Environmental Assessment and Alternative Route Analysis for the Dallam to Sherman 115-kV Transmission Line Project Dallam and Sherman Counties, Texas

PBS&J Job No. 100001203

ENVIRONMENTAL ASSESSMENT AND ALTERNATIVE ROUTE ANALYSIS FOR THE DALLAM TO SHERMAN 115-KV TRANSMISSION LINE PROJECT DALLAM AND SHERMAN COUNTIES, TEXAS

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Contents

Page

Figures

Page

Tables

Page

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Acronyms and Abbreviations

ac	acre
APLIC	Avian Power Line Interaction Committee
BEG	Bureau of Economic Geology
BLS	Bureau of Labor Statistics
CCN	Certificate of Convenience and Necessity
CR	County Road
CWA	Clean Water Act
EA	environmental assessment
EPA	Environmental Protection Agency
EPRI	Electric Power Research Institute
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FEMA	Federal Emergency Management Agency
FM	Farm-to-Market Road
ft	feet/foot
FWS	U.S. Fish and Wildlife Service
HPA	high probability area
kV	kilovolt
MPO	Metropolitan Planning Organizations
NASS	National Agricultural Statistics Service
NDD	Natural Diversity Database
NOI	Notice of Intent
NRCS	Natural Resources Conservation Service
NWI	National Wetlands Inventory
NWP	Nationwide Permits
OTHM	Official Texas Historical Markers
PUC	Public Utility Commission of Texas
ROW	right-of-way
SAL	State Archeological Landmark
SDHPT	State Department of Highways and Public Transportation
SPS	Southwestern Public Service Company
SWPPP	Storm Water Pollution Prevention Plan
TARL	Texas Archeological Research Laboratory
TCEQ	Texas Commission on Environmental Quality
THC	Texas Historical Commission
TORI	Texas Outdoor Recreation Inventory
TOS	Texas Ornithological Society
TPWD	Texas Parks and Wildlife Department
TUC	Texas Utilities Code

TWC	Texas Workforce Commission
TWDB	Texas Water Development Board
TxDOT	Texas Department of Transportation
US	U.S. Highway
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USGS	U.S. Geological Survey

1.0 DESCRIPTION OF THE PROPOSED PROJECT

1.1 SCOPE OF PROJECT

Southwestern Public Service Company (SPS), a Subsidiary of Xcel Energy, is proposing to construct a single-circuit, 115-kilovolt (kV) electric transmission line between the existing Dallam County Substation, located approximately 0.5 miles east of U.S. Highway (US) 87 on Ponderosa Lane, on the northwest side of the City of Dalhart, and the existing Sherman County Substation, located approximately 0.17 miles south of the intersection of US 54 and County Road (CR) 9, approximately 2.5 miles northeast of the City of Stratford, in Dallam and Sherman Counties, Texas (Figure 1-1). Depending on which route is ultimately selected, the proposed project would be approximately 42 miles long and located entirely within Dallam and Sherman Counties, Texas.

1.2 PURPOSE AND NEED

SPS has developed several projects to improve the transmission service to the customers in the Texas Panhandle. These projects are needed to improve the reliability of existing transmission service, and to accommodate the growth of existing customer loads.

One of these projects is construction of a 115 kV line from the Dallam County Substation to the Sherman County Substation. This line is needed to support the Dalhart, Texas area during the contingency loss of any of the existing 115 kV transmission lines feeding Dalhart.

1.3 AGENCY ACTIONS

Construction documents and specifications will indicate any special construction measures needed to comply with the regulatory requirements listed below. In addition, depending upon the location of the transmission line structures, road crossing and railroad crossing permits may be required.

1.3.1 Public Utility Commission

SPS's proposed transmission line project will require an application for a Certificate of Convenience and Necessity (CCN) with the Public Utility Commission of Texas (PUC). This environmental assessment and route analysis report has been prepared by PBS&J in support of SPS's application for the CCN on this project. This document is intended to provide information on certain environmental and land use factors contained in Section 37.056(c)(4) of the Texas Utilities Code, PUC Substantive Rule 25.101(b)(3)(B), as well as to address relevant questions in the PUC's CCN application. This report may also be used in support of any other local, state, or federal permitting requirements, if necessary. SPS will acquire PUC approval prior to beginning construction of the transmission line.

1.3.2 U.S. Army Corps of Engineers

Under Section 404 of the Clean Water Act (CWA), activities in wetlands are regulated by the U.S. Army Corps of Engineers (USACE), in conjunction with the EPA. The discharge of dredged or fill materials, draining, excavation, or mechanized land clearing in waters of the U.S., including wetlands, is subject to USACE regulatory policies. Thus, potential wetland impacts incurred by the proposed transmission line project are subject to USACE regulation.

Certain construction activities that potentially impact waters and wetlands may be authorized by one of the USACE's Nationwide Permits (NWP). Permits that may apply to placement of support structures and associated activities are NWP numbers 25 and 12. NWP 25 authorizes the discharge of concrete, sand, rock, etc., into tightly sealed forms or cells where the material is used as a structural member for standard pile-supported structures (linear projects, not buildings or other structures). NWP 12 authorizes discharges associated with the construction of utility lines and substations within waters of the U.S. and additional activities affecting waters of the U.S. such as those associated with the construction and maintenance of utility line substations; foundations for overhead utility line towers, poles, and anchors; and access roads for the construction and maintenance of utility lines.

Under Section 10 of the Rivers and Harbors Act of 1899, the USACE is directed by Congress to regulate all work and structures in, or affecting the course, condition, or capacity of, navigable waters of the U.S. According to the Tulsa District office of the USACE, there are no features within the study area that would require permitting under Section 10 of the Rivers and Harbors Act.

1.3.3 Texas Commission on Environmental Quality

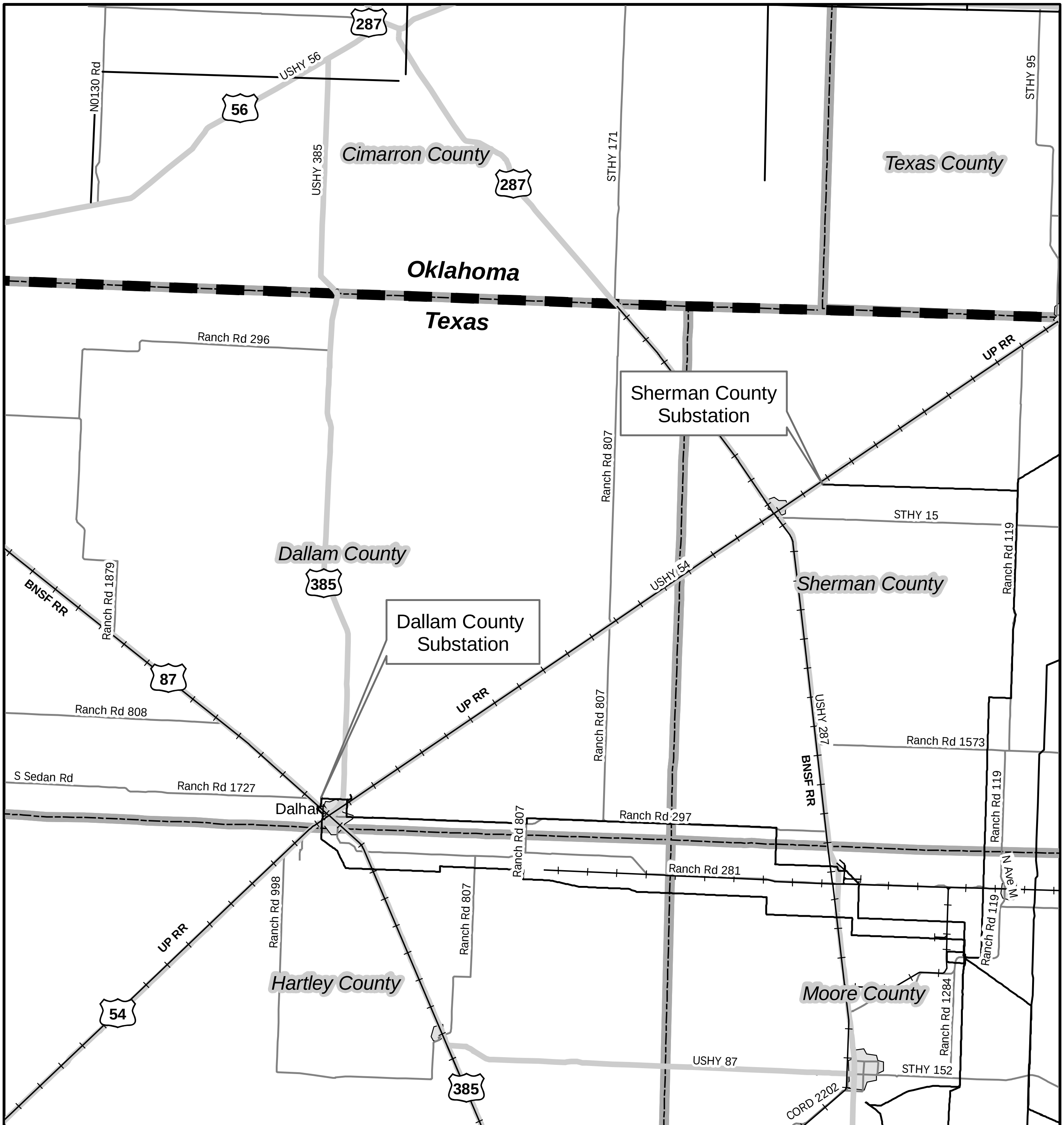
If this project requires more than 1 acre (ac) of clearing, the Texas Commission on Environmental Quality (TCEQ) would require implementation of a Storm Water Pollution Prevention Plan (SWPPP). SPS will submit a Notice of Intent (NOI) to the TCEQ prior to clearing and construction if it is determined that more than 1 acre will be cleared.

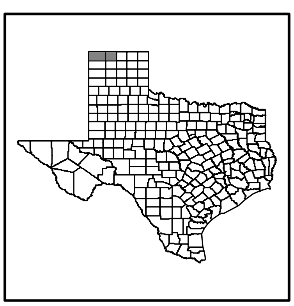
1.3.4 Federal Aviation Administration

SPS is evaluating alternative routes that are in the vicinity of three Federal Aviation Administration (FAA)-registered airports and one private airstrip. The airports are: Dalhart Municipal Airport, Stratford Field Airport, and Pronger Brothers Ranch Airport (FAA, 2009). SPS will file a "Notice of Proposed Construction or Alteration" (Form 7460-1) with the FAA if the alternative route certificated by the PUC is located in the vicinity of any of the FAA-registered airports.

1.3.5 Texas Historical Commission

SPS will obtain clearance from the Texas Historical Commission (THC) with regard to requirements concerning historic and prehistoric cultural resources, prior to construction.





Legend

N W E S

County Boundary

State Boundary

0 2.5 5 10

Miles

BASE MAP: ESRI STREETMAP USA DATA

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Xcel Energy

Figure 1-1
Project Area Location Map
Dallam - Sherman
115 kV Transmission Line Project
Revised Date: 06/16/2009

PROJ.NO. 100001203

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1.3.6 Texas Department of Transportation

Permits will be obtained from the Texas Department of Transportation (TxDOT) for any crossing of a state-maintained roadway.

1.3.7 Railroad Crossing Permit

Permits will be obtained from Union Pacific Railroad and Burlington Northern Santa Fe Railroad for any crossing of a railroad.

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2.0 SELECTION AND EVALUATION OF ALTERNATIVE TRANSMISSION LINE ROUTES

2.1 OBJECTIVE OF STUDY

The objective of this study was to select and evaluate several alternative transmission line routes and ultimately recommend a preferred and several alternate routes for the proposed 115-kV transmission line that are feasible from economic, engineering, and environmental standpoints. SPS and PBS&J utilized a comprehensive transmission line routing and evaluation methodology to delineate and evaluate alternative transmission line routes. Methods used to locate and evaluate potential routes were governed by SPS's transmission line routing process and criteria, and the Texas Utilities Code (TUC). The following sections provide a description of the process used in the selection and evaluation of alternative transmission line routes.

2.2 DATA COLLECTION

Data used by PBS&J in the delineation and evaluation of alternative routes were drawn from a variety of sources, including published literature (documents, reports, maps, aerial photography, etc.) and information from local, state and federal agencies. Aerial photography acquired from the National Agriculture Imagery Program (NAIP) dated 2008, U.S. Geological Survey (USGS) topographic maps (1:24,000 and 1:100,000), TxDOT county highway maps, and ground reconnaissance surveys were used throughout the selection and evaluation of alternative routes. Ground reconnaissance of the study area and computer-based evaluation of digital aerial imagery were utilized for both refinement and evaluation of alternative routes. The data collection effort, although concentrated in the early stages of the project, was an ongoing process that continued up to the point of final route selections.

2.3 DELINEATION OF ALTERNATIVE ROUTES

2.3.1 Study Area Delineation

The first step in the selection of alternative routes was to select a study area. This area needed to encompass both project termination points (the existing Dallam County Substation and the existing Sherman County Substation) and include a large-enough area within which an adequate number of alternative routes could be located. The study area, as shown on Figure 2-1, is a roughly rectangular area located between Dallam County Substation on the southwest and Sherman County Substation on the northeast. The study area is approximately 20 miles long and 35 miles wide. Altogether, this study area covers approximately 700 square miles in Dallam and Sherman Counties.

