transportation and aviation, utilities, socioeconomic patterns, population, employment and income, visual character, and communication towers.

3.4.1 Community Values and Community Resources

The term "community values" is included as a factor for the consideration of transmission line certification under Section 37.056(c)(4)(A)-(D) of the Texas Utilities Code. Community values have been interpreted in different ways. Recent decisions by the PUCT have considered facts such as those listed below within the discussion of community values.

- a shared appreciation of an area or other natural or human resource by members of a national, regional, or local community
- AM, FM, microwave, and other electronic installations in the area
- approvals or permits required from governmental agencies
- comments received from the community leaders and the public
- description of the study area
- FAA-registered airstrips, private airstrips, and heliports within the study area
- habitable structures within 500 ft of the centerline of the proposed project
- center-pivot or other traveling irrigation systems
- input received from public meetings and open-house meetings

Burns and McDonnell also considered those community resources that may not be specifically identified by the PUCT but could be important to a particular community as a whole, including: parks or recreational areas, historical and archeological sites, or scenic vistas within the project area.

Burns and McDonnell mailed consultation letters to federal, state, and local officials as well as participated in public open-house meetings and other meetings with interested parties, to identify and collect information regarding community values and community resources. The above referenced community values and community resources are discussed in the following sections.

3.4.1.1 Land Use and Development Patterns

The western portion of the study area (Central A to Central C) is typified as prairie populated with small, scattered communities (with the exception of Abilene). Agriculture maintains a strong presence in this portion of the study area. The central portion of the study area (Central C to Sam Switch) is a transition zone between more densely populated areas in the east and the sparsely populated area to the west. The landscape in this portion of the study area is also one of transition, changing from prairie to hilly woods in

an easterly transit. The eastern portion of the study area (Sam Switch to Navarro) is close to the Dallas-Ft. Worth Metroplex, and as such, has a higher population. Prairies dominate the landscape in this portion of the study area.

3.4.1.2 Agriculture

In 2007, Texas was the second largest overall producer of agricultural products and the largest producer of livestock, poultry, and their products in the U.S. Total value of agricultural products sold was $21,001,074,000, of which approximately 6.21 percent came from the counties found within the study area. Sales from livestock were more than double that of crop sales with the most valuable commodity group being cattle and calves raised for the beef market, with total sales approximately $14,435,499,000. From 2002 to 2007, the number of farms increased by almost ten percent, while the average size of farms decreased by about six percent, resulting in a four percent gain of total land in farms (USDA, 2010).

Beginning with the western segment of the project, the main agricultural enterprise in 2007 came from crop sales, with cotton and cotton seed being the most profitable. A total of 302,288 acres were committed to the production of cotton in this segment of the study area. The second highest grossing commodity group for this segment of the study area was the production of cattle and calves. These two commodity groups comprised approximately 77 percent of the region's agricultural production, based on cash value of total commodities. On average, the region experienced a surge of 10.5 percent in the number of farms in 2007, while concurrently experiencing a 1.3 percent average reduction in the size of farms. The amount of land in farms varied widely from county to county, with this region experiencing both the greatest gains and losses for the entire study area, with a regional average gain of 9.3 percent (USDA, 2010).

The main agricultural enterprise in 2007 for the central segment of the project, was from livestock sales, with cattle and calves being the most profitable. A total number of 742,677 cattle and calves were produced across this segment of the study area. The second highest grossing commodity group for this segment of the study area was the production of other crops and hay. These two commodity groups comprised approximately 42 percent of the regions agricultural production, based on cash value of total commodities. On average, the region experienced a surge of 10.83 percent in the number of farms in 2007, while concurrently experiencing a 7.5 percent average reduction in the size of farms. The amount of land in farms for this segment of the study area gained by an average of 3.75 percent over the same time period (USDA, 2010).

The main agricultural enterprise in 2007 for the eastern segment of the study area, was from livestock sales, with cattle and calves being the most profitable. The second highest grossing commodity group for this segment of the study area was the production of grains, oilseeds, dry beans, and dry peas. These two commodity groups comprised approximately 74 percent by market value of the regions agricultural production, based on cash value of total commodities. On average, the region experienced a surge of 7.5 percent in the number of farms in 2007, while concurrently experiencing a 7.83 percent average reduction in the size of farms. The amount of land in farms lost by an average of one percent over the same time period (USDA, 2010).

3.4.1.3 Urban and Residential Areas

There are 64 municipalities, which are either partially or completely located within the study area (TNRIS, 2009). In general, the population density in the study area increases from west to east toward Hillsboro, Texas. However, east of Hillsboro (primarily between interstate highway (IH) 35 and IH 45) the population density begins to decrease. Table 3-3 indicates this trend, on average, can be followed east (US Census Bureau, 2009).

Table 3-3 Housing and Population Data

Study Area	Total Housing Units	Average Housing Units (per county)	Average People per Mile
West	69,962	11,660	35.2
Central	118,377	9,865	38.1
East	159,068	26,511	74.4

Source: US Census Bureau, 2009

Another indicator of population density is the average number of independent school districts (ISDs) found per county. According to the Texas Education Agency (TEA), the western portion of the study area has an average of 3.7 ISDs per county, the central portion has an average of 4.3 ISDs, and the eastern portion has an average of nine ISDs (TEA, 2009).

In general, the majority of residential areas within the study area are located within the city limits of municipalities. There are also occasional rural residences throughout the study area along County and FM roads. Most business, industry, and commercial operations within the study area are located along the major roadways and interstate highways within the city limits of the municipalities.

3.4.1.4 Park and Recreation Areas

Numerous park and recreational opportunities can be found in the study area. Community parks, ball fields, swimming pools, recreation centers, golf courses, and other recreation-type activities are available in the majority of the municipalities in the study area. In addition, there are several large reservoirs, creeks and rivers, church camps, etc. that serve as recreational venues in the study area. Some of the larger park and recreational areas within the study area are outlined below.

Whitney Lake State Park (WLSP), as well as the USACE parks along Whitney Lake, constitutes the largest recreational complex in the study area. Under the USACE, there are 11 parks and two day parks that offer 384 camp/picnic sites, 25 picnic sites, and six boat launches. Whitney Lake and all associated parks are located along the Brazos River, and span the border of Bosque and Hill counties. According to the USACE, over two million visitors come to the lake annually to enjoy various public recreational activities including hunting, fishing, bird watching, camping, horseback riding, nature study, and photography (USACE, 2009).

Navarro Mills Lake and the associated parks, which are managed by the USACE, combine to make the second largest recreation spot in the study area. The four seasonal parks and one continuously open park offer visitors 155 camp/picnic sites, ten picnic sites, and four boat launches. Navarro Mills Lake and all associated parks are located in Hill and Navarro counties. According to the USACE, over 300,000 visitors come to the lake annually to enjoy various public recreational activities including hunting, fishing, bird watching, camping, horseback riding, nature study, and photography (USACE, 2009).

Aquilla Lake is managed by the USACE as well and offers eight recreation areas and three boat launches. Aquilla Lake is located within Hill County and is fed by Aquilla Creek and Hackberry Creek. According to the USACE, over 83,000 visitors come to the lake annually to enjoy various public recreational activities including hunting, fishing, bird watching, boating, nature study, and photography (USACE, 2009).

Fort Phantom Hill Lake and its associated parks, which are managed by TPWD, are located 15 miles north of Abilene in Jones County. It offers a limited number of boat docks, picnic areas, and camp sites. Fort Phantom Hill is a 22-acre site located north of Fort Phantom Hill Lake that is owned by the nonprofit Fort Phantom Foundation and registered with the Texas Historical Survey Committee. It served as a military installation during the 19th century and is considered one of the most pristine historical sites in Texas.

Hubbard Creek Reservoir and its associated parks, which are managed by TPWD, are located five miles west of Breckenridge in Stephens County. It is primarily used for recreational fishing.

Meridian State Park is managed by TPWD and is located two miles southwest of Meridian in Bosque County. It is primarily used for hiking, fishing, and bird watching.

Dinosaur Valley State Park is managed by TPWD and is located three miles northwest of Glen Rose in Somervell County. It is known for its preserved dinosaur tracks and statues. It also has camping, picnicking, hiking, mountain biking, horseback riding, river swimming, fishing, and wildlife observation. Dinosaur world and Fossil Rim Wildlife Center are private parks adjacent to Dinosaur Valley State Park.

In addition, private landowners within the study area often use their land for hunting, fishing, wildlife and bird watching, and other recreational activities that are not available to the general public.

Somervell County Commissioner Mike Ford, in a June 10, 2009 letter, identified several park/recreational areas within Somervell County to be considered when evaluating potential routes. Those areas are:

- Dinosaur Valley State Park
- Dinosaur World
- Fossil Rim Wildlife Preserve
- Recreation areas along the Paluxy River

In a similar letter from Somervell County/District Clerk Candace Garret (received June 9, 2009), Fossil Rim Wildlife Preserve and Dinosaur State Park were once again mentioned as areas that should be considered through the route development process.

3.4.1.5 Transportation and Aviation

The study area is served by interstate highways (IH), U.S. Highways, state highways (SH), FM roads, and local streets. The main arterial roads located within the study area include IH 20, IH 35, and IH 45 as well as U.S. Highways 67, 77, 81, 83, 84, 180, 183, 277, 281, 283, and 377. The primary north-south traveling roads include IH 35 as well as U.S. Highways 77, 81, 83, 84, 183, 277, 281, and 377. The primary east-west traveling roads include IH 20 as well as U.S. Highways 67, 180, and 283.

In a letter dated July 14, 2009, the TxDOT identified several transportation projects (see list below) that are either currently under way or planned to begin within the near future that should be considered during the route development process.

- IH 45 at Briar Creek – Rehabilitate and widen southbound frontage road bridge. Work should begin in spring 2011 and should be completed in approximately two years. Vertical and horizontal alignments should remain unchanged.
- Business IH 45 just north of Corsicana – rehabilitate and widen frontage road bridges. Vertical and horizontal alignment should remain unchanged.
- SH 14 Union Pacific RR crossing south of City of Richland – rebuild RR intersection. Present underpass will be reversed and intersection is to be shifted southward. Construction should begin in spring 2011 and completed in two years.
- SH 31 Bypass – build new bypass south of Corsicana. Construction of a new four-lane freeway with frontage roads is to be constructed in two phases south of Corsicana as shown on the attached maps. Construction should begin in the next seven to ten years and be completed in approximately four-five years.
- FM 55 – minor safety treatments from SH 31 to FM 709.
- SH 31 – replace bridge at Cedar Creek. Construction was planned to begin in winter 2009 and be complete in two years.
- FM 709 – replace bridge at Treadwell Branch. Construction was planned for fall 2009 and be complete in two years.
- IH 35E – revised ramps and add frontage roads from FM 566 to FM 308. Construction should begin in spring 2011 and be completed in three-four years.
- FM 308 – replace bridge at one mile northwest of IH35E. Construction should begin late 2015 and be completed in two years.
- FM 1126 – restore pavement and upgrade structures from SH 22 to FM 3383. Work was planned to begin winter of 2009 and completed in one-two years. No changes in vertical or horizontal profiles expected.

There are several railway lines within the study area, including the Atchison, Topeka and Santa Fe Railway, the Missouri-Kansas-Texas Railroad, and the Missouri Pacific Railroad, as well as several unnamed routes and spurs. Burlington Northern and Santa Fe (BNSF), Southern Switching Company, Union Pacific, and Fort Worth and Western Railroad are the companies that manage these railroads.

