Environmental Assessment and Alternative Route Analysis

for the

Proposed Central A to Central C to Sam Switch to Navarro 345 kV Transmission Line Project

prepared for

Lone Star Transmission, LLC
Austin, Texas

May 2010

Project No. 52554

prepared by

Burns & McDonnell Engineering Company, Inc.

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ACRONYMS AND ABBREVIATIONS

BTS	Bureau of Transportation Statistics
Burns & McDonnell	Burns & McDonnell Engineering Company
CCN	Certificate of Convenience and Necessity
CREZ	Competitive Renewable Energy Zones
EMF	Electric and Magnetic Fields
FAA	Federal Aviation Administration
FCC	Federal Communication Commission
FEMA	Federal Emergency Management Agency
FM	Farm to Market Road
FPPA	Farmland Protection Policy Act
Ft	Feet/Foot
GIS	Geographic Information System
HPA	High Probability Area
IH	Interstate Highway
ISD	Independent School District
IUCN	International Union for Conservation of Nature
kV	Kilovolt
NAIP	National Agriculture Imagery Program
NERC	North American Electric Reliability Corporation
NESC	National Electrical Safety Code
NHD	National Hydrology Dataset
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetland Inventory
PUCT	Public Utility Commission of Texas
RCT	Railroad Commission of Texas
ROW	Right-of-Way
SAL	State Archaeological Landmarks
SH	State Highway

SWPPP	Storm Water Pollution Prevention Plan
TEA	Texas Education Agency
THC	Texas Historical Commission
TPWD	Texas Parks & Wildlife Department
TWDB	Texas Water Development Board
TxDOT	Texas Department of Transportation
TxNDD	Texas Natural Diversity Database
USACE	U.S. Army Corps of Engineers
USCB	U.S. Census Bureau
USDA	U.S. Department of Agriculture
USDOT	U.S. Department of Transportation
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WLSP	Whitney Lake State Park

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1.0 PROJECT DESCRIPTION

1.1 SCOPE OF THE PROJECT

Lone Star™ Transmission, LLC (Lone Star) proposes to design and construct a new 345 kilovolt (kV) double circuit transmission line connecting the Central A Substation in Scurry County, Texas to the Central C Substation in Shackelford County, continuing to the proposed Sam Switch Substation located in Hill County. From the Sam Switch Substation to the Navarro Substation located in Navarro County, Texas the transmission line will be built as a single-circuit (double circuit capable) transmission line. Figure 1-1 depicts the project area.

Lone Star retained Burns & McDonnell Engineering Company, Inc. (Burns & McDonnell) to prepare an Environmental Assessment (EA) and Alternative Route Analysis to support their application for a Certificate of Convenience and Necessity (CCN). This report has been prepared to provide information and address requirements of Section 37.056 (c)(4)(A)-(D) of the Texas Utilities Code, the Public Utility Commission of Texas (PUCT) CCN application form and PUCT Substantive Rule § 25.101. This report may also be used in support of any additional local, state, or federal permitting activities that may be required for Lone Star's proposed project.

To assist Burns & McDonnell in its evaluation of the proposed project, Lone Star provided Burns & McDonnell information regarding construction practices, and ROW requirements for the proposed project. Lone Star also provided information regarding engineering and design requirements.

1.2 PURPOSE OF AND NEED FOR THE PROJECT

The need for this project was established in orders issued in PUCT Docket Nos. 33672.

1.3 DESCRIPTION OF PROPOSED CONSTRUCTION

1.3.1 Transmission Line Design

Lone Star has proposed to use double-circuit concrete pole structures (Figure 1-2). In some areas, a tubular steel pole structure will be used. Most of the proposed line angle structures will utilize guy wires and anchors. In some cases, self supporting steel poles on concrete caisson foundations will be utilized where guying is not possible. Design criteria will be in compliance with applicable statutes, North American Electric Reliability Corporation (NERC) Standards, and the 2007 National Electrical Safety Code (NESC). The typical structure height will be 110 feet (ft) but could vary depending upon terrain and structure type.

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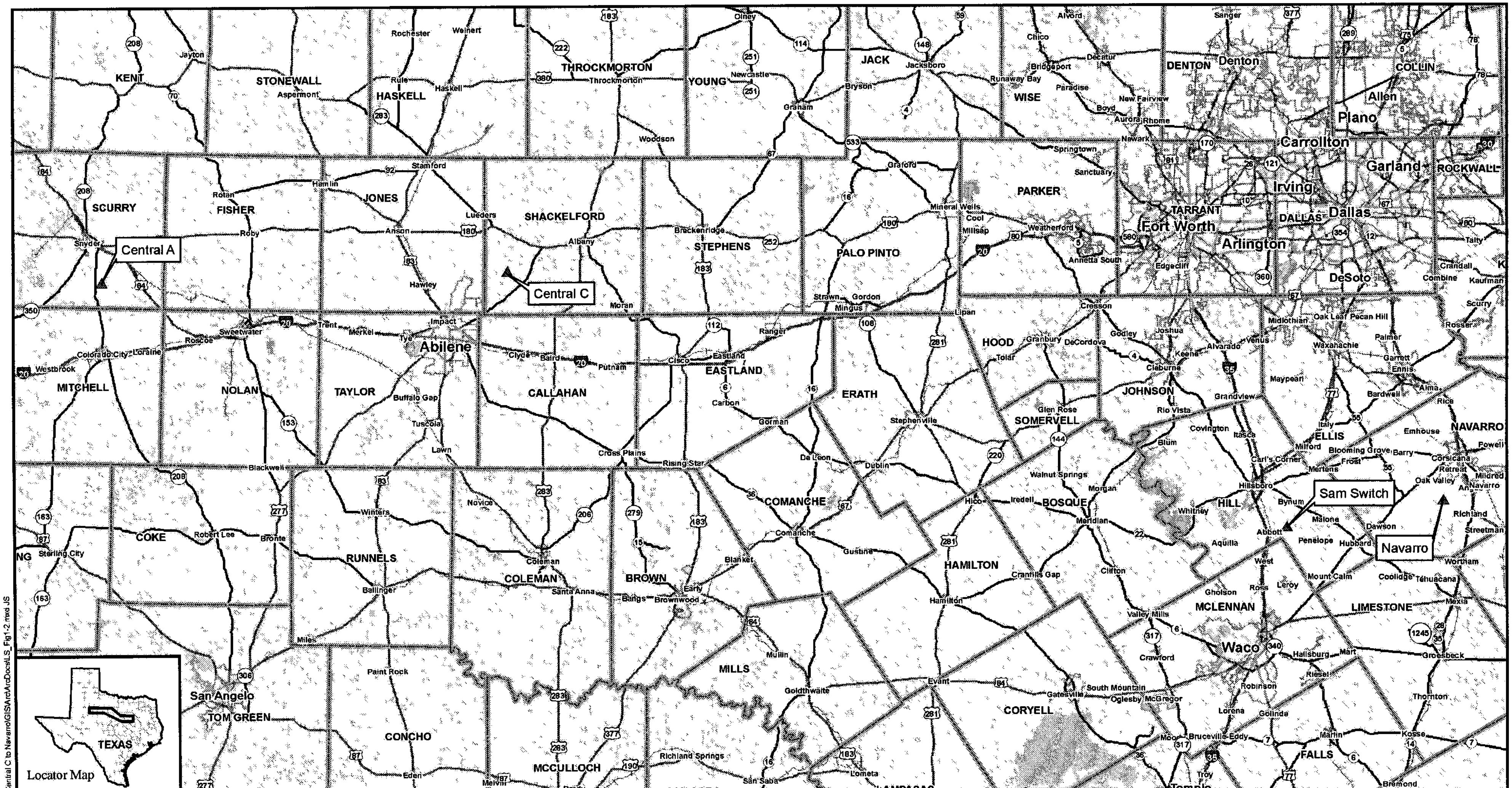

LEGEND

- ▲ Proposed Substation
- Road
- Interstate
- U S. Highway
- State Highway
- Railroad
- Municipal Areas
- County Boundary
- Park/Recreational Area

18 0 18

Miles

NORTH

Source Texas Natural Resources Information System, ESRI Data

LONESTAR

Burns & McDonnell

Figure 1-1
Project Area Location Map
Central A to Central C to
Sam Switch to Navarro
345 kV Transmission Line Project

\\espen\data\projects\Lone_Star\52554 – Central C to Navarro\GIS\ArcDocs\LS_Fig1-2.mxd JS

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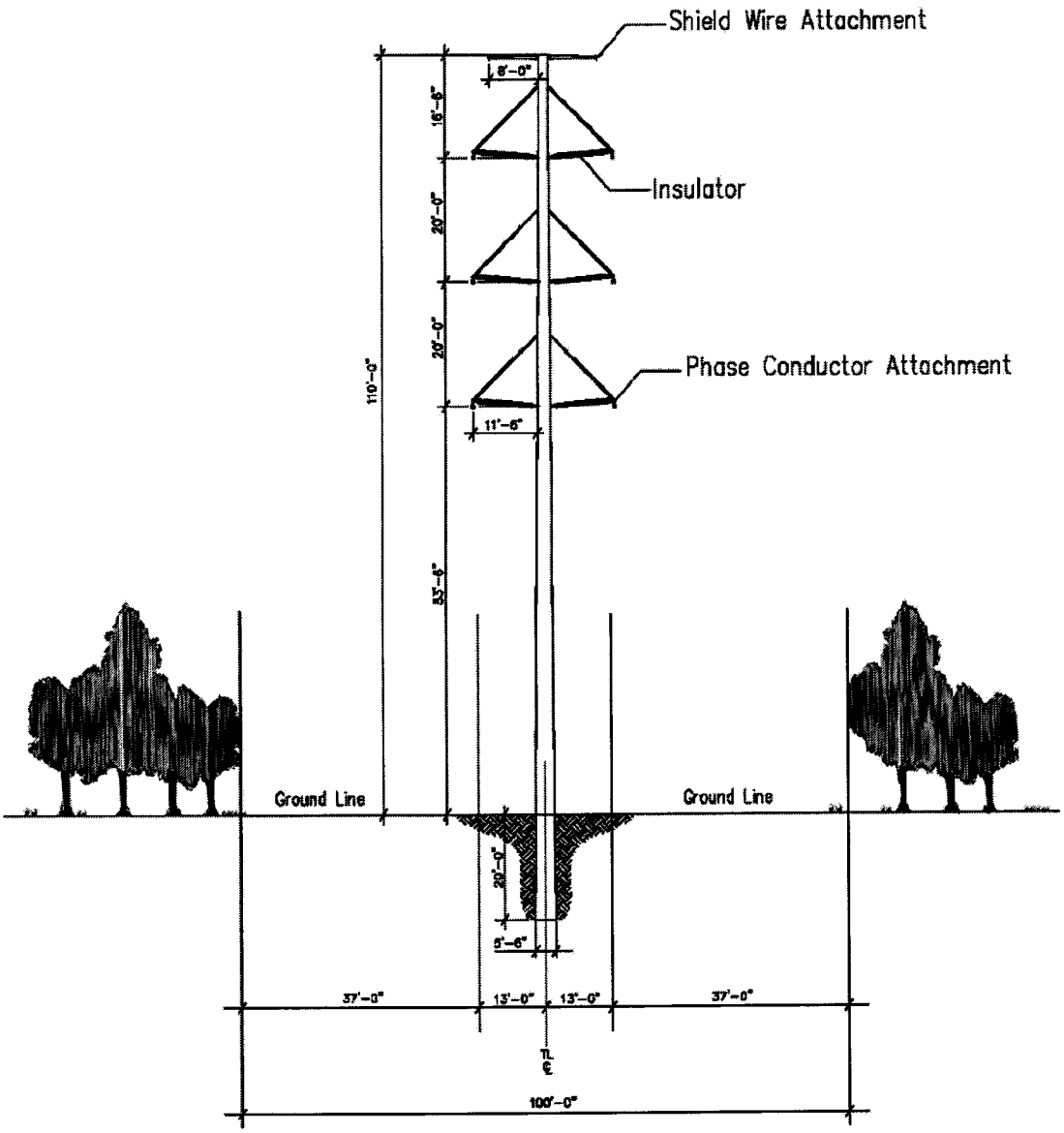
SPUN CONCRETE MONOPOLE
345 kV DOUBLE CIRCUIT TANGENT STRUCTURE