2.3.2 Constraints Mapping

Since a large number of potential routes could be drawn to connect the Dallam County Substation and the Sherman County Substation, a constraints mapping process was used in selecting/refining possible alternative routes. The geographic locations of environmentally sensitive and other restrictive areas within the study area were located and considered during transmission line route delineation. These constraints were mapped on a topographic base map, which was created using USGS 1:100,000 topographic maps (Figure 2-2, map pocket). The overall impact of the alternative routes presented in this report has been greatly reduced by avoiding, to the greatest extent possible, such constraints as individual residences, rural subdivisions, community facilities, airstrips, traveling irrigation systems, cemeteries, historic sites, archaeological sites, wetlands, parks, churches, schools, and endangered or threatened species habitat, and by utilizing or paralleling existing compatible right-of-way (ROW) and property lines, where possible.

2.3.3 Preliminary Alternative Routes

Utilizing the information described above, PBS&J identified numerous links that would ultimately be combined to form preliminary routes, which were presented to SPS for review and comment. These initial links were examined in the field in spring 2008 by PBS&J staff. The project team made modifications to the links, based on the results of the field evaluation and review of high-resolution aerial photography. These links, which are shown on Figure 2-3 (map pocket), were presented to the public at an open-house meeting held in the study area on June 24, 2008.

Subsequent to the public meetings, PBS&J staff and/or SPS performed additional reviews to look at areas of concern expressed at the public meetings, met with individual landowners, evaluated the public comments, and considered revisions to the links. In response to public and landowner concerns, some new links were added and others were dropped completely. The project team, utilizing this input, made final revisions to the links and identified preliminary routes.

Generally, the changes that were made to the preliminary routes after the June public meeting were made for the following reasons:

- To improve the paralleling of apparent property lines,
- To improve the paralleling of compatible ROW, and
- To reduce other land use impacts on ranching and farming operations.

2.3.4 Primary Alternative Routes

Ultimately, five primary alternative routes were selected from the preliminary routes to be evaluated by PBS&J in the document. The results of PBS&J's effort are presented in this environmental assessment (EA) in Sections 4.0 and 6.0. The primary alternative routes are shown on Figure 2-4 (map pocket). The primary routes constitute, for the purposes of this analysis, the only alternative routes addressed in this report. Table 2-1 presents the composition of these routes by link as well as their approximate length in miles.

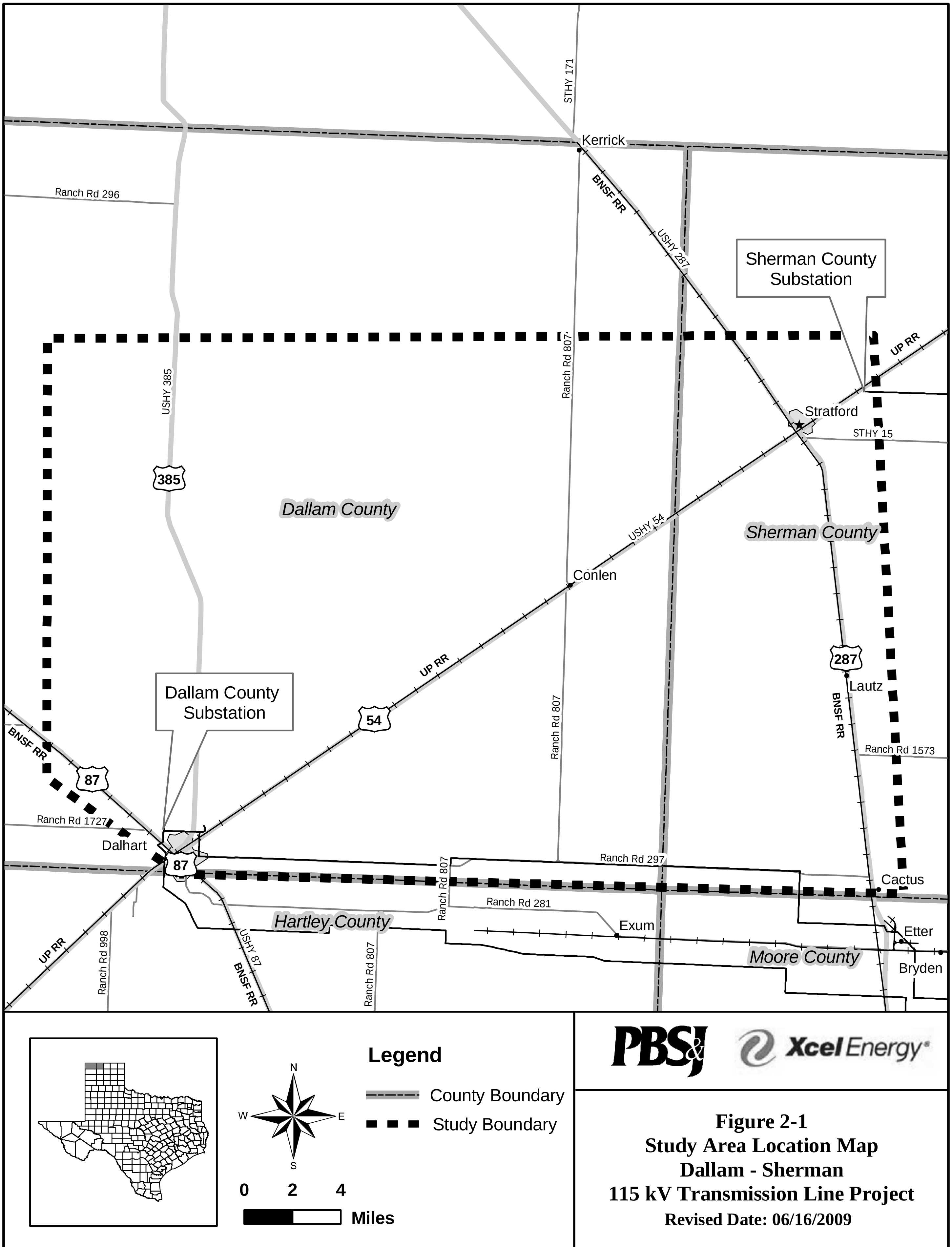

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Figure 2-1
Study Area Location Map
Dallam - Sherman
115 kV Transmission Line Project
Revised Date: 06/16/2009

PROJ.NO. 100001203

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Table 2-1

Primary Alternative Route Composition and Length
Dallam to Sherman Project

Route Number	Link Combinations	Length (miles)
1	XX-VV-TT-OO-E-F-I-J-QQ-M-N-P-T-Y-CC-HH-II	40.6
2	XX-VV-TT-OO-NN-RR-H-QQ-M-N-P-K-V-DD-HH-II	41.0
3	XX-VV-TT-OO-NN-RR-H-KK-ZZ-YY-N-P-K-V-Y-CC-HH-II	41.7
4	XX-VV-TT-OO-E-F-I-L-U-DD-HH-II	46.8
5	XX-VV-TT-OO-NN-RR-H-QQ-M-N-P-T-Y-CC-HH-II	37.4

Note: For primary route locations, see Figure 2-4 (map pocket).

Each of the alternative routes was examined in detail in the field during summer 2008 and winter 2009. In evaluating the alternative routes, 33 environmental criteria were considered. The goal of this evaluation was to select a preferred and several alternate transmission line routes between the Dallam County Substation and the Sherman County Substation. PBS&J's recommendations of a preferred and several alternate routes are discussed in Section 6.1. The analysis of each route involved inventorying and tabulating the number or quantity of each environmental criterion located along the centerline of each route (e.g., number of habitable structures, the length across wooded areas, etc.). The number or amount of each factor was determined by reviewing various maps and recent color aerial photography, and by field verification, where possible. The environmental advantages and disadvantages of each alternative were then evaluated. Potential environmental impacts of the primary alternative routes are addressed in Section 4.0 of this document. After PBS&J made their preferred and alternate route recommendations, SPS undertook a further evaluation in which PBS&J's environmental evaluations were considered in conjunction with SPS's criteria associated with constructability, maintenance, and operation. SPS's evaluation, and their selection of preferred and alternate routes, is located in Section 6.2 of this document.

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3.0 ENVIRONMENTAL SETTING OF THE STUDY AREA

3.1 PHYSIOGRAPHY AND GEOLOGY

As shown on Figure 3-1, Dallam and Sherman Counties (including the study area) is within the High Plains physiographic regions of Texas (Bureau of Economic Geology {BEG}, 1996). The High Plains form a nearly flat plateau with average elevations of approximately 3,000 feet. Gravel deposits and stream-laid sands, which contain the Ogallala Aquifer, underlie the plains. Windblown sands and silts form thick, rich soils and caliches locally. There are numerous playa lakes scattered randomly over the treeless plains. The eastern boundary is a westward-retreating escarpment capped by a hard caliche.

The Canadian River cuts across the region, creating the Canadian Breaks and separating the Central High Plains from the Southern High Plains. The Pecos River drainage erodes the west-facing escarpment of the Southern High Plains, which terminates against the Edwards Plateau on the south. Widespread small, intermittent streams dominate the drainage.

Quaternary geologic formations include alluvial and fluviatile deposits associated with the Canadian River and its larger tributaries. Alluvium includes recent floodplain deposits consisting of clay, silt, sand, and gravel (BEG, 1969, 1983, 1984). Mapped deposits of alluvium occur along Rosita, East Amarillo, West Amarillo, Horse, Big Blue, Coldwater, Rita Blanca, Punta de Agua, Indian, Corral, and Sand Creeks. Fluviatile terrace deposits include terraces along streams (low terrace deposits) and high gravel deposits. These terrace deposits generally occur above the floodplain and consist of varying amounts of gravel, sand, silt, clay, and organic material, with gravel more prominent on the older, higher terraces (BEG, 1969). Low terrace deposits occur along the major streams within the study area, while high gravel deposits occur at slightly higher elevations. Other Quaternary formations include wind-deposited sand and loess.

There is one tertiary formation within the study area: the Ogallala Formation. The Ogallala Formation overlies Permian, Triassic, Jurassic, and Cretaceous strata and consists primarily of heterogeneous space of coarse-grained sand and gravel in the lower part grading upward into fine clay, silt, and sand (BEG, 1969).

Triassic formations include both the Trujillo and Tecovas formations. The Trujillo Formation is a conglomerate with sand and shale. This is sandy and composed of granules and pebbles of quartz, limestone, sandstone, siltstone, chert, and fragments of petrified wood (BEG, 1983). The Tecovas Formation is composed of shale, clay, siltstone, and sand (BEG, 1983).

3.2 SOILS

3.2.1 Soil Associations

According to the Natural Resources Conservation Service (NRCS) soil survey mapping, there are eight soil associations found within Dallam (1975) and Sherman Counties (1975). The soil associations found within the study area include the Dallam-Perico, Dallam-Vingo-Spurlock, Sunray-Conlen, Gruver-Sherm-Dumas, Plack-Berthoud, Sherm-Gruver, Spurlock-Dalhart, and Mobeetie-Pastura-Berthoud. (NRCS, 1975).

The Dallam-Perico, Gruver-Sherm-Dumas, Plack-Berthoud, and Sunray-Conlen Associations consists of nearly level and gently sloping, loamy soils. The Dallam-Vingo-Spurlock Association consists of nearly level and gently sloping, sandy and loamy soils. The Sherm-Gruver Association consists of nearly level, loamy soils. The Spurlock-Dalhart Association consists of nearly level and gently sloping, well drained, loamy soils. The Mobeetie-Pastura-Berthoud Association consists of gently sloping to steep, loamy soils (NRCS, 1975).