There are numerous airports, both public and private, as well as heliports within the study area. Over 75 airports/airstrips are located within the study area, consisting mostly of small private airstrips with limited usage (Air Nav, 2010). In their June 26, 2009 letter, TxDOT identified the following public use airports/airstrips within the study area:

- Stephens County Airport (BKD) - approximately two miles south of Breckenridge
- Albany Municipal Airport (T23) - approximately two miles east of Albany
- Hillsboro Municipal Airport (INJ) - approximately three miles north of Hillsboro
- Eastland Municipal Airport (ETN) - approximately one mile north of Eastland
- Ranger Municipal Airport (F23) - approximately one mile south of Ranger
- Clark Field Municipal Airport (SEP) – approximately one mile east of Stephenville
- Winston Field Airport (SNK) – approximately two miles southwest of Snyder
- Fisher County Airport (56F) – approximately three miles southeast of Rotan
- Hamlin Municipal Airport (14F) – approximately three miles south of Hamlin
- Arledge Field Airport (F56) – approximately four miles southeast of Stamford
- Dublin Municipal Airport (9F0) – approximately one mile southeast of Dublin
- Clifton Municipal/Eisenhower Field Airport (7F7) – approximately two miles north of Clifton
- Whitney Lake State Park Airport (F50) – approximately three miles southwest of Whitney
- TSTC Waco Airport (CNW) – approximately eight miles northeast of Waco
- Mexia-Limestone County Airport (KLXY) – approximately three miles southwest of Mexia
- C David Campbell Field-Corsicana Municipal Airport (CRS) – approximately six miles southeast of Corsicana

Additionally, one FAA registered heliport was identified from the above mentioned letter to be within the study area:

- Little C Ranch Heliport (4T7) – approximately four miles northeast of Hico

3.4.1.6 Utility Facilities

Existing utility facilities found within the study area primarily include 69 kV, 138 kV, and 345 kV electric transmission lines as well as associated substations. These transmission lines are managed by Electric Transmission Texas, Oncor Electric Delivery, AEP Texas North Co., Brazos Electric Power Cooperative, and Texas New Mexico Power. Additionally, there are many different pipelines found within the study area, carrying carbon dioxide, natural gas, and several forms and grades of hydrocarbons. These pipelines are managed and owned by companies such as: Chevron Pipe Line Company, Kinder Morgan Production Co., LLC, and Mobil Pipeline Company, to name a few (Railroad Commission of Texas (RCT), 2010).

3.4.1.7 Visual Character

The study area is located within the Blackland Prairie, Rolling Plains, and Oak Woods and Prairies regions of Texas. Blackland Prairie and Rolling Plains areas generally share topographical characteristics such as rolling and undulating hills, tall grasses and meandering streams and rivers. These areas are typically good to excellent areas for the production of cotton as well as utilization for grazing. The Oak Woods and Prairie region of Texas is a region that extends from Oklahoma to central Texas and is typified by stands of hard and soft woods, depending on the underlying soil. This region serves not only as a source of timber, but also is the recharge point for several aquifers in the region (The Handbook of Texas, 2009).

The western segment of the study area falls largely within the Rolling Plains region, and shares the typical characteristics where agriculture has not overly altered it. Trees can most readily be found along the many rivers and creeks found within this area, which includes the Colorado River and the Clear Fork and Double Mountain Fork, both tributaries of the Brazos River. Aside from the canyons associated with the rivers and streams, this region is also defined in part by the Callahan Divide, which is a low range of hills (The Handbook of Texas, 2009).

The central segment of the study area has elements of both the Rolling Plains and Oak Woods and Prairies regions, with the prairies dominating the western portion and the timber in the east. The western portion of this area is typified with tall grasses and occasional mesquite savanna with larger trees following along the rivers and streams. The east is typified with larger stands of forest which includes, but is not limited to, cedar, oak, and pecan. Several rivers and streams wind their way through this region, including the Leon and Brazos Rivers as well as several tributaries of the Colorado River. Major physical features include the continuation of the Callahan Divide with some areas of hills and topographic relief, as well as Whitney Lake (The Handbook of Texas, 2009).

The eastern segment of the study area includes elements from the Blackland Prairie, Rolling Plains, and the Oak Woods and Prairies regions, with most of the transition taking place in the western portion of this area. The western portion of this area contains stands of trees as well as stretches of prairie. Trees are typically found along bottomland with less mesquite savanna than that which is found in the Rolling Plains region. The area not associated with the Oak Woods and Prairies region is generally grassy and rolling. Several rivers and streams are found within this area, including the Brazos and Nolan Rivers and associated tributaries as well as Whitney Lake, Aquilla Lake, and Navarro Mills Lake (The Handbook of Texas, 2009).

3.4.1.8 Communication Towers

Numerous communication towers were identified within the study area. The majority of the communications towers are located primarily within municipalities and along and near the major roadways. A large amount of these are privately owned. The communication towers located in the study area include:

- AM commercial towers
- FM commercial towers
- Microwave towers
- Cellular towers

3.4.2 Socioeconomic Patterns

Texas is the second largest state by area in the U.S. and the largest within the lower 48 states. As such, Texas has a correspondingly large economy. According to 2008 statistics, Texas had the nation's second largest Gross Domestic Product (GDP) of $1.22 trillion with government and mining contributing the most. Texas, being the second most populous state in the U.S., ranked third in total personal income (U.S. Department of Commerce, 2009).

3.4.2.1 Population

The population of Texas rose an estimated 16.7 percent from 2000 - 2008, from approximately 20,851,811 to an estimated 24,326,974. Of those 24 plus million people, approximately 4.3 percent could be found within the 24 study area counties (2008 estimates). Table 3-4 illustrates the population of each segment of the study area.

Table 3-4 Population Data

Study Area	2000 Population	2008 Population (est.)	Percent Change
West	193,541	189,982	-5.1
Central	318,384	359,245	5.5
East	442,242	504,607	11.2

Source: US Census Bureau, 2009

3.4.2.2 Employment and Income

Texas had approximately 15,617,373 persons (63.6 percent of the total population for the state) in the civilian work force with 3.8 percent being unemployed in 2000. The largest employment sector for the state was educational, health and social services, which employed approximately 19.3 percent. The retail

trade sector employed the second largest percentage of people in the state, with an average of 12 percent. The mean household income in 2000 was $39,927 per year (U.S. Census Bureau (USCB), 2009).

Approximately 90,634 persons (46.8 percent of the total population for this region) in the western segment of the study area were in the civilian work force with an average 3.1 percent of the population being unemployed in 2000. The largest employment sector for this region was educational, health and social services, which employed approximately 25.6 percent. The agriculture, forestry, fishing and hunting, and mining sectors employed the second largest percentage of people in this region, with an average of 10.9 percent. The mean household income in 2000 was $29,087 per year (USCB, 2009).

The central segment of the study area had approximately 151,050 persons (47.4 percent of the total population for this region) in the civilian work force with an average three percent of the population being unemployed in 2000. The largest employment sector for this region was educational, health and social services which employed approximately 20.7 percent. The manufacturing sector employed the second largest percentage of people in this region, with an average of 11.4 percent. The mean household income in 2000 was $34,853 per year (USCB, 2009).

The eastern segment of the study area had approximately 208,886 persons (47.2 percent of the total population for this region) in the civilian work force with an average of 3.5 percent of the population being unemployed in 2000. The largest employment sector for this region was educational, health and social services which employed approximately 22.6 percent. The manufacturing sector employed the second largest percentage of people in this region, with an average of 14.2 percent. The mean household income in 2000 was $35,603 per year (USCB, 2009).

3.5 CULTURAL RESOURCES

Cultural resources are defined as sites, features, structures, or properties that are 50 years old or older and that may hold significant cultural, historical or scientific value. Section 106 of the National Historic Preservation Act secures the protection and review of cultural resources by ensuring that they are considered as part of federal project planning, funding, and permitting. Regulations developed by the Advisory Council on Historic Preservation direct the implementation of the Section 106 process. The National Register of Historic Places (NRHP), administered by the Secretary of Interior, establishes significance criteria for inclusion on the register. Cultural resources are evaluated based on these criteria, and may be considered historic properties if they meet the criteria and are determined eligible for inclusion or if they are placed on the NRHP by the Secretary of the Interior. In addition, cultural

resources that have not been discovered or evaluated but may meet eligibility criteria are considered historic properties.

3.5.1 Pre-Historic Cultural Background

The Texas archaeological record is divided into four periods: Paleo-Indian (beginning 9200 B.C., perhaps earlier and lasting to around 6000 B.C.), Archaic (commencing around 6000 B.C. lasting up to A.D. 700, or the beginning of the Christian era in some locales), Late Prehistoric (beginning approximately A.D. 700- and lasting until 1600) and Historic. The beginning and ending of an archaeological period is not clearly defined, and is affected by a variety of influences including the size of the area in question, diversity in both local and regional ecosystems, as well as the amount of archaeological work conducted in an area.

Initial human occupation in the Americas has been the subject of numerous debates in American archaeology. There is currently no agreement on the timing of human entry into the New World. Current estimates vary from 11,200 to 200,000 years ago. However the earliest, most well documented is the Clovis Complex, so named for the diagnostic artifact of the period. Sites with these distinctive lanceolate-shaped, fluted points and other chipped stone artifacts in the Clovis toolkit (e.g. side scrapers, end scrapers, drills, burins, gravers, knives) are distributed throughout every geographic region of the country. The better-known Clovis sites in Texas include the Gault Site in Central Texas, the Aubrey Site in Denton County, and Miami, a mammoth kill site in Roberts County (none of which are in the study area). The Clovis period occurred during the Late Pleistocene, and tight dating of such sites, combined with widespread Clovis point distribution, makes the type an excellent horizon marker. The Folsom complex follows Clovis beginning around 8800-8200 B.C. named for the type of site and distinctive projectile point. Folsom points are also lanceolate-shaped, fluted points with concave bases. The differences between the two are in the morphology. Clovis fluting consists of the removal of several flakes whereas Folsom fluting consists of the removal of one long flake covering nearly the entire surface of the point.

Other projectile points that define subsequent Paleo-Indian occupations include: Dalton, San Patrice, and Plainview which similarly all coincide with the terminal Pleistocene-emergent Holocene geologic period. This period was a time of great environmental change (Delcourt and Delcourt, 1981). During the same time as this epic vegetation change, the megafauna were vanishing and the hunter-gathers were adapting to a warmer and more diverse environment. Also during this period, humans began exploiting forest mammals and increasing their reliance on plant foods. A change in lithic technology reflects adaptations for the exploitation of available resources. Scottsbluff, Golodondrina, and Angostura, are examples of

this change with Angostura marking the end of the period (Hester and Turner, 2000). At the end of the period there is great diversification of point types and some groups appear to retain their tool manufacture and settlement patterns (Hester and Turner 2000).

The Archaic period is marked by the start of the Hypsithermal climatic episode. This episode was a period of warmer and drier climates that led to a vegetational shift and as a result of the climatic change; previously exploited larger species became extinct, necessitating the exploitation of smaller mammals such as white-tail deer, rabbits, and squirrels. The Archaic peoples continued with hunting and gathering practices exhibiting changes in the style of projectile points and tools, the distribution of site types, and introduction of grindstone tools and implements. These changes indicate a gradual population increase and greater reliance on abundant plant and animal resources. The Archaic period covers a broad span of prehistory in Texas and is divided into three periods: Early, Middle, and Late. Each period is defined by changes in cultural patterns which include specific artifact forms, methods of hunting, types of sites utilized, and other elements (Hester and Turner, 2000).