LONEstar

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Figure 1-2
Typical Double-Circuit
345 kV Single Pole Structure
Central A to Central C to
Sam Switch to Navarro
345 kV Transmission Line Project

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1.3.2 Right-of-Way Requirements

The proposed right-of-way (ROW) width for this project will be approximately 100 ft. The proposed transmission line will be located along the centerline of the ROW. Additional ROW will be required at line angles, special crossings (e.g. rivers), or where the terrain requires longer than typical spans.

1.3.3 Clearing Requirements

The proposed transmission line project will be constructed on a mix of land that includes land that has already been cleared for cropland or pastureland as well as land that is forested. In areas that are already cleared, very little or no clearing will be required. In forested areas, clearing of the ROW will be necessary. In general, trees and woody vegetation will be removed within the ROW and Lone Star will minimize effects on flora and fauna by utilizing structures with a small footprint, utilizing a relatively narrow ROW (e.g. 100 ft) and allowing some small trees and woody vegetation to remain that would not interfere with access or construction and whose mature height would not interfere with the safe and reliable operations of the transmission line in accordance with NERC Standard FAC-003-1 (Transmission Vegetation Management Program).

1.3.4 Support Structure Assembly and Erection

Structure assembly will begin with auger drilling of a cylindrical shaft in the soil of appropriate diameter (typically 6 feet) and depth (typically 20 feet deep) to provide necessary support to the structure. For direct-embedded concrete or tubular steel poles, the bottom section of the pole will be centered in this cylindrical shaft and the annulus between the pole and the shaft will be backfilled with aggregate. For base-plated tubular steel poles, a steel reinforcing bar "cage" and an anchor bolt "cage" will be placed in the shaft and the shaft will be filled with concrete to create a sturdy concrete foundation for the structure. Once this foundation has been constructed for each structure type, the remaining structure will be assembled and erected on top of this foundation. Equipment required for construction will likely include a combination of cranes, trucks, and augers. Equipment may be tired or tracked to address ROW conditions and construction requirements.

1.3.5 Conductor Stringing

Once a series of support structures has been erected along the transmission line, the conductor stringing phase can begin. Specialized equipment will be attached to insulators that will properly support and protect the conductor during the pulling, tensioning, and sagging operations. Once the conductors and shield wires are in place, and tension and sag have been verified, suspension units are installed at each

suspension point to maintain conductor position. Conductor stringing will continue until the transmission line construction is complete.

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2.0 ROUTE SELECTION METHODOLOGY AND SUMMARY

The objective of this study was to identify and evaluate alternative transmission line routes for Lone Star's proposed 345 kV transmission line project. Throughout this report the terms "environmental" or "environment" shall include the human environment as well as the natural environment. Burns & McDonnell used a comprehensive transmission line routing and evaluation methodology to identify and evaluate alternative transmission line routes. Methods used to identify and evaluate potential routes were in accordance with Section 37.056 (c)(4)(A)-(D) of the Texas Utilities Code, the PUCT's CCN application form and PUCT Substantive Rule § 25.101.

The following sections provide a description of the process that consisted of study area delineation, data collection, constraints mapping, preliminary alternative route identification, public involvement program, addition/modification of preliminary alternative routes following the public open-house meetings, and alternative route evaluation.

2.1 STUDY AREA DELINEATION

The first step in the identification of alternative routes was to select a study area. This area needed to encompass the Central A Substation, Central C Substation, Sam Switch Substation and the Navarro Substation, and include an area large enough that a reasonable number of alternative routes could be identified.

The Burns & McDonnell Project Manager reviewed The Roads of Texas Map (2005, 2008), aerial photography produced by the National Agriculture Imagery Program (NAIP) in 2008, as well as conducted a site reconnaissance survey on September 8, 2008 to develop and identify the study area boundary for this project. The Burns & McDonnell Project Manager and a GIS Specialist depicted the project end points on the various maps and identified the major land use features in the project area such as Lake Fort Phantom Hill; Hubbard Creek Reservoir; Possum Kingdom Lake; the City of Abilene, Texas; Proctor Lake; Dinosaur Valley State Park; Fossil Rim Wildlife Center; Whitney Lake; the Dallas-Fort Worth Metroplex area; and the City of Waco, Texas as well as major roadways, existing transmission lines, etc. in the project area. The Burns & McDonnell Project Manager then evaluated and reviewed the various maps, and ultimately delineated and identified the initial study area boundary in September 2008. Subsequently, the study area boundary was expanded slightly to the south to accommodate a change in the location of the Central C Substation.

The purpose of delineating a study area for the project was to establish boundaries and limits for the information gathering process (i.e., identifying environmental and land use constraints). The delineation of the study area also allowed the Burns & McDonnell Project Team to focus its evaluation on a specific area associated with the proposed project.

2.2 DATA COLLECTION

2.2.1 Request for Information from Local, State, and Federal Offices/Agencies

Once the study area boundary was identified, the Burns & McDonnell Project Team initiated a variety of data collection activities. One of the first data collection activities was the development of a list of officials to be mailed a consultation letter regarding the proposed project. The purpose of the letter was to inform the various officials and agencies of the proposed project and give them the opportunity to provide information they may have regarding the study area. Burns & McDonnell utilized websites from area counties and various municipalities, as well as confirmation via telephone calls to identify local officials. Various state and/or federal agencies that may have potential permitting requirements for the proposed project were also contacted. Copies of correspondence sent to and received from the following local officials and departments, and the various state/federal regulatory agencies are included in Appendix A:

State/Federal Agencies that were mailed a consultation letter:

- Federal Emergency Management Agency (FEMA)
- Natural Resources Conservation Service (NRCS)
- U.S. Army Corps of Engineers (USACE)
  - Ft. Worth District
- U.S. Fish & Wildlife Service (USFWS)
- U.S. Department of Transportation (USDOT)
  - Federal Aviation Administration (FAA) (Southwest Region)
- Texas Department of Transportation (TxDOT)
  - Abilene, Ft. Worth, Dallas and Waco Districts
  - Aviation Division
  - Environmental Affairs Division
- Texas General Land Office (Survey / Asset Management)
- Texas Water Development Board (TWDB)
- Texas Parks & Wildlife Department (TPWD)

- Texas Historical Commission (THC)
- West Central Texas Council of Governments
- Central Texas Council of Governments
- Heart of Texas Council of Governments
- North Central Texas Council of Governments
- Texas Farm Bureau
- County Officials in: Bosque, Callahan, Comanche, Eastland, Ellis, Erath, Fisher, Freestone, Hamilton, Hill, Hood, Johnson, Jones, Limestone, McLennan, Mitchell, Navarro, Nolan, Palo Pinto, Scurry, Shackelford, Somervell, Stephens, and Taylor Counties (including Farm Bureaus and Historical Commissions for all counties listed above)

City Officials with the following cities were mailed a consultation letter:

Abbott	Covington	Hubbard	Penelope
Abilene	Cranfills Gap	Iredell	Ranger
Albany	Dawson	Italy	Retreat
Anson	DeLeon	Itasca	Rio Vista
Aquilla	Dublin	Leroy	Roby
Barry	Eastland	Lueders	Ross
Blooming Grove	Emhouse	Malone	Rotan
Blum	Frost	Meridian	Snyder
Breckenridge	Gholson	Milford	Stamford
Bynum	Glen Rose	Mertens	Stephenville
Carbon	Gordon	Mexia	Strawn
Carl's Corner	Gorman	Mingus	Tehuacana
Cisco	Hamlin	Moran	Walnut Springs
Clifton	Hawley	Morgan	West
Coolidge	Hico	Mount Calm	Whitney
Corsicana	Hillsboro	Oak Valley	Wortham

The following independent school districts were also mailed a consultation letter:

Abbott	Covington	Lingleville	Santo
Abilene	Cranfills Gap	Lipan	Snyder
Albany	Dawson	Lueders-Avoca	Stamford
Anson	De Leon	Malone	Stephenville
Aquilla	Dublin	Meridian	Strawn
Avalon	Eastland	Merkel	Sweetwater
Axtell	Frost	Mexia	Three Way
Blooming Grove	Gholson	Milford	Tolar
Bluff Dale	Glen Rose	Moran	Trent
Blum	Gordon	Morgan	Valley Mills
Breckenridge	Hamlin	Morgan Mill	Walnut Springs
Bynum	Hawley	Mount Calm	Waxahachie
China Spring	Hico	Paint Creek	West
Cleburne	Hillsboro	Palo Pinto	Whitney
Clifton	Hubbard	Penelope	Woodson
Clyde	Huckabay	Ranger	Wortham
Colorado	Iredell	Roby	
Coolidge	Itasca	Roscoe	
Corsicana	Kopperl	Rotan	

Other data collection activities consisted of file and record reviews conducted at various state regulatory agencies, a review of published literature, available geographic information system (GIS) mapping, and frequent review of a variety of maps including recent color aerial photography (SAM, Inc. flown on May 18 and 19, 2009 and NAIP flown in 2008), U.S. Geological Survey (USGS) topographic maps, various roadway maps, and county appraisal district land parcel boundary maps.