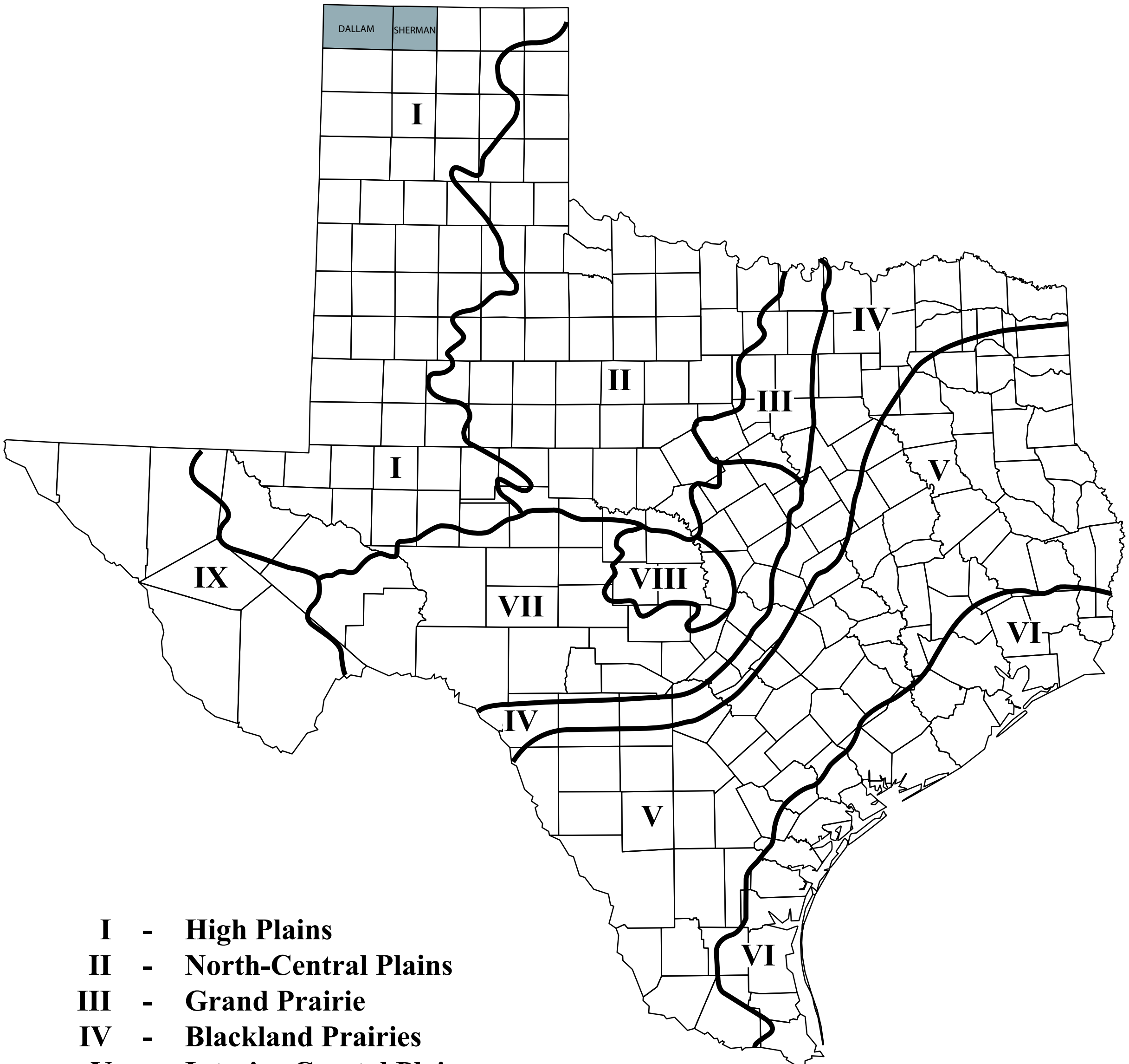
3.2.2 Prime Farmland

The Secretary of Agriculture, in 7 U.S.C. 4201(c)(1)(A), defines prime farmland soils as those soils that have the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops. They have the soil quality, growing season, and moisture supply needed for the economical production of sustained high yields of crops when treated and managed (including water management) according to acceptable farming methods. Additional potential prime farmlands are those soils that meet most of the requirements of prime farmland but fail because they lack the installation of water management facilities (irrigation or drainage) or lack sufficient natural moisture. Some soils are considered prime farmland in their native state and others are considered prime farmland only if they are irrigated well enough to grow the main crops in the area. In Dallam County, prime farmlands make up approximately 13 percent of the total county land area and in Sherman County, prime farmlands make up approximately 45 percent of the total county land area (NRCS, 1979). Soils that occur within the study area and that are listed by the NRCS as prime farmland soils include: Gruver soils, 0 to 1 percent slopes; Gruver soils, 1 to 3 percent slopes; Sherm clay loam; and Sherm, 0 to 1 percent slopes (NRCS, 2000).

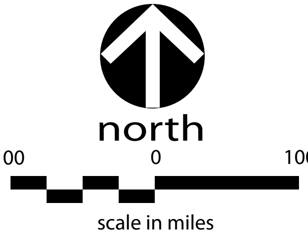
3.3 WATER RESOURCES

3.3.1 Surface Water

The study area is within the Canadian River Basin. The Canadian River Basin extends from its headwaters in northeastern New Mexico through the Texas Panhandle into Oklahoma and merges with the Arkansas River in eastern Oklahoma. Total drainage area of the basin is 12,700 square miles. Limited



I - High Plains
II - North-Central Plains
III - Grand Prairie
IV - Blackland Prairies
V - Interior Coastal Plains
VI - Gulf Coastal Prairies
VII - Edwards Plateau
VIII - Central Texas Uplift
IX - Trans-Pecos Basin & Range



Source: BEG, 1996

FIGURE 3-1

LOCATION OF DALLAM AND SHERMAN COUNTIES IN RELATION TO THE PHYSIOGRAPHIC PROVINCES OF TEXAS

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surface water supplies, often depleted by drought, remain an issue in the basin. Historically, groundwater supplies have provided the majority of water used in the basin, yet these groundwater supplies are experiencing long-term decline.

Small surface-water impoundments are located throughout the study area, and the most prominent creeks and streams found within the study area include Rita Blanca Creek and Coldwater Creek. The remaining creeks and streams are smaller tributaries of the Canadian River (Texas Water Development Board [TWDB], 2007).

3.3.2 Groundwater/Aquifer

The study area overlies both the Ogallala Aquifer and the Dockum Aquifer in Dallam and Sherman Counties, Texas.

The Ogallala Aquifer is the largest aquifer in the United States and is a major aquifer of Texas underlying much of the High Plains region. It consists of sand, gravel, clay, and silt and has a maximum thickness of 800 feet. The Ogallala Aquifer covers more than 36,497 square miles of the High Plains in the Texas Panhandle, providing water to all or parts of 47 counties in Texas. This aquifer extends through eight states northward to South Dakota; the Texas High Plains is the southernmost extension of the Great Plains physiographic province. More water is pumped from the Ogallala Aquifer than from any other aquifer in Texas. Total groundwater pumping from the Ogallala Aquifer in Texas was 6.0 million acre-feet (ac-ft) during 2003 (TWDB, 2007).

The Dockum Aquifer is a minor aquifer found in the northwest portion of the state. The Dockum Aquifer consists of sand and conglomerate interbedded with layers of silt and shale. Uranium within the aquifer produces naturally occurring radioactivity and has resulted in radiation in excess of the state’s primary drinking water standard. Radium also occurs in amounts above acceptable standards. Water quality in the aquifer is considered poor. Fresh water is contained in the outcrop areas in the east, while brine water occurs in the western subsurface portions of the aquifer. Water from the aquifer is used mainly for irrigation, municipal water supply, and oil field operations. Recharge is typically from rainfall in the outcrop, while discharge is primarily to wells, adjacent aquifers, and the saline zone (TWDB, 2007).

3.4 ECOLOGY

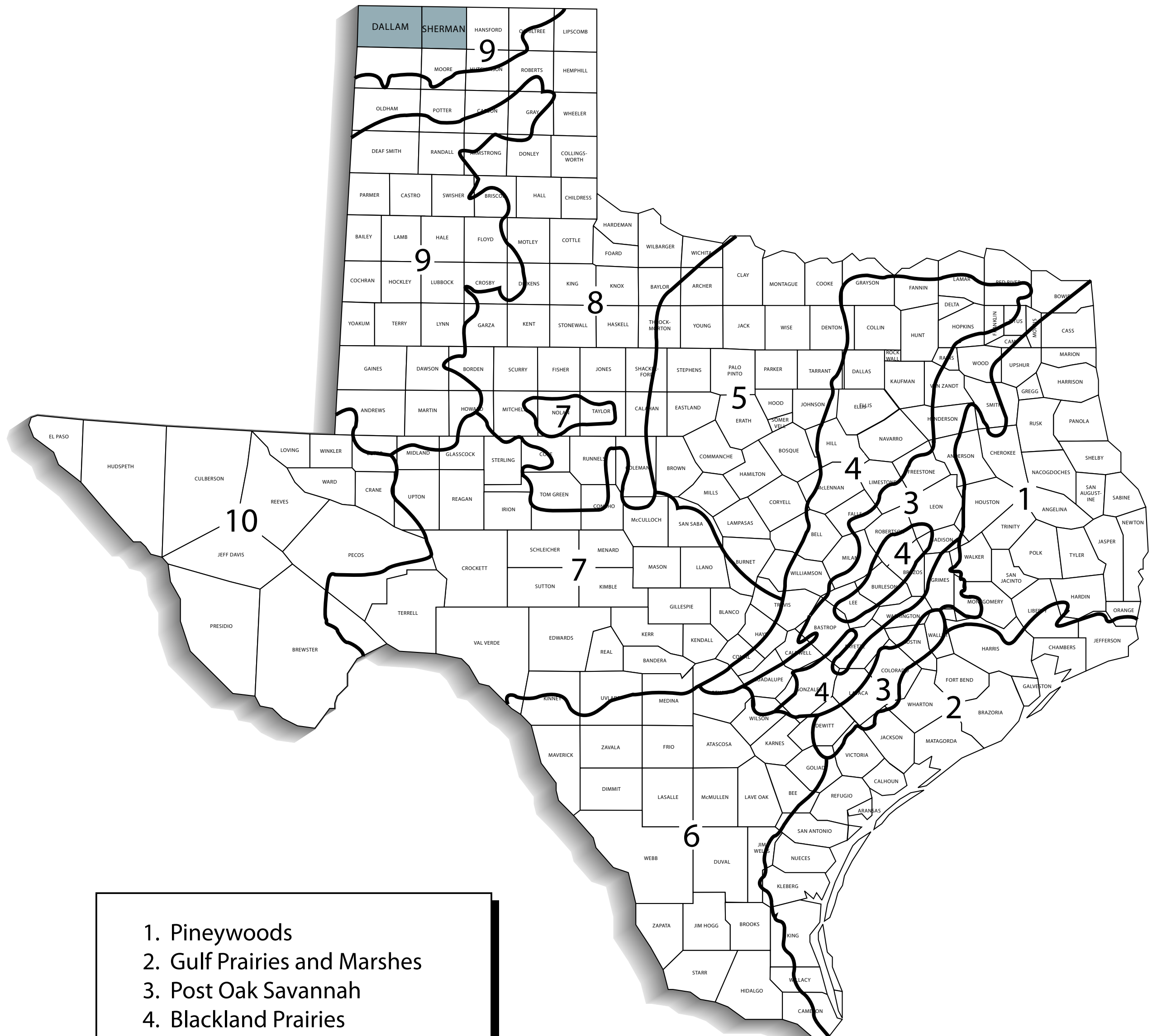
3.4.1 Vegetation

As shown in Figure 3-2, the study area falls within the High Plains Vegetational Areas of Texas as delineated by Hatch et al. (1990). The High Plains Vegetational Area is higher and drier than the Central Great Plains to the east, and in contrast to the irregular, mostly grassland or grazing land of the Northwestern Great Plains to the north. Much of the High Plains is characterized by smooth to slightly irregular plains with a high percentage of cropland. Grama-buffalograss is the potential natural vegetation in this region compared to mostly wheatgrass-needlegrass to the north, Trans-Pecos shrub savanna to the south, and taller grasses to the east. The northern boundary of this ecological region is also the approximate northern limit of winter wheat and sorghum and the southern limit of spring wheat.

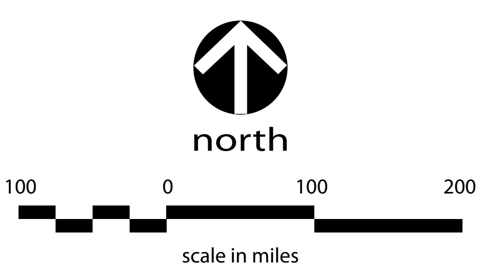
Within the High Plains, the project area is located within the Rolling Sand Plains and the Canadian/Cimarron High Plains. The Rolling Sand Plains expand northward from the lip of the Canadian River trough, and they are topographically expressed as flat sandy plains or rolling dunes. In northern Texas, the vegetative cover of the Rolling Sand Plains is transitional between the Shinnery Sands to the south and the sandsage prairies of Oklahoma and Kansas. Havard shin oak (*Quercus havardii*) and sand sagebrush (*Artemisia filifolia*) perform an important function of stabilizing sandy areas subject to wind erosion. The goal of both agricultural and grazing management is to keep enough vegetative cover on the land surface to minimize wind erosion. The sandsage association includes grasses such as big sandreed (*Calamovilfa gigantea*), little bluestem (*Schizachyrium scoparium*), sand dropseed (*Sporobolus cryptandrus*), and sand bluestem (*Andropogon hallii*).

The Canadian/Cimarron High Plains ecoregion includes that portion of the Llano Estacado that lies north of the Canadian River in the Texas Panhandle. Winters are more severe than on the Llano Estacado; the increased snow accumulation delays summer drought conditions because the snowmelt saturates the ground in the spring season. Although the topography is as flat as the rest of the Llano Estacado, the northern portion has fewer playas, and it is more deeply dissected by stream channels. There is also more grazing land; the rougher terrain near the stream incisions tends to be grazed rather than tilled. In cultivated areas, corn, winter wheat, and grain sorghum are the principal crops.

Vegetation community types occurring in the study area include upland woodland, riparian woodland, open savannah, grassland (including pasture and cropland), and hydric and aquatic habitats. The grassland community type comprises the large majority of the study area. Upland woodland communities are a relatively small component within the study area due to the fact that much of the region has been converted to cropland, pastureland, and rangeland, with the majority of the remaining woodlands restricted to linear, riparian zones along streams, and bottomlands.



1. Pineywoods
2. Gulf Prairies and Marshes
3. Post Oak Savannah
4. Blackland Prairies
5. Cross Timbers and Prairies
6. South Texas Plains
7. Edwards Plateau
8. Rolling Plains
9. High Plains
10. Trans-Pecos



Source: Hatch et al., 1990

PBSJ Xcel Energy

FIGURE 3-2

LOCATION OF DALLAM AND SHERMAN COUNTIES IN RELATION TO THE VEGETATIONAL AREAS OF TEXAS

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3.4.1.1 Terrestrial

The community types that occur within the study area, as described by McMahan et al. (1984), are Blue Grama-Buffalograss Grassland, Mesquite Shrub/Grassland, Sandsage-Havard Shin Oak Brush, and Crops. The Grama-Buffalograss Grassland community type makes up the majority of the grassland areas found within the study area. These communities consist of sideoats grama (*Bouteloua curtipendula*), hairy grama (*Bouteloua hirsuta*), sand dropseed, grassland pricklypear (*Opuntia* spp.), narrowleaf yucca (*Yucca angustissima*), western ragweed (*Ambrosia psilostachya*), broom snakeweed (*Gutierrezia sarothrae*), zinnia (*Zinnia* spp.), rushpea (*Hoffmannseggia glauca*), scurfpea (*Psoralidium tenuiflora*), catclaw sensitive briar (Schrankia nuttalli), wild buckwheat (*Polygonum convolvulus*), and woollywhite (*Hymenopappus artemisiifolius*). The Mesquite Shrub/Grassland is located primarily in the High Plains, Rolling Plains and northwestern Edwards Plateau Vegetational Areas. These communities consist of narrow-leaf yucca, tasajillo (*Cylindropuntia leptocaulis*), juniper (*Juniperus* spp.), grassland pricklypear, blue grama (*Bouteloua gracilis*), hairy grama, purple three-awn (*Aristida purpurea*), buffalograss (*Bouteloua dactyloides*), little bluestem, western wheatgrass (*Pascopyrum smithii*), Indiangrass (*Sorghastrum nutans*), switchgrass (*Panicum virgatum*), James rushpea (*Hoffmanseggia jamesii*), scurfpea, plains beebalm (*Monarda* spp.), scarlet gaura (*Gaura coccinea*), yellow evening primrose (*Oenothera flava*), sandsage, and wild buckwheat. The Sandsage-Havard Shin Oak Brush contains most of the brushland located within the project area. This community consists of skunkbush sumac (*Rhus trilobata*), Chickawaw plum (*Prunus angustifolia*), Indiangrass, switchgrass, sand lovegrass (*Eragrostis trichodes*), big sandreed, sideoats grama, hairy grama, sand dropseed, sand paspalum (*Paspalum* spp.), scurfpea, slickseed bean (*Strophostyles leiosperma*), wild blue indigo (*Baptisia australis*), wild buckwheat, and bush morningglory (*Ipomoea leptophylla*). The Crops in this area consist of cultivated cover crops or row crops providing food and/or fiber for either humans or domestic animals. This type may also portray grassland associated with crop rotations.