Early Archaic dating from 6000 to 2500 B.C. is the least well understood. Settlements during this time appear to be small, dispersed, and highly mobile. Distinctive artifacts include Martindale, Uvalde, Early Triangular, Andice, and Bell or Calf Creek projectile points. The Middle Archaic beginning around 2500 B.C. and up to 1000 B.C. is typified by significant population growth, increased site densities, occurrence of Fary and Kent, Pedernales, Langtry, and Tortugas projectile points, in addition, associated burnt rock middens begin to appear. The Late Archaic dating from 1000 B.C. to A.D. 700 maintains settlement and subsistence patterns of the previous period but is marked by distinctive projectile points such as Ensor, Darl, Frio and Fairland. Diversity is represented regionally with cemeteries more prominent in the southeast; bison kill sites occurring in Central Texas, lower Pecos, the Panhandle, and the South Plains; the emergence of more permanent settlements in east Texas; and the occurrence of many rock art sites particularly in the lower Pecos (Hester and Turner, 2000).

The Late Prehistoric period (A.D. 700 to the historic) is distinguished by the emergence of pottery and the appearance of small arrow points which mark the introduction of the bow and arrow across the region. Bison hunting is popular throughout the state while more sedentary villages, ceremonial centers, and established social hierarchies emerge in some groups such as the Caddoan. Local types of projectile points include Livermore in the Trans-Pecos, Friley and Catahoula on the Texas-Louisiana border, Lott and Garza on the Llano Estacado, and McGloin and Bulbar Stemmed on the coast. Some styles that developed with the use of the bow and arrow include the Scallorn and Perdiz. Late Prehistoric people

also participated in long distance trade as indicated by the presence of obsidian, with some of the obsidian coming from as far as Wyoming, Idaho, and Central Mexico (Hester and Turner, 2000).

3.5.2 Historic Cultural Background

The Historic Period is marked by changes in the native population brought on by Spanish and French expeditions as well as the intrusion of the Apache and later the Comanche. In the Caddo areas there are recognizable changes in the pottery and some prominent projectile point types such as Harrell and Washita. Rock art exhibits the changes that occurred with the inclusion of churches and horse riding Indian warriors or Spaniards. By the late 18th century, chipped stone tools are replaced by worked glass, and brass and iron particularly for arrow points. The historic period was experienced similarly with slight variations by all of the counties in the study area. A summary of each study area county history is provided below.

Bosque County

A number of Native American tribes historically lived in the area, notably the Tonkawa, Waco, and Tawakoni, while the Comanche who resided in neighboring areas, conducted periodic raids. The earliest recorded Spanish expedition to the area occurred in 1721 by Marques de San Miguel de Aguayo who named a tributary of the Brazos River where he camped, Bosque, from which the county was named. Early white settlement began in 1825 with the colonization along the Brazos River. More settlers arrived with the passing of the Texan-Santa Fe expedition in 1841. In 1847 the town of Kimball was established near a good ford of the river in an effort to draw more settlers. The Chisholm Trail crossed the river at this point aiding in the prosperous development of the town until several years later when the railroads came and were built a distance away leading to an eventual decline in the town's population. The county officially formed in 1854 and the county seat established in Meridian. Norwegian immigrants began to move into the area in 1854 and settled around Clifton, Norse, and Cranfills Gap. Although many men from the county served in the military during the Civil War, only a little is known about their contributions to the war. The majority of their services protected the area against Indians. The most significant effect of the Civil War on the area was the slowing of development. Populations began to rise again during Reconstruction, however lawlessness was rampant. The railroads came in the 1880s leading to some prosperity with the addition of manufacturing. However, populations, livestock and crop productions, and manufacturing began to decline after the turn of the century. The Great Depression added to the already prevalent economic downturn which continued into the 40s and 50s. As a result of continued dry years many farms were abandoned. However, manufacturing industries began to rise at

this time increasing employment opportunities after the 1970s (Handbook of Texas Online). There are 53 historic markers and 141 cemeteries recorded in the county (THC, 1995).

Callahan County

The Comanche occupied much of Callahan County and their presence kept white settlement to a minimum until after the Civil War. Despite the Comanche domination, the first recorded white expedition into the area occurred around 1840 and the county officially formed in 1858. The Comanche threat was ended in 1874 after a defeat by United States troops at Palo Duro Canyon followed by their expulsion by a company of Texas Rangers. Most of the early settlers were ranchers and with the Comanche gone, settlements began to emerge. Cattle drives passed through the area drawing even more settlers. Once the railroads came the cattle drives ended but towns and settlements continued to increase with the arrival of more residents by rail. Agriculture was introduced in the 1880s and aided the population growth that continued to rise until the early 20th century. Ranchers and farmers branched out and began raising hogs, sheep, and chickens. As populations increased so did land prices putting ownership out of reach for many newcomers causing many to turn to sharecropping. By the 1930s many of the tenants and owners were deeply in debt and the Great Depression, failing stock market, and a boll weevil outbreak lead to great economic struggles for many. Although many farms were lost at this time, some were sustained and even prospered with the discovery of oil and subsequent boom. Ranching, farming, and oil extraction continue as the primary economic revenues (Handbook of Texas Online). There are 33 historic markers and 21 cemeteries recorded in the county (THC, 1995).

Comanche County

Like Callahan County, Comanche County was occupied by the Comanche until the mid-nineteenth century. In 1854 the first white settlement was organized and the county was formed in 1856. Most of the settlers were ranchers and some farmers. During the time of the Civil War, population decreased due to the lack of military protection from Indian raids. Once the war was over and military presence returned, populations began to grow spurred by the cattle boom. Agriculture also began to aid in the county growth and combined with ranching, the area prospered until the 1930s. The boll weevil outbreak led to the loss of one third of the county's farmers. However, the devastation encouraged the remaining farmers to diversify and that combined with the discovery of oil, helped many survive the outbreak and even lessen some of the effects of the Great Depression. After World War II the introduction of mechanized agriculture led to some population decline. However, oil extraction, ranching, and farming remain the driving economic factors of the county (Handbook of Texas Online). There are 62 historic markers and 50 cemeteries recorded in the county (THC, 1995).

Eastland County

Several Plains Indian groups including the Comanche and Kiowa are known to have visited the area of Eastland County prior to white settlement. However, as white settlement developed, conflicts between the neighboring Indians and whites arose. Blair's Fort was built around 1860 for protection from the Indians but population growth was still very slow, with agricultural development only just beginning. In the early 1870s a company of minutemen formed to protect the settlers. Once the Indian raids ended, settlement increased with agriculture and ranching contributing successfully to the economy. The railroads arrived in 1881 and spurred immigration and the development of commercial farming and trade. The county continued to grow aided by the boom in cotton production until the boll weevil outbreak in the early part of the twentieth century. Although some farms were lost, the economic crisis was offset by the discovery of oil. Oil production began to taper off in the mid twenties, followed by the Great Depression, and then development of mechanized agriculture all led to overall population decline of the county. Oil production, ranching, and agriculture continue to fuel the economy of the county (Handbook of Texas Online). There are 47 historic markers and 48 cemeteries recorded in the county (THC, 1995).

Ellis County

A number of Native American tribes historically hunted in the Ellis County area: Waco, Bidais, Anadarko, and Kickapoo, but the Tonkawa are the only group known to have resided in the area of Ellis County. Spanish missionaries worked with the Tonkawa until they were removed to Oklahoma around 1859. American settlers began arriving around this time, most of them from the southern parts of the United States. Many of these first white settlers brought slaves and farming to the area. Also during this time a number of Czechs, Hungarians, and Germans settled the area. The primary sources of revenue were farming and cattle ranching. A contingent of the county was slave holders and the county generally supported secession and ultimately resented Reconstruction after the Civil War. After the war the county prospered and grew as a result of the railroads and transition from ranching to cotton production. The county remained largely rural and agricultural and was greatly affected by the Great Depression. A downward trend in population and the economy continued until the 1960s when several events occurred that helped turn the county around. Roads were improved, electricity was brought in, and oil was discovered. Economic activities not related to agriculture began to prosper including: manufacturing, oil and gas extraction, transportation, and public utilities. By the end of the twentieth century the county was more economically diversified (Handbook of Texas Online). There are 116 historic markers and 176 cemeteries recorded in the county (THC, 1995).

Erath County

The earliest white settlement of Erath County began in 1854 with county formation in 1856. Most of the early settlers were from southern states. Development of the county was hindered by Indian raids until the 1870s when the Comanche were removed. Farming was the major economy with cotton the primary revenue source. Diversification in farming practices was implemented after the boll weevil infestation. Beginning in the late 19th century, mining and manufacturing began to supplant the county's economy. Several factors led to the decline in the county population after 1910. The first was the loss of cotton production, second was the conversion of railroads from coal to oil which left the mining industry reeling, followed by the consolidation of smaller farms and subsequent conversion to ranches. There are 72 historic markers and 181 cemeteries recorded in the county (THC, 1995).

Fisher County

Historic cultures residing in Fisher County included the Lipan Apache in the 1500s; followed by the Comanches and Kiowas; and the Pawnee, Wichita, and Wacos who hunted in the area. Several expeditions traversed the county including Francisco Vazquez de Coronado in 1541, Jose Mares in 1788, Robert B. Marcy in 1847 and Robert E. Lee in 1856. Buffalo hunters traveled through the county in the early 1870s. Once the county officially formed in 1876 the first permanent settlers arrived, many as ranchers. Railroads came in 1881 bringing more settlers, many of whom took up farming. The first farms provided subsistence crops but by the 1910s wheat and cotton dominated production. Cotton production boomed until the 1930s when falling prices, droughts, and boll weevil outbreaks drastically affected the market. As populations increased so did land prices, putting ownership out of reach for many newcomers and causing many to turn to sharecropping. The Great Depression, failing stock markets, and the boll weevil outbreak lead to great economic struggles for many. Although many farms were lost at this time, some were sustained and even prospered with the discovery of oil and subsequent boom. Ranching, farming, mining, and oil extraction continue as economic revenues (Handbook of Texas Online). There are 17 historic markers and 17 cemeteries recorded in the county (THC, 1995).

Freestone County

A number of native groups resided or hunted in Freestone County prior to white settlement, including the Caddo, Kichai, and Tawakoni. Although the Spanish were familiar with the local tribes the French were more so and they often traded with the historic groups. The Mexican Government opened Texas to colonization but few white settlers arrived until the Indian Treaty of 1843. The county was organized in 1851 and by 1860 an agricultural economy supported by a largely slave population was developing. The county suffered losses during the Civil War and from the effects of Reconstruction but showed growth

within ten years after the war. Railroads helped spur the growth and cotton production began to rise. All areas of agriculture and ranching flourished until the 1920s. The economy slowed during the Great Depression but showed gains with oil and gas extraction industries (Handbook of Texas Online). There are 71 historic markers and 227 cemeteries recorded in the county (THC, 1995).

Hamilton County

It is unclear which tribes inhabited Hamilton County; however there is evidence that suggests that the Tawakoni, Waco, Tonkawa, and Comanche all at least hunted or visited the area. The first white settlers arrived by 1854 and the county was marked off by 1856. These early settlements were primarily ranches and farms. Although the county continued to grow, great increases were not seen until after the 1870s when the threat of Indian raids was reduced. The Chisholm Trail ran through the county, used by many ranchers driving their herds to market. Ranching and farming continued to spur growth which was also supported by the arrival of the railroads. The economy began to suffer just before the Great Depression and continued to affect population numbers as well as revenues until the 1970s when numbers began to rise (Handbook of Texas Online). There are 45 historic markers and 54 cemeteries recorded in the county (THC, 1995).

Hill County

Early historic occupants of Hill County date back to 1300. Later groups such as the Waco and Tawakoni occupied the area. The first European expedition into the area was by Pedro Vial in 1786. In 1801, Philip Nolan established a camp in the county only to be killed by the Spanish when he refused their entreaty to leave. Land disputes in the 1820s between Stephen F. Austin and Sterling Robertson kept the area in turmoil for years and kept many from wanting to settle in the area, as well as preventing peace efforts with the Indians. Military outposts were established to ward off raids and protect the settlers. The county was officially formed in 1853. County population continued to increase with the addition of farms and ranches. The Chisholm Trail passed through the county and populations continued to increase. Railroads arrived in 1881 bringing even more settlers, particularly immigrants from Germany and Eastern Europe. As with many other counties in the area, cotton became an important crop around the turn of the century, only to fail from impacts of the Great Depression and boll weevil infestations. The economic declines led to an increase in tenant farming. Manufacturing started a slow steady decline in the early twentieth century that continued until mid-century (Handbook of Texas Online). There are 108 historic markers and 109 cemeteries recorded in the county (THC, 1995).