2.2.2 Field Reconnaissance Surveys

During the course of the above-mentioned data collection activities, the Burns & McDonnell project team conducted numerous reconnaissance surveys of the study area to confirm the findings of the previous research and data collection activities and to identify potential constraints that may not have been previously noted. The site visits were also utilized to assist in the route selection process. Since Burns & McDonnell did not have access to private property, reconnaissance surveys were conducted by visual

observations from public roads and public ROW located within the study area as well as several reconnaissance surveys conducted via helicopter.

The initial ground reconnaissance survey of the study area was conducted on September 8, 2008 by the Burns & McDonnell Project Manager. The purpose of the September 2008 survey was to observe and document the various project end points and land use features within the project area. The findings of the September 2008 ground reconnaissance survey were used to establish the study area boundary.

Another round of ground reconnaissance surveys was conducted on July 13, 14, 15, 16, 17, 20, 21, and 22, 2009 by the Burns & McDonnell Assistant Project Manager. The purpose of the July 2009 surveys was to observe the preliminary alternative routes that were identified prior to the reconnaissance survey.

On October 27, 28 and 29, 2009 and March 12, 2010 the Burns & McDonnell project wildlife biologist conducted helicopter surveys. On November 16, 17, 18 and 19, 2009 the Burns & McDonnell Project Manager and Assistant Project Manager conducted a helicopter survey. The helicopter surveys enabled the Burns & McDonnell project team to visually observe areas not accessible or visible from public roads. The purpose of the October 2009 and March 2010 helicopter surveys were to assess the preliminary alternative routes for various environmental permitting requirements, such as the potential for crossing threatened or endangered species habitat or other environmentally sensitive areas. The November 2009 helicopter survey was conducted to observe and further evaluate the preliminary alternative routes and to evaluate and observe the various routing issues and concerns raised by landowners and the communities at the eight previously held public open-house meetings.

On November 2, 3, 4, 5, 6, 9, 10, 11, 12, and 13, 2009 the Burns & McDonnell land use specialist and biologist conducted a reconnaissance survey. The purpose of this reconnaissance survey was to further evaluate the natural resources, land use and habitable structures along the preliminary alternative routes.

On December 1, 2009, the Burns & McDonnell Project Manager and Assistant Project Manager conducted another reconnaissance survey to further evaluate several preliminary alternative links/routes.

The data collection effort was an ongoing process. Results of the various data collection activities (i.e. request for information from local, state, and federal officials and agencies; file/records review; visual reconnaissance surveys, GIS mapping, etc.) are presented throughout Sections 3.0 and 7.0 of this report.

2.3 CONSTRAINTS MAPPING

The data and information collected during the data collection activities were utilized to develop an environmental and land use constraints map. The constraints map, various public maps, recently flown aerial photography, reconnaissance surveys, helicopter surveys, etc. were all used to identify and select potential preliminary alternative routes within the study area. The geographic locations of exclusionary areas, avoidance areas, and opportunity areas, as well as environmentally sensitive areas within the study area, were located and considered during transmission line route identification and to the greatest extent possible, Burns & McDonnell was able to identify and select alternative routes that minimized potential impacts to those types of areas.

An exclusion area is defined as an area that cannot be crossed by a transmission line due to federal, state, or local laws, regulations, or ordinances.

Avoidance areas include those areas for which there is no law or regulation that prohibits the crossing of a transmission line, but that would require special considerations or mitigation measures. Avoidance areas can be generally broken down into different levels (i.e. low, medium, and high) depending upon the type of constraint.

Once the exclusion and avoidance areas are identified and mapped as routing constraints, the remaining areas are considered opportunity areas. Opportunity areas are considered to be lower-impact areas, or those areas with a relatively low likelihood of containing existing natural, human, or cultural resources that could be negatively impacted by a transmission line.

2.4 IDENTIFICATION OF PRELIMINARY ALTERNATIVE ROUTES

Upon completion of the various data collection activities and constraint mapping process, the next step in the project was to identify preliminary alternative routes to connect the project end points. Burns & McDonnell utilized the following to identify the preliminary alternative routes:

- Input received from the various correspondence with local officials and others as described in Section 2.2.1
- Results of the visual reconnaissance activities of the study area (habitable structures, oil/gas wells, etc.)
- Review of recent aerial photography (NAIP, 2008 and Sam, Inc., 2009)
- Findings of the various data collection activities
- Environmental and land use constraints map

- Apparent property boundaries
- Existing compatible corridors
- Location of existing/known platted developments
- Location of towns and cities

The preliminary alternative routes were identified in accordance Texas Utilities Code § 37.056 (c)(4)(A)-(D), PUCT Substantive Rule § 25.101, and the PUCT policy of prudent avoidance. It was Burns & McDonnell's intent to identify an adequate number of alternative routes, which were environmentally acceptable, considering such factors as community values, park and recreational areas, historical and aesthetic values, environmental integrity, length of route parallel to or utilizing existing compatible corridors and parallel to apparent property boundaries, and prudent avoidance. The preliminary alternative routes identified by Burns & McDonnell were then presented at eight public open-house meetings. Prior to the open-house meetings, the Lone Star and Burns & McDonnell team met with members of the PUCT staff. At this meeting, Lone Star and Burns and McDonnell presented the environmental and land use constraints map depicting the preliminary alternative routes, and discussed these routes and routing considerations with the PUCT staff.

2.5 PUBLIC INVOLVEMENT PROGRAM

Once the preliminary alternative routes were identified, eight public open-house meetings were held. The open-house meetings were held on October 5 through October 8, 2009 and October 12 through October 15, 2009 at the following locations:

Monday, October 5, 2009
5:00-8:00PM
Roby High School Cafeteria
141 S. College Street
Roby, Texas 79543

Tuesday, October 6, 2009
5:00-8:00PM
Hawley School Cafeteria
800 1st Street
Hawley, TX 79525

Wednesday, October 7, 2009
5:00-8:00PM
Albany Old Jail/Arts Center
201 South 2nd Street
Albany, TX 76430

Thursday, October 8, 2009
5:00-8:00PM
Breckenridge Women's Forum
1804 West Walker Street
Breckenridge, TX 76424

Monday, October 12, 2009
5:00-8:00PM
Ranger High School Cafeteria
1842 Loop 254E
Ranger, TX 76470

Tuesday, October 13, 2009
5:00-8:00PM
Stephenville High School Cafeteria
2655 West Overhill Drive
Stephenville, TX 76401

Wednesday, October 14, 2009
5:00-8:00PM
Meridian Civic Center
306 River Street
Meridian, TX 76665

Thursday, October 15, 2009
5:00-8:00PM
Hillsboro City Hall
127 East Franklin Street
Hillsboro, TX 76645

The purpose of the meetings was to solicit comments and input from residents, landowners, public officials, and other interested parties concerning the proposed project, the preliminary alternative routes, and the overall transmission line routing process, and to:

- Promote a better understanding of the proposed project including the purpose, need, and potential benefits and impacts;
- Educate and encourage public involvement in the routing and certification process;
- Inform the public with regard to the routing procedure, schedule, and decision-making process; and
- Ensure that the decision-making process adequately identifies and considers the values and concerns of the public and community leaders.

Lone Star mailed written notice of the meetings to all owners of property within 500 ft of the centerline of the preliminary alternative routes (nearly 4,500 landowner notices were mailed). Notices were also mailed to the local officials and various state/federal regulatory agencies. In addition, advertisements ran in the local newspapers listed below announcing the location, time, and purpose of the meetings. A copy of the notice can be found in Appendix B.

Snyder Daily News (September 27, 2009 and October 4, 2009)
Colorado City Record (September 24, 2009 and October 1, 2009)
Rotan Advance/Roby Star Record (September 24, 2009 and October 1, 2009)
Abilene Reporter News (September 27, 2009 and October 4, 2009)
Western Observer (September 23, 2009 and September 30, 2009)
Clyde Journal (September 23, 2009 and September 30, 2009)
Baird Banner (September 23, 2009 and September 30, 2009)
Cross Plains Review (September 23, 2009 and September 30, 2009)
The Albany News (September 24, 2009 and October 1, 2009)
Breckenridge American (September 30, 2009 and October 7, 2009)
Mineral Wells Index (October 4, 2009 and October 11, 2009)
The Lake Country Sun (October 2, 2009 and October 9, 2009)
Cisco Press (October 4, 2009 and October 11, 2009)

Eastland Telegram (October 4, 2009 and October 11, 2009)
Ranger Times (October 4, 2009 and October 11, 2009)
The Rising Star (September 30, 2009 and October 7, 2009)
Stephenville Empire-Tribune (October 4, 2009 and October 11, 2009)
The Dublin Citizen (October 1, 2009 and October 8, 2009)
The Comanche Chief (September 30, 2009 and October 7, 2009)
The Glen Rose Reporter (September 30, 2009 and October 7, 2009)
Glen Rose Newspaper (October 1, 2009 and October 8, 2009)
Cleburne Times-Review (October 4, 2009 and October 11, 2009)
Bosque County News (September 30, 2009 and October 7, 2009)
The Clifton Record (September 30, 2009 and October 7, 2009)
The Hillsboro Reporter (October 5, 2009 and October 12, 2009)
The Lakelander (October 7, 2009 and October 14, 2009)
Navarro County Times (October 1, 2009 and October 8, 2009)
Corsicana Daily Sun (October 4, 2009 and October 11, 2009)

At each open-house meeting, Lone Star set up information stations in the meeting space. Each station was devoted to a particular aspect of the project and was manned by Lone Star (Welcome Table, CCN Certification Process, and Purpose/Need of the Project), Burns & McDonnell (Environmental and Routing), JS Land Services, Inc. and Contract Land Staff LLC (Landowner identification and ROW), and Electrical Consultants Inc. (Engineering and Construction).

Each station had maps, illustrations, photographs, and/or text explaining each particular topic. Interested citizens and property owners were encouraged to visit each station in order, so that the entire process could be explained in the general sequence of project development. The information station format is advantageous because it allows attendees to process information in a more relaxed manner and also allows them to focus on their particular area of interest and ask specific questions. Furthermore, the one-to-one discussions with the Lone Star Team encouraged more interaction from those citizens who might be hesitant to participate in a speaker-audience format.

Upon entering, attendees were asked to sign in and were handed an information packet containing a fact sheet, frequently asked questions, overview map, and a questionnaire. The questionnaire solicited comments on the proposed project as well as an evaluation of the information presented at the open-house meetings. A flow chart that detailed the certification process for new transmission lines as well as

information on electric and magnetic fields (EMF) was also handed out. Copies of the information packet and the handouts can be found in Appendix B.