Cropland/pastureland is land used for the production of cultivated cover crops or row crops, and grasslands that are associated with crop rotations. Managed pastureland is typically dominated by improved varieties of bermudagrass (*Cynodon dactylon*) and bahiagrass (*Paspalum notatum*). Unimproved pastureland, old fields, and right-of-ways (ROWs) consist of a variety of grasses, forbs, and woody species.

3.4.1.2 Aquatic/Hydric

Aquatic habitat within the study area includes North Palo Duro Creek, Coldwater Creek, and other lakes, ponds, and creeks. Vegetation in aquatic habitat is typically limited to the shallow edges of the water. Plant species common to this habitat type include black willow (*Salix nigra*), spikerushes (*Eleocharis* spp.), sedges (*Carex* spp.), cattails (*Typha* sp.), and flatsedges (*Cyperus* spp.). Additional species covering portions of the water's surface include yellow nelumbo (*Nelumbo lutea*), American waterlily (*Nymphaea odorata*), pondweed (*Potamogeton* sp.), and duckweed (*Lemna* sp.).

The hydric habitats in the study area are primarily located within the floodplains and are generally associated with streams, creeks, impoundments, and low topographic areas. Wetter portions of the study area that could be classified as hydric habitat undergo seasonal inundation and/or maintain saturated soils. Typical plant species in these portions include American elm (*Ulmus americana*), cedar elm, and pecan. Marshes are typically found as narrow bands along the edges of ponds and streams and support such species as cattails, rushes (*Juncus* spp.), sedges, flatsedges, smartweeds (*Polygonum* spp.), bushy bluestem (*Andropogon glomeratus*), cocklebur (*Xanthium* sp.) and, occasionally, woody species such as common buttonbush (*Cephalanthus occidentalis*) and black willow.

National Wetlands Inventory (NWI) mapping on 1:24,000 topographic maps prepared by the United States Fish and Wildlife Service (FWS) indicate potential wetlands scattered throughout the study area. They may be defined as jurisdictional wetlands by the USACE. If these areas meet the criteria necessary to define them as jurisdictional wetlands pursuant to Section 404 of the CWA, certain activities (e.g., placement of fill) within these habitats are subject to regulation.

3.4.1.3 Commercially or Recreationally Important Plant Species

Commercially important species are defined as those that: (a) are commercially or recreationally valuable; (b) are endangered or threatened; (c) affect the well-being of some important species within criterion [a] or [b]; and (d) are critical to the structure and function of the ecological system or are biological indicators.

Commercially important species within the study area include hay crops, row crops, and pastureland. Pastureland and cropland are extensive throughout much of the study area. Row crops cultivated within the study area, to a limited extent, include wheat, corn, oats, cotton, and sorghum.

3.4.1.4 Endangered and Threatened Plant Species

An endangered species is one that is in danger of extinction throughout all or a significant portion of its range, while a threatened species is one likely to become endangered within the foreseeable future throughout all or a significant portion of its range. Proposed species are those that have been formally submitted for official listing as endangered or threatened, but have yet to be so designated. In addition, the FWS has identified species that are candidates for listing as a result of identified threats to their continued existence. Candidates are those species for which the FWS has on file sufficient information on biological vulnerability and threat(s) to support their being listed as either endangered or threatened, and are likely to be proposed for listing in the foreseeable future.

The federal Endangered Species Act (ESA) also provides for the conservation of “critical habitat,” the areas of land, water, and air space that an endangered species needs for survival. These areas include sites with food and water, breeding areas, cover or shelter sites, and sufficient habitat to provide for normal population growth and behavior. One of the primary threats to endangered and threatened species is the destruction or modification of essential habitat areas by uncontrolled land and water development. No designated critical habitat for any endangered/threatened species occurs within the study area.

Information was received from the Texas Parks and Wildlife Department (TPWD) Natural Diversity Database (TXNDD) concerning the occurrence and location of state and federally listed plant species in the study area (TXNDD, 2008). The official state list of endangered and threatened plant species promulgated by the TPWD includes the same species listed by the FWS as endangered or threatened. Currently, 28 plant species are listed by the FWS as endangered or threatened in Texas (FWS, 2008).

There are no known locations of threatened or endangered plant species occurring within the study area (TXNDD, 2008). The 92,989-acre Rita Blanca National Grasslands are located within the northern portion of the study area. The grassland is administered by the U.S. Forest Service (USFS) together with the Cibola National Forest and the Black Kettle, Kiowa, and McClellan Creek National Grasslands, from common headquarters located in Albuquerque, New Mexico. The national grasslands in Texas are a part of the High Plains vegetation type, with open grasslands. The national grasslands provide recreation areas for camping, hunting, and habitat for wildlife. Primary management emphasis on the Rita Blanca National Grasslands concerns restoration of the land and conservation of soil and watershed resource values. Grass is the most visible resource in the national grasslands and is the source of much of the income derived from permits. The Rita Blanca National Grasslands provide forage for privately owned livestock on native unimproved pasture (U.S. Department of Agriculture (USDA), 2008).

3.4.2 Waters of the U.S., Including Wetlands

The USACE regulates waters of the U.S., including wetlands, under Section 404 of the CWA. Waters of the U.S. include, but are not limited to, territorial seas, lakes, rivers, streams, oceans, bays, ponds, and other special aquatic features, including wetlands. The USACE uses the regulatory term "ordinary high water mark" in describing the jurisdictional portion of a stream. This term refers to the established line on the bank or shore indicated by the fluctuation of water (an average width is determined). The USACE defines wetlands in a broad sense as transitional areas (ecotones) between terrestrial and aquatic systems where the water table is usually at or near the ground surface, or where shallow water covers the land (Cowardin et al., 1979). Wetlands generally include bogs, seeps, marshes, swamps, forested bottomland wetlands, and other similar areas (USACE, 1987). Construction activities resulting in the placement of fill materials within waters of the U.S. are subject to the regulations and restrictions outlined in Section 404 of the CWA and may require coordination with the USACE to ensure compliance.

Streams containing an ordinary high water mark and wetlands in the study area may meet the criteria necessary to classify them as jurisdictional streams or wetlands, pursuant to Section 404. Certain activities (e.g., placement of fill) within these habitats are subject to regulation and may require some level of permitting.

3.4.3 Fish and Wildlife

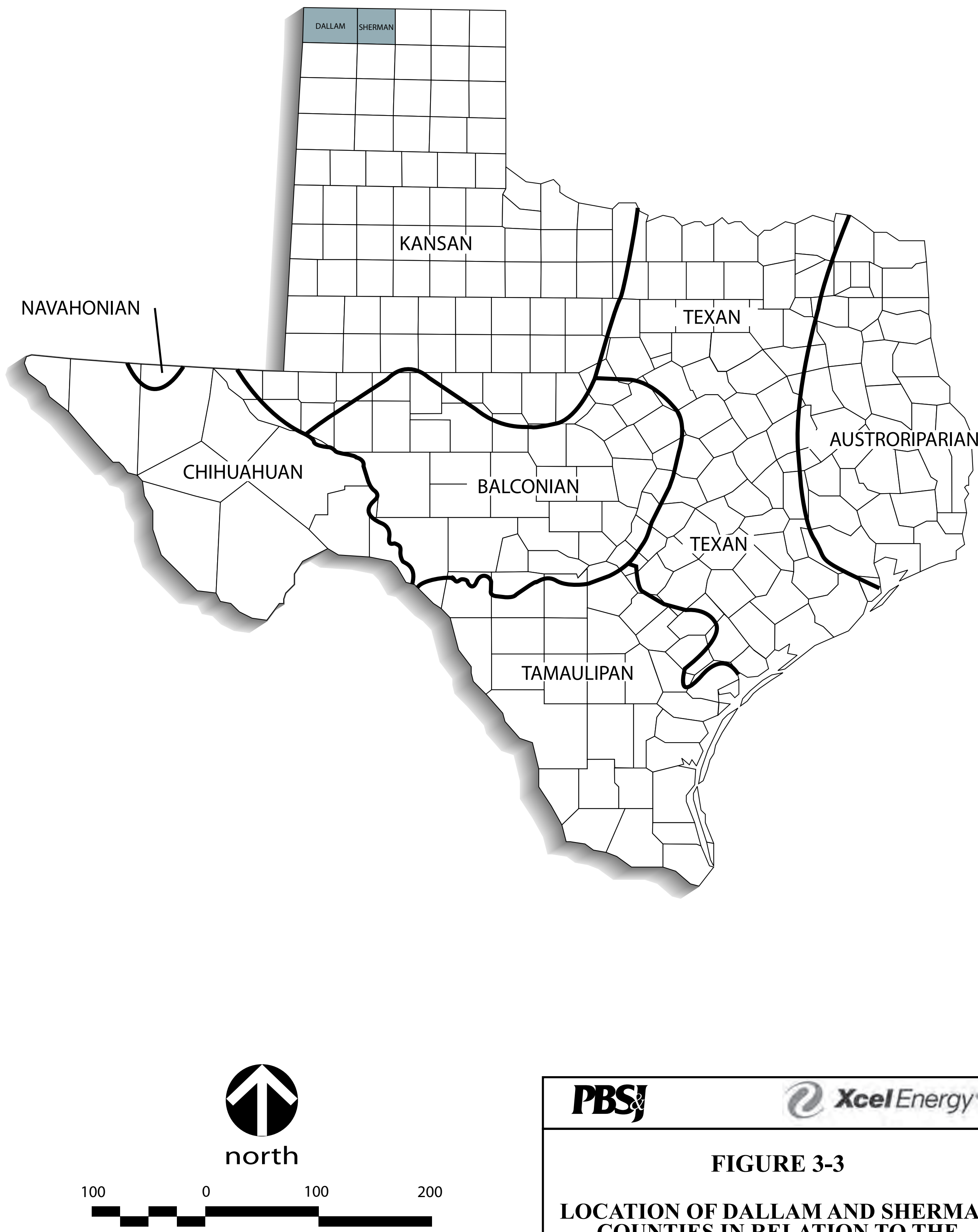
3.4.3.1 Terrestrial

The study area lies within the Kansan Biotic Province (Figure 3-3), as described by Blair (1950). The Kansan Biotic Province is divided into three well-marked biotic districts: Mixed-grass Plains district, Mesquite Plains district, and Short-grass Plains district. At least 59 species of mammals are known to have occurred in the Kansan Biotic province in recent times, in addition to 31 snake species, 14 lizards, one land turtle, 14 anurans (frogs and toads), and one urodele (salamanders and newts) (Blair, 1950). There are five species of mammals that are restricted to the Kansan Biotic Province. These species include: swift fox (*Vulpes velox*), pocket gopher (*Geomys lutescens*), plains pocket mouse (*Perognathus flavescens*), Texas kangaroo rat (*Dipodomys elator*), and Palo Duro mouse (*Peromyscus comanche*). One snake species, Brazos water snake (*Natrix harteri*), is limited to the province as well.

Urodele fauna likely to occur in the study area include the barred tiger salamander (*Ambystoma tigrinum mavortium*), which are restricted to moist bottomland or hydric habitats (Garrett and Barker, 1987; Dixon, 2000).

Anuran species (frogs and toads) found in the study area include the plains spadefoot (*Spea bombifrons*), New Mexico spadefoot (*Spea multiplicata*), great plains toad (*Bufo cognatus*), Woodhouse's toad (*Bufo woodhousii*), western green toad (*Bufo debilis*), red-spotted toad (*Bufo punctatus*), plains leopard frog (*Rana blairi*), bullfrog (*Rana catesbeiana*), and couch's spadefoot toad (*Scaphiopus couchii*). No treefrogs are found within the study area (Garrett and Barker, 1987; Dixon, 2000).

