1% in 2000 to 7.0% in 2011 (USBOC 2000 and 2011). Table 2-13 presents the employment and unemployment data for the study area counties and the state of Texas for the years 2000 and 2011.

TABLE 2-13 LABOR FORCE AND EMPLOYMENT

STATE/COUNTY	2000	2011
Texas		
Labor Force	9,830,559	11,962,847
Employment	9,234,372	11,125,616
Unemployment	596,187	837,231
Unemployment Rate	6.1%	7.0%
Blanco County		
Labor Force	4,058	5,317
Employment	3,941	4,989
Unemployment	117	328
Unemployment Rate	2.9%	6.2%
Gillespie County		
Labor Force	9,663	12,276
Employment	9,301	11,804
Unemployment	362	472
Unemployment Rate	3.7%	3.8%
Kendall County		
Labor Force	11,276	16,327
Employment	10,902	15,662

TABLE 2-13 LABOR FORCE AND EMPLOYMENT

STATE/COUNTY	2000	2011
Unemployment	374	665
Unemployment Rate	3.3%	4.1%

Source: USBOC 2000 and 2011.

2.9.3 Leading Economic Sectors

The major occupations in Blanco County in 2011 are listed under the category of management, business, science, and arts occupations, followed by the category of sales and office occupations. The major occupations in Gillespie County in 2011 are listed under the category of management, business, science, and arts occupations, followed by the category of sales and office occupations. The major occupations in Kendall County in 2011 are listed under the category of management, business, science, and arts occupations, followed by the category of sales and office occupations (USBOC 2011). Table 2-14 presents the number of persons employed in each occupation category during 2011 in the study area counties.

TABLE 2-14 OCCUPATIONS IN THE COUNTIES WITHIN THE STUDY AREA

OCCUPATION	BLANCO COUNTY	GILLESPIE COUNTY	KENDALL COUNTY
Management, business, science, and arts occupations	1,653	3,941	7,267
Service occupations	1,030	2,200	2,262
Sales and office occupations	1,164	2,837	3,467
Natural resources, construction, and maintenance occupations	851	1,622	1,606
Production, transportation, and material moving occupations	291	1,204	1,060

Source: USBOC 2011.

In 2000 and 2011, the industry group employing the most people in all three of the study area counties was educational services, and health care and social assistance. The industry group that experienced the most growth in Blanco County from 2000 to 2011 was professional, scientific and management, and administrative and waste management services, which experienced a 81% increase (240 people). The industry group that experienced the most growth in Gillespie County from 2000 to 2011 was information, which experienced a 95% increase (87 people). The industry group that experienced the most growth in Kendall County from 2000 to 2011 was professional, scientific and management, and administrative and waste management services, which experienced a 104% increase (966 people) (USBOC 2011). Table 2-15

presents the number of persons employed in each of the industries in the study area counties for the years 2000 and 2011.

TABLE 2-15 INDUSTRIES IN THE COUNTIES WITHIN THE STUDY AREA

INDUSTRY GROUP	BLANCO COUNTY		GILLESPIE COUNTY		KENDALL COUNTY	
	2000	2011	2000	2011	2000	2011
Agriculture, forestry, fishing and hunting, and mining	376	257	736	538	465	700
Construction	443	728	1,023	1,261	1,283	1,655
Manufacturing	287	157	590	832	659	1,134
Wholesale trade	144	85	236	313	342	183
Retail trade	449	508	1,372	1,549	1,175	1,446
Transportation and warehousing, and utilities	259	198	304	501	402	534
Information	64	60	92	179	273	252
Finance and insurance, and real estate and rental and leasing	221	303	418	738	1,331	1,771
Professional, scientific and management, and administrative and waste management services	297	537	607	889	929	1,895
Educational services, and health care and social assistance	602	921	2,039	2,547	2,176	3,310
Arts, entertainment, and recreation, and accommodation and food services	328	563	1,044	1,529	858	1,163
Other services, except public administration	242	358	522	683	542	895
Public administration	229	314	318	245	467	724

Source: USBOC 2000 and 2011.

2.10 AESTHETICS

Section 37.056(c)(4)(C) of the Texas Utilities Code incorporates aesthetics as a consideration when evaluating proposed electric transmission facilities. There are currently no formal guidelines provided for managing visual resources on private, state, or county owned lands. For the purposes of this study, the term aesthetics is defined by POWER to accommodate the subjective perception of natural beauty in a landscape and measure an area's scenic qualities. The visual analysis was conducted by describing the regional setting and determining a viewer's

sensitivity. Related literature, aerial photograph interpretation, and reconnaissance surveys were used to describe the regional setting and to determine the landscape character types for the area.

Consideration of the visual environment includes a determination of aesthetic values (where the major potential effect of a project on the resource is considered visual) and recreational values (where the location of a transmission line could potentially affect the scenic enjoyment of the area) that would help define a viewer's sensitivity. POWER considered the following aesthetic criteria that combine to give an area its aesthetic identity:

- Topographical variation (hills, valleys, etc.) POWER noted that there is greater topographical variation in the southern portion of the study area.
- Prominence of water in the landscape (rivers, lakes, etc.)
- Vegetation variety (woodland, meadows)
- Diversity of scenic elements
- Degree of human development or alteration
- Overall uniqueness of the scenic environment compared with the larger region

The study area is primarily rural with residential development concentrated in the communities of Blumenthal and Stonewall. The predominant land use within the study area is rangeland and cropland. There are also several local vineyards and orchards within the study area. The majority of the study area has been impacted by land improvements associated with agriculture, land contouring, residential/commercial structures, and roadways. Overall, the study area viewscape consists of open rangeland/pastureland with gently rolling hills associated with Pedernales and Blanco rivers along with several creeks.

No known high quality aesthetic resources, designated views, or designated national or state scenic roads or highways were identified within the study area. However, US Hwy 290 is listed as a scenic road on motorcycleroads.com and myscenicdrives.com. The study area is located within the 19-county Texas Hill Country Trail Region. The primary trail runs along US Hwy 290 within the study area, and sites of interest include LBJ State Park, Stonewall, Luckenbach, Wildseed Farms and two local vineyards (Becker and Grape Creek) (THC 2013a).

A review of the NPS website did not indicate any Wild and Scenic Rivers, National Monuments, National Historic Landmarks, National Trails, or National Battlefields within the study area (NWSRS 2013; NPS 2013b; NPS 2013c).

Based on these criteria, the study area exhibits a moderate to high degree of aesthetic quality for the region. The majority of the study area maintains the feel of a rural community. Although some portions of the study area might be visually appealing; overall, the aesthetic quality of the study area is not distinguishable from that of other adjacent areas within the region.

2.11 CULTURAL RESOURCES

Section 37.056(c)(4)(A-D) of the Texas Utilities Code incorporates historical and aesthetic values as a consideration when evaluating proposed electric transmission facilities. The PUC's Standard Application for a CCN further stipulates that known historical sites within 1,000 feet of an alternative route will be listed, mapped, and their distance from the centerline of the alternative route documented in the application filed for consideration. Archeological sites within 1,000 feet of a route will be listed and their distance from the centerline documented, but they need not be shown on maps for the protection of the site. Sources consulted to identify known sites (national, state, or local commission) shall also be listed.