Markers and grease pencils were available at each meeting so that attendees could identify areas of interest (i.e. houses, environmentally sensitive areas, property boundary information, etc.) on the various routing maps and exhibits. In addition, Contract Land Staff LLC manned a computer station enabling attendees to view their property with the preliminary alternative routes superimposed onto aerial photography. This afforded landowners yet another opportunity to identify and mark specific areas of interest.

After the public open-house meetings, Burns & McDonnell reviewed and evaluated each questionnaire response that was submitted at the meetings (or mailed at a later date) as well as all routing maps that had areas of interest identified by the attendees. Attendee comments were evaluated, considered, and factored into the overall evaluation of the alternative routes.

2.6 ADDITION/MODIFICATION OF PRELIMINARY ALTERNATIVE ROUTES FOLLOWING THE OPEN- HOUSE MEETINGS

Following the open-house meetings and subsequent additional landowner and other stakeholder meetings, 11 new route links were added and modifications were made to the location of portions of 50 existing links as a result of input from the meeting attendees and additional evaluation of the preliminary alternative routes by Burns & McDonnell. The new links and modifications to the existing links occurred in various portions of the project area and are further described in Section 6.0. The new route links and modifications made to the existing route links following the open-house meetings were only made in areas where Burns & McDonnell could accommodate landowner requests and still adhere to the PUCT routing criteria as set forth in Section 37.056 (c)(4)(A)-(D) of the Texas Utilities Code, PUCT Substantive Rule § 25.101, etc.

2.7 EVALUATION OF THE ALTERNATIVE ROUTES

After new route links were added and modifications to the existing route links were made, a total of nine alternative routes were identified for the Central A to Central C segment of the project, 265 alternative routes were identified for the Central C to Sam Switch segment of the project, and seven alternative routes were identified for the Sam Switch to Navarro segment of the project. The Burns & McDonnell Project Team then initiated a detailed evaluation of each alternative route/link. In evaluating the alternative routes/links, a variety of environmental and land use criteria were considered as well as the results of the public involvement program. Thirty-four environmental and land use criteria were utilized.

The criteria were based on routing factors set forth in Section 37.056 (c)(4)(A)-(D) of the Texas Utilities Code, the PUCT CCN application form and PUCT Substantive Rule §25.101. Table 2-1 provides a description of these criteria.

Table 2-1 Environmental and Land Use Criteria

1. Length of alternative route
2. Length of route parallel and adjacent to existing transmission lines
3. Length of route parallel and adjacent to existing public roads/highways
4. Length of route parallel and adjacent to existing pipelines
5. Length of route parallel and adjacent to railroads
6. Length of route parallel to apparent property boundaries
7. Total length of route parallel to existing corridors (including apparent property boundaries)
8. Number of habitable structures within 500 ft of the route centerline
9. Length of route across parks/recreational areas
10. Number of additional parks or recreational areas within 1,000 ft of the route centerline
11. Length of route across agricultural rangeland
12. Length of route across agricultural cropland
13. Length of route across agricultural land with mobile irrigation systems
14. Length of route across upland woodland
15. Length of route across bottomland forest, including forested wetlands
16. Length of route across emergent wetlands
17. Number of streams/rivers crossed by the route
18. Length of streams parallel to routes (within 100 ft)
19. Number of known rare/unique plant locations within the ROW
20. Length of route through known habitat of endangered or threatened species
21. Number of recorded cultural resource sites crossed by the route
22. Number of additional recorded cultural resource sites within 1,000 ft of the route centerline
23. Length of route across areas of high prehistoric and historic archaeological site potential
24. Number of FAA-registered airstrips > 3,200 ft long within 20,000 ft of the route centerline
25. Number of FAA-registered airstrips < 3,200 ft long within 10,000 ft of the route centerline
26. Number of private airstrips (non-FAA registered) within 10,000 ft of the route centerline
27. Number of heliports within 5,000 ft of the route centerline
28. Length of route across open water (lakes, ponds)
29. Number of commercial AM radio transmitters within 10,000 ft of route centerline
30. Number of FM radio transmitters, microwave relay stations, and other electronic installations within 2,000 ft
31. Number of U.S. or State Highways crossed by the route
32. Number of farm-to-market (FM), county roads, or other streets crossed by the route
33. Length of route within foreground visual zone of park/recreational areas (1/2 mile)
34. Length of route within foreground visual zone of State or U.S. Highways (1/2 mile)

The analysis of each alternative route/link involved taking inventory and tabulating the number or quantity of each environmental and land use criterion located along the centerline of each route (i.e. number of stream crossings, the length across agricultural land, etc.). These criteria were developed and tailored to the specific characteristics that were identified in the study area. Burns & McDonnell identified a majority of these criteria within the study area during the reconnaissance surveys. For instance, Burns & McDonnell identified a number of county and FM roads as well as existing transmission lines as existing corridors within the study area. Paralleling and/or utilizing existing compatible corridors are factors to be considered in the selection and evaluation of alternative routes. The number or amount of each factor was determined by primarily reviewing recent color aerial photography and by visual observations, where possible.

The Burns & McDonnell Project Team then evaluated the advantages and disadvantages of each primary alternative route. Potential environmental and land use impacts of the primary alternative routes are addressed in Section 7.0 of this document.

* * * * *

3.0 DESCRIPTION OF THE STUDY AREA

3.1 DELINEATION OF THE STUDY AREA BOUNDARY

Prior to the collection of data and information for the environmental setting of the study area, Burns & McDonnell identified the study area boundary as previously described in Section 2.1.

Overall, the boundary of the study area was based on the location of the project end points (the Central A Substation, Central C Substation, Sam Switch Substation, and Navarro Substation); the location of several potential routing constraints located in the project area (Lake Fort Phantom Hill, Hubbard Creek Reservoir, Possum Kingdom Lake, the City of Abilene, Proctor Lake, Dinosaur Valley State Park, Fossil Rim Wildlife Center, Whitney Lake, the Dallas-Fort Worth Metroplex area, and the City of Waco); as well as the location of existing corridors (i.e. pipelines, roadways, electric transmission lines, etc.) to allow sufficient area to identify potential alternative routes to connect the project end points. Based on the location of the Central A Substation and the Central C Substation, Burns & McDonnell defined this portion of the study area to encompass the eastern two-thirds of Scurry County and all of Fisher, Jones, and Shackelford Counties. The study area between the Central C Substation and the Sam Switch Substation was defined with the following considerations: to incorporate an existing pipeline that traverses Callahan, Eastland, Comanche and Erath Counties from northwest to southeast in the direction of the Sam Switch Substation; to stay south of Possum Kingdom Lake that posed a routing constraint in the northern portion of the project area; and Whitney Lake located on the Hill/Bosque County line (to allow sufficient area to identify potential alternative routes to both the north and south of the lake). The northern and southern boundaries of the study area were extended to the east respectively from the Whitney Lake area to encompass both the Sam Switch Substation and Navarro Substation and to allow sufficient area to identify potential alternative routes to both the north and south of Aquilla Lake and Navarro Mills Lake. Figure 3-1 depicts the study area boundary.

3.2 CONSTRAINTS MAPPING

After the study area boundary was identified, the Burns & McDonnell Project Team initiated the information gathering process and the identification of environmental and land use constraints within the study area. The result of the information gathering process was a constraint map that plotted environmental and land use constraints and which was utilized in identifying preliminary alternative routes. The geographic locations of environmentally sensitive areas, avoidance areas, exclusion areas, environmental and land use constraints, etc. within the study area were identified on an aerial photograph base map (Figures 3-2, 3-2A, 3-2B, 3-2C, 3-2D, 3-2E, and 3-2F) that is located in map pockets at the end of this document.

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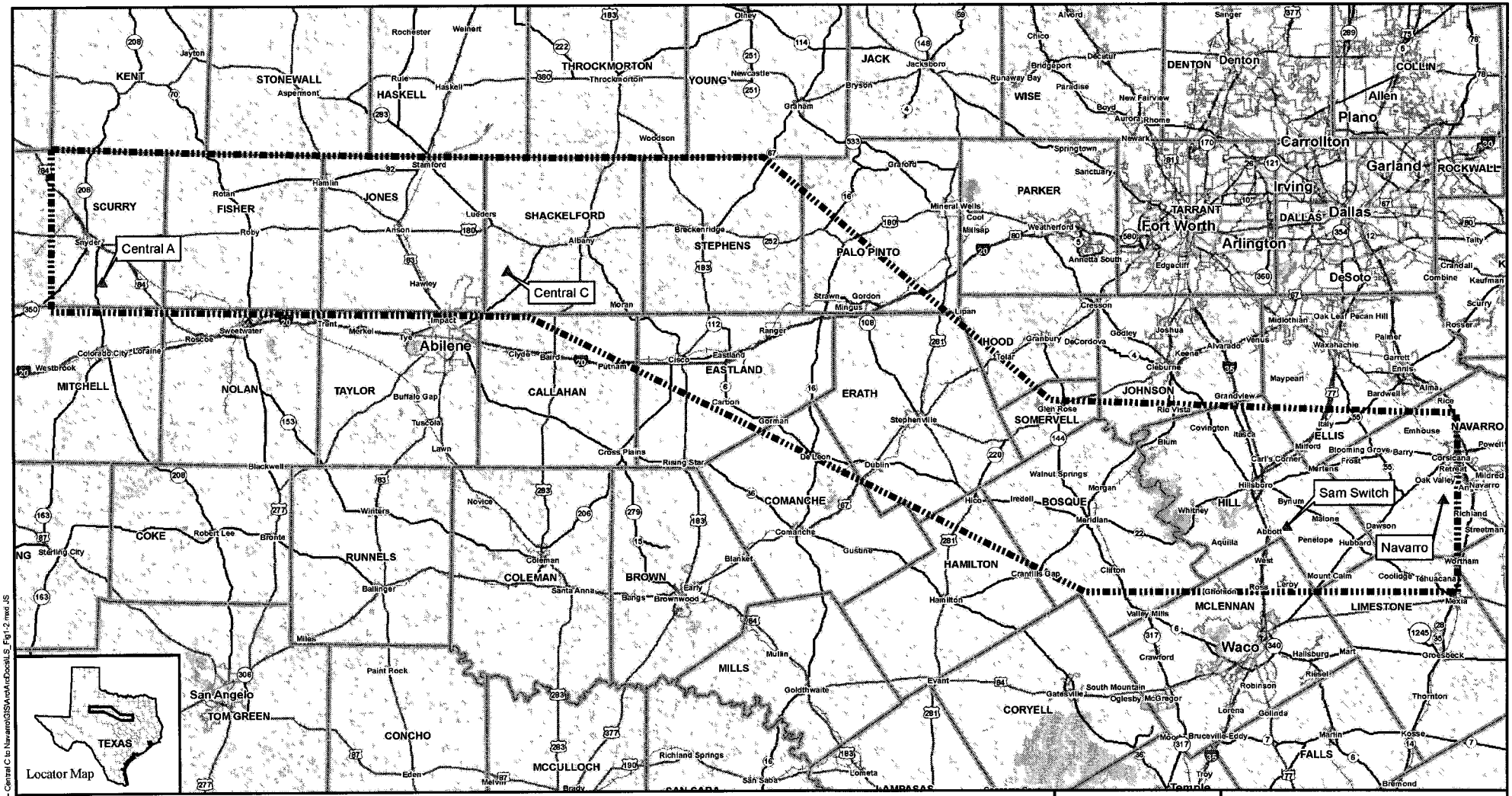

Figure 3-1
Project Study Area Map
Central A to Central C to
Sam Switch to Navarro
345 kV Transmission Line Project

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3.3 NATURAL RESOURCES

The following is a description of the natural resources in the study area. These resources include topography, soils, hydrology, vegetation, wetlands, wildlife, and threatened and endangered plant and animal species. An evaluation of the potential impacts of this project upon these resources is described in Chapter 7.0.