Common reptiles expected to occur in the study area include the ornate box turtle (*Terrapeneornata ornata*), red-eared slider (*Trachemys scripta elegans*), yellow mud turtle (*Kinosternon flavescens flavescens*), common snapping turtle (*Chelydra serpentina serpentina*), and lizards such as the eastern collared lizard (*Crotaphytus collaris collaris*), northern earless lizard (*Holbrookia maculate maculate*), Texas horned lizard (*Phrynosoma cornutum*), southern prairie lizard (*Sceloporus undulates consobrinus*), great plains skink (*Eumeces obsoletus*), and prairie-lined racerunner (*Cnemidophorus sexlineatus viridis*). Snakes in the area include the New Mexico blind snake (*Leptotyphlops dulcis dissectus*), Kansas glossy snake (*Arizona elegans elegans*), ground snake (*Sonora semiannulata*), eastern yellow-bellied racer (*Coluber constrictor flaviventris*), prairie ring-necked snake (*Diadophis punctatus arnyi*), plains hog-nosed snake (*Heterodon nasicus nasicus*), Brazos water snake (*Natrix harteri*), central plains milk snake (*Lampropeltis triangulum gentilis*), western coachwhip (*Masticophis flagellum testaceus*), bull snake (*Pituophis catenifer sayi*), mountain patch-nosed snake (*Salvadora grahamiae grahamiae*), plains black-headed snake (*Tantilla nigriceps nigriceps*), blotched water snake (*Nerodia erythrogaster transversa*), Texas night snake (*Hypsiglena torquata jani*), Texas longnose snake (*Rhinocheilus lecontei tessellates*), western garter snake (*Thamnophis radix haydenii*), checkered garter snake (*Thamnophis marcianus marcianus*), New Mexico garter snake (*Thamnophis sirtalis* dorsalis), prairie kingsnake (*Lampropeltis



Source: Blair, 1950

PBSJ Xcel Energy

FIGURE 3-3

LOCATION OF DALLAM AND SHERMAN COUNTIES IN RELATION TO THE BIOTIC PROVINCES OF TEXAS

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calligaster calligaster), great plains rat snake (*Elaphe guttata emoryi*), desert kingsnake (*Lampropeltis getula splendida*), and speckled kingsnake (*Lampropeltis getula holbrooki*). A couple of venomous species also occur in the region, including the western diamondback rattlesnake (*Crotalus atrox*) and prairie rattlesnake (*Crotalus viridis viridis*) (Garrett and Barker, 1987; Tennant, 1998; Dixon, 2000).

Numerous avian species are found within the study area. Year-round residents include the eared grebe (*Podilymbus podiceps*), black-crowned night-heron (*Nycticorax nycticorax*), white-faced ibis (*Plegadis chihi*), great blue heron (*Ardea herodias*), turkey vulture (*Cathartes aura*), red-tailed hawk (*Buteo jamaicensis*), northern harrier (*Circus cyaneus*), sharp-shinned hawk (*Accipiter striatus*), Cooper's hawk (*Accipiter cooperii*), ferruginous hawk (*Buteo regalis*), peregrine falcon (*Falco peregrinus*), American kestrel (*Falco sparverius*), ring-necked pheasant (*Phasianus colchicus*), scaled quail (*Callipepla squamata*), northern bobwhite (*Colinus virginianus*), American coot (*Fulica americana*), killdeer (*Charadrius vociferus*), mourning dove (*Zenaida macroura*), white-winged dove (*Zenaida asiatica*), greater roadrunner (*Geococcyx californianus*), barn owl (*Tyto alba*), burrowing owl (*Athene cunicularia*), great horned owl (*Bubo virginianus*), belted kingfisher (*Ceryle alcyon*), northern flicker (*Colaptes auratus*), red-headed woodpecker (*Melanerpes erythrocephalus*), downy woodpecker (*Picoides pubescens*), ladder-backed woodpecker (*Picoides scalaris*), eastern phoebe (*Sayornis phoebe*), loggerhead shrike (*Lanius ludovicianus*), brown thrasher (*Toxostoma rufum*), curve-billed thrasher (*Toxostoma curvirostre*), blue jay (*Cyanocitta cristata*), American crow (*Corvus brachyrhynchos*), Chihuahuan raven (*Corvus cryptoleucus*), horned lark (*Eremophila alpestris*), blue-gray gnatcatcher (*Polioptila caerulae*), American robin (*Turdus migratorius*), cedar waxwing (*Bombycilla cedrorum*), common yellowthroat (*Geothlypis trichas*), spotted towhee (*Pipilo maculatus*), red-breasted nuthatch (*Sitta canadensis*), rock wren (*Salpinctes obsoletus*), Bewick's wren (*Thryomanes bewickii*), house wren (*Troglodytes aedon*), chipping sparrow (*Spizella passerine*), vesper sparrow (*Pooecetes gramineus*), lark sparrow (*Chondestes grammacus*), savannah sparrow (*Passerculus sandwichensis*), song sparrow (*Melospiza melodia*), Bullock's oriole (*Icterus bullockii*), lark bunting (*Calamospiza melanocorys*), house finch (*Carpodacus mexicanus*), red crossbill (*Loxia curvirostra*), pine siskin (*Carduelis pinus*), American goldfinch (*Carduelis tristis*), eastern bluebird (*Sialia sialis*), northern mockingbird (*Mimus polyglottos*), European starling (*Sturnus vulgaris*), northern cardinal (*Cardinalis cardinalis*), red-winged blackbird (*Agelaius phoeniceus*), eastern meadowlark (*Sturnella magna*), western meadowlark (*Sturnella neglecta*), yellow-headed blackbird (*Xanthocephalus xanthocephalus*), common grackle (*Quiscalus quiscala*), great-tailed grackle (*Quiscalus mexicanus*), brown-headed cowbird (*Molothrus ater*), field sparrow (*Spizella pusilla*), and house sparrow (*Passer domesticus*) (Texas Ornithological Society [TOS], 1995; Seyffert, 2001).

Many species of birds migrate through the study area in the spring and fall, including such winter residents as the mallard (*Anas platyrhychos*), blue-winged teal (*Anas discors*), green-winged teal (*Anas crecca*), canvasback (*Aythya valisineria*), redhead (*Aythya americana*), ruddy duck (*Oxyura jamaicensis*), cinnamon teal (*Anas cyanoptera*), northern shoveler (*Anas clypeata*), northern pintail (*Anas acuta*), American wigeon (*Anas americana*), snow goose (*Chen caerulescens*), Ross's goose (*Chen rosii*), Canada goose (*Branta canadensis*), American white pelican (*Pelecanus erythrorhynchos*), Mississippi kite (*Ictinia mississippiensis*), bald eagle (*Haliaeetus leucocephalus*), merlin (*Falco columbarius*), prairie falcon (*Falco mexicanus*), sandhill crane (*Grus canadensis*), common snipe (*Gallinago gallinago*), common nighthawk (*Chordeiles minor*), common poorwill (*Phalaenoptilus nuttallii*), scissor-tailed flycatcher (*Tyrannus forficatus*), northern shrike (*Lanius excubitor*), common raven (*Corvus corax*), ruby-crowned kinglet (*Regulus calendula*), Townsend's solitaire (*Myadestes townsendi*), Swainson's thrush (*Catharus ustulatus*), hermit thrush (*Catharus guttatus*), yellow-rumped warbler (*Dendroica coronata*), American tree sparrow (*Spizella arborea*), clay-colored sparrow (*Spizella pallida*), white-crowned sparrow (Zonotrichia leucophrys), grasshopper sparrow (*Ammodramus savannarum*), white-throated sparrow (*Zonotrichia albicollis*), Lincoln's sparrow (*Melospiza lincolnii*), McCown's longspur (*Calcarius mccownii*), lapland longspur (*Calcarius lapponicus*), and dark-eyed junco (*Junco hyemalis*). Summer migrant species expected to reside in the study area during the summer months include cattle egret (Bubulcus ibis), American bittern (*Botaurus lentiginosus*), green heron (*Butorides virescens*), chimney swift (*Chaetura pelagica*), Swainson's hawk (*Buteo swainsoni*), eastern kingbird (*Tyrannus tyrannus*), cliff swallow (*Petrochelidon pyrrhonota*), barn swallow (Hirundo rustica), Cassin's sparrow (*Aimophila cassinii*), blue grosbeak (*Guiraca caerulea*), western kingbird (*Tyrannus verticalis*), painted bunting (*Passerina ciris*), dickcissel (*Spiza americana*), western tanager (*Piranga ludoviciana*), yellow warbler (*Dendroica petechia*), orchard oriole (*Icterus spurius*), and black-and-white warbler (*Mniotilta varia*). Numerous other migrating species, such as arctic shorebirds wintering on the Gulf coast, northern passerines wintering in Central and South America, raptors, and waterfowl, which pass through or over the study area during spring and fall migrations (TOS, 1995; Seyffert, 2002).

Common mammals of this region include the Virginia opossum (*Didelphis virginiana*), desert shrew (*Notiosorex crawfordi*), least shrew (*Cryptotis parva*), eastern mole (*Scalopus aquaticus*), hoary bat (*Lasiurus cinereus*), big brown bat (*Eptesicus fuscus*), silver-haired bat (*Lasionycteris noctivagans*), western pipistrelle (*Pipistrellus Hesperus*), Townsend's big-eared bat (*Corynorhinus townsendii*), Pallid bat (*Antrozous pallidus*), Brazilian free-tailed bat (*Tadarida brasiliensis*), eastern red bat (*Lasiurus borealis*), nine-banded armadillo (*Dasypus novemcinctus*), eastern cottontail (*Sylvilagus floridanus*), desert cottontail (*Sylvilagus audubonii*),black-tailed jackrabbit (*Lepus californicus*), eastern fox squirrel (*Sciurus niger*), spotted ground squirrel (*Spermophilus spilosoma*), thirteen-lined ground squirrel (*Spermophilus tridecemlineatus*), black-tailed prairie dog (*Cynomys ludovicianus*), plains pocket gopher (*Geomys bursarius*), yellow-faced pocket gopher (*Cratogeomys castanops*), plains pocket mouse (*Perognathus flavescens*), silky pocket mouse (*Perognathus flavus*), hispid pocket mouse (*Chaetodipus hispidus*), Ord's kangaroo rat (*Dipodomys ordii*), beaver (*Castor canadensis*), western harvest mouse (*Reithrodontomys megalotis*), plains harvest mouse (*Reithrodontomys montanus*), white-footed mouse (*Peromyscus leucopus*), deer mouse (*Peromyscus maniculatus*), northern pygmy mouse (*Baiomys taylori*), northern grasshopper mouse (*Onychomys leucogaster*), hispid cotton rat (*Sigmodon hispidus*), eastern white-throated woodrat (*Neotoma leucodon*), southern plains woodrat (*Neotoma micropus*), porcupine (*Erethizon dorsatum*), coyote (*Canis latrans*), kit fox (*Vulpes velox*), gray fox (*Urocyon cinereoargenteus*), ringtail (*Bassariscus astutus*), common raccoon (*Procyon lotor*), American badger (*Taxidea taxus*), striped skunk (*Mephitis mephitis*), eastern spotted skunk (*Spilogale putorius*), mountain lion (*Puma concolor*), bobcat (*Lynx rufus*), pronghorn (*Antilocapra americana*), mule deer (*Odocoileus *hemionus*), and white-tailed deer (*Odocoileus virginianus*), (Davis and Schmidly, 1994; Manning and Jones, 1998; Schmidly, 2004).

3.4.3.2 Aquatic

As mentioned previously, the study area lies in the Kansan Biotic Province. Although the various biotic provinces were originally separated on the basis of terrestrial animal distributions, Hubbs (1957) has shown that the distribution of freshwater fishes within the state generally corresponds with the terrestrial-vertebrate province boundaries, although northeast Texas and the coastal zone show a number of departures from this general rule.

The aquatic habitats in the study area are dominated by the North Canadian River, North Palo Duro Creek, Coldwater Creek, intermittent streams, ephemeral streams, and man-made impoundments. The principal streams within and adjacent to the study area include the North Canadian River in the northeast corner, North Palo Duro Creek near the southern boundary, and Coldwater Creek bisecting the northern half of the study area, as well as their tributaries.

The manmade ponds located in the study area exhibit variability in terms of their age, drainage, use by cattle, past stocking, and fertilization history. Unlike the creeks and streams of the area, these aquatic habitats are almost always exposed to full sunlight and do not experience the large fluctuations in water level and flow associated with streams during heavy precipitation. Bottom materials in these ponds are universally silt-sized to clay-sized particles, either naturally occurring where the pond was built or added as a liner to prevent its leaking.

In stream reaches dominated by scoured, sandy-clay bottoms, accumulations of woody debris or leaf pack provide the most important feeding and refuge areas for invertebrates and forage fish. While this material is also an important habitat component in reaches with soft, muddy substrate, the softer bottoms also generally harbor substantial populations of burrowing invertebrates (e.g., larval diptera and oligochaetes), which may be an important food resource to higher trophic levels.

The streams of the study area support aquatic species primarily adapted to ephemeral pool habitats. Because they consist of small headwater drainages in a predominantly sandy clay substrate, flow is unlikely to be sufficiently persistent to support any substantial lotic assemblage. Stream inhabitants will, instead, be species adapted to rapid dispersal and completion of life cycles in pool habitats having fine-grained substrates.

Fish are prominent in the trophic structure of most streams, being the largest and most conspicuous of the ecosystem's resident consumers. Extensive environmental changes in an area can lead directly or indirectly to changes in the feeding habits of fish. However, changes in available feeding levels are not necessarily detrimental, unless the organism's feeding habits are very specialized. Food habits of fish vary with season, food availability and life cycle stages. For example, the diet of most young fish consists of microscopic plants and animals including algae, protozoans and crustaceans found on plants, in bottom material or suspended in the water column. As fish develop and attain sexual maturity, feeding adaptations develop and the diets of some species become very restricted. Some fish are herbivorous, while others (e.g., bass) are strictly carnivorous. Most of the sunfish (*Lepomis* spp.) and catfish (*Ictalurus punctatus*) are omnivorous.