Hood County

Hood County was occupied during the early historic period by the Comanche, Lipan Apache, and Kiowa groups. Settlers from the east first began arriving in the 1840s. The threat of Comanche raids kept population numbers low until the 1870s. The population grew steadily for 30 years as ranchers and farmers arrived. The main crops were cotton, corn, and oats. Population numbers began to fall after 1910 and continued along with the number of farms and livestock until the 1950s. Spurred by the development of Lake Granbury, the county population tripled between 1960 and 1980. The county became a popular resort and recreation area. There are 76 historic markers and 49 cemeteries recorded in the county (THC, 1995).

Johnson County

Many groups including the Tonkawa, Kickapoo, Anadarko, Caddo, and Waco are known to have hunted in the area of Johnson County; however none are believed to have lived here. Although several expeditions passed through the area (Moscoso in 1542, Pedro Vial in 1788, and Philip Nolan in 1820) none of them formed permanent settlements. The earliest recorded settlement was in 1849 and the county was formed in 1854. An Indian conflict led by the Caddo arose in 1851 forcing many settlers to abandon their homes. By the 1860 census the county population had expanded from 700 in 1854 to 4,305. The county fully supported secession and all who were able participated in the war effort. The county grew considerably after Reconstruction. The county was historically based on agriculture suffered many of the same effects of a boll weevil outbreak, dust bowls, and share cropping as other counties. The railroads brought additional economic support. In the latter part of the 20th century the county became increasingly associated economically with the neighboring Dallas-Fort Worth metropolitan area (Handbook of Texas Online). There are 69 historic markers and 163 cemeteries recorded in the county (THC, 1995).

Jones County

A number of native groups resided or hunted in Jones County prior to white settlement, including the Comanche, Kiowa, Tonkawa, Caddo, and Delaware. Many of these groups hunted the bison that roamed the area. The earliest white settlement formed in 1851 as one of the military outposts protecting the frontier. The Butterfield Overland Mail route had a station at the settlement after it was abandoned. The military presence was withdrawn during the Civil War and Indian raids increased, keeping settlement down. After the war the military returned and white settlement began to increase. The Indians were eventually moved off to reservations and buffalo hunters came in, ultimately wiping out most of the buffalo population. White settlement began to increase initially as large open range ranches, and later as smaller farms and ranches. The railroads arrived spurring the beginning of small towns. Crops were

introduced consisting of mostly cotton, sorghum, and wheat, with cotton becoming the dominant crop. As in other counties tenant farming also increased. Oil was discovered and helped offset some of the effects of the Great Depression. Agriculture and manufacturing prevail as the primary revenue source through the 20th century (Handbook of Texas Online). There are 29 historic markers and 72 cemeteries recorded in the county (THC, 1995).

Limestone County

A number of Native American tribes historically lived in the Limestone County area, notably the Tonkawa, Waco, and Tawakoni, while the Comanche and Apache, who resided in neighboring areas, conducted periodic raids. The area witnessed a struggle between the Mexican government and American settlers on colonization efforts; other struggles ensued between settlers and Indian raiders. Further settlement was postponed until an Indian Treaty was signed in 1844. The earliest settlers were farmers and development progressed slowly. The county was organized in 1846. New roads and a stage line brought more settlers and populations increased. The county supported secession and opposed Reconstruction. Racial tensions flared and martial law was declared for a time. The railroads arrived bringing more settlers and development. A number of private and public schools were established by the 1880s. Discovery of gas and oil brought in more residents and population numbers continued to grow. The county suffered during the Great Depression, losing many residents, farms, and businesses. Depression Era Relief programs alleviated some effects, but populations continued to decline into the 1970s. By the 1980s retail trade was the largest employment sector (Handbook of Texas Online). There are 87 historic markers and 95 cemeteries recorded in the county (THC, 1995).

McLennan County

Historic native groups found in the McLennan County area include the Tonkawa, Wichita, Waco, and by the 1800s some Caddo and Delaware. Several expeditions passed through the area (Athanase de Mézières in 1779 and Pedro Vial in 1786) and the area was part of a colonization grant from the Mexican Government in 1825, but due to Indian threats, few permanent settlements were established until after Texas was annexed by the United States. The county was formed in 1850. Many of the earliest settlers came from other parts of Texas and other southern states and were Americans of English, Scottish, or Irish descent; and after the Civil War German and Czech immigrants arrived. By the time of the Civil War farming and ranching were the primary economic revenue sources. Although the county voted for secession, it remained divided over the issue long into the Reconstruction period. The county suffered economically after the war but was able to rebound as transportation improvements allowed Waco to become a major trading center. Cotton became the principal force of the agricultural economy but Waco,

supported by the industrialization that occurred in larger cities and diversification that it brings, continued to dominate the county in population and economic revenues (Handbook of Texas Online). There are 211 historic markers and 19 cemeteries recorded in the county (THC, 1995).

Mitchell County

Several Spanish expeditions passed through Mitchell County: Juan de Salas in 1629 and 1632, Hernán Martin and Diego Del Castillo in 1650, and Diego de Guadalajar in 1654. The Comanche took up residence around 1750 and stayed until they were moved to reservations in 1875. The county was formed in 1876 and with the Indians relocated, settlers began to move in and the county was officially organized in 1881. Cattle ranchers were the first to settle followed by merchants and traders in preparation for the arrival of the railroads. Ranching and the cattle trade boomed until the late 19th century when drought and hard winters caused many to lose their livestock. Agriculture was introduced, particularly cotton and sorghum, and as in other areas, cotton was the dominant crop. By the time of the Great Depression many had turned to tenant farming and the droughts and federal regulations caused many to suffer economically. The population began to drop but discovery of oil helped offset some of the effects of the Depression. Mechanized agriculture and consolidation of farms aided in the population decline. Oil extraction, ranching, and agriculture remain large revenue sources for the county (Handbook of Texas Online). There are 42 historic markers and 33 cemeteries recorded in the county (THC, 1995).

Navarro County

A number of native groups lived in Navarro County during historic times including the Ione, Kickapoo, and Comanche. The county was part of a Mexican land grant issued in 1834. In 1838 the Battle Creek fight between a surveying party and some Kickapoo was fought near the town of Dawson. More settlers arrived in 1839 and the county was formed in 1846. The population continued to increase though the time of the Civil War and into the Reconstruction period. Farming was the main revenue source and then oil when it was discovered near the end of the 19th century. The railroads came, spurring growth and development and bringing manufacturing industries. The county was supported during the Great Depression with several projects from President Roosevelt's Depression Era work relief programs. Manufacturing, oil and gas extraction, farming and agriculture support much of the county economy (Handbook of Texas Online). There are 149 historic markers and 143 cemeteries recorded in the county (THC, 1995).

Nolan County

The first white settlers to Nolan County were buffalo hunters arriving after the Civil War. The county was formed in 1876. As the county grew, the principal economic focus was ranching followed by

agriculture. The county officially organized in 1881, the same year the railroads arrived. With the railroads, more settlers arrived. By the turn of the century farming took over as the primary economic source. The trend continued with cotton dominating until the 1930s. As in other counties, Nolan County was hit hard by the Great Depression and population numbers began to drop. The local economy revived after World War II and farms began to consolidate and mechanize. Cotton remained the primary agricultural crop. Although oil was discovered in the 1930s it had little impact on the local economy until mid-century when production began to boom. Farming, ranching, oil and gas extraction, and mining continue as the main revenue sources (Handbook of Texas Online). There are 21 historic markers and 13 cemeteries recorded in the county (THC, 1995).

Palo Pinto County

A number of native groups lived in Palo Pinto County during historic times including the Delaware, Shawnee, Tonkawa, Wichita, and Caddo as well as Comanche and Kiowa who hunted in the area. The first white man in the area is believed to have been William A. A. (Bigfoot) Wallace around 1837. After Wallace, a number of settlers began establishing ranches in the area. As more white settlers arrived, skirmishes and hostility began to rise between the natives and settlers. The tribes were eventually moved to reservations in Oklahoma and more settlers moved in. Populations increased with efforts focused on ranching and farming. Ranching remained the primary economic revenue source well into the 1880s; at this time cotton began to emerge as an important cash crop. The two helped spur growth and development in the county; with the arrival of the railroad the number of farms and ranches tripled by 1910. Most of the new residents were white Americans however many European immigrants also settled in the area. Cotton production continued to expand and tenancy rates also rose. Infestation of cotton crops in the 1920s forced many farmers to diversify their efforts. Oil production also helped diversify the local economy. These combined efforts helped offset some effects of the Great Depression. The development of several lakes and parks in the county has created a tourist industry in more recent times (Handbook of Texas Online). There are 54 historic markers and 41 cemeteries recorded in the county (THC, 1995).

Scurry County

There is evidence of native populations as early as 1000 B.C. in Scurry County. Historically, the county was occupied by the Apache until around 1800 when Comanche moved in and created a war trail to Old Mexico across the county. The tribes were defeated in 1874 during the Red River War, after which white settlement began to creep in. Francisco Vázquez de Coronado visited the area in the sixteenth century during an expedition. However, the earliest white settlers were buffalo hunters in the 1870s who

ultimately wiped out the herds. The next wave of settlement consisted of ranchers setting up large open range ranches. These first settlements began in the late 1870s, but within 20 years smaller farms and ranches were popping up. Population increases from farms and ranches combined with the arrival of the railroad spurred the beginning of small towns. Crops were introduced consisting of mostly cotton, corn, and wheat. A great deal of ranch land was plowed up to accommodate the growing agricultural industry. By the 1930s farms replaced ranches, increasing the need for railroads and improved roads. Agricultural revenue sources dropped along with population numbers during the Great Depression. Although many farms were lost at this time, some were sustained and even prospered with the discovery of oil. New oil wells beginning production in the 1940s altered the economy, fully reversing many effects of the Great Depression. For the most part oil prevailed as the primary revenue source through the 20th century (Handbook of Texas Online). There are 62 historic markers and ten cemeteries recorded in the county (THC, 1995).

Shackelford County

Shackelford County was occupied historically by the Athabascan Apache until they were driven out by the Comanche in the late nineteenth century. José Mares may have entered what is now a portion of Shackelford County during an expedition in 1788. When the War Department began to build forts along the frontier the first settlers began to arrive in the county. Ranchers and farmers began to move in and communities and trading posts began to spring up to supply soldiers, hunters, and cattle drivers. The county was officially formed in 1874. Railroads followed by better roads continued to support growth of the county. Farming, ranching, and oil production have been the primary sources of revenue (Handbook of Texas Online). There are 38 historic markers and nine cemeteries recorded in the county (THC, 1995).

Somervell County

There is well preserved evidence that dinosaurs once resided in the area of Somervell County. In more modern times, historic native groups that occupied the area included the Caddo, Tonkawa, and later Apache and Comanche hunters. The earliest evidence of white settlement is an Indian trading post established in the 1840s by brothers Charles and George Barnard. The Barnards built a mill in 1860 that still stands in Glen Rose and is listed on the NRHP. The County was established in 1875. The county was largely agricultural until the Great Depression when New Deal programs provided funds for new projects that ultimately led to a more diversified economy. After World War II agriculture production dropped while industry and manufacturing began to rise. Close proximity to the large metropolitan Dallas-Fort Worth area helped spur industrial development through the twentieth century (Handbook of Texas Online). There are 21 historic markers and 26 cemeteries recorded in the county (THC, 1995).

Stephens County

The notable groups to occupy Stephens County prior to white settlement were the Tonkawa, Comanche, and Kiowa. The earliest white settlers arrived in the 1850s and the county was established in 1858. Skirmishes with some of the Indians persisted until the 1870s when most were removed to reservations in Oklahoma. Initial settlements primarily focused on ranching, however, a coal mine was established in 1878 and crop farming was soon to add to the county's economic resources. The railroads came and encouraged more farming and settlement. Cotton emerged as the dominant crop by the end of the nineteenth century. But by 1910 farmers were diversifying their crops due in part to boll weevil infestations. The oil boom that started in the 1920s helped the county through the Great Depression. Population numbers began to fall in the 1940s and except for the oil boom of the 1970s, continued to decline until the end of the twentieth century. Oil has remained an important economic factor to the county (Handbook of Texas Online). There are 19 historic markers and 121 cemeteries recorded in the county (THC, 1995).

Taylor County

Historically, the Comanche occupied the Taylor County area until their defeat in 1874 during the Red River War. After the Comanche were removed white settlement began to creep in. The earliest whites in the area were buffalo hunters who ultimately wiped out the herds. The next wave of settlement consisted of ranchers setting up large open range ranches. These first settlements began in the late 1870s, and the county was organized in 1878. Within 20 years smaller farms and ranches were popping up. Population increases from farms and ranches, combined with the arrival of the railroad, spurred the beginning of small towns. Crops were introduced consisting of mostly cotton, corn, and wheat. A great deal of ranch land was plowed up to accommodate the growing agricultural industry. By the 1930s farms replaced ranches, increasing the need for railroads and improved roads. Agricultural revenue sources dropped along with population numbers during the Great Depression. Many farms were lost at this time. Although oil was discovered earlier, the county did not begin to prosper from it until the 1940s. Farming and ranching are still important economic sources but the push for industrialization helped bring the county through the twentieth century (Handbook of Texas Online). There are 74 historic markers and 26 cemeteries recorded in the county (THC, 1995).

3.5.3 Records Search

In an effort to identify known cultural resources that could be affected by this project, an on-line search of the THC Texas Atlas was conducted by Burns & McDonnell archaeologists in September 2009 and was followed up by file search at the Texas Archaeological Research Laboratory. The search also included

state archaeological landmarks (SAL), historical markers, NRHP properties, cemeteries, military sites, shipwrecks, sawmills, and bridges. In addition, a search of the National Park Service (NPS) NRHP database was conducted.

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4.0 IDENTIFICATION OF PRELIMINARY ALTERNATIVE ROUTES

After completion of the data gathering and constraint mapping process, Burns & McDonnell identified preliminary alternative routes that would connect the Central A, Central C, Sam Switch, and Navarro Substations as previously described in Section 2.4.

Based on the findings of the various ground surveys and the various data collection activities, and utilizing the environmental and land use constraints map and property boundary maps, the Burns & McDonnell Project Manager and Assistant Project Manager identified preliminary alternative routes on aerial photography (NAIP flown in 2008 and SAM, Inc. flown in 2009). The property boundary maps that were utilized to locate apparent property boundaries consisted of the various county appraisal districts, map sources purchased from a private title company, and other sources as supplied to Burns & McDonnell by JS Land Services, Inc. and Contract Land Staff LLC (third party land information companies). Burns & McDonnell obtained digital gas pipeline data and oil/gas well data from the GIS of the RCT. The digital gas pipeline data and the oil/gas well data were intended for the internal use of the RCT and therefore, the RCT makes no claim as to its accuracy or completeness. Burns & McDonnell used the RCT data as a resource to identify potential compatible pipeline corridors (that could be paralleled by potential preliminary alternative routes) as well as to identify the location of oil and gas wells (to be avoided by potential preliminary alternative routes). Where possible, Burns & McDonnell verified the location of certain pipelines and oil/gas wells by reviewing the aerial photography and inspection during the various reconnaissance surveys, but did not alter the digital pipeline data as received from the RCT and shown on the environmental and land use constraints map.

In addition, Burns & McDonnell also received data from the TPWD regarding documented occurrences of state and federally listed threatened or endangered species or their habitat as well as documented occurrences of environmentally sensitive areas (i.e. native grasslands). These areas are identified as "Environmentally Sensitive Areas" on Figure 3-2 and Figures 3-2A through 3-2F. According to TPWD personnel, the documented occurrences have been mapped by TPWD based on historic records, verbal descriptions, and other various means, and therefore, these areas are not exact boundaries and are not considered to be completely accurate. Burns & McDonnell utilized this data for informational purposes and to supplement the more detailed helicopter surveys that were conducted to identify potential environmentally sensitive areas along the alternative routes.

Based on the data obtained, Burns & McDonnell identified preliminary route links that, when combined in different arrangements, would form a continuous route to connect the four substations. Each route link begins and ends at intersections with other route links.

Burns & McDonnell evaluated multiple route links between the Central A and Central C Substation; between the Central C and Sam Switch Substations; and between the Sam Switch and Navarro Substations. The preliminary alternative routes developed by Burns & McDonnell can generally be grouped by their geographic location (i.e. northern routes, north-central routes, south-central routes, and southern routes). In addition to the general groupings, Burns & McDonnell also developed several route links that would connect the alternative routes. Figure 4-1 depicts the location of all preliminary alternative routes considered. Figure 4-2 depicts the preliminary alternative routes that were presented at the open-house meetings. Following is a description of the identification of the preliminary alternative routes.

4.1 CENTRAL A TO CENTRAL C

There are generally three preliminary alternative routes between the Central A and Central C Substations: northern, central, and southern; with a few interconnecting route links that allow for different combinations of portions of these routes.

The northern alternative route (Links A and G) leaves the Central A Substation heading to the east and northeast generally parallel to roads and apparent property boundaries. About ten miles northeast of Central A, the northern route turns more generally to the east, paralleling U.S. Highway 180 in various places, detouring from the highway along county roads and apparent property boundaries to avoid the towns of Roby and Anson. About 2.5 miles south of Lueders, the northern route turns south along apparent property boundaries to the Central C Substation. A variation of the northern route would follow Link H along apparent property boundaries to connect to the central route.

The central alternative route (Links B, E, I, and J) heads generally east from the Central A site primarily parallel to county roads and apparent property boundaries. Just inside Jones County, the route "stair-steps" along apparent property boundaries to the south several miles, avoiding the town of Hawley, to the Central C site.

A variation on this central route would follow Link K to connect with Link L, a portion of the southern route that runs south of Fort Phantom Hill Lake on the north side of Abilene and then parallels an existing Oncor 345 kV transmission line northeast to the Central C site.

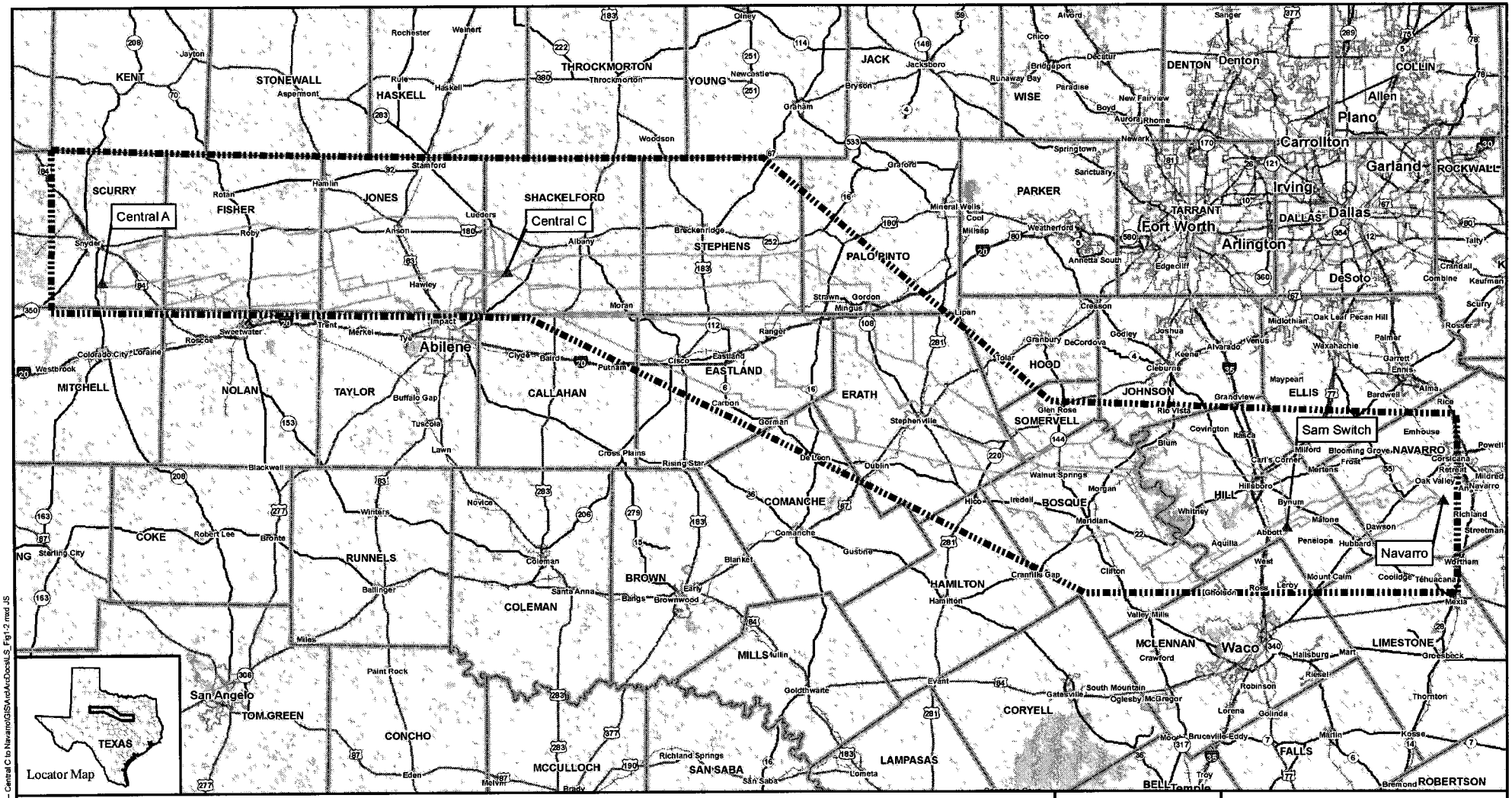

Figure 4-1
Preliminary Alternative Routes
Central A to Central C to
Sam Switch to Navarro
345 kV Transmission Line Project

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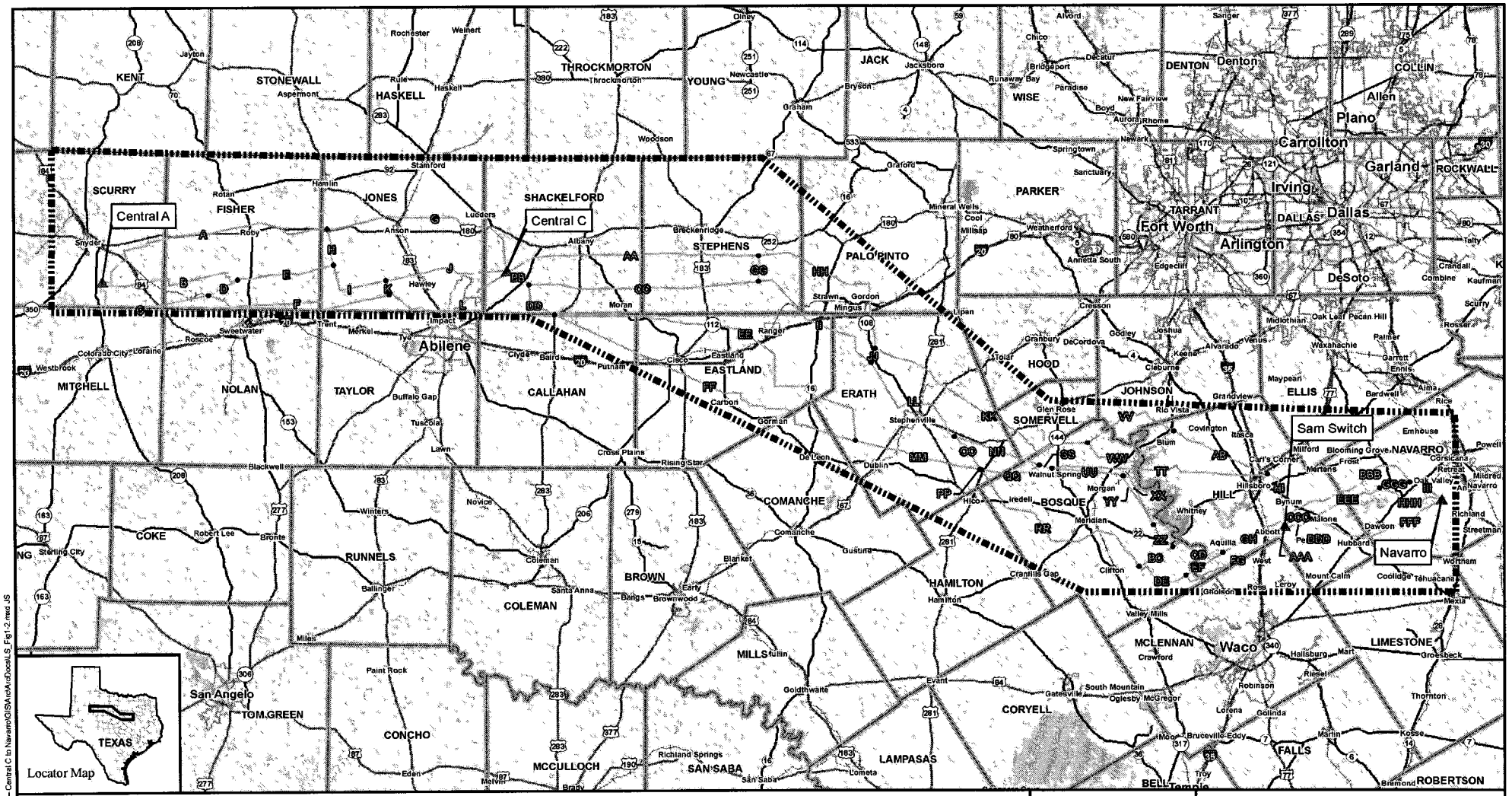

Figure 4-2
Preliminary Alternative Routes
Presented at the Open House Meetings
Central A to Central C to
Sam Switch to Navarro
345 kV Transmission Line Project

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The southern alternative route (Links C, F, and L) heads south from the Central A site parallel to an existing Oncor 138 kV transmission line and county roads to reach another existing Oncor 138 kV transmission line that heads east. The southern route parallels this existing line to the east for approximately seven miles where an Oncor 345 kV transmission line joins the 138 kV line along its south side. The southern route parallels this existing 138/345 kV transmission corridor for an additional 13 miles, then turns to the southeast along a BNSF railroad for approximately five miles. The southern route then turns east again, occasionally following apparent property boundaries to reach an existing Oncor double-circuit 345 kV transmission line that runs along the north side of Abilene and south of Fort Phantom Hill Lake. The southern route parallels this existing transmission line for approximately 18 miles to the east and then northeast to the Central C site, deviating from the existing transmission line to the south in two locations to avoid homes and businesses located on both sides of the existing transmission line. A variation on this alternative would use Link D, which continues to follow the existing Oncor 138/345 kV transmission line corridor to the northeast from Link C to connect to the central route, which it would then follow to the Central C site. The southern route maximizes the paralleling of existing transmission lines in Scurry, Fisher, and Jones counties.

4.2 CENTRAL C TO SAM SWITCH

The preliminary alternative routes identified between the Central C Substation and the Sam Switch Substation have been grouped into the northern, north-central, south-central, and southern alternative routes, in addition to a number of connector links.

The northern alternative routes (Links AA, HH, KK, WW, VV, AB, and HI) exit the Central C Substation site generally along the existing Oncor 345 kV transmission line that runs northeast. After about 2.5 miles, the northern routes turn east primarily along apparent property boundaries, avoiding development in and around the town of Albany and the town of Breckenridge. Just before entering Palo Pinto County, the northern routes turn southeast along an existing Enbridge Gathering (North Texas) LP pipeline corridor for about 12.5 miles. The northern alternative routes then turn east to an existing Brazos Electric Power Cooperative 138 kV transmission line, which it parallels to the south for approximately 13.5 miles into Erath County. The northern alternative routes then turn away from the existing transmission line to the southeast, paralleling apparent property boundaries where possible. The northern alternative routes follow a portion of the southern Somervell County line, and then turn to the northeast to avoid crossing Whitney Lake. Two options were developed for crossing the Brazos River, which feeds Whitney Lake. One option would use Link WW, which crosses the river parallel to a BNSF railroad. This route link would cross some USACE-owned land. The other option (Link VV) would cross the river further north,

and north of USACE-owned lands, paralleling apparent property boundaries where possible. Both options eventually meet and parallel an existing Energy Transfer Company natural gas pipeline corridor for approximately 23-28 miles, deviating in a few places to avoid homes located close to the pipeline. The northern alternative routes then turn south parallel to an existing Oncor double-circuit 345 kV transmission line for about nine miles to the Sam Switch Substation site. Several variations to the northern alternative routes were also developed. Link GG and Link JJ would connect the northern and north-central alternative routes.

The north-central alternative routes (Links BB, CC, II, LL, NN, OO, PP, QQ, SS, TT, and HI) head to the south and east from the Central C Substation site, then turn more directly east parallel to apparent property boundaries and several county roads into central Stephens County. At this point, the north-central routes turn southeast to eventually parallel an existing Sunoco Pipeline LP crude oil pipeline that also heads southeast. After paralleling the pipeline, the north-central routes head south and east along apparent property boundaries to reach a Brazos Electric Power Cooperative 138 kV transmission line, which it then parallels to the southeast for about ten miles, then deviates primarily along apparent property boundaries to the north around the town of Stephenville. On the east side of Stephenville, the north-central routes either parallel an existing Oncor 138 kV transmission line for approximately 18 miles, heading east/southeast along Link NN, or continue southeast along apparent property boundaries to the Sunoco Pipeline LP crude oil pipeline corridor, which it would then parallel to the east to join Link NN along the existing Oncor 138 kV transmission line (Links OO, PP, and QQ). At this point, the north-central routes would continue heading east parallel to a pipeline corridor containing a Magellan Pipeline Company, LP gasoline/jet fuel/diesel pipeline and an LDH Energy Pipeline LP natural gas liquids pipeline. Approximately 41 miles of this pipeline corridor would be paralleled by the north-central alternative routes, with several deviations to avoid clusters of residential and commercial development along the pipeline, as well as a private airstrip located just north of the pipeline. At this point, the north-central routes would intersect with the pipeline corridor followed by the northern routes (containing a Sunoco Pipeline LP crude oil pipeline and an Energy Transfer Company natural gas pipeline). The north-central routes would continue along the same alignment as the northern routes at this point and would follow the pipeline for about two miles, and then parallel Oncor's existing double-circuit 345 kV transmission line south to the Sam Switch site. A variation to the north-central routes uses Links OO and PP to connect the north-central routes with the southern alternative routes (Link RR). Link SS also connects the north-central and south-central alternative routes.

The south-central alternative routes (Links BB, DD, EE, MM, PP, QQ, SS, UU, XX, ZZ, CD, and GH), similar to the north-central routes, extend from the Central C site to the south and east. These routes continue further south parallel to the existing Sunoco Pipeline LP crude oil pipeline to the southeast and then an Atmos Energy pipeline to the east, generally along the Shackelford / Callahan county line. The pipeline corridor widens in Eastland County and turns to the southeast. In this area, additional pipelines in the corridor include Enbridge Gathering (North Texas) LP natural gas pipelines and smaller diameter gasoline / jet fuel / diesel fuel pipelines owned by Alon USA, LP. The south-central routes deviate from these pipelines north of the town of Eastland, turning southeast between the cities of Eastland and Ranger, and then parallel apparent property boundaries south to another gas pipeline corridor that includes large-diameter natural gas pipelines owned by Atmos Energy and Enterprise Products Operating LP. The south-central routes parallel these pipelines east about seven miles, then parallel an existing Oncor 138 kV transmission line for another eight miles before turning south, along apparent property boundaries, to meet and parallel another corridor of pipelines to the southeast. This pipeline corridor contains gasoline / jet fuel / diesel lines owned by Magellan Pipeline Company and natural gas pipelines owned by LDH Energy Pipeline LP. The south-central routes parallel this pipeline corridor to the east/southeast for approximately 34 miles, with several deviations to avoid residences along the pipeline and a private airstrip just north of the pipeline in Erath County. The south-central alternative routes turn from the pipeline shortly before it intersects with Oncor's existing 138 kV transmission line to avoid the Flat Top Ranch airstrip. The south-central routes parallel the existing Oncor transmission line to the north of the airstrip and north of Walnut Springs, continuing to the east parallel to the existing transmission line for approximately 17 miles and then turning to the southeast to continue paralleling the existing Oncor transmission line for another 16 miles on the east side of Whitney Lake. The existing transmission line and the south-central routes cross a small portion of USACE-owned land that extends west from Whitney Lake. South of Whitney Lake, the south-central routes would then parallel another existing Oncor 138 kV transmission line (that is also parallel to an existing 345 kV transmission line) southeast for approximately 5.5 miles. From this point, the south-central routes follow apparent property boundaries and county roads to the northeast to the Sam Switch site. Link YY was identified to connect the south-central routes to the north-central and southern alternative routes and to avoid USACE-owned land.

The southern alternative routes (Links BB, DD, FF, MM, PP, RR, DE, and FG) exit the Central C Substation site to the south and east. Where the south-central routes turn east, the southern routes continue to the southeast parallel to the Sunoco Pipeline LP crude oil pipeline corridor for approximately 41 miles. In southern Eastland County, the southern routes deviate from the pipeline near the town of Carbon to parallel apparent property boundaries and roads to avoid cropland and residences along the

pipeline. The southern routes continue paralleling apparent property boundaries and roads in Comanche County, avoiding the Quahadi Ranch Airstrip (also known as the Meregrass Airstrip). In Erath County, the southern routes parallel the pipeline corridor containing large-diameter pipelines operated by Magellan Pipeline Company LP and LDH Energy Pipeline LP, similar to the south-central routes for approximately 24 miles, then turn southeast along Link RR, paralleling apparent property boundaries and county roads between the towns of Hico and Iredell before turning east to extend between the towns of Meridian and Clifton. The southern routes then turn to the south for about four miles to the east of Clifton, along county roads and apparent property boundaries. The southern routes continue south for approximately eight miles south of Farm Road 708, then turn to the northeast, following apparent property boundaries (to the extent practicable) until it meets the existing Oncor double-circuit 345 kV transmission line, which it follows north to the Sam Switch site.

4.3 SAM SWITCH TO NAVARRO

There are generally three preliminary alternative routes between the Sam Switch and Navarro Substations: northern, central, and southern routes.