3.3.1 Topography

The study area is situated within three ecoregions of Texas as defined by the TPWD. The Rolling Plains region features a landscape with topography that increases gradually from east to west. The region is nearly level to gently sloping, but slopes are short and steep within valleys. The Rolling Plains are part of the Great Plains of the central United States and covers approximately 24 million acres of terrain. The region is bordered on the west by the Caprock Escarpment, on the south by the Edwards Plateau, and on the east by the Oak Woods and Prairies region. Annual precipitation is 20 to 30 inches and elevations range from 1,600 to 3,000 feet above sea level (The Handbook of Texas, 2009).

The Oak Woods and Prairies region consists of smooth plains with gradual sloping hills. This region covers approximately 17 million acres in north-central Texas. Rapid surface drainage is typical throughout the region. Annual precipitation is 25 to 35 inches and elevations range from 650 to 1,500 feet above sea level (The Handbook of Texas, 2009).

The Blackland Prairie region increases in topography gradually from south to north and from east to west. The area is mostly a nearly level to gently rolling dissected plain. Nearly level to gently sloping uplands merge into narrow valleys that have more sloping valley walls. The region covers approximately 11 million acres in northeast Texas. Annual precipitation is 30 to 45 inches and elevations range from 300 to 800 feet above sea level (The Handbook of Texas, 2009).

3.3.2 Soils

Land use patterns in the study area are influenced by the suitability and limitations of soil properties for development. The U.S. Department of Agriculture (USDA), NRCS has surveyed and mapped the soil units in each of the counties in the study area based on the physical properties and composition of the soil and the amount of slope and drainage where the soil is located. These soil maps are helpful in planning future land use and development.

Specific soil classifications are called soil map units. Soil map units describe the soil characteristics in a specific geographic area. The western third of the study area is dominated by Paducah, Chaney, and

Woodward soil units. The central third of the study area is dominated by Cranfill, Denton, and Maloterre-Tarrant soil units and the eastern third of the study area is dominated by Purves, Heiden, and Houston soil units. Table 3-1 includes a detailed description of the dominant soil associations located in the study area.

Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops. It also is well suitable for cropland, pastureland, rangeland, or forestland. It has the soil quality needed to economically produce sustained high yields of crops when treated and managed, including water management, according to acceptable farming methods (USDA, 2009). Table 3-1 provides prime farmland information for dominant soil associations located in the study area.

Table 3-1 Dominant Soil Associations in the Study Area

Soil Association	Characteristics
Chaney	• Nearly level to gently sloping • Moderately well drained, slowly permeable soils • Deep, loamy-sandy soils • Associated with gently sloping to sloping plains with mixed concave and convex surfaces • Used mainly for cropland and pasture • Often considered prime farmland if irrigated
Cranfill	• Gently sloping to moderately steep • Well drained, moderately permeable soils • Very deep, fine-loamy soils • Associated with uplands and footslopes • Used mainly for rangeland
Denton	• Nearly level to gently sloping • Well drained, slowly permeable soils • Deep, silty-clay soils • Associated with uplands • Used mainly for cropland and pasture • Considered prime farmland
Heiden	• Nearly level to moderately steep • Well drained, very slowly permeable soils • Deep, silty-clay soils • Associated with uplands • Used mainly for pasture and hay • Often considered prime farmland on level or near level topography
Houston	• Nearly level to gently sloping • Well drained, slowly permeable soils • Deep, clay soils • High clay content, shrink-swell potential • Associated with uplands • Used mainly for pasture and hay

Soil Association	Characteristics
Maloterre-Tarrant	• Gently sloping to moderately steep • Somewhat excessively drained, moderately slow permeable soils • Very shallow, clay-loam soils • Associated with uplands • Used as rangeland
Puducah	• Nearly level to gently sloping • Well drained, moderately permeable soils • Very deep, loam soils • Associated with uplands • Used mainly for cropland and pasture, occasionally for rangeland • Considered prime farmland
Purves	• Gently sloping to steep • Well drained, moderately slowly permeable soils • Shallow, clay-loam soils • Associated with uplands • Used mainly as rangeland
Woodward	• Very gently sloping to moderately steep • Well drained, moderately permeable soils • Moderately deep, silty-loam soils • Associated with summits, shoulders, and backslopes of ridges and escarpments • Used mainly for cropland and pasture • Often considered prime farmland if irrigated

Source: NRCS, 2009

3.3.3 Hydrology

According to The Handbook of Texas, the study area receives an average of approximately 30 inches of rain per year. The study area lies within three watersheds, the Colorado River, the Brazos River, and the Trinity River. The western half of Scurry County and all of Mitchell County are within the Colorado River watershed. The majority of the study area is within the Brazos River watershed, extending from the eastern half of Scurry County to the western half of Hill County. The Clear Fork of the Brazos River runs in an easterly direction through Scurry, Fisher, and Jones Counties. Major tributaries in these Counties are Cottonwood Creek, California Creek, Sweetwater Creek, Mulberry Creek, and Elm Creek, which all run in a northerly direction. Major tributaries of the Clear Fork of the Brazos River in Shackelford, Stephens, Callahan, and Eastland Counties include Salt Prong Creek, Hubbard Creek, Deep Creek, Battle Creek, Sandy Creek, Gonzales Creek, Cedar Creek, and Caddo Creek. Other major tributaries in Stephens, Palo Pinto, and Eastland Counties include Colony Creek, Leon Creek, Palo Pinto Creek, and South Fork Creek. The Bosque River runs in a southerly direction through Erath and Bosque Counties. Other major tributaries in Erath, Bosque, and Hill Counties include Spring Creek, Steele Creek, Nolan Creek, Childress Creek, Aquilla Creek, and Hackberry Creek. The Eastern half of Hill County and all of

Navarro County are within the Trinity River watershed, including two major tributaries, White Rock Creek and Richland Creek.

The TPWD indicated in its August 3, 2009 letter to Lone Star that there are six Ecologically Significant Stream Segments (Brazos River, Double Mountain Fork Brazos River, Paluxy River, Colony Creek, Steele Creek, and Neils Creek) within ten miles of the project area.

The Commissioner of Precinct #2 for Somervell County indicated in his June 10, 2009 letter that areas designated as recreational for the Brazos and Paluxy Rivers should be avoided. The County and District Clerk for Somervell County also indicated in a June 2, 2009 letter that the Brazos and Paluxy Rivers should be considered when routing.

According to the TWDB, Mitchell and Scurry Counties are in Region F of the Texas Regional Water Planning Area. Its total existing water supply is projected to be approximately 610,000 acre-ft in 2010, slightly decreasing to 605,000 acre-ft in 2060. Surface water and groundwater supplies account for approximately 25 and 75 percent of the total water to this region respectively. Four main aquifers account for the majority of the groundwater supply in this region (Edwards-Trinity, Cenozoic, Ogallala, and Trinity). None of these aquifers fall within the study area. Only one minor aquifer, Dockum, falls within this portion of the study area. Its approximate annual groundwater availability for Mitchell and Scurry Counties is 14,000 and 16,000 acre-ft respectively (TWDB, 2007).

Bosque, Callahan, Comanche, Eastland, Erath, Fisher, Hamilton, Hill, Hood, Johnson, Jones, Limestone, McLennan, Nolan, Palo Pinto, Shackelford, Somervell, Stephens, and Taylor Counties are in Region G of the Texas Regional Water Planning Area. Its total existing water supply is projected to be approximately 1,150,000 acre-ft in 2010, slightly decreasing to 1,110,000 acre-ft in 2060. Surface water and groundwater supplies account for approximately 75 and 25 percent of the total water to this region respectively. Six main aquifers account for the majority of the groundwater supply in this region (Edwards-Trinity, Seymour, Edwards, Carrizo-Wilcox, Gulf Coast, and Trinity). Only the Seymour and Trinity fall within this portion of the study area. Three minor aquifers fall within this portion of the study area (Dockum, Woodbine, and Brazos River Alluvium). The approximate annual groundwater availability for the Seymour and Trinity aquifers is 100,000 and 90,000 acre-ft respectively. The approximate annual groundwater availability for the Dockum, Woodbine, and Brazos River Alluvium aquifers is 5,000; 1,500; and 23,000 acre-ft respectively (TWDB, 2007).

Ellis, Freestone, and Navarro Counties are in Region C of the Texas Regional Water Planning Area. Its total existing water supply is projected to be approximately 1,500,000 acre-ft in 2010, slightly decreasing

to 1,400,000 acre-ft in 2060. Surface water and groundwater supplies account for approximately 90 and 5 percent of the total water supply to this region respectively. Two main aquifers account for the majority of the groundwater supply in this region (Carrizo-Wilcox and Trinity). Neither of these aquifers fall within this portion of the study area. Two minor aquifers (Woodbine and Nacatoch) fall within this portion of the study area. The approximate annual groundwater availability for this portion of the study area is 400 acre-ft (TWDB, 2007).

The Trinity Aquifer is a major aquifer extending north through the Blackland Prairie of Texas and supplies water to all or parts of 68 counties. The aquifer is composed primarily of sandstone, sand, silt, clay, conglomerate, shale, and limestone. Water moves slowly through the Edwards-Trinity formation in a southerly direction. Water ranges from fresh to slightly saline, containing from approximately 500 to 1,500 milligrams per liter of total dissolved solids. The majority of the groundwater pumped from the aquifer, 50 percent, is used for municipal supply, with the remainder primarily used for irrigation and industrial use (TWDB, 2007).