According to Lee et al. (1980) and Hubbs et al. (1991), up to 100 species of freshwater fish are known to occur in this region of Texas. Based on the size and characteristics of the various water bodies, however, not all of these species would occur in the particular habitats available in the study area. Most of the creek segments in the area are too small or ephemeral to offer habitat to larger species, especially gamefish. The headwater segments of the feeder tributaries probably host minnows (*Notropis* spp.), mosquitofish (*Gambusia affinis*), red shiner (*Cyprinella lutrensis*), and darters (*Etheostoma* spp.), with some younger members of larger species. With distance downstream, especially in pooled areas, the fish community tends to be heavily dominated by sunfish that are probably widely distributed in area streams when sufficient water is present. Impoundments within the study area support various gamefish such as the largemouth bass (*Micropterus salmoides*), channel catfish, and various species of sunfish.

3.4.3.3 Commercially or Recreationally Important Animal Species

As stated in Section 3.4.2.3, a species is considered commercially important if one or more of the following criteria applies: (a) the species is recreationally or commercially valuable; (b) the species is endangered or threatened; (c) the species affects the well-being of some important species within criterion [a] or criterion [b]; and (d) the species is critical to the structure and function of the ecological system or is a biological indicator.

Wildlife resources within the study area provide human benefits as a result of both consumptive and nonconsumptive uses. Nonconsumptive uses include activities such as observing and photographing wildlife, birdwatching, etc. These uses, although difficult to quantify, deserve consideration in the evaluation of the wildlife resources of the study area. Consumptive uses of wildlife species, such as hunting and trapping, are more easily quantifiable. Consumptive and nonconsumptive uses of wildlife are often enjoyed simultaneously and are generally compatible. Many species occurring in the study area provide consumptive uses, and all provide the potential for nonconsumptive benefits.

The white-tailed deer is the most important big game mammal in Texas. Deer require woodlands containing good shrub layers that provide food and cover. Edge situations are often favored for browsing. Although food habits vary regionally and seasonally, twigs of shrubs and trees, acorns, and various forbs and grasses make up most of a deer's diet (Martin et al., 1951). The TPWD divides the counties of Texas into ecological areas for white-tailed deer management, with Dallam and Sherman Counties falling within the High Plains Vegetational Area as described in previous sections.

Other game species regularly hunted within the High Plains Vegetational Area are the pheasant, northern bobwhite, scaled quail, dove, rabbits, and numerous species of migratory waterfowl (NRCS, 1975; Sullivan, 1997; Peterson, 1998; Perez, 1998).

Streams in the study area are generally too small to provide or support any substantial recreational or commercial fishery. The majority of sport fish in the creeks would either be too small, or found in such low numbers, that few people would fish them. Instead, the major impoundments and river in the study area, North Canadian River, provides the bulk of the recreational fishery. Pond habitats in the area typically provide a private recreational fishery for landowners and their guests. No commercial fishery is known to occur in the study area.

Important gamefish and recreational species expected to occur in North Canadian River and other smaller study area lakes and aquatic habitats include the largemouth bass, white crappie, black crappie (*Pomoxis nigromaculatus*), striped bass, white bass, channel catfish, green sunfish (*Lepomis* cyanellus), and bluegill (*Lepomis macrochirus*). Threadfin shad (*Dorosoma petenense*), brook silverside (*Labidesthes sicculus*), sunfishes, and gizzard shad (*Dorosoma cepedianum*) are important forage species. Important rough species include gar (*Lepisosteus* spp.) and several species of catfish.

3.4.3.4 Endangered and Threatened Animal Species

Table 3-1 lists those fish and wildlife species with a geographic range that includes Dallam and Sherman Counties and that are considered by FWS and/or TPWD to be endangered, threatened, or rare. Sources reviewed to develop the list include FWS (2008), TPWD (2009), and TXNDD (2008). It should be noted that inclusion on the list does not imply that a species is known to occur in the study area, but only acknowledges the potential for occurrence. Only those species listed as endangered or threatened by FWS are afforded federal protection.

Two species listed in Table 3-1 are considered by both the FWS and TPWD as endangered. These are the whooping crane (*Grus americana*) and gray wolf (*Canis lupus)*. One additional species is considered by the FWS and TPWD as threatened: black bear (*Ursus americanus*). In addition, the FWS lists the lesser prairie chicken (*Tympanuchus pallidicinctus)* as a candidate species and the black-footed ferret (*Mustela nigripes*) as endangered.

While not listed by the FWS, seventeen of the remaining species in Table 3-1 are state-listed as threatened, endangered, or rare by TPWD. The species that are state-listed as threatened are the bald eagle, peregrine falcon, black bear, and Texas horned lizard. The remaining 12 species are state-listed as rare. They are: mountain plover, Baird’s sparrow, western burrowing owl, ferruginous hawk, prairie falcon, Wiest’s sphinx moth, plains spotted skunk, big free-tailed bat, black-tailed prairie dog, pale Townsend’s big-eared bat, swift fox, and the western small-footed bat.

Table 3-1

Endangered, Threatened And Rare Wildlife Of Potential Occurrence In Dallam And Sherman Counties[1]

Common Name[2]	Scientific Name[2]	Status[3] FWS	Status[3] TPWD	Known Occurrence in the Study Area
BIRDS				
Whooping crane	*Grus americana*	LE	E	
Bald eagle	*Haliaeetus leucocephalus*	DL	T	
Mountain plover	*Charadrius montanus*	NL	R	Y
Peregrine falcon	*Falco peregrinus anatum*	DL	T	
Baird's sparrow	*Ammodramus bairdii*	NL	R	
Western burrowing owl	*Athene cunicularia hypugaea*	NL	R	
Ferruginous hawk	*Buteo regalis*	NL	R	
Lesser prairie chicken	*Tympanuchus pallidicinctus*	C	R	
Prairie falcon	*Falco mexicanus*	NL	R	
Insects				
Wiest's sphinx moth	*Euproserpinus wiesti*	NL	R	
MAMMALS				
Plains spotted skunk	*Spilogale putorius interrupta*	NL	R	
Big free-tailed bat	*Nyctinomops macrotis*	NL	R	
Black bear	*Ursus americanus*	T/SA;NL	T	
Black-footed ferret	*Mustela nigripes*	LE	R	
Black-tailed prairie dog	*Cynomys ludovicianus*	NL	R	Y
Gray wolf	*Canis lupus*	LE	E	
Pale Townsend's big-eared bat	*Corynorhinus townsendii pallescens*	NL	R	
Swift fox	*Vulpes velox*	NL	R	Y
Western small-footed bat	*Myotis ciliolabrum*	NL	R	
REPTILES				
Texas horned lizard	*Phrynosoma cornutum*	NL	T	

1 According to FWS (2008), TXNDD (2008),

2 Nomenclature follows Crother (2000, 2001, 2003), Hatch et al. (1990), Hubbs et al. (1991), AOU (1998, 2000, 2002, 2003, 2004, 2005, 2006, 2007), and Manning and Jones (1998).

3 FWS – U.S. Fish and Wildlife Service.
TPWD – Texas Parks and Wildlife Department.

E – Endangered; in danger of extinction.

T – Threatened; severely depleted or impacted by man.

T/PDL – Currently listed as threatened, but proposed for delisting.

E w/CH- Endangered; critical habitat (in Texas unless annotated *).

DL – Formerly listed as threatened or endangered, but due to significant population increases has officially been removed from threatened or endangered status.

NL – Not listed.

LE – Listed Endangered.

R – State listed as rare, but with no regulatory listing status.

Information was received from the TPWD TXNDD concerning the occurrence and location of state concerning the occurrence and location of state and federally listed species in the study area (TXNDD, 2008). The official state list of endangered and threatened animal species promulgated by the TPWD includes the same species listed by the FWS as endangered or threatened. Species considered rare by TPWD that have known occurrences within the study area are mountain plover, black-tailed prairie dog, and swift fox.

The mountain plover (*Charadrius montanus*) is typically found in freshly plowed agricultural fields. It was proposed for federal listing as threatened (64 FR 7587–7601; February 16, 1999), but its listing was recently determined to be unwarranted and the proposal has been withdrawn (68 FR 53083–53101; September 9, 2003). The mountain plover has been documented in one location within the study area. Documentations by the TXNDD (2008) include an area located in the northwestern portion of the study area within the Rita Blanca National Grasslands. Even though this species is not listed as threatened or endangered by FWS and/or TPWD, it is protected under the Migratory Bird Treaty Act (MBTA), which provides protection of a select group of migratory birds.

The black-tailed prairie dog is scattered throughout the study area. It occupies dry, flat, short grasslands with low, relatively sparse vegetation, including areas overgrazed by cattle. The areas of occupancy are large underground networks of tunnels sometimes consisting of hundreds of individuals known as, “Prairie Dog Towns.”

The swift fox is restricted to current and historic shortgrass prairies in the western and northern portions of the Texas Panhandle. Swift foxes typically live in the open desert or grasslands. They hunt in high, well-drained mesas, hilltops, along the borders of valleys, and sparsely vegetated hillsides and other well-drained areas. They have also adapted to cultivated and ranchlands.

3.5 SOCIOECONOMICS

This section presents a summary of economic and demographic characteristics of Dallam and Sherman Counties and the State of Texas and briefly describes the socioeconomic environment of the study area. The study area is located entirely within Dallam and Sherman Counties. Literature sources reviewed include publications of the TWDB, Texas Workforce Commission (TWC), the U.S. Census Bureau, and the Bureau of Labor Statistics (BLS).

3.5.1 Population Trends

As shown on Figure 3-4, the populations of both Dallam County and Sherman County experienced overall increases between 1990 and 2007. The population of Dallam County increased by approximately 14% between 1990 and 2000, while the population of Sherman County increased by approximately 11% during the same period. The populations of both counties decreased slightly between 2000 and 2007, by 1.6% (Dallam County) and 8.9% (Sherman County). Meanwhile, the State of Texas’s population increased consistently from 1990 to 2007, from 16,986,510 persons in 1990 to an estimated 23,904,380 persons in 2007 (an increase of 41%) (U.S. Census Bureau, 1990, 2000, 2009).

According to population projections published by the TWDB, the populations of Dallam and Sherman Counties, and the state are expected to increase consistently between 2000 and 2030. The state's population is expected to increase by 38% between 2000 and 2030, while Dallam County's population is expected to increase by 26%, and Sherman County's population is expected to increase by 34% (TWDB, 2006).

3.5.2 Employment

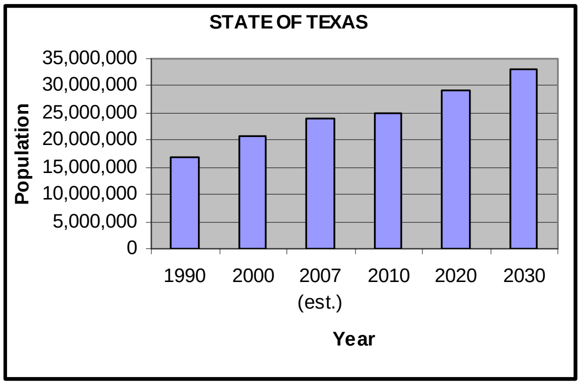
As shown on Figure 3-5, the labor forces of Dallam and Sherman Counties have fluctuated since 2000, while the state's labor force has steadily increased. The labor forces in Dallam and Sherman Counties each decreased between 2000 and 2005, and then experienced increases between 2005 and December 2008. Overall, during the eight-year period, Dallam County's labor force increased by 7%, while Sherman County's labor force decreased by 10%. The state's labor force increased consistently between 2000 and December 2008, for an overall increase of 14% (BLS, 2009). The unemployment rates of both counties and the state experienced similar changes between 2000 and December 2008. All experienced an increase between 2000 and 2005, and then decreased between 2005 and December 2008 (BLS, 2009).

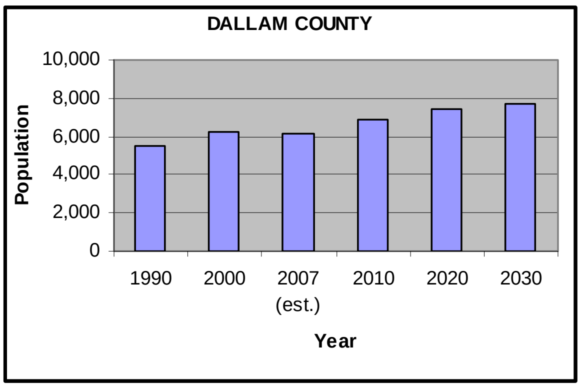
3.5.3 Leading Economic Sectors

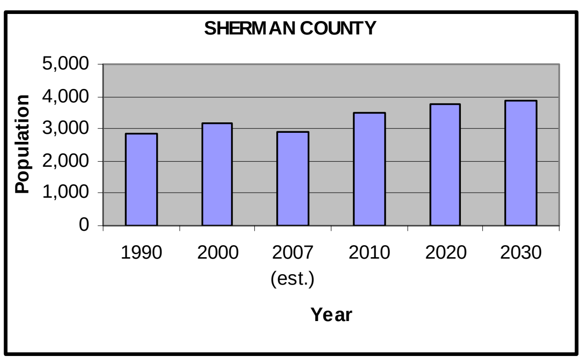
Covered employment data incorporates jobs that are located within the county and state. It includes workers who are covered by state unemployment insurance and most agricultural employees. The employment count includes all corporation officials, executives, supervisory personnel, clerical workers, wage earners, pieceworkers, and part-time workers. The data excludes employment covered by the Railroad Retirement Act, self-employed persons, and unpaid family workers. A comparison of third quarter covered employment data between 2003 and 2008 show the total number of jobs in Dallam County increased from 3,291 to 3,857 (an increase of 17%), while the total number of jobs within Sherman County decreased from 774 to 747 (a decrease of approximately 4%). During the same five-year period, covered employment at the state level increased from 9,178,177 to 10,427,514 (an increase of approximately 14%) (TWC, 2009).