The THC is the state agency responsible for preservation of the state's cultural resources. The THC, working in conjunction with the Texas Archeological Research Laboratory (TARL), maintains records of previously recorded cultural resources as well as records of previous field investigations. Information from the THC's restricted-access Texas Archeological Sites Atlas (TASA) and Texas Historical Sites Atlas (THSA) was acquired in addition to GIS shapefiles acquired from TARL to identify and map locations of previously recorded cultural (archeological and historical) resources within the study area. TxDOT's historic bridges database was also reviewed for bridges that are listed or determined eligible for listing on the NRHP. At the national level, National Park Service (NPS) websites and data centers were reviewed to identify locations and boundaries for nationally designated historic landmarks, trails and battlefield monuments.

Together, archeological and historical sites are often referred to as cultural resources. Under the NPS standardized definitions, cultural resources include districts, sites, buildings, structures, or objects important to a culture, subculture, or community for scientific, traditional, religious, or

other reasons. For this study, cultural resources have been divided into three major categories: archeological resources, historical resources, and cemeteries. These three categories correlate with the organization of cultural resource records maintained by the THC and TARL.

Archeological resources are sites where human activity has measurably altered the earth and left deposits of physical remains (e.g., burned rock middens, stone tools, petroglyphs, house foundations, trails, trash scatters). Most archeological sites in Texas are Native American (prehistoric), Euro/African American, or Hispanic in origin. Much of the study area has not been studied intensively for archeological resources. Therefore, high probability areas for prehistoric and historic archeological resources were determined based on proximity to perennial water sources, certain topographic features, and the presence of structures on historic maps in currently undeveloped areas.

Historical resources include standing buildings or structures (e.g., houses, barns and out buildings), and may also include dams, canals, bridges, transportation routes, silos, etc., and districts that are non-archeological in nature.

Cemeteries are locations of intentional human interment and may include large public burial grounds with multiple individuals, small family plots with only a few burials, or individual grave sites. In some instances, cemeteries may be designated as Historic Texas Cemeteries (HTCs) by the THC or recognized with an Official Texas Historical Marker (OTHM). Cemeteries may also be documented as part of the THC Record-Investigate-Protect (RIP) Program.

2.11.1 Previous Archeological Investigations

A review of the records from the THC (2013c) database indicates that the study area has not been subjected to comprehensive or systematic archeological survey. A majority of archeological sites previously recorded within the study area were located during the mid to late 1970s by avocational archeologists (e.g., members of the Hill Country Archeological Society) or during the University of Texas-San Antonio (UTSA) field schools of that period. Beginning in the late 1960s and continuing up to the present, NPS or TPWD archeological survey and site inventory assessments have been conducted specifically associated with the Lyndon B. Johnson National Historic Park. A small number of recent archeological surveys or assessments in the study area have focused on utility related upgrade projects.

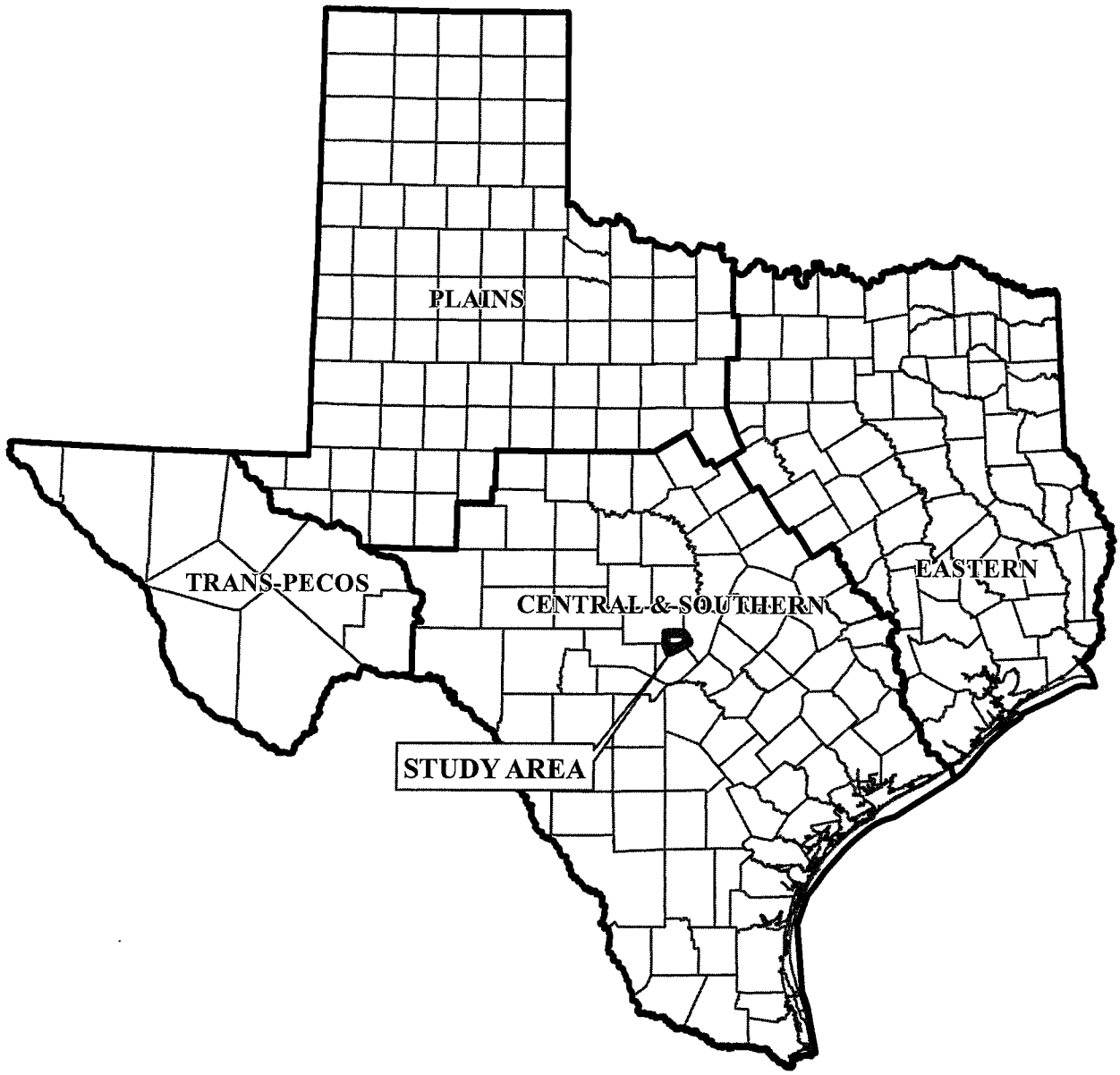
2.11.2 Cultural Background

Prehistory

The study area is situated near the eastern edge of the Edwards Plateau region between the Pedernales River that roughly parallels the northern study area boundary and the Blanco River headwaters region on the southern boundary. The study area is in the Central Texas archeological region, as mapped by Perttula (2004) and in the Central Planning Region as delineated by the THC (Mercado-Allinger et al. 1996) (Figure 2-5). The eastern edge of the Edwards Plateau region ranges in elevation between 800 to 2,250 feet above sea level.