The Seymour Aquifer is a major aquifer extending across north central Texas. Water is contained in isolated patches of alluvium up to 360 ft thick composed of discontinuous beds of poorly sorted gravel, conglomerate, sand, and silty clay. Water ranges from fresh to slightly saline, containing from approximately 100 to 3,000 milligrams per liter of total dissolved solids. Throughout its extent, the aquifer is affected by nitrate in excess of primary drinking water standards. Excess chloride also occurs throughout the aquifer. Almost all of the groundwater pumped from the aquifer, 90 percent, is used for irrigation, with the remainder primarily used for municipal supply (TWDB, 2007).

Several major lakes and reservoirs occur within the study area. From west to east they are Fort Phantom Hill Lake, Hubbard Creek Reservoir, Lake Cisco, Lake Daniel, Lake Leon, Palo Pinto Lake, Bosque County Reservoir, Whitney Lake, Aquilla Lake, and Navarro Mills Lake.

The TWDB indicated in its July 23, 2009 letter that the proposed Wheeler Branch Reservoir in Somervell County and the proposed Cedar Ridge Reservoir in Shackelford County would fall within the study area. The City of Abilene also indicated in its July 14, 2009 letter that the proposed Cedar Ridge Reservoir should be considered during routing. The County and District Clerk for Somervell County indicated in her June 2, 2009 letter that the proposed Wheeler Branch Reservoir should be considered during routing. Navarro County Office of Planning & Development indicated in its June 4, 2009 letter that there are 111 flood control lakes within Navarro County and those lakes in the study area should be considered during routing.

3.3.4 Vegetation

Twelve main plant communities, defined by the TPWD, are located within the study area. These plant communities are live oak (*Quercus virginiana*) – ashe juniper (*Juniperus ashei*) parks; live oak (*Quercus virginiana*) – mesquite (*Prosopis*) – ashe juniper (*Juniperus ashei*) parks; silver bluestem (*Bothriochloa saccharoides*) – Texas wintergrass (*Stipa leucotricha*) grassland; mesquite (*Prosopis*) – lotebrush (*Ziziphus obtusifolia*) shrub; mesquite (*Prosopis*) brush; harvard shin oak (*Quercus havardii*) – mesquite (*Prosopis*) brush; oak (*Quercus*) – mesquite (*Prosopis*) – juniper (*Juniperus*) parks/woods; post oak (*Quercus stellata*) parks/woods; post oak (*Quercus stellata*) woods, forest, and grassland mosaic; Ashe juniper (*Juniperus ashei*) parks/woods; elm (*Ulmus*) – hackberry (*Celtis*) parks/woods; and water oak (*Quercus nigra*) – elm (*Ulmus*) – hackberry (*Celtis*) forest (TPWD, 2008).

Commonly associated plants of the live oak-ashe juniper parks and live oak-mesquite-ashe juniper parks vegetation community typically includes such species as Texas oak (*Quercus texana*), cedar elm (*Ulmus crassifolia*), netleaf hackberry (*Celtis laevigata*), flameleaf sumac (*Rhus lanceolata*), agarito (*Mahonia trifoliolata*), mexican persimmon (*Diospyros texana*), Texas pricklypear (*Opuntia engelmannii*), saw greenbriar (*Smilax bona-nox*), Texas wintergrass (*Nassella leucotricha*), little bluestem (*Schizachyrium scoparium*), curly mesquite (*Hilaria belangeri*), Texas grama (*Bouteloua rigidiseta*), Hall's panicum (*Panicum hallii*), purple three-awn (*Aristida purpurea*), hairy tridens (*Erioneuron pilosum*), cedar sedge (*Carex planostachys*), two-leaved senna (*Senna roemeriana*), mat euphorbia (*Chamaesyce serpens*), and rabbit tobacco (*Pseudognaphalium obtusifolium*) (TPWD, 2008).

Commonly associated plants of the silver bluestem – Texas wintergrass grassland plant community include little bluestem (*Schizachyrium scoparium*), sideoats grama (*Bouteloua curtipendula*), Texas grama (*Bouteloua rigidiseta*), three-awn (*Aristida*), hairy grama (*Bouteloua hirsuta*), tall dropseed (*Sporobolus asper*), buffalograss (*Bouteloua dactyloides*), windmillgrass (*Chloris sp.*), hairy tridens (*Erioneuron pilosum*), tumblegrass (*Schedonnardus paniculatus*), western ragweed (*Ambrosia psilostachya*), broom snakeweed (*Gutierrezia sarothrae*), Texas bluebonnet (*Lupinus subcarnosus*), live oak (*Quercus virginiana)*, post oak (*Quercus stellata*), and mesquite (*Prosopis*) (TPWD, 2008).

Commonly associated plants of the mesquite – lotebrush shrub and mesquite brush plant communities include lotebush (*Ziziphus obtusifolia*), shin oak (*Quercus sp.*), sumac (*Rhus*), Texas pricklypear (*Opuntia engelmannii*), tasajillo (*Cylindropuntia leptocaulis*), kidneywood (*Eysenhardtia*), agarito (*Mahonia trifoliolata*), redbud (*Cercis*), yucca (*Yucca*), lindheimer silktassel (*Garrya ovata*), sotol (*Dasylirion*), catclaw (*Uncaria tomentosa*), Mexican persimmon (*Diospyros texana*), sideoats grama (*Bouteloua curtipendula*), three-awn (*Aristida*), Texas grama (*Bouteloua rigidiseta*), hairy grama (*Bouteloua hirsute*),

curly mesquite (*Hilaria belangeri*), buffalograss (*Bouteloua dactyloides*), and hairy tridens (*Erioneuron pilosum*) (TPWD, 2008).

Commonly associated plants of the harvard shin oak – mesquite brush community typically include sandsage (*Artemisia filifolia*), catclaw (*Uncaria tomentosa*), yucca (*Yucca*), giant dropseed (*Sporobolus giganteus*), sand dropseed (*Sporobolus cryptandrus*), indiangrass (*Sorghastrum*), silver bluestem (*Bothriochloa saccharoides*), sand bluestem (*Andropogon hallii*), little bluestem (*Schizachyrium scoparium*), feather plume (*Dalea Formosa*), Illinois bundleflower (*Desmanthus illinoensis*), fox glove (*Digitalis*), and yellow evening primrose (*Oenothera flava*) (TPWD, 2008).

Commonly associated plants of the oak – mesquite – juniper parks/woods community typically include post oak (*Quercus stellata*), ashe juniper (*Juniperus ashei*), shin oak (*Quercus* sp.), Texas oak (*Quercus texana*), blackjack oak (*Quercus marilandica*), live oak (*Quercus virginiana*), cedar elm (*Ulmus crassifolia*), agarito (*Mahonia trifoliolata*), soapberry (*Sapindus*), sumac (*Rhus*), hackberry (*Celtis*), Texas pricklypear (*Opuntia engelmannii*), Mexican persimmon (*Diospyros texana*), purple three-awn (*Aristida purpurea*), hairy grama (*Bouteloua hirsute*), Texas grama (*Bouteloua rigidiseta*), sideoats grama (*Bouteloua curtipendula*), curly mesquite (*Hilaria belangeri*), and Texas wintergrass (*Stipa leucotricha*) (TPWD, 2008).

Commonly associated plants of the post oak parks/woods and post oak woods, forest, and grassland mosaic communities typically include blackjack oak (*Quercus marilandica*), eastern redcedar (*Juniperus virginiana*), mesquite (*Prosopis)*, black hickory (*Carya texana*), live oak (*Quercus virginiana*), sandjack oak (*Quercus incana*), cedar elm (*Ulmus crassifolia*), hackberry (*Celtis*), yaupon (*Ilex vomitoria*), poison oak (*Toxicodendron*), American beautyberry (*Callicarpa Americana*), hawthorn (*Crataegus*), supplejack (*Berchemia*), trumpet creeper (*Campsis radicans*), dewberry (*Rubus* sp.), coral-berry (*Symphoricarpos orbiculatus*), little bluestem (*Schizachyrium scoparium*), silver bluestem (*Bothriochloa saccharoides*), sand lovegrass (*Eragrostis trichodes*), beaked panicum (*Panicum anceps*), three-awn (*Aristida*), spranglegrass (*Chasmanthium sessiliflorum*), and tickclover (*Desmodium triflorum*) (TPWD, 2008).

Commonly associated plants of the ashe juniper parks/woods community typically include live oak (*Quercus virginiana*), Texas oak (*Quercus texana*), cedar elm (*Ulmus crassifolia*), mesquite (*Prosopis)*, agarito (*Mahonia trifoliolata*), tasajillo (*Cylindropuntia leptocaulis*), western ragweed (*Ambrosia psilostachya*), scurfpea (*Cullen*), little bluestem (*Schizachyrium scoparium*), sideoats grama (*Bouteloua curtipendula*), Texas wintergrass, silver bluestem, hairy tridens, tumblegrass, and red three-awn (TPWD, 2008).

Commonly associated plants of the elm – hackberry parks/woods community typically include mesquite (*Prosopis*), post oak (*Quercus stellata*), woollybucket bumelia (*Bumelia lanuginose*), honey locust (*Gleditsia triacanthos*), coral-berry (*Symphoricarpos orbiculatus*), pasture haw (*Crataegus spathulata*), elbowbush (*Forestiera pubescens*), Texas pricklypear (*Opuntia engelmannii*), tasajillo (*Cylindropuntia leptocaulis*), dewberry (*Rubus* sp.), silver bluestem (*Bothriochloa saccharoides*), buffalograss (*Bouteloua dactyloides*), western ragweed (*Ambrosia psilostachya*), giant ragweed (*Ambrosia trifida*), goldenrod (*Solidago*), frostweed (*Helianthemum*), ironweed (*Vernonia*), prairie parsley (*Polytaenia texana*), and broom snakeweed (*Gutierrezia sarothrae*) (TPWD, 2008).