As shown in Figure 3-6, the leading economic sectors in the third quarter of 2008 for Dallam County were natural resources and mining (25%), trade, transportation, and utilities (21%), and federal, state, and local government (15%). The leading sectors for Sherman County were federal, state, and local government (43%), and natural resources and mining (28%). For the State of Texas, the leading economic sectors were trade, transportation, and utilities (21%), federal, state, and local government (16%), and professional and business services (13%) (TWC, 2009).

FIGURE 3-4
POPULATION TRENDS AND PROJECTIONS







Source: U.S. Census Bureau, 1990, 2000, 2009; TWDB, 2006

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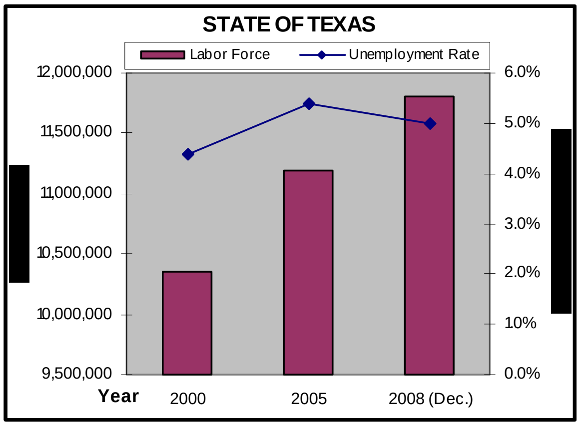
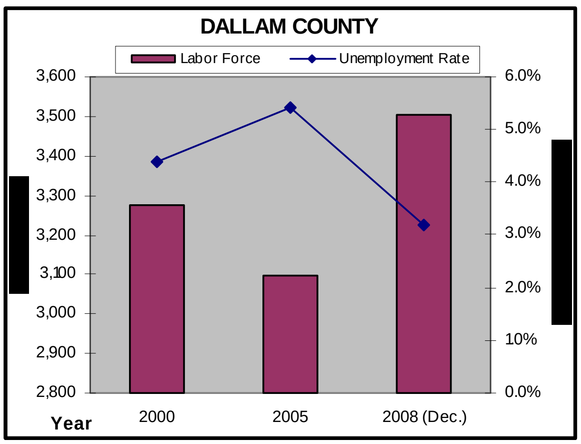
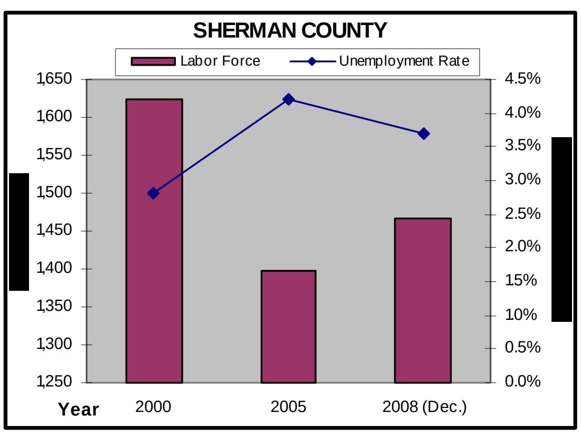
FIGURE 3-5
CIVILIAN LABOR FORCE AND UNEMPLOYMENT







Source: TWC, 2009

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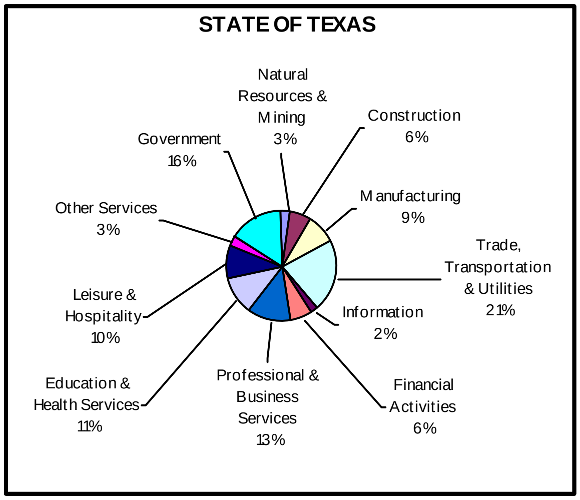
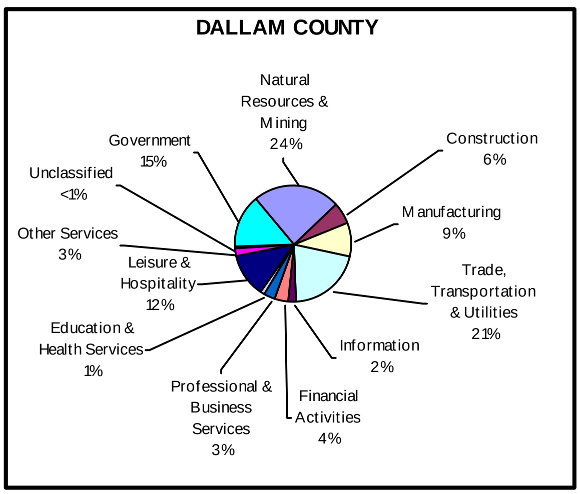
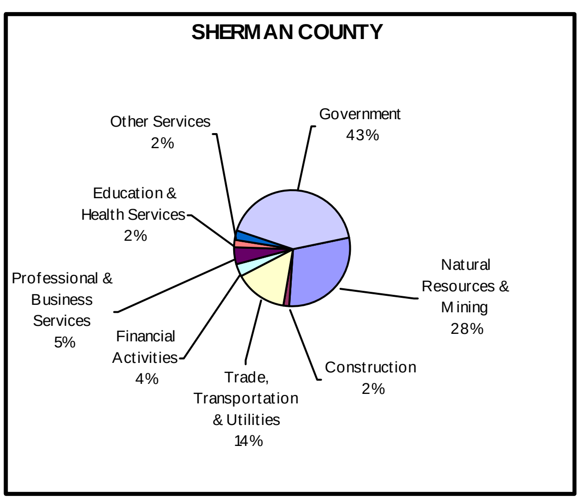
FIGURE 3-6
COVERED EMPLOYMENT AND WAGES
3RD QUARTER 2003 AND 2008







Source: TWC, 2009

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3.5.4 Agriculture

Agriculture is an important segment of the economy throughout the Texas Panhandle and is represented mostly by pastureland and cropland. Aerial figures of the study area (Figures 2-3 through 2-4) illustrate the extent of circle pivot irrigation and dryland agricultural areas. Dallam and Sherman Counties are located within the Texas Agricultural Statistics Service District 1, the Northern High Plains Region (National Agricultural Statistics Service [NASS], 2008a). Dallam County livestock includes beef and milk cattle, angora goats and sheep; crops include corn for grain, oats, sorghum for grain, sunflower and wheat (NASS, 2008b). Sherman County crop data was not available in 2008; however, crop data from the 2002 Agricultural Census was available. Sherman County livestock includes beef cattle and angora goats; crops include primarily corn, wheat, winter wheat, sorghum and soybeans (NASS, 2002 and 2008b).

Primarily, the only areas not under some kind of agricultural production in the study area are developed towns and cities. All but two small tracts within the Rita Blanca National Grassland units have active grazing allotments (U.S. Forest Service [USFS], 2007).

3.5.5 Community Values

The term "community values" is included as a factor for the consideration of transmission line certification under Section 37.056(c)(4) of the TUC, although the term has not been specifically defined for regulatory purposes by the PUC.

For the purposes of evaluating the effects of the proposed transmission line, PBS&J has defined the term community values as a "shared appreciation of an area or other natural or human resource by a national, regional, or local community."

3.6 LAND USE, AESTHETICS, AND RECREATION

3.6.1 Land Use

The study area includes portions of Dallam and Sherman Counties, Texas, and encompasses the communities of Dalhart, Chamberlain, Conlen, Lautz and Stratford. The communities of Cactus and Malett are within the study area but are two miles or more from the nearest proposed routes. Development is generally concentrated in the cities and towns located along major roadways; however, rural single-family residences and farm operations are scattered throughout the study area along the various Farm to Market Roads (FM) and CRs. Major roadway corridors include US 287, US 385, US 87, US 54, and State Highway (SH) 354 (TxDOT, 2006).

PBS&J solicited information from Dallam and Sherman Counties, independent school districts, and various state and federal agencies regarding environmental and/or land use constraints within the study area (See Appendix A: Agency Correspondence).

3.6.2 Aesthetic Values

Aesthetics is included as a factor for consideration in the evaluation of transmission facilities in Section 37.056(c)(4)(A)–(D) of the TUC. For the purposes of this study, the term aesthetics is defined by PBS&J as the subjective perception of natural beauty in a landscape and scenic qualities that may be perceived from the proposed facilities.

Consideration of the visual environment includes a determination of aesthetic values (where the major potential effect of a project on the resource is considered visual) and recreational values (where the location of a transmission line could potentially affect the scenic enjoyment of the area). PBS&J considered the following aesthetic values in this study that combine to give an area its aesthetic identity:

- topographical variation (hills, valleys, etc.);
- prominence of water in the landscape (rivers, lakes, etc.);
- vegetation variety (woodlands, meadows);
- diversity of scenic elements;
- degree of human development or alteration; and
- overall uniqueness of the scenic environment compared with the larger region.

The immense flat sandy plain of the study area is north of the Llano Estacado (U.S. Geological Survey [USGS], 2000) that spans into New Mexico and a large part of the Texas Panhandle, one of the largest expanses of near featureless terrain in the U.S. North of the Canadian River, the study area exhibits similar topographical features to the Llano Estacado – flat expansive terrain – dissected by the eroded breaks along tributaries to the Canadian River (Rita Blanca Creek and Punta de Agua Creek). While these vast views are occasionally interrupted by localized wind farm, circle pivot irrigation, and oil and gas development structures, the intensely rural character of the area supports the Texas Economic Development and Tourism Office's claim that the region has the "clearest and brightest star-filled evening skies you'll find anywhere in the Lone Star State" (2008). Distinguished from many areas rapidly developing across Texas, this landscape exhibits a unique contrasting aesthetic.

A review of a TxDOT publication entitled "Scenic Overlooks and Rest Areas" in Texas, found that none of the locations listed as having particularly strong aesthetic views or settings were located within the study area (TxDOT, 1998). The National Park Service website does not identify any Wild and Scenic Rivers, Historic Trails, National Parks, National Monuments, or National Battlefields within the study area (National Park Service, 2005). No other outstanding aesthetic resources, designated scenic views, scenic roadways, or unique visual elements were identified from the literature review of the study area.

3.6.3 Recreational and Park Areas

A review of the Texas Outdoor Recreation Inventory (TORI) (TPWD, 1990), Texas Land and Water Conservation and Recreation Plan (TPWD, 2005), Dalhart Area Chamber of Commerce (2008), USFS

National Grasslands Plan Revision (2007), Office of the Governor Economic Development and Tourism (2008), and federal, state, and local maps identified several park/recreational facilities within the study area.

The largest recreational area in the study area is the Rita Blanca National Grasslands, which consists of numerous small shortgrass prairie tracts managed by the USFS intermixed with private lands across 115,000 acres in New Mexico and the Texas Panhandle. The tracts are managed for wildlife, vegetation and soil conservation; grazing; and recreation (birdwatching, hunting, hiking, and riding) (USFS, 2007). This feature is documented on the TPWD Rita Blanca Loop map of the Panhandle Plains Wildlife Viewing Trail (2006).

The Stratford County Club (golf course) is within the study area, southwest of the city. Additional parks in the study area are concentrated within the City of Dalhart (swimming pool; sand volleyball, basketball and tennis courts; playgrounds and picnic areas; walking trail; skate park; and veterans' memorial) and the City of Stratford (Stratford City Park) (Dalhart Area Chamber of Commerce, 2008; Office of the Governor Economic Development and Tourism, 2008). None of the communities within the study area are on the THC's Texas Plains Trail Loop (2006).

3.6.4 Transportation/Aviation

Surface transportation in the vicinity of the study area is provided by a network of primary, secondary, and local roads. The study area is served by multiple U.S. and state highways (SH), which include: US 287, US 385, US 87, US 54, and SH 354. Most of the smaller roadways in the study area (see aerial extents on Figures 2-3 through 2-4) are private ranch and oil/gas exploration roads (TxDOT, 2008a).

No Metropolitan Planning Organizations (MPO) operate in the study area. The Panhandle Regional Transportation Advisory Group was formed to address the rural transit needs of the Panhandle area. This group recently received the Final Panhandle Region Transportation Coordination Study (Goodman Corporation, 2007), which identified areas of high need in Dallam County and moderate need in Sherman County; however, no known projects are planned at this time to address those needs.

A review of TxDOT's Statewide Transportation Improvement Program (2008-2011) did not identify any improvements to be made within the study area (TxDOT, 2007).

A review of the Dallas, Albuquerque and Wichita Sectional Aeronautical Charts (FAA, 2008a), the FAA Airport/Facility Directory (FAA, 2009), the TxDOT Texas Airport Directory (TxDOT, 2008c), recent aerial photography, USGS maps, field reconnaissance, and Internet resources revealed three FAA-registered airports within the vicinity of the study area. The three airports consist of Dalhart Municipal Airport, Stratford Field Airport, and Pronger Brothers Ranch Airport (FAA, 2009). There is one private airport/landing strip located in the southwestern portion of the study area. The Miller Airport is located south of Ranch Road (RR) 695 and east of US 54, just northwest of Dalhart (AirNav, 2008).