The terrain is generally rolling, hilly to mountainous, and along some streambeds the landscape has a "stairstep" appearance due to limestone benches and steep slopes. The vegetation consists mainly of stands of live oak and juniper, with mesquite and grasses. The soils are generally shallow, calcareous, stony, clay loams with rock outcrops. The soils in the bottomlands along the Pedernales River and some major creeks are deeper and loamier. The deeper soils in the valleys and plains produce a true prairie of medium and tall grasses mixed with forbs and woody plants (Kohout 2013; Ogilvie and Leffler 2013; Smyrl 2013).

The following discussion focuses primarily on the cultural chronology of central Texas, as presented by Collins (2004). The prehistoric occupation of central Texas is most often divided into three broad archeological periods spanning at least the last 12,000 years, based primarily on perceived technological changes evident in the archeological record and often correlated with broad changes in the physical and cultural environment. These periods include the Paleoindian period, beginning around 11,500 years ago and lasting approximately 2,700 years. Following the Paleoindian period is the long-lasting Archaic period, which comprises almost two-thirds of the prehistoric occupation of central Texas from about 8,800 years ago until 1,250 years ago. The final period before Euroamerican contact is the Late Prehistoric period, which ended with the first Spanish expedition into the region in the mid-1500s. All dates pertaining to the prehistory of the study area are given as approximate years Before Present (B.P.).



N
W E
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0 30 60 120 180 240

Miles

Source: Mercado- Allinger et. al., 1996

Legend

Cultural Resource Planning Region Boundary

County Boundary

Figure 2-5

LOCATION OF THE STUDY AREA IN RELATION TO THE CULTURAL RESOURCE PLANNING REGIONS OF TEXAS

Blumenthal Substation and 138-kV Transmission Line Project

POWER ENGINEERS

LCRA

Paleoindian Period (12,000-8,800 B.P.)

The Paleoindian period in central Texas is divided into the early and late sub-periods. The early Paleoindian period, also called the Clovis cultural horizon, began about 12,000 years ago and is the earliest known cultural sequence in the region. Corresponding with the waning years of the Pleistocene era, the early period was characterized by a comparatively cooler, wetter environment. Despite the popular misconception that these early populations were primarily hunters, evidence from the Gault Site in central Texas suggests that their diet was more generalized (Collins 2002). Archeological evidence indicates that these early hunting and gathering populations subsisted on a well-diversified resource base that included not only the last of the mammoth, but also smaller animals, fish, and a variety of reptiles. Site types dating to this period are also varied and include kill, quarry/stone-working, cache, camp, ritual, and burial sites. Artifacts associated with early Paleoindian period sites include large, fluted Clovis spear points, bone and ivory points, and stone bolas. The hallmark Clovis spear points of the early Paleoindian period soon gave way to the shorter, fluted Folsom points and a greater variety of smaller dart points. Many of the artifacts were made from exotic stone suggesting a highly mobile, wide-ranging hunting and gathering subsistence strategy. When the Pleistocene era came to an end around 10,900 years ago and the mammoth populations had all but disappeared, prehistoric populations began to focus their hunting efforts on bison, one of the hallmarks of the transition for the early to the late Paleoindian period (Collins 2004).

The late Paleoindian period in central Texas extended from about 10,900 to 8,800 years ago. Although the subsistence base now emphasized large game over the more diversified resource base of the early period, small animals, fish, reptiles, and plants remained important food sources. Small groups continued to hunt, gather plants, and obtain raw material for stone tool manufacture over a broad territory. Earlier Clovis and Folsom projectile point types are eventually replaced by a variety of unfluted lanceolate types known as Angostura, Golondrina, and St. Mary's Hall, and early stemmed types such as Wilson or Berclair (Bousman et al. 2004). Ritualistic and intentional burial practices also continued from the early to the late period as evidenced by interments in Williamson and McLennan counties that contained both utilitarian and ornamental objects (Collins 2004).

Archaic Period (8,800-1,250 B.P.)

The Archaic period is subdivided into Early (ca. 8,800 to 6,000 years ago), Middle (ca. 6,000 to 4,000 years ago), and Late (4,000 to 1,250 years ago) sub-periods. The transition from the late

Paleoindian period to the Early Archaic is gradual, but has generally been characterized as a time when broad territorial hunting and gathering became more localized and the artifact assemblages began to show greater diversity than during the late Paleoindian period. Lanceolate points typical of the Paleoindian period are replaced by notched and stemmed points in the Early Archaic. Regionally distinctive projectile points develop after 5000 BP (Hester 1989). Other hallmarks of the Early Archaic include the greater use of groundstone tools and the widespread occurrence of heated-altered rocks, which may have functioned as hearths, ovens, or other features. Clear Fork and Guadalupe tools, possibly woodworking tools, and grooved and notched stones, possibly net sinkers, appear during the Early Archaic (Black and McGraw 1985; Collins 2004). Although there is a paucity of subsistence data for the Early Archaic in central Texas, there is some evidence that deer, various small animals, fish, and roasted plant bulbs were part of the diet. Hester (1989) suggests that Early Archaic inhabitants developed specialized adaptations to the hunting of white-tailed deer and gathering of acorns, in addition to other abundant regional resources. Bison is conspicuously absent from the archeological assemblages dating to this sub-period (Collins 2004).

During the early portion of the Middle Archaic, bison hunting is evident in the archeological record (Collins 2004). Earlier Middle Archaic projectile point styles, such as Bell, Andice, and Calf Creek are thin, triangular forms that represent a shift in lithic technology from the Early Archaic point types. These types could serve equally well as knives or the tips of lances, spears, or darts, and are viewed as part of an adaptation to a more mesic environment and the return of bison in the region (Black and McGraw 1985; Collins 2004).

By around 5,000 years ago, bison are once again absent from the archeological record in central Texas, concomitant with the onset of the driest conditions faced by humans in central Texas. Large burned rock features (hearths and rock ovens) of the early part of the Middle Archaic are replaced in the later Middle Archaic by smaller burned rock middens. Johnson and Goode (1994:26) suggest the middens represent increased reliance on xerophytes such as sotol. The spread of xerophytes during the Middle Archaic is consistent with Collins (1995) and Johnson (1995), both of whom see a period of drying at the end of the Middle Archaic. Thoms (2008, 2009) posited that a marked increase in the use of hot-rock ovens is an expected signature of land-use intensification, which would be expected during a prolonged nearly catastrophic drought such as seen in the later Middle Archaic (Collins 1995).

The onset of the Late Archaic occurred when central Texas was at its driest, around 4,000 years ago. Despite the continuation of Middle Archaic subsistence strategies, a proliferation of new projectile point types is characteristic of the beginning of the Late Archaic, including Bulverde and Pedernales points. Prewitt suggests the proliferation of point types is indicative of a return to small, dispersed, widely ranging bands similar to that of the Early Archaic. Johnson and Goode (1994) include the appearance of Bulverde dart points and later the Pedernales, Lange, Marshall, Montell and Castroville points in their Late Archaic I subperiod, which coincides the hotter, dryer climate. During the Late Archaic I subperiod, burned rock middens continued to be a common site type, even increasing in frequency in the eastern region of central Texas (Collins 2004).

As the desert plants were replaced by plants adapted to a moister climate around 3,500 to 2,500 years ago the number of burned rock middens in east-central Texas decreased but did not entirely disappear. Johnson and Goode's (1994) Late Archaic II subperiod coincides with this more mesic climate. West-central Texas remained dry and burned rock middens continued to be used to process the plant foods at the same intensity as during the Middle Archaic. Trade between central and coastal groups increased. The end of the Late Archaic period appears to be characterized by a broadening in the diet base, perhaps in response to climatic stressors or increasing population density. Projectile points diagnostic of the latter part of the Late Archaic include Darl, Ensor, Frio, and Mahomet types (Collins 1995, 2004).

Late Prehistoric Period

The onset of the Late Prehistoric period has been arbitrarily set by some archeologists around 1,250 years ago, but may have started as recently as 800 years ago. Little changed in subsistence patterns during the late Prehistoric; the hunting and gathering strategy continued as did the processing of plants in burned rock middens. The most notable shift from the Late Archaic to the Late Prehistoric was the introduction and subsequent prevalence of arrow points over dart and spear points in the archeological record. There also appears to be an increase in intergroup violence, possibly as a result of increasing population pressure, as evidenced by numerous skeletal remains exhibiting fatal arrow wounds. Pottery begins to appear in the archeological assemblages dating to the latter part of the late Prehistoric period (Collins 2004).

The Late Prehistoric is often divided into an earlier Austin Phase, and later Toyah phase in central Texas (Black 1989; Story 1990; Arnn 2012). The Austin phase occurred between

approximately 1250 years ago and 800 years ago, and is marked by the replacement of dart points with the Scallorn point, a thinner, smaller, and lighter point assumed to be used with a bow (Arnn 2012). Aside from the adoption of the bow and arrow, there appears to be little difference between economy of the Austin phase and the preceding period. The end of the Austin phase is generally marked by the introduction of the Perdiz arrow point and the appearance of ceramics throughout much of Texas (Arnn 2012), although the Scallorn and Perdiz types appear to be contemporaneous at a number of sites.

The Perdiz point is part of an assemblage commonly thought to represent an adaption to the return of bison to central Texas in numbers not seen since the Early Archaic. Arnn (2012: 190-191) suggests the ubiquity of the Perdiz point and its distribution, which approximates the distribution of white-tailed deer in Texas, call into question the long-held association between the Toyah and bison. Mauldin et al. (2013) suggest that carbon and nitrogen isotope analyses of Toyah-aged hunter gatherers at the Coleman site indicate the population did not rely on bison, but, instead, on animals that feed on trees, shrubs, and temperate grasses, such as deer (Mauldin et al. 2013).

Shortly before the arrival of Europeans to Central Texas, native groups were living in small band-sized encampments and large, diffuse camps comprised of people with multiple tribal affiliations. Hunting focused on bison, but also included deer and antelope. Group mobility patterns were governed by the seasonal movements of the native animals and availability of resources, and, later affected by the newly introduced horse. The presence of Caddoan ceramics at several central Texas sites indicates a long pattern of Hasinai Caddo interaction with groups indigenous to the northern part of central Texas (Collins 2004).

Historic Period

As early as the late seventeenth century, native groups from northern Mexico and south Texas migrated in to central Texas to escape forced labor in Spanish mines, missions, and ranches. High Plains groups, mounted nomadic bison hunters, pushed hunting and foraging groups southward into central Texas. In the early eighteenth century, the first documented Europeans arriving in the region would have encountered these relatively recent, fragmented groups (Newcomb 1993), who were later joined by Comanche, Kiowa, and other groups.

There is little documentary evidence of early Spanish and French exploration in the region, but the fact that there was a proposal for a mission on the Pedernales River submitted by a Father Santa Ana, plus the fact that the Marqués de San Miguel de Aguayo named the Blanco River in 1721, suggests that the Spanish knew the area (Ogilvie and Leffler 2013). In 1826, Benjamin R. Milam was given a contract to settle 300 families between the Colorado and Guadalupe Rivers. In 1830, the Mexican Congress prohibited immigration of US citizens into Texas, hindering Milam's efforts to introduce the required number of settlers specified in his grant contract (Garver 2014).

After gaining independence from Mexico, the Republic of Texas was formed in March, 1836. In 1842, the Fisher-Miller Land Grant, made by the Republic of Texas, granted more than three million acres between the Llano and Colorado rivers to be settled by Dutch, German, Swiss, Danish, Swedish and Norwegian families under the auspices of the San Saba Colonization Company, and, in 1844, the Society for the Protection of German Immigrants in Texas (Biesele 2014). John O. Meusebach led 120 Germans to the site of Fredericksburg, in modern day Gillespie County, in 1846 (Kohout 2013). The Fisher-Miller grant included lands claimed by the Comanche. Despite warnings from the governor of Texas (annexed as a US State in 1845), in 1847, Meusebach entered the Comanche territory and made a treaty with head chiefs Buffalo Hump, Santa Anna, and other chiefs allowing Meusebach's settlers to go unharmed into Indian territory and the Indians to enter the white settlements (Tetzlaff 2014). After the ratification of the treaty and before 1855, German immigrants established Sisterdale, Tusculum (later renamed Boerne), Curry's Creek, and Comfort in modern day Kendall County (Smyrl 2013). Captain James Hughes Callahan and his friend Eli Clemens built homes on the Blanco River in 1854, thus becoming the first white settlers in what is now Blanco County (Ogilvie and Leffler 2013).

Fredericksburg grew quickly, and in 1847, 150 settlers petitioned the Texas legislature to establish a new county. Gillespie County was created from portions of Bexar and Travis Counties in 1850, and originally included parts of Blanco, Burnet, Llano, and Mason Counties. The current boundaries were established in 1883 (Kohout 2013). Most of Kendall County was part of Bexar County, until Kerr County was created from portions of Bexar and Comal Counties in 1856. Comfort served as the Kerr County seat before Kendall County was formed in 1862. Boerne was chosen as the seat of Kendall County (Smyrl 2013). Blanco County was formed in, 1858, from parts of Comal, Hays, Burnet, and Gillespie counties and named for the Blanco River. The act that established Blanco County also stipulated that the county seat should be

called Blanco and that an election should be held to determine the location. The Pittsburgh Land Company donated a 120-acre tract of land on the north bank of Martin's Fork of the Blanco River, and Blanco was founded. Johnson City later became the county seat (Ogilvie and Leffler 2013).

A sense of community and social responsibility was very important to the Germans of Gillespie County (Kohout 2013). Churches, and, later, athletic clubs, reform clubs, reading societies, farmer's associations, political unions, and fraternal organizations played a vital role in the lives of Gillespie County residents. By 1858, there were five free public schools in Gillespie County, and it's parochial and public schools were among the best in the state in the nineteenth century.

Within the study area, Luckenbach, in southern Gillespie County, was settled in the late 1840s by German farmers, and originally called South Grape Creek. In 1854, the South Grape Creek post office opened, and by the late 1800s, a dancehall, cotton gin, and blacksmith shop were opened. The town was renamed Luckenbach in 1886 by the postmaster, who opened a general store which remains in its original building (Lich and Schnautz 2014). The Luckenbach School, an NRHP-listed log cabin schoolhouse, was built in 1855 (Friends of Gillespie County Country 2014a). A limestone addition was built in 1881 to accommodate a growing study body. The school was replaced in 1905 by a limestone schoolhouse, which was expanded in 1949. The NRHP-listed Lower South Grape Creek School, located north of Luckenbach near SH 290 and South Grape Creek, was completed in 1901 to replace a less accessible log cabin school approximately 1.5 miles to the south (Friends of Gillespie County Country 2014b).

Albert, Texas, dates to 1877, and was founded by ranchers from Fredericksburg looking for new cattle grazing grounds (Kohout 2014a). Originally called Martinsburg, the town was on the Fredericksburg-Blanco stage route. Albert Luckenbach, after selling his store in Luckenbach, opened a new post office in Martinsburg after the original one closed, and registered it as Albert. The NRHP-listed Williams Creek (Albert) School was built in 1897 to replace a less accessible log cabin school on Williams Creek (Friends of Gillespie County Country 2014c). Lessons were originally taught only in German to a growing study body that, by 1922, consisted of 70 students. The 36th President of the United States, Lyndon Baines Johnson, was enrolled in the school in 1920 and 1921.

In 1870, Israel P. Nunez established a stage station near Stonewall, on the Pedernales River, and a post office five years later. In 1879, a settlement called Millville was founded nearby, and the post office and stage station were moved to Millville, and its name changed to Stonewall. Cattle, sheep and fruit trees were raised by the German settlers, and today the area is a major source of peaches (Kohout 2014b).

Cotton raising and the slavery that frequently accompanied it, was never central to the economies of Blanco, Gillespie, and Kendall Counties. Indian corn and wheat were the county's most important crops in Blanco County, but early settlers also grew rye, tobacco, and cotton. Cattle and sheep were central to the local economy (Ogilvie and Leffler 2013). By 1850, Gillespie county farms were producing more than 15,000 bushels of Indian corn annually. In another ten years, the production of wheat climbed from 80 bushels to 18,136 bushels (Kohout 2013). Sheep ranching, which had been introduced to the area by George W. Kendall in the 1850s, had become Kendall County's principal industry by the late 1800s. Secession from the U.S. was voted down in Blanco and Gillespie Counties. Precinct 2 of Kerr County, the area which later became Kendall County, opposed secession, although Kerr County voted in favor of secession (Smyrl 2013). The level of Unionist sentiment in the region, according to Smyrl (2013) was due in large part to the number of German immigrants, who opposed both slavery and secession.

The Civil War inevitably interrupted economic development in the study area. The population of sheep, in Blanco County, for instance, fell by approximately 16,000 by 1870 (Ogilvie and Leffler 2013). Wheat harvests were approximately half of their prewar levels. Between 1864 and 1866, Kendall County experienced a 52 percent loss in property tax receipts, reflecting declining farm acreage, farm values, and livestock values (Smyrl 2013). Gillespie and Kerr Counties were put under the charge of James Duff after martial law was imposed on Central Texas in 1862 (Kohout 2013). Rather than swear allegiance to the Confederacy, Union loyalists attempted to flee to Mexico. Duff and his men caught up with the Union loyalists in Kinney County. The cruelty of Duff's men in the ensuing battle shocked the people of Gillespie County. Thirty five of the 61 fleeing Germans were killed. Afterwards, approximately 2,000 Gillespie County citizens fled Duff's reign of terror.

Following the war, the economy gradually improved. The number of cattle almost tripled, to over 31,000 by 1880, in Blanco County, and the number of sheep in the county recovered to prewar

levels by 1880. Similarly, crop production and the number of farms increased during this period (Ogilvie and Leffler 2013). Similar recoveries were evident in Gillespie and Kendall Counties. In 1877, the completion of the Galveston, Harrisburg, and San Antonio Railway opened up outside markets to Kendall County residents (Smyrl 2013). In 1887, the San Antonio and Aransas Pass Railway reached Boerne. In 1914 the San Antonio, Fredericksburg, and Northern Railway connected Fredericksburg with the San Antonio and Aransas Pass track just east of Comfort. Blumenthal was established around 1900, and had grown to twenty-five residents by 1945 (Smyrl 2013).

By 1900 the amount of land in farms doubled in Kendall County (Smyrl 2013). In Blanco County, cotton became increasingly important to the local economy (Ogilvie and Leffler 2013). Agricultural production in Gillespie County increased dramatically in the late nineteenth and early twentieth century (Ogilvie and Leffler 2013). Between 1900 and 1930 Gillespie county farmers diversified, and produced peanuts, peaches, pecans, pears, plums, grapes, and figs (Kohout 2013). By 1929, more than 20,000 peach and pecan trees were being harvested. All three counties were hit hard by the plummeting ranch values and lack of crop production during the Great Depression.

The effects of the depression on the county were tempered by a marked rise in government projects in the area, many of them acquired through the influence of Lyndon Baines Johnson (Olgivie and Leffler 2013), who had developed a close relationship with President Franklin D. Roosevelt. The New Deal introduced full electric power to the area through the Lower Colorado River Authority and the Pedernales Electric Cooperative (Ogilvie and Leffler 2013).

2.11.3 Literature and Records Review

The study area is located within the Central Cultural Resource Planning Region as shown in Figure 2-5. Historical and archeological data from TARL, TASA, and THSA were reviewed online to identify the locations and descriptions of previously documented archeological sites, State Antiquities Landmarks, address-restricted NRHP properties, OTHMs, and previously conducted cultural resource investigations within the study area boundary. At the national level, NPS websites and data centers were reviewed to identify locations and boundaries for nationally designated historic landmarks, trails and battlefield monuments, and NRHP-listed properties. The results of the review are summarized in Table 2-16.

TABLE 2-16 RECORDED CULTURAL RESOURCES WITHIN THE STUDY AREA

COUNTY	RECORDED ARCHEOLOGICAL SITES	STATE ARCHEOLOGICAL LANDMARKS	NRHP-LISTED PROPERTIES	CEMETERIES	HTC	OTHM
Blanco	2	0	0	0	0	0
Gillespie	25	4	4	13	4	10
Kendall	9	0	0	1	0	0

Four NRHP properties are recorded in the study area based on a review of NPS data (Table 2-17). Three of the NRHP-listed properties are early school buildings located in Gillespie County currently used as community centers. The fourth NRHP-listed property, the Lyndon B. Johnson National Historic Park, is a National Historic Landmark. Portions of the park extend into the study area.

TABLE 2-17 NRHP PROPERTIES WITHIN THE STUDY AREA

NAME	ADDRESS	PROPERTY TYPE
Lower South Grape Creek School	10273 E US 290, Fredericksburg, TX	Building
Williams Creek School	5501 South RM 1623, Stonewall, TX	Building
Luckenbach School	3566 Luckenbach Rd, Fredericksburg, TX	Building
Lyndon B. Johnson National Historic Park	Johnson City, TX	National Historic Landmark

According to the TARL, TASA and THSA data, 29 prehistoric, four prehistoric/historic period multi-component sites, and three historic period archeological sites have been previously documented within the study area (summarized in Table 2-18). One of the archeological sites, 41GL136, the LBJ Ranch, is part of the Lyndon B. Johnson National Historic Park. Four of the archeological sites, 41GL4, 41GL7, 41GL8, and 41GL48, are designated State Antiquities Landmarks. All four of these sites are located in the Lyndon B. Johnson State Historic Park. Of the twelve TASA-recorded cemeteries in the study area, four are designated Texas Historic Cemeteries (Table 2-19). Two additional cemeteries were reported with the study area by landowners. Ten OTHMs are located within the study area, commemorating early families, towns, buildings, and prominent citizens in the study area (Table 2-20).

TABLE 2-18 RECORDED ARCHEOLOGICAL SITES WITHIN THE STUDY AREA

TRINOMIAL	NRHP STATUS	SITE DESCRIPTION	COMMENTS/RECOMMENDATIONS
41BC86	undetermined	Unknown prehistoric; BRM	No further investigation
41BC87	undetermined	Unknown prehistoric; BRM	No further investigation
41GL4	eligible 1983; undetermined 2009	Dog trot log cabin and rectangular stone foundation, stone milk cellars, trash dump	Lyndon B. Johnson State Historic Park; State Antiquities Landmark
41GL5	undetermined	Historic homesite; ca. 1850-1930	Further investigation
41GL6	undetermined	Old dog trot log cabin, cellar, outbuildings, milk house, well	Further investigation
41GL7	eligible 1983	Late prehistoric; lithic scatter and campsite	Lyndon B. Johnson State Historic Park; State Antiquities Landmark
41GL8	eligible	Unknown prehistoric	Lyndon B. Johnson State Historic Park; further investigation; State Antiquities Landmark
41GL9	undetermined	Unknown prehistoric	Further investigation
41GL10	eligible 1983	Middle Archaic-Late Archaic prehistoric	Lyndon B. Johnson State Historic Park; further investigation; State Antiquities Landmark
41GL48	eligible 1983; ineligible 1995	Unknown prehistoric, possible Late Archaic, possible quarry site	Lyndon B. Johnson State Historic Park; State Antiquities Landmark
41GL55	undetermined	Unknown prehistoric; flakes, grinding implements, projectile points, axes	
41GL56	undetermined	Unknown prehistoric, possible Archaic; Neo-American	
41GL136	Listed	LBJ Ranch	Lyndon B. Johnson National Historic Park
41GL137	undetermined	Unknown prehistoric	Further investigation
41GL138	undetermined	Unknown prehistoric	
41GL139	undetermined	BRM	No further investigation
41GL140	undetermined	Prehistoric burnt rock, bifaces, cores, Archaic points	No further investigation
41GL141	undetermined	Prehistoric Archaic implements, cores, copper artifacts, points, flakes, bifacial cores, unifaces	No further investigation
41GL142	undetermined	Unknown prehistoric, manos, bifacial cores, bifaces, points, unifaces, burnt rock	Further investigation
41GL143	undetermined	Unknown historic and prehistoric	Further investigation
41GL144	undetermined	Unknown prehistoric BRM	Further investigation
41GL197	undetermined	N/A	Lyndon B. Johnson State Park (eastern fence line survey)

TABLE 2-18 RECORDED ARCHEOLOGICAL SITES WITHIN THE STUDY AREA

TRINOMIAL	NRHP STATUS	SITE DESCRIPTION	COMMENTS/RECOMMENDATIONS
41GL303	undetermined	Historic log cabin (placed above prehistoric site); Middle Archaic prehistoric, FCR	Monitoring of future work at this site
41GL317	undetermined	Unknown prehistoric; large deep lithic scatter	Lyndon B. Johnson National Historic Park (Archeological Inventory Shovel Test Survey)
41GL396	undetermined	N/A (no site form available)	
41GL397	undetermined	Unknown prehistoric; lithic scatter, lithic quarry	
41GL398	undetermined	Unknown prehistoric; Late 19th c. stone bridge feature	
41KE18	undetermined	Unknown prehistoric	
41KE19	undetermined	Unknown prehistoric; Tortugas point, scraper fragment, core, biface fragment	
41KE20	undetermined	Unknown prehistoric	
41KE24	undetermined	Unknown prehistoric; large lithic scatter, wall construction	
41KE121	undetermined; potentially eligible	Prehistoric; Paleoindian through Late Prehistoric	Further investigation
41KE153	undetermined	Unknown prehistoric; Late Paleoindian through Late Archaic	Further investigation
41KE155	ineligible 2004	Unknown prehistoric	No further investigation
41KE156	ineligible 2004	Late Prehistoric; Neo-American	No further investigation
41KE157	ineligible 2004	Unknown prehistoric	No further investigation

TABLE 2-19 CEMETERIES RECORDED WITHIN THE STUDY AREA

CEMETERY NUMBER	CEMETERY NAME	COUNTY	COMMENTS
GL-C002	Guadalupe	Gillespie	
GL-C002	Trinity Cemetery	Gillespie	Historic Texas Cemetery
GL_C003	Stonewall Community	Gillespie	Historic Texas Cemetery
GL-C009	Unknown (S. Luckenbach)	Gillespie	
GL-C010	Unknown (N. Luckenbach)	Gillespie	
GL-C060	Wilke Cemetery of Albert	Gillespie	Historic Texas Cemetery
GL-C071 / 0120	Luckenbach / South Grape Creek Catholic Cemetery	Gillespie	
GL-C068	Unknown grave (SW Luckenbach)	Gillespie	
GL-C087	Unknown grave (N. Luckenbach)	Gillespie	
GL-C088	Unknown grave (W. Wehmeyer)	Gillespie	
GL-C089	Unknown grave (N. Luckenbach cemetery)	Gillespie	
GL-C129	Brodbeck Family	Gillespie	Historic Texas Cemetery

TABLE 2-19 CEMETERIES RECORDED WITHIN THE STUDY AREA

CEMETERY NUMBER	CEMETERY NAME	COUNTY	COMMENTS
___	Unknown	Gillespie	Landowner reported cemetery
___	Unknown	Kendall	Landowner reported cemetery

TABLE 2-20 OFFICIAL TEXAS HISTORICAL MARKERS WITHIN THE STUDY AREA

NAME	COUNTY
Luckenbach	Gillespie
Engel Family	Gillespie
Luckenbach School	Gillespie
E. Kirby Smith	Gillespie
Lower South Grape Creek School	Gillespie
Lyndon Baines Johnson	Gillespie
Israel M. Nunez	Gillespie
Albert Nebgen	Gillespie
Stonewall Community Center	Gillespie
Williams Creek School	Gillespie

The majority of the prehistoric archeological sites that have been recorded in the study area appear to be open campsites associated with burned rock middens (BRMs), lithic scatter, and hearths in close proximity to stream and river channels, upland adjacent to these channels, and the blufflines overlooking the major draws (prehistoric archeological site density is greatest in close proximity to West Sister Creek, the headwaters sector of the Blanco River, the West and Middle Forks of Williams Creek, Three Mile Creek, and along the Pedernales River between Stonewall and Hye [although the site concentration along the Pedernales may also be a direct function of sheer intensity and regularity of cultural resource surveys related to the Lyndon B. Johnson National Historic Park]). For the few prehistoric sites in the study area that have produced diagnostic artifacts, most would appear to date to the Archaic period, perhaps not unexpected given the preponderance of sites with BRMs, which appear in this region beginning in the Middle Archaic Period and continue to appear in the central Texas archeological record into the Late Prehistoric Period.

2.11.4 High Probability Areas

Review of the previously recorded cultural resource sites data indicates that the study area has not been fully examined during previous archeological and historical investigations. Consequently, the records review results do not include all possible cultural resources sites within the study area. To further assess and avoid potential impacts to cultural resources, high probability areas (HPAs) for prehistoric archeological sites will be defined during the route analysis process. Within the study area, the prehistoric HPAs typically occur along streams, near streams, and near outcroppings of gravels suited to stone tool manufacture (central Texas is rich in sources of chert for raw material). Terraces and topographic high points (blufflines) that would provide flats for camping and expansive landscape views as well as access to fresh water sources are also considered to have a high probability for containing prehistoric archeological sites. Prehistoric sites recorded in the study area are located in close proximity to stream channels, and on gravelly upland soils on level terraces overlooking larger draws, for example. HPAs are also defined within 300 meters of prerecorded archeological sites.

Historic age resources are also likely to be found near water sources. However, they will also be located in proximity to primary and secondary transportation routes (e.g., trails, roads, and railroads) which provided access to the sites. Buildings and cemeteries are also more likely to be located within or near historic communities, such as Luckenbach, Albert, Stonewall, or Blumenthal. Review of current maps and aerials shows that development activities may have diminished the number of historic-period building sites that once existed in the region. However, historic resources may still be extant at or near the locations of more the prominent or named ranch complexes depicted on historic and current USGS topographic maps (e.g., Wehmeyer, Gellerman, Bauer, Arhelger, Weinheimer, Danz, Ottmers, Wilke, Schumann, Kilborn, Petsch, Merz, Schladoer, Franz, and Brehmer). The small sample of historic period archeological sites in the study area appear to be characterized by relatively ephemeral mid-to-late nineteenth century ranching activities, small farmsteads, or temporary pastoral camps. Consequently, locations and patterns of distribution for historic-period archeological sites are not readily predictable or quantifiable and the route analysis process discussed in Section 4.0 considers only recorded archeological sites listed with official state and federal agencies, proximity to historic towns and ranches as shown on USGS topographic quadrangles, and HPAs developed for prehistoric archeological resources within the study area.

3.0 ENVIRONMENTAL AND LAND USE CONSTRAINTS

A description of the land use, environmental, and cultural resources within the study area was presented in Section 2.0 of this report. These resources were taken into consideration during the preliminary alternative route development process. These resources that have particular value or are particularly sensitive to potential impacts from this type of project are discussed below. The following sections indicate areas to be avoided, where practicable, and areas which should be crossed only with care and possible mitigation.

3.1 NATURAL RESOURCES

Sensitive natural resources identified within the study area include the Blanco and Pedernales Rivers, wetland/riparian habitat associated with the floodplains and tributaries of the Blanco and Pedernales Rivers, and woodland/brushland areas. Riparian areas along creeks/streams provide a source of water, habitat, and are often corridors for wildlife to move through that area. In addition, these riparian zones are sensitive because of the potential for construction-related impacts to surface waters, and because of the possible presence of associated wetland habitats. The upland woodland/brushland vegetation communities provide valuable wildlife habitat. Potential suitable habitat was modeled in the study area utilizing several habitat models for the golden-checked warbler. These areas were considered during the route development process. While the proposed line cannot avoid crossing all of these sensitive areas, routing should be planned carefully, and efforts used to minimize impacts where necessary.

3.2 HUMAN RESOURCES

The study area contains several categories of human and cultural resources that should be avoided where practicable to minimize potential adverse impacts. These areas were considered, although in some instances project requirements (i.e., the project endpoints) and/or other routing constraints made it necessary to locate alternatives in close proximity to these areas, such as habitable structures, residential subdivisions, and parks and recreation areas. Those areas considered to be particularly sensitive with regard to the location and construction of this proposed project are:

- **Habitable structures** – Single-family and multi-family dwellings and related structures, mobile homes, apartment buildings, commercial structures, industrial structures, business structures, churches, hospitals, nursing homes, schools, or other structures normally inhabited by humans or intended to be inhabited by humans on a daily or regular basis.

- **Residential Subdivisions** – A few residential subdivisions are located in the northern portion of the study area, they are concentrations of residences located near the communities of Blumenthal and Stonewall. These areas should be avoided by new ROW, where practicable, or crossed along existing ROW or property lines, because of the number of and density of existing habitable structures.

- **Parks and Recreation Areas** – One national park, one state park, and a school playground area are located within the study area. Because of the recreational, aesthetic, and conservation benefits that parks provide to the public, these areas should be avoided whenever practicable.

3.3 CONSTRAINT AREAS

For the purpose of routing the proposed transmission line, the resources described above were classified as either areas which should be avoided, if practicable, by the alternative routes, or as those areas that should be crossed only with special care and possible mitigation. Constraint areas are shown on Figures 4-3 (Appendix D) and 5-1 (Appendix E). In order to protect recorded cultural resources sites from potential vandalism, their locations have been omitted from the constraints map. The following areas should be avoided, where practicable, or crossed with care or possible mitigation:

Avoid Where Practicable

- Habitable structures
- Developed areas (residential, commercial, industrial, recreational and cultural [churches, schools, etc.])
- Parks and recreation areas
- Known habitat of federally listed endangered/threatened species
- Cemeteries and graves, for their cultural, social, and historic values
- Airports and private airstrips, because of potential conflicts with navigable airspace

- VORTAC Facilities

Areas Crossed With Care/Possible Mitigation

- Vegetated floodplains of the Blanco River, Pedernales River, South Grape, Hunters, Threemile, Wenzel, West Sister, Hopfs, and Williams creeks and adjacent wetlands for their ecological value as habitat and avian stopover areas, and their sensitivity to construction-related impacts.
- Large ponds and associated wetlands, for their ecological value to wildlife and their sensitivity to construction-related impacts.
- Potential endangered species habitat, particularly that of the golden-cheeked warbler and black-capped vireo.
- Recorded cultural resources sites (historic and prehistoric) for their social and historical value.

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4.0 SELECTION AND EVALUATION OF ALTERNATIVES

4.1 NO ACTION ALTERNATIVE

Under the No-Action Alternative, LCRA TSC would not construct or operate the proposed 138-kV transmission line. With this alternative the potential impacts discussed in Section 5.0 would not occur and the requirements for the proposed project, as described in Section 1.2, would also not be met.

4.2 ALTERNATIVE SUBSTATION SELECTION AND EVALUATION

A new 138-kV electric transmission line is required to connect the proposed substation with the existing LCRA TSC Kendall to Mountain Top 138-kV electric transmission line. POWER conducted environmental studies and prepared a description of the existing environment, Sections 2.0 through 2.10.3, within the study area for the purpose of identifying preliminary alternate transmission line routes. This information was also useful to LCRA TSC while evaluating the alternate substation locations.

LCRA TSC and POWER identified several preliminary alternate substation locations that were coordinated with CTEC which support the need for the project (Substation Sites One through Seven). Factors considered in identifying these locations include the proximity to the load growth area, located on a single property/parcel owner with approximately five acres, costs associated with construction of the substation and CTEC distribution infrastructure, ability to serve existing and future electric load, proximity to existing CTEC distribution facilities, proximity to suitable access roads, topography, and nearby environmental features and land uses. The seven preliminary alternate substation site locations were presented at the May 15, 2014 open house meeting and are shown on Figure 4-1.

4.3 ALTERNATIVE ROUTE SELECTION

The objective of this study was to develop and evaluate numerous alternative transmission line routes that are feasible from an economic, engineering, system planning, and environmental perspective. LCRA TSC utilizes a multiphase approach for completing a project: define the study area; obtain environmental information; map environmental and land use constraints; develop preliminary alternative route segments; conduct a public involvement program; identify primary alternative routes; conduct environmental, engineering and cost analyses; evaluate primary alternative routes; acquire PUCT approval; and design and construct the transmission facility.

4.3.1 Preliminary Alternative Route Segments

The preliminary alternative route segments were identified in accordance with Section 37.056 (c)(4)(A)-(D) of the Texas Utilities Code, PUCT Substantive Rule 25.101(b)(3)(B), including the PUCT's policy of prudent avoidance, and are consistent with LCRA TSC's standard routing practices. It was POWER's intent to identify an adequate number of environmentally acceptable and geographically diverse preliminary alternative route segments while considering among other such factors as community values, parks and recreational areas, historical and aesthetic values, environmental integrity, route length parallel to or using existing compatible corridors or parallel to parcel boundaries, and prudent avoidance.

POWER performed environmental and land use data collection and prepared a description of the existing environment within the study area for the proposed project (Section 2.0). POWER used information obtained during the data collection process to develop a constraints map (Figure 4-8) and to identify preliminary alternative route segments. The preliminary route segments were selected by taking into account the use of and paralleling of existing compatible ROWs (existing transmission lines and their ROWs, pipelines, roadways, parcel lines, natural or cultural features), ongoing and proposed land uses and areas of land use and environmental concern. More detail of the features considered while developing the preliminary alternative route segments and preliminary alternative routes is provided in Sections 5.2.3.2 through 5.2.3.4.

Ground reconnaissance of the study area and computer-based evaluation of digital aerial imagery were utilized for both refinement and evaluation of the preliminary alternative route segments. The data collection effort, although concentrated in the early stages of the project, was an ongoing process and continued through the point of filing the CCN application.

LCRA TSC reviewed these preliminary alternative route segments, taking into consideration the additional factors of engineering, construction, and cost constraints, and made only a few, minor revisions by modifying individual segments. The resulting preliminary alternative route segment network (Figure 4-1) was presented to the public at an open house meeting in May 2014.

4.3.2 Public Involvement Program

The purpose of the open house meeting was to solicit comments, concerns and input from residents, landowners, public officials, and other interested parties concerning the proposed

project, the preliminary alternative route segments, and the overall transmission line routing process, and to:

- Promote a better understanding of the proposed project including the purpose, need, potential benefits and impacts, and PUCT certification process.
- Inform the public with regard to the routing procedure, schedule, and route approval process.
- Gather the values and concerns of the public and community leaders.

4.3.2.1 Open House Meeting

The open house meeting was held on May 15, 2014, from 5:30 p.m. to 7:30 p.m. at the Stonewall Chamber of Commerce in Stonewall, Texas. LCRA TSC mailed written notices of the meeting to all owners of property within 300 feet of each preliminary alternative route segment centerline (see Appendix B). Additional letters were sent to elected officials and other interested parties. This resulted in the mailing of 356 meeting notices. In addition, a public notice was published on the listed dates in the following six newspapers having circulation within the project area counties:

- Blanco County News – April 30 & May 7
- Johnson City Record Courier – May 1 & May 8
- Fredericksburg Standard-Radio Post – April 30 & May 7
- Boerne Star – May 6 & May 13
- Comfort News – May 1 & May 8
- San Antonio Express News – April 30 & May 7

The public notices announced the location, time, and purpose of the meeting. A copy of the published newspaper notice is located in Appendix B.

At the meeting, personnel from LCRA TSC, CTEC, and POWER manned information stations with each station devoted to a particular aspect of the project. These stations included maps, illustrations, photographs, photo simulations, and/or text explaining each particular topic. A GIS software station was available to show the extent of the project, the proposed preliminary alternative route segments, property ownership parcel boundaries and recent aerial photography of the project area. The GIS station was also available to answer detailed questions such as the distance from the proposed alternative route segment centerline to the

nearest corner of a habitable structure. Interested citizens and property owners were encouraged to visit each station in order, so that the entire process could be explained in the logical sequence of project development. The information station format is typically advantageous because it allows attendees to process information in a more relaxed manner and also allows them to focus on their particular area of interest and ask specific questions. Furthermore, the one-to-one discussions with LCRA TSC, CTEC, and/or POWER personnel typically encourage more interaction from those citizens who might be hesitant to participate in a more formal speaker-audience format.

Upon entering, visitors were asked to sign in and were handed an information packet including a questionnaire. The questionnaire solicited comments on the proposed project and also included an evaluation of the information presented at the meeting. The information packet also included answers to frequently asked questions and a map indicating the location of the preliminary alternative route segments and substation locations. Copies of the questionnaire and information packet are located in Appendix B.

After the open house meeting, POWER reviewed and evaluated each questionnaire that was submitted at the meeting or that was sent in after the meeting. Of the 189 people that signed in at the open house meeting, a total of 56 submitted questionnaires to LCRA TSC.

In addition to the questionnaires received at the open house meeting, 127 additional questionnaires, as well as letters and e-mails were received from individuals after the meeting, some of whom did not attend the open house meeting. A total of 183 questionnaires were received by LCRA TSC.

A review of the questionnaires indicated that the majority of the respondents agreed that the need for the project had been adequately explained (81%), and that the exhibits and information presented was helpful to them in understanding the project (75%). Fifty-three (29%) of the questionnaires received indicated that the features on the Land Use and Environmental Constraints Map were accurately plotted. Ninety-six respondents (52%) indicated that they were not aware of any missing features on the Land Use and Environmental Constraints Map.

The attendees were asked if they had a concern with a particular preliminary alternative route segment as they were presented at the open house meeting (Appendix B and Figure 4-1). They

were also asked to describe their concerns. Segment R received the most negative concerns (31), followed by Segments T1 (20) and E1 (19). Segment H received the most written positive comments (40), followed by Segment I (38) and G (34). Table 4-1 summarizes the segments that received the most responses to this question, both negative and positive.

TABLE 4-1 SEGMENT CONCERNS/COMMENTS

SEGMENT	R	T1	E1	H	I	G
Negative Concerns	31	20	19	18	8	12
Positive Comments	2	8	1	40	38	34

The questionnaire also solicited comments concerning typical transmission line routing issues, such as land use, paralleling existing corridors, and community values/resources. The questionnaire asked the respondents to rank their greatest concerns from one (greatest concern) to 11 (least concern) from a list of features which included: reliable electric service; parallel existing transmission line right-of-way; parallel other existing compatible ROW; parallel property lines; maximize the distance from residences, schools, churches, nursing homes; commercial buildings; historic sites; parks and recreational areas; minimize visibility of the lines; and minimize environmental impacts or other concerns. The greatest concerns regarding routing the proposed transmission line project include maximizing the distance from residences (23%), paralleling existing electrical transmission ROW (12%), and minimizing the visibility of the lines (10%).

When asked on the questionnaire if the respondents had a preference for the type of transmission line structure that is being proposed for the project, the following responses were received:

- 89% (162) prefer single pole
- 3% (5) prefer H-frame
- 2% (4) prefer lattice towers

4.3.2.2 Post Open House Meetings

After the open house meeting held in Stonewall on May 15, LCRA staff met individually or in groups with more than 75 landowners or their representatives. Some of the meetings [more than 20 total meetings] were held on the landowners' property while others were held at LCRA's