Commonly associated plants of the water oak – elm – hackberry forest community typically include cedar elm (*Ulmus crassifolia*), American elm (*Ulmus Americana*), willow oak (*Quercus phellos*), southern red oak (*Quercus falcate*), white oak (*Quercus alba*), black willow (*Quercus velutina*), cottonwood (*Populus*), red ash (*Fraxinus pennsylvanica*), sycamore (*Platanus*), pecan (*Carya illinoinensis*), bois d'arc (*Maclura pomifera*), flowering dogwood (*Cornus florida*), dewberry (*Rubus* sp.), coral-berry (*Symphoricarpos orbiculatus*), dallisgrass (*Paspalum dilatatum*), switchgrass (*Panicum virgatum*), rescuegrass (*Bromus catharticus*), bermudagrass (*Cynodon dactylon*), eastern gamagrass (*Tripsacum dactyloides*), Virginia wildrye (*Elymus virginicus*), johnsongrass (*Sorghum halepense*), giant ragweed (*Ambrosia trifida*), yankeeweed (*Eupatorium compositifolium*), and Leavenworth's eryngo (*Eryngium leavenworthii*) (TPWD, 2008).

The TPWD indicated in its August 3, 2009 letter to Lone Star that there are seven natural communities, ashe juniper-oak (*Junperus ashei-Quercus spp.*) series, cedar elm-sugarberry (*Ulmus crassifolia-Celtis laevigata*) series, little bluestem-indiangrass (*Schizachyrium scoparium-Sorghastrum nutans*) series, pecan-sugarberry (*Carya illinoinensis-Celtis laevigata*) series, post oak-blackjack oak (*Quercus stellata-Quercus marilandica*) series, redberry juniper-midgrass (*Juniperus pinchotii*) series, and Texas oak (*Quercus buckleyi*) series, within ten miles of the study area.

3.3.5 Threatened and Endangered Plant Species

According to the TPWD, three federally listed endangered plant species, Texas poppy-mallow (*Callirhoe scabriuscula*), large-fruited sand-verbena (*Abronia macrocarpa*), and Navasota ladies'-tresses (*Spiranthes parksii*) occur within the study area. The TPWD indicated in its January 21, 2009 letter to the PUCT regarding the Competitive Renewable Energy Zones (CREZ) projects that dwarf broomspurge (*Chamaesyce jejuna*), Hill Country wild-mercury (*Argythamnia aphoroides*), Irion Country wild-buckwheat (*Eriogonum nealleyi*), Warnock's coral-root (*Hexalectris warnockii*), Comanche Peak prairie-clover (*Dalea reverchonii*) and Glen Rose yucca (*Yucca necopina*), which are state listed species of

concern, are known to occur in the three broad ecoregions (the Rolling Plains, the Oak Woods and Prairies and the Blackland Prairie) within the study area. The TPWD indicated in its August 3, 2009 letter to Lone Star that Comanche Peak prairie-clover (*Dalea reverchonii*), dwarf broomspurge (*Chamaesyce jejuna*), and Glen Rose yucca (*Yucca necopina*) are known to occur within ten miles of the study area. The USFWS indicated in its June 26, 2009 letter that the federally endangered Navasota ladies'-tresses (*Spiranthes parksii*) occur in Limestone County.

3.3.6 Wetlands

Wetlands are especially valued because of their location on the landscape, the wide variety of ecological functions they perform, the ability for storing or conveying floodwaters, and the uniqueness of their vegetation and animal communities. Wetlands also provide high-quality habitats for wildlife, including foraging and nesting areas for birds and spawning and nursery areas for fish sites for educational research.

Based on USFWS National Wetland Inventory (NWI) maps, there are eight distinctive types of wetland categories in the study area. These eight wetland types fall into two broad categories, palustrine and riverine. The Palustrine System includes all nontidal wetlands dominated by trees, shrubs, and emergents (herbaceous plants). The Riverine System includes all wetlands and deepwater habitats contained within a channel except for wetlands dominated by trees, shrubs, persistent emergents, emergent moss, or lichens and habitat with water containing ocean-derived salts in excess of 0.5% (Cowardin et al, 1979). The study area contains five main groups of palustrine wetlands: emergent, forested, scrub-shrub, unconsolidated shore, and unconsolidated bottom. The riverine wetlands include intermittent streambed, lower perennial unconsolidated shore, and lower perennial unconsolidated bottom. Most of these wetlands are associated with the streams in the study area.

3.3.7 Wildlife

The proposed study area is primarily used for grazing cattle, crop cultivation, and various ranching operations. Much of the native wildlife that occurs within the study area has to compete with cattle ranching and agricultural land uses and is typically restricted to unused wooded and scrubby areas along streams and in river floodplains.

Mammals that are likely to occur within the study area include white-tailed deer (*Odocoileus virginianus*), bobcat (*Lynx rufus*), coyote (*Canis latrans*), gray fox (*Urocyon cinereoargenteus*), raccoon (*Procyon lotor*), opossum (*Didelphis virginiana*), striped skunk (*Mephitis mephitis*), armadillo (*Dasypus novemcinctus*), cottontail rabbit (*Sylvilagus floridanus*), fox squirrel (*Sciurus niger*), thirteen lined ground squirrel (*Spermophilus tridecemlineatus*), plains pocket gopher (*Geomys bursarius*), least shrew

(*Cryptotis parva*), eastern mole (*Scalopus aquaticus*), white-footed mouse (*Peromyscus leucopus*), and deer mouse (*Peromyscus maniculatus*) (TPWD, 2009a).

Birds commonly encountered within the study area include the northern cardinal (*Cardinalis cardinalis*), American robin (*Turdus migratorius*), scissor-tailed flycatcher (*Tyrannus caudifasciatus*), tufted titmouse (*Parus bicolor*), summer tanager (*Piranga rubra*), blue-gray gnatcatcher (*Polioptila caerulea*), Carolina wren (*Thryothorus ludovicianus*), brown-headed cowbird (*Molothrus ater*), eastern meadowlark (*Sturnella magna*), red-winged blackbird (*Agelaius phoeniceus*), eastern bluebird (*Sialia sialis*), northern mockingbird (*Mimus polyglottos*), turkey vulture (*Cathartes aura*), wild turkey (*Meleagris gallopavo*), northern bobwhite (*Colinus virginianus*), and mourning dove (*Zenaida macroura*) (TPWD, 2009a).

Amphibians and reptiles likely to occur within the study area include the Texas toad (*Bufo speciosus*), Woodhouse's toad (*Bufo woodhousii*), ornate box turtle (*Terrapene ornate*), tiger salamander (*Ambystoma tigrinum*), checkered garter snake (*Thamnophis marcianus*), prairie kingsnake (*Lampropeltis calligaster*), gopher snake (*Pituophis catenifer*), and western diamondback rattlesnake (*Crotalus atrox*) (TPWD, 2009a).

Fish likely to occur within the study area lakes and creeks include the spotted gar (*Lepisosteus oculatus*), largemouth bass (*Micropterus salmoides*), bluegill (*Lepomis macrochirus*), redear sunfish (*Lepomis microlophus*), green sunfish (*Lepomis cyanellus*), bowfin (*Amia calva*), flathead catfish (*Pylodictis olivaris*), white crappie (*Pomoxis annularis*), freshwater drum (*Aplodinotus grunniens*), channel catfish (*Ictalulrus punctatus*), walleye (*Sander vitreum*), and black crappie (*Pomoxis nigromaculatus*) (TPWD, 2009a).

Various species throughout the study area are considered recreationally or commercially valuable. These species provide human benefits as a result of both nonconsumptive recreational and hunting activities. Nonconsumptive activities include bird-watching, wildlife photography, etc. These types of activities apply to all wildlife within the study area. The majority of recreational activity in the study area consists of hunting. Commonly hunted animals within the study area include white-tailed deer, Rio Grande turkey, squirrel, rabbit, dove, and various types of migratory waterfowl. Numerous high game fences were noted in various portions of the study area that would include hunting of the above species, as well as imported exotic species in some cases. The relative small size of streams and lakes in the study area is considered too small for significant recreational or commercial fishery. Major rivers such as the Brazos River, Bosque River, and Paluxy River, and their respective tributaries, provide recreational fishing but have no known commercial fisheries. Common gamefish in the Fort Phantom Hill Lake, Hubbard Creek

Reservoir, Lake Cisco, Lake Daniel, Lake Leon, Palo Pinto Lake, Bosque County Reservoir, Whitney Lake, Aquilla Lake, Navarro Mills Lake and other smaller study area lakes includes largemouth bass, white bass, channel catfish, white crappie, redear sunfish, and walleye (TPWD, 2009a).

3.3.8 Threatened and Endangered Animal Species

According to the TPWD and the USFWS, 21 threatened or endangered species are known or likely to occur in the study area (Table 3-2). Two additional species, the sharpnose shiner and the smalleye shiner, are listed as candidates for listing by the USFWS. TPWD indicated in its August 3, 2009 letter to Lone Star that the western burrowing owl (*Athene cunicularia hypugaea*), Guadalupe bass (*Micropterus treculii*), plains spotted skunk (*Spilogale putorius interrupta*), and the Texas garter snake (*Thamnophis sirtalis annectens*) are species of concern within the ten miles of the study area. Additionally, TPWD listed colonial waterbird rookeries and prairie dog (*Cynomys ludovicianus*) towns as special features within ten miles of the study area. Only those species listed as threatened or endangered by USFWS are protected by federal law. A brief description of habitats used by the protected species listed by the TPWD and USFWS is provided below.

Table 3-2 Protected Species that are Known or Likely to Occur within the Study Area Counties

Species	State Status	Federal Status	Counties of Occurrence	Potential for Occurrence in Study Area
American peregrine falcon (*Falco peregrinus anatum*)	Endangered	Delisted	All Counties	Yes
Arctic peregrine falcon (*Falco peregrinus tundrius*)	Threatened	Delisted	All Counties	Yes
Bachman's sparrow (*Aimophila aestivalis*)	Threatened	None	Freestone	No
Bald eagle (*Haliaeetus leucocephalus*)	Threatened	Delisted	All Counties	Yes
Black-capped vireo (*Vireo atricapilla*)	Endangered	Endangered	Bosque, Callahan, Comanche, Erath, Hamilton, Hood, Johnson, McLennan, Nolan, Palo Pinto, Somervell, Stephens, and Taylor	Yes
Golden-cheeked warbler (*Dendroica chrysoparia*)	Endangered	Endangered	Bosque, Comanche, Eastland, Ellis, Erath, Hamilton, Hill, Hood, Johnson, McLennan, Palo Pinto, Somervell, and Stephens	Yes