3.6.5 Communication Towers

A search of the Federal Communications Commission (FCC) website identified one AM radio tower (KXIT) in Dalhart, a total of four FM radio towers, and no television towers within the study area (FCC, 2008). Additionally, a total of 17 cellular telephone towers were identified within the study area (FCC, 2008; MM, 2008).

3.7 CULTURAL RESOURCES

As shown on Figure 3-7, both of the counties in the study area are in the Plains Planning Region, as delineated by the Texas Historical Commission (Mercado-Allinger et al., 1996). The geographic region is described as the High Plains and the vegetation as Plains Grassland (Biesaart et al., 1985). The topography is generally very flat, showing little vertical relief. Playa lakes and shallow depressions, which collect runoff water into ponds, are scattered throughout the study area. A brief description of the cultural chronology and major cultural developments of the study area are presented below.

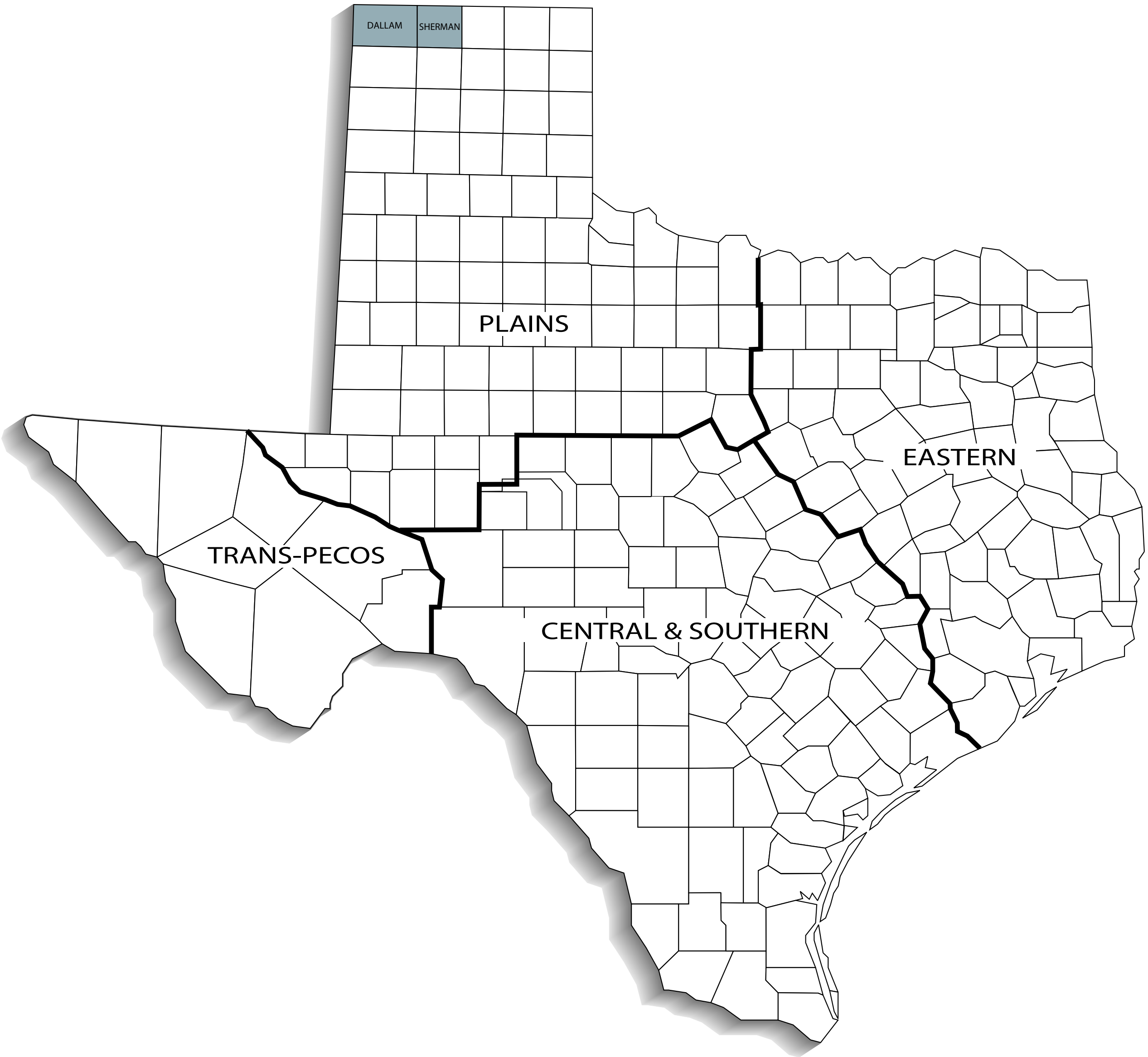
The generalized cultural chronology that is recognized for the Texas Panhandle Plains region is divided into four cultural stages or periods. The cultural history of the study area can be assigned to one of four developmental periods: Paleoindian, Archaic, Late Prehistoric, and Protohistoric (Boyd, 1997). These divisions primarily reflect changes in subsistence as indicated by material remains and settlement patterns. The following sections present an overview of major prehistoric and historic resources that may be found within the study area.

3.7.1 Cultural Background

3.7.1.1 Paleoindian Period

The Paleoindian period refers to prehistoric populations that inhabited North America from the end of the Pleistocene epoch until the early Holocene epoch. The earliest well-defined period of human habitation in the New World began about 11,000 B.C. These populations are believed to have been composed of small nomadic bands of hunters and gatherers who exploited herds of megafauna, such as mammoth, and now extinct bison, as well as smaller mammals. Plants were almost certainly consumed, but data regarding this aspect of subsistence is rare.

The Paleoindian period on the Llano Estacado is subdivided into a sequence of four main cultures (Holliday, 1987), from earliest to latest these are *Clovis, Folsom, Plainview,* and *Firstview* (Turner and Hester, 1985). Distinctive projectile points and economic activities differentiate one from the next.



Source: Mercado-Allinger et. al., 1996

PBSJ

Xcel Energy

FIGURE 3-7

LOCATION OF DALLAM AND SHERMAN COUNTIES IN RELATION TO THE CULTURAL RESOURCES PLANNING REGIONS OF TEXAS

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The primary marker of the Clovis culture is the Clovis fluted point. Clovis hunters commonly attacked now-extinct megafauna such as mammoths. A number of Clovis sites occur in the region. These include the Clovis type site at Blackwater Draw Locality #1 near Clovis, New Mexico (Hester, 1972) and the Roberts County Miami site on the northern edge of the Llano Estacado (Sellards, 1938). Johnson and Holliday (1980) report Clovis material at the Lubbock Lake site near Lubbock, Texas.

Folsom culture is characterized by the Bison antiquus hunting using a more refined fluted point than Clovis. Regional Folsom sites include the type site near Folsom, New Mexico (Figgins, 1927), the Lipscomb site in Lipscomb County (Wormington, 1957) the Lubbock Lake site, the Adair-Steadman site in Fisher County (Tunnell, 1977), and the Briscoe County Lake Theo site (Harrison and Smith, 1975).

Environmental changes and the resultant adaptation by later cultural groups define the end of the Paleoindian period. By about 6,500 B.C. the wet and cool conditions of the Anathermal gave way to much warmer and drier conditions. Most megafauna species, including mammoth, mastodon, and Bison antiquus became extinct.

3.7.1.2 Archaic Period

The Archaic period spans the period between 6,500 B.C. to approximately A.D. 500 and is divided into Early Archaic (6,500 B.C. to 2,000 B.C.) and Late Archaic (2,000 B.C. to A.D. 500). The Early Archaic sub-stage on the High Plains is characterized by a pattern of localized foraging for wild plant food and small game. There is a notable absence of bison kill sites and Dillehay (1974) surmises this as the first period of bison scarcity on the Southern Plains. Lithic artifacts that are common during the Early Archaic include stemmed dart points, gouges, grinding implements, hearth stones and boiling pebbles (Hughes, 1991).

3.7.1.3 Late Archaic Period

By about 2,000 B.C. the Late Archaic sub-stage is identified primarily based on climatic changes to a more modern climate (Medithermal). The Late Archaic is represented by thousands of archaeological sites in sharp contrast to the few sites that have been identified to date to the Early Archaic sub-stage. During the Late Archaic the primary mode of subsistence was bison hunting, even though assemblages dating to this sub-stage indicate exploitation of both large and small game animals and wild plaints. Nomadic groups of people followed the ever-increasing bison herds, redeveloping bison-hunting skills reminiscent of their Paleoindian predecessors (Hughes, 1991; Boyd, 1997). Late Archaic site types include bison kill/butchering sites, campsites, and rockshelters. The predominant types of projectile points during this time are various kinds of barbed dart points (Hughes, 1991). Other types of lithic tools of the Late Archaic assemblage include knives, key-shaped drills, bifacial and unifacial choppers, various types of scrapers, gravers and denticulates. Bison kill sites are the most commonly investigated site types from this time period.

3.7.1.4 Late Prehistoric

The Late Prehistoric period begins with a wetter climate than the preceding Late Archaic period, and the introduction of several new ideas to the cultural inventory began the change from nomadic hunter-gatherers toward a more sedentary villager-gardener lifestyle (Hughes, 1991). These new innovations included the bow and arrow, pottery, pit houses and some gardening or horticulture (Hughes, 1991; Boyd, 1997). Settlements typically are located near active or abandoned river and stream channels. Late Prehistoric occupations typically occur in the same locations as those of the preceding Archaic period. Hunting and gathering was still the primary mode of subsistence for people in the area.

Hughes (1991) defines this period as "…starting about A.D. 200…with the appearance of barbed arrowpoints and Woodland cordmarked and/or Mogollon brownware pottery. The terminal date of about A.D. 1100 splits the difference between about A.D. 1000, when a Woodland/Village transition was taking place in the northern part of the Panhandle Plains, and about A.D. 1200, when a pit-to-surface-house transition was taking place on the southwestern part of the South Plains" (Cruse, 1992). This transition also included changes in house type as well as a shift from barbed points to side-notched triangular points.

Three Late Prehistoric Woodland cultures occur on the Llano Estacado: Lake Creek on the northern edge, Palo Duro on the eastern edge, and Eastern Jornada on the southwest. The latter consists of Querecho and Maljamar phases.

The Lake Creek complex was first identified on the bases of excavations conducted at the Lake Creek site in Hutchinson County by Hughes (1962). The identifying characteristics of this complex include cordmarked ceramics and Scallorn-like arrowpoints, and a lithic assemblage consisted of scrapers, retouched flakes, and a high frequency of one-handed cobble manos and basin type slab metates. Features usually found at Lake Creek sites include storage pits and rock-lined hearths. These sites tended to be located on lesser tributaries rather than along primary waterways in areas that appear to have been frequently flooded (Couzzourt, 1982; Cruse, 1992).

The Palo Duro phase dating from about A.D. 200 to A.D. 1000 was initially recognized as a separate cultural complex by Hughes and Willey in 1978. The type site for the Palo Duro phase is the Deadman's Shelter site located in Tule Canyon below the juncture of Deadman's and Barber's creeks, now in McKenzie Reservoir (Hughes and Willey, 1978). Other sites that have been identified as Palo Duro sites include the Canyon City Club Cave in Randall County (Hughes, 1969), the Blue Clay site (Hughes and Willey, 1978), the Chalk Hollow site (Wedel, 1975), and the Kent Creek Site (Cruse, 1992).

The artifactual assemblage for Palo Duro sites consists primarily of Deadman's and Scallorn arrowpoints and Mogollon Brownware ceramic. Also included in the assemblage are corner-notched dart points, high concentrations of slab metates and cobble manos, ovate-shaped knives, scrapers, and some bone tools. The lithic material used is predominately local, but a few flakes of materials such as obsidian can be found at these sites. Sites dating to the Palo Duro phase are small open camps or rockshelters located along the eastern margins of the Texas Panhandle (Cruse, 1992).

The Plains Village complex that developed out of the Plains Woodland cultures first appears in western Oklahoma and is referred to as the Early Plains Village period (Baugh et al., 1984; Hofman, 1984). In the Texas Panhandle, transition from Woodland to Plains Village cultural lifestyle takes place about A.D. 1200, with the Antelope Creek phase (A.D. 1200-1500) located principally along the Canadian River and the Washita River phase (A.D. 1250-1450) located in western and central Oklahoma (Cruse, 1992). Characteristics of the Antelope Creek phase include Borger Cordmarked ceramics, Washita and Fresno arrowpoints, and rectangular structures with slab rock foundations. The economy during the Antelope Creek phase is presumed to have been based on bison hunting and horticulture.

The Washita phase is characterized by a ceramic assemblage that is primarily plain wars and houses that are not slab-lined. Some of the characteristics that it does share with the Antelope Creek phase are the use of Washita and Fresno arrowpoints and subsistence-activated, revolving around bison procurement and horticulture (Hughes, 1991; Cruse, 1992).

The Spaniard Coronado crossed the northern Llano and Panhandle Plains between 1540 and 1542. The Eastern Apache by then had a well-defined seasonal round including communal hunts and raids and limited agriculture. Apache camps of this time are identified by the presence of Garza and Lott projectile points, Tierra Blanca plain ceramics and Rio Grande glaze wares (Cruse, et al., 1993). At the time of European contact, the area was inhabited by indigenous groups who appear to have initiated extensive trading activities with the Caddo in east Texas and the Trans-Pecos groups to the west (Suhm, 1958). The Lipan Apache entered the area from the Plains in pursuit of food in the seventeenth century. Their weapons included the lance and the bow. Trade items such as glass beads, European-made ceramics, gun parts, and metal arrow points indicate contact-period occupations. Two inter-related events eventually led to the removal of the Eastern Apache from the Llano proper.

Historically, the project area lies in the eighteenth and nineteenth century *Comancheria*, the regions of Comanche dominance (Thurmond et al., 1981). From approximately A.