The northern route (Links AAA, BBB, and III) heads north from the Sam Switch site parallel to an existing Oncor double-circuit 345 kV transmission line for about two miles, then turns to the northeast following apparent property boundaries where feasible. The northern route continues to the east/northeast for about 25 miles until it reaches an existing Oncor double-circuit 345 kV transmission line that runs to the southeast towards the Navarro Substation site. The northern route parallels this existing transmission line to the southeast for about 1.5 miles, and then deviates from the existing transmission line to avoid a cluster of homes along Farm Road 744. About one mile south of Farm Road 744, the northern route returns to paralleling the existing transmission line southeast for approximately 6.5 miles to the Navarro Substation site.

The central alternative route (Links AAA, CCC, EEE, and HHH) heads north for a short distance parallel to the existing Oncor double-circuit 345 kV transmission line, then northeast along apparent property boundaries to an existing Oncor 138 kV transmission line. The central route parallels this existing transmission line to the southeast for approximately two miles before turning again to the northeast along apparent property boundaries and county roads, where practicable, for another 15 miles, running north of Navarro Mills Lake. The central alternative route turns to the southeast parallel to an existing Brazos Electric Power Cooperative 69 kV transmission line for about 3.5 miles, then turns south from the existing transmission line, following apparent property boundaries where possible to the Navarro Substation site. Link GGG was identified to connect the central and northern alternative routes.

The southern route (Links DDD and FFF) heads slightly south from the Sam Switch site parallel to the Oncor double-circuit 345 kV transmission line, then heads generally northeast parallel to county roads to an existing Oncor 138 kV transmission line. The southern route then parallels the 138 kV transmission line to the southeast, deviates slightly from the existing transmission line to avoid development in the northern portion of the town of Hubbard, then meets and parallels another existing 138 kV transmission line to the northeast. The southern route parallels this existing transmission line for about 12 miles, and then deviates to the north to avoid residences located along the existing transmission line on Ranch Road 709. After deviating from the existing transmission line, the route follows apparent property boundaries where possible to the Navarro Substation site.

After developing the preliminary alternative routes described above, the routes were then presented at eight public open-house meetings, as further discussed in Chapter 5.0. A total of 12 route links were presented for the Central A to Central C segment of the project, 34 route links were presented for the Central C to Sam Switch segment of the project, and nine route links were presented for the Sam Switch to Navarro segment of the project. Figure 4-2 depicts the preliminary alternative routes that were presented at the public open-house meetings. However, after the public open-house meetings, based on the input and comments received from the meeting attendees, Burns & McDonnell made modifications to portions of a number of route links and added several new route links. Chapter 6.0 provides a detailed description of the adjustments to the preliminary alternative routes that were made as well as the new route links that were added following the public open-house meetings. Section 6.0 also provides a description of the final primary alternative routes.

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5.0 RESULTS OF THE PUBLIC INVOLVEMENT PROGRAM

To provide landowners and communities in the area with information about the project and gather public input on route alternatives and community values, Lone Star held eight open-house meetings in October 2009. Open-house notices were published in the local papers and nearly 4,500 notices were mailed to landowners within 500 feet of all route links.

The open-house meetings included displays with information on project need, engineering, and route alternatives. Representatives from Lone Star, Burns & McDonnell, JS Land Services, Inc., Contract Land Staff LLC, and Electrical Consultants Inc. were present to address the public's questions and take comments. Preliminary route links developed for the proposed transmission line were depicted on 2009 aerial photographs. Photographs and drawings showing the type of structure proposed to be used for the project were displayed.

Participants at the open-house meetings received a written questionnaire to communicate their opinions of the routing criteria, the route link locations and issues of concern regarding the project. Appendix B contains samples of the various handouts provided at each open-house meeting.

A total of 1,116 people signed in as attending the eight public open-house meetings throughout the project area: 143 in Roby, Texas; 187 in Hawley, Texas; 68 in Albany, Texas; 79 in Breckenridge, Texas; 106 in Ranger, Texas; 182 in Stephenville, Texas; 130 in Meridian, Texas; and 221 in Hillsboro, Texas. Of the people attending the open-house meetings, 35 submitted questionnaire responses at the Roby open-house; 22 submitted questionnaire responses at the Hawley meeting; no one submitted a questionnaire response at the Albany meeting; 18 submitted questionnaire responses at the Breckenridge open-house; eight submitted questionnaire responses at the Ranger meeting; 32 submitted questionnaire responses in Stephenville; 19 submitted questionnaire responses at the Meridian meeting; and 19 submitted questionnaire responses at the Hillsboro meeting. An additional 232 questionnaire responses were mailed in following the open-house meetings. A number of respondents also sent in letters, sometimes in addition to a questionnaire response, addressing their concerns with the project.

Results of the questionnaire responses received from attendees both during and after the open-house meetings show the following:

- 57% of the people thought the need for the project was adequately explained,
- 61% of the respondents thought the explanation of the need was helpful, and
- 75% of the respondents found that the open-house meetings were helpful.

When asked what additional information would have been helpful for their understanding of the need, the most commonly mentioned suggestions included:

- a desire for additional communication from Lone Star representatives at the meeting,
- a detailed map of the proposed routes,
- improved notification of the open-house meetings, and
- a concern for proximity to residences.

The questionnaire asked people to review the constraint maps shown at the open-house meetings and provide additional information on other constraints that were not shown on the maps. Fifty-three percent of respondents considered the features shown on the maps to be accurately depicted and 54% of the respondents answered yes when asked if they knew of constraints either not shown or incorrectly located on the maps. When asked to mark these sites on the maps, some respondents marked them on the maps, but many more respondents simply described the sites on their questionnaires. Most comments were related to the location of homes, stock tanks, wells, irrigation systems, historic sites, communication towers, airstrips, threatened and endangered species habitat, and incorrectly depicted or labeled roads.

The questionnaire asked people if they were aware of any leases or encumbrances on their property that might affect the proposed routes. Twenty-eight percent of the respondents indicated they do have a lease or encumbrance on their property. When asked to identify the approximate location, most respondents referred to road, pipeline, and mineral easements and leases, as well as threatened and endangered species habitat or conservation easements, and plans for future development of their property.

Sixty-three percent of the respondents thought that other factors or features besides those shown on the constraint maps should be considered in the evaluation of the proposed routes. The most common suggestions included proximity to homes, aesthetics, property values, wildlife or environmental impacts, health concerns, location on individual properties, the history of the land, and to follow existing transmission lines.

The questionnaires asked people to rank certain routing considerations or factors from most important to least important. These factors included placing the line next to existing transmission lines, pipelines, and roads; proximity to residences, airports and airstrips, communication towers, parks, and cultural resources; impacts to environmentally sensitive areas, protected or endangered species, and irrigated land; and cost. The factors were ranked by the respondents in the below order of importance:

1. Proximity 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
2. Proximity to FAA-registered airports, private airstrips and heliports
3. Proximity to historical or archeological sites
4. Proximity to parks and/or recreational areas
5. Existing corridors (electric transmission lines, pipelines, etc.)
6. Environmentally sensitive areas
7. Proximity to commercial radio transmitters, microwave relay stations or other electronic installations
8. Agricultural areas irrigated by traveling irrigation systems
9. Protected or endangered species
10. Cost of the line

When asked which of five situations applied to them, responses were as follows:

- 49% of the respondents indicated a potential line route would be near their home
- 57% indicated a potential line route would be near their farm or business
- 68% indicated the line route would be on their land
- 5% indicated they would not be affected by a proposed route
- 15% indicated they would be affected in another way (most respondents indicated an airstrip would be affected, their property value or aesthetics would be affected, or a new home or proposed development would be affected by a proposed route).

According to the questionnaire responses, 60% of the respondents believed the proposed routes were adequately explained. Of the respondents that indicated they had a concern with a particular route, most of the concerns were directed toward Links AA, CC, EE, HH, KK, MM, RR and TT in the Central C to Sam Switch segment of the project. Most of the other route links were also mentioned, but not as frequently. Many respondents listed their assigned tract number as their area of concern.

When asked whether they would prefer monopole or lattice tower structures, 64% indicated a preference for monopoles, while 36% indicated no preference. One respondent indicated a preference for lattice tower structures. The majority of respondents (82%) indicated that they heard of the open-house meetings by mail.

The questionnaire also allowed space for people to write in general comments and or concerns. The most frequently mentioned comments or concerns mentioned in letters or questionnaire format included:

- Concern for a particular link crossing their property and the suggestion to select a different route or a proposal for a new alignment that would avoid their property or concern
- Concern for property devaluation resulting from the line and fair compensation for use of the land
- Concern for views or aesthetics, particularly the Chalk Mountain area
- Concern for environmentally sensitive species or areas, particularly the golden-cheeked warbler and the black-capped vireo, as well as clearing of trees
- Health concerns, in part associated with EMF
- Suggestions to use existing ROW
- Concern for farming/crop impacts
- Complaints regarding the format and helpfulness of the open-house meeting and notification concerns
- Concern for the proximity of the routes to homes, stock tanks, and other features on their property

* * * * *

6.0 MODIFICATION/ADDITION OF ALTERNATIVE ROUTES FOLLOWING THE PUBLIC INVOLVEMENT PROGRAM

Portions of several route links identified prior to the open-house meetings were modified, as well as several new route links were added, following the public open-house meetings. Changes were made in response to information obtained through public comments and from public officials including PUCT staff, to accommodate landowner requests, and as a result of more detailed information obtained through additional surveys, both on-the-ground and from a helicopter. A total of 50 route link adjustments were made and 11 new route links were added following the open-house meetings.

6.1 CENTRAL A TO CENTRAL C LINK ADJUSTMENTS

The following route links were modified between the Central A and Central C Substations: A (two adjustments); B (three adjustments); E, F (two adjustments); G; H (two adjustments); I; and L.

The first adjustment to Link A was made in response to a request from a landowner to follow their northern property line, rather than through the middle of their property (Figure 6-1). Another modification was made to Link A to move the preliminary alternative route further from three homes located close to a property line (Figure 6-2).

The portion of Link B departing the Central A site was adjusted at a landowner's request to follow property lines and to follow Oncor's preferred route for its proposed Central A to Tonkawa transmission line project. The landowners stated that if the preliminary routes crossed their property, their preference would be to have both proposed transmission lines (Oncor and Lone Star) in the same corridor along their property boundary (Figure 6-3). Another modification was made to Link B to follow property lines and FM 1606 (Figure 6-4). A third adjustment was made to Link B in Fisher County. This adjustment was requested by a landowner so that the route would not be located as close to the north and east of their house. The proposed route would remain on their property and would still follow property lines, but would be further from their house (Figure 6-5).

A short portion of Link E was adjusted to follow property lines, as identified by landowners at the open-house meetings, rather than cross cropland at a diagonal (Figure 6-6).

Two modifications were made to Link F. The westernmost modification was made to avoid a house located close to a property line that was identified during the helicopter survey. The route was moved approximately 650 feet to the south at this location (Figure 6-7).

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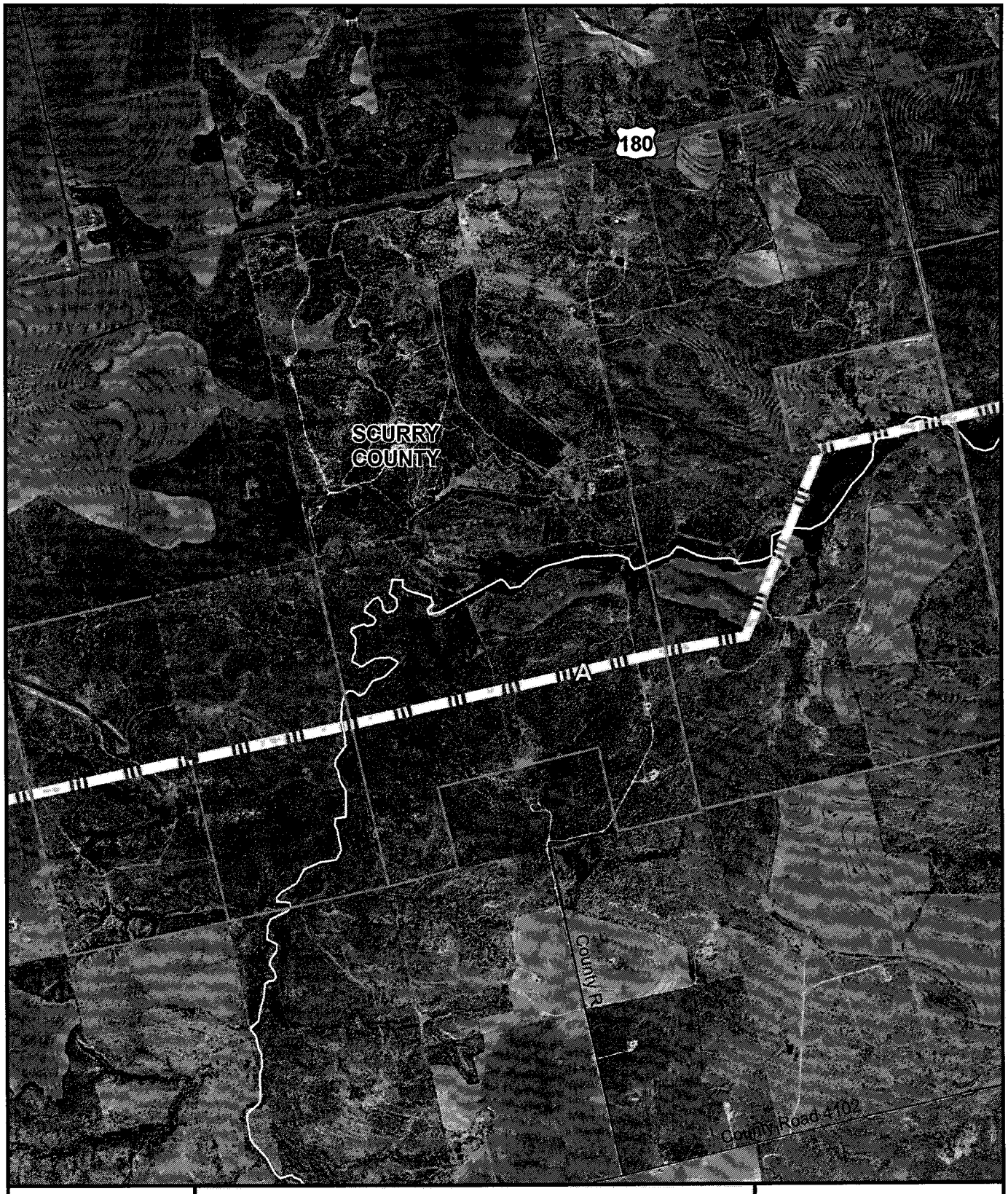

NORTH

0 2,000

Feet

Aerials Flown by SAM Inc 5/19/09

LEGEND

Preliminary Alternative Routes as Shown at Open House Meetings

Adjusted Alternative Routes (Following Open House Meetings)

Wind Farm

Apparent Property Boundary

AA Link Identifier

Figure 6-1
Link A Adjustment #1
Following Open Houses
Central A to Navarro
345 kV Transmission
Line Project

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NORTH

0 3,000

Feet

Aerials Flown by SAM Inc 5/19/09

LEGEND

- Preliminary Alternative Routes as Shown at Open House Meetings
- Adjusted Alternative Routes (Following Open House Meetings)
- Apparent Property Boundary
- AA Link Identifier

Figure 6-2
Link A Adjustment #2
Following Open Houses
Central A to Navarro
345 kV Transmission
Line Project

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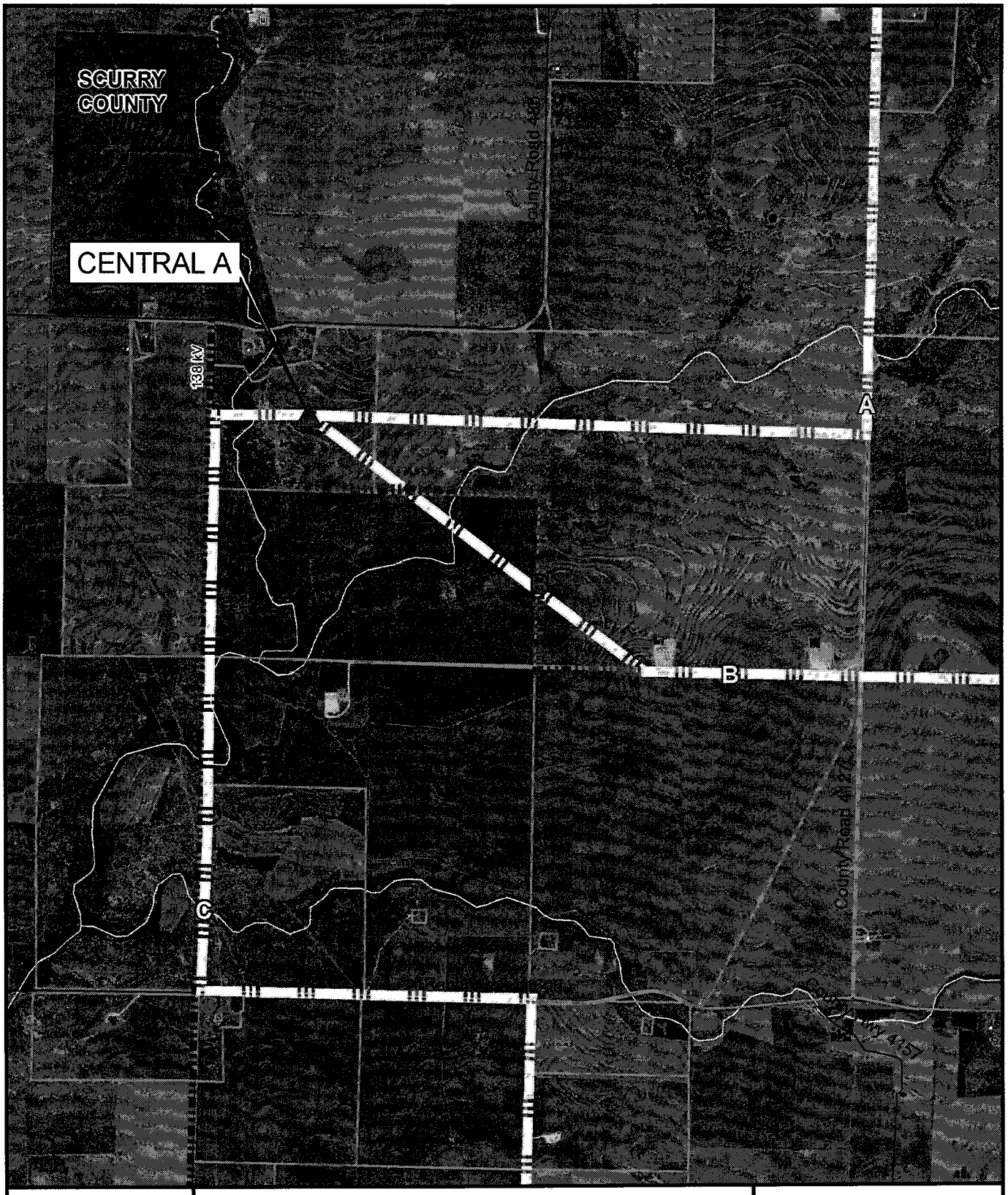

NORTH

0 2,000

Feet

Aerials Flown by SAM Inc 5/19/09

LEGEND

Preliminary Alternative Routes as shown at Open House Meetings

Adjusted Alternative Routes (Following Open House Meetings)

Existing Transmission Line

Apparent Property Boundary

AA Link Identifier

Figure 6-3
Link B Adjustment #1
Following Open Houses
Central A to Navarro
345 kV Transmission
Line Project

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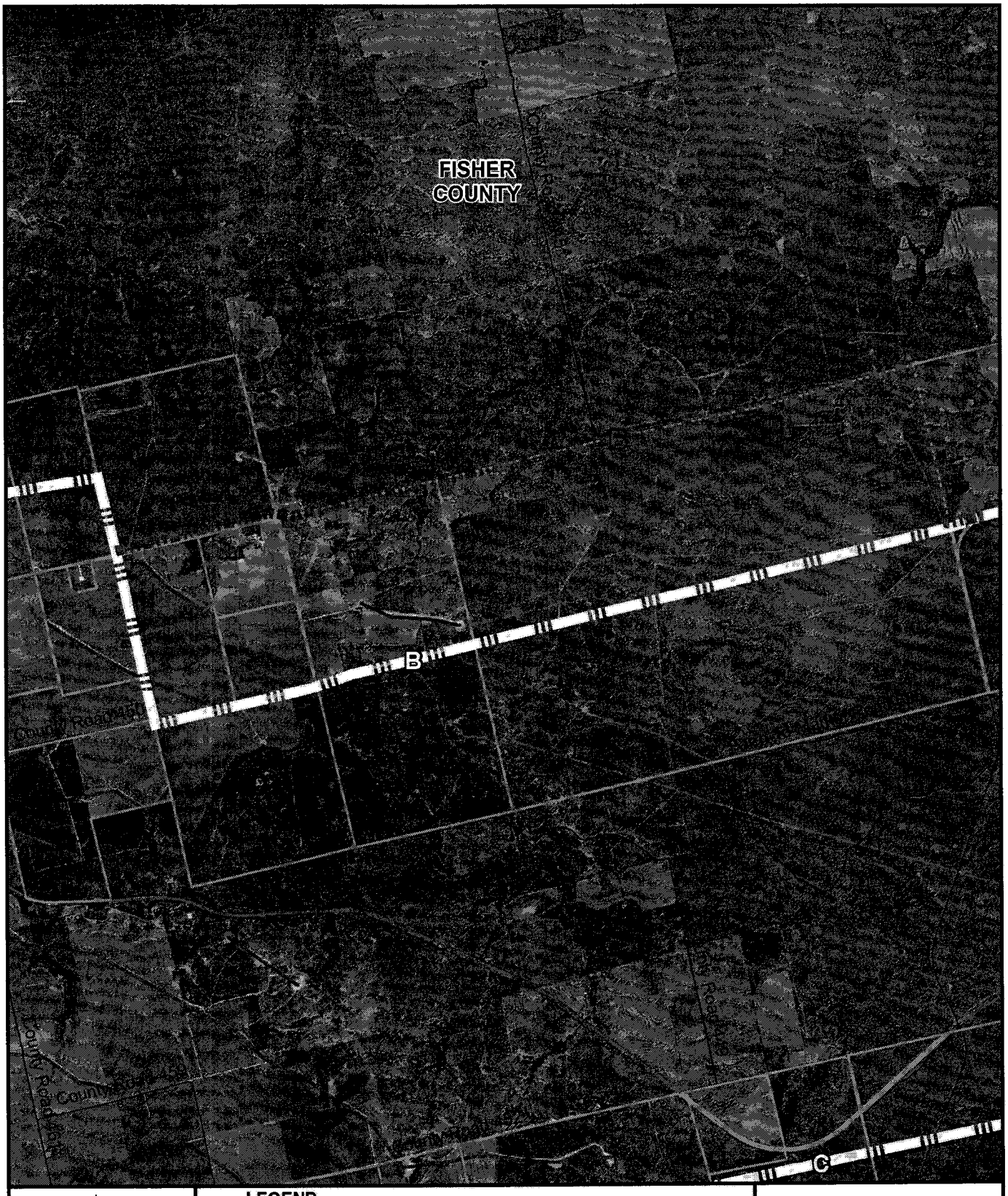

Figure 6-4
Link B Adjustment #2
Following Open Houses
Central A to Navarro
345 kV Transmission
Line Project

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