Species	State Status	Federal Status	Counties of Occurrence	Potential for Occurrence in Study Area
Interior least tern (*Sterna antillarum*)	Endangered	Endangered	Bosque, Comanche, Ellis, Freestone, Hill, Hood, Johnson, Limestone, McLennan, Mitchell, Navarro, Palo Pinto, Scurry, Somervell, and Stephens	Yes
Piping plover (*Charadrius melodus*)	Threatened	Threatened	Freestone and Navarro	Yes
White-faced ibis (*Plegadis chihi*)	Threatened	None	Ellis, Hill, Johnson, Limestone, McLennan, and Navarro	Yes
Whooping crane (*Grus americana*)	Endangered	Endangered	All Counties	Yes
Wood stork (*Mycteria Americana*)	Threatened	None	Ellis, Freestone, Hill, Limestone, McLennan, and Navarro	Yes
Sharpnose shiner (*Notropis oxyrhynchus*)	None	Candidate	Bosque, Fisher, Hill, Hood, Johnson, Jones, McLennan, Palo Pinto, and Somervell	Yes
Smalleye shiner (*Notropis oxyrhynchus*)	None	Candidate	Bosque, Comanche, Eastland, Erath, Fisher, Hamilton, Hill, Hood, Johnson, Jones, Limestone, McLennan, Palo Pinto, Shackelford, Somervell, and Stephens	Yes
Black bear (*Ursus americanus*)	Threatened	Threatened	Hood	No
Black-footed ferret (*Mustela nigripes*)	None	Endangered	Fisher, Jones, Mitchell, Nolan, and Scurry	Yes
Gray wolf (*Canis lupus*)	Endangered	Endangered	Callahan, Comanche, Eastland, Erath, Fisher, Hamilton, Hood, Johnson, Jones, Mitchell, Nolan, Palo Pinto, Scurry, Shackelford, Somervell, Stephens, and Taylor	No
Red wolf (*Canis rufus*)	Endangered	Endangered	Bosque, Callahan, Comanche, Eastland, Ellis, Erath, Freestone, Hamilton, Hill, Hood, Johnson, Jones, Limestone, McLennan, Navarro, Palo Pinto, Shackelford, Somervell, Stephens, and Taylor	No
Alligator snapping turtle (*Macrochelys temminckii*)	Threatened	None	Ellis, Freestone, Limestone, and Navarro	Yes
Brazos water snake (*Nerodia harteri*)	Threatened	None	Bosque, Erath, Hill, Hood, Johnson, Jones, Palo Pinto, Shackelford, Somervell, and Stephens	Yes
Concho water snake (*Nerodia paucimaculata*)	Threatened	None	Mitchell	No
Houston toad (*Bufo houstonensis*)	Endangered	Endangered	Freestone	No

Species	State Status	Federal Status	Counties of Occurrence	Potential for Occurrence in Study Area
Texas horned lizard (*Phrynosoma cornutum*)	Threatened	None	All Counties	Yes
Timber/canebrake rattlesnake (*Crotalus horridus*)	Threatened	None	Bosque, Eastland, Ellis, Freestone, Hill, Hood, Johnson, Limestone, McLennan, Navarro, and Somervell	Yes

Sources: USFWS, 2009 and TPWD 2009b

Both listed species of peregrine falcon inhabit open areas usually associated with high cliffs and bluffs over rivers and coasts but they may nest on buildings and bridges in urban areas. These falcons are observed most often during the spring and fall migration, especially in areas with high concentrations of shorebirds and waterfowl (TPWD, 2009c).

Bachman's sparrows are a year-round resident in north-eastern Texas. Typically, they inhabit areas with scattered, scrubby vegetation and a dense herbaceous understory. Breeding for the bachman's sparrow occurs in open pine forests. They eat seeds of herbaceous plants and pines, and small insects (IUCN, 2009a).

During winter, bald eagles congregate near rivers and reservoirs with open water and often near large concentrations of waterfowl. They usually perch within a riparian corridor or along lake shores where there is limited human activity. In addition to feeding on fish, bald eagles also feed on dead or crippled waterfowl, small mammals and carrion. During winter nights, bald eagles may congregate at communal roosts (TPWD, 2009d).

Black-capped vireos nest only in Texas and Oklahoma in clusters and small thickets of deciduous brush, oak scrub, brushy hillsides, and rocky canyons. This species may also be found along eroded gullies where relatively low growing shrubby vegetation occurs. Black-capped vireos are particularly prone to nest parasitism by cowbirds (*Molothrus ater*). Heavy cowbird parasitism and loss of habitat due to destruction and natural succession resulting from fire suppression are major threats (TPWD, 2009e).

Golden-cheeked warblers nest only in mature woods of mixed ashe-juniper and oak on hillsides and slopes of ravines, streams, and canyons. Golden-cheeked warblers are found in the southeastern quarter of the Edwards plateau, the southeastern quarter of the Oak Woods and Prairies natural regions, and locally north to Palo Pinto County. The decline of the golden-cheeked warbler is related to the

fragmentation and loss of nesting habitat resulting from land-clearing for agricultural land and land development (TPWD, 2009f).

Interior least terns nest in small colonies on sandbar islands in major rivers and sand and gravel pits. Suitable nesting sites have sparse or no vegetation and are well back from the water line. Interior least terns forage along shorelines, sandbar margins, backwaters, and chutes usually within a few hundred meters of the nesting colony. Their diet consists almost entirely of small fish, primarily minnows (TPWD, 2009g).

Piping plovers live on open sandy beaches or rocky shores, often in high, dry sections away from water. Nests are typically located near small clumps of grass, drift, or other windbreak. They mainly eat small insects, marine worms, and crustaceans (TPWD, 2009h).

The white-faced ibis frequents swamps, ponds and rivers but prefers freshwater marshes, where it can find insects, crayfish, frogs and fish. They roost on low platforms of dead reed stems or on mud banks. The areas where these nests are built usually are where water is less than three feet deep (TPWD, 2009i).

Whooping cranes nest in Canada during warmer months and winter in coastal marshes in Texas. The migration route of this population passes through north central Texas and migrating whooping cranes often are sighted at and along reservoirs, large ponds, rivers, and wetlands at stop-over habitats (TPWD, 2009j).

Wood storks require open access to nest in trees and are frequently found in or adjacent to open water areas such as a forested or scrub-shrub wetland. They are tactile feeders and frequently feed in large groups in open wetlands, where prey species are available and water depth is less than two feet (International Union for Conservation of Nature (IUCN), 2009b).

Sharpnose shiners and smalleye shiners are endemic to the Brazos River drainage. Both shiner species are typically found in the turbid waters of sandy main channels of the Brazos River with moderate depths and current velocities (Marks, 1999).

The black bear is found in a wide array of habitats ranging from swamps to desert scrub, however, they prefer forest and shrubby areas. Most species of black bears have been extirpated from Texas, with the exception of the Mexican black bear (*Ursus americanus eremicus*) and the New Mexico black bear (subspecies *U. a. amblyceps*), which are found in the Chisos and Guadalupe Mountains in West Texas (Texas Tech University, 2009).

Black-footed ferrets inhabit short and middle grass prairies. Their diet consists mainly of prairie dogs. A single black-footed ferret eats approximately 100 prairie dogs a year and struggles to survive without access to large colonies of them. They are also known to eat other small mammals, birds, and insects (TPWD, 2009k).

Wolves inhabit forests, brushlands, and grasslands but prefer broken, open country in which suitable "hideouts" and denning sites are available. Red and gray wolves have been extirpated from most of Texas and currently only occupy areas in south Texas and along the Texas-Mexico border (Davis and Schmidly, 1994).

The alligator snapping turtle inhabits slow running and muddy rivers, streams, ponds and marshes, often lying partially embedded in the mud of the river bottom. Only females venture out into open areas in order to deposit their eggs. They are known to eat anything smaller than themselves, but most often they feed on various fish species (USGS, 2009).

The Brazos water snake is found along rocky waterways in the Brazos River system. Specifically, it is found under rocks, along borders of streams, or in shallow water, and amid grasses and sedges along the banks. Little else is known about its behavior (Greene et al, 1994).

Concho water snakes are active from March through October. In the heat of summer, the snakes are active primarily in the early morning and evening. These snakes hibernate during the winter in areas such as crayfish burrows, rock ledges, debris piles, and concrete low water crossings. The snakes catch prey by remaining stationary near fish concentrations or by actively searching under and around rocks in riffles. Minnows (red shiners and bullhead minnows), mosquitofish, channel and flathead catfish, gizzard shad, and sunfish make up the bulk of its diet (Greene et al, 1994).

The Houston toad lives primarily on land and is a year-round resident of Texas. The toad burrows into the sand for protection from cold weather in the winter and hot, dry conditions in the summer. The Houston toad is associated with loblolly pine, post oak, bluejack or sandjack oak, yaupon, and little bluestem. It requires loose, deep sands supporting woodland savannah and still or flowing waters for breeding (TPWD, 2009l).

Texas horned lizards are found in arid and semiarid habitats in open areas with sparse plant cover. They feed on ants and other small insects and are found on loose sand or loamy soils and dig burrows for hibernation and nesting (Davis and Schmidly, 1994).

Timber rattlesnakes are typically found only in the wetter habitats of wooded forests, well-vegetated lowlands, and heavily vegetated riparian waterways in the eastern quarter of the state of Texas. It feeds on small rodents and is often found along rodent paths in dense vegetation (TPWD, 2009m).

In addition to the above listed species, TPWD indicated in its August 3, 2009 letter to Lone Star that the western burrowing owl, plains spotted skunk, Guadalupe bass, and Texas garter snake are species of concern within ten miles of the study area. The TPWD also referenced colonial waterbird populations and prairie dog colonies as special features potentially occurring within ten miles of the study area.

The western burrowing owl can be found in grasslands, rangelands, agricultural areas, deserts, or any other dry, open area with low vegetation. They typically feed on eat large insects, small rodents, and frogs (TPWD, 2009n).

The plains spotted skunk is generally associated with streams or rivers, but will also live in areas of human habitation including barns and brush piles. They feed on small birds, vegetables, insects, and rodents (Davis and Schmidly, 1994).

The Guadalupe bass is found in shallow, flowing water throughout Texas. They feed on aquatic invertebrates (TPWD, 2009o).

The Texas garter snake is typically found in lightly wooded and dry areas. They are also often found in urban locations, under debris, rocks, logs and vegetation. They feed on small amphibians, earthworms, fish, small birds, and rodents (Rossman, 1996).

Colonial waterbird populations are key environmental indicators of estuary health and productivity in Texas. They represent the top of the food chain and reflect the system's overall health. Colonial waterbirds are found on coastal beaches, bays, and estuaries, and its diet consists mainly of fish and aquatic invertebrates (USFWS, 2002).

Prairie dog colonies or "towns" are established in areas that have been heavily grazed by cattle. Burrows are usually quite visible because of the large mound of dirt around the entrance. They are especially important as a food and habitat resource for the surrounding ecosystem (TPWD, 2009p).

3.4 HUMAN RESOURCES

Following is a description of the existing human resources in the study area, including community values and community resources, land use, agriculture, urban and residential areas, park and recreation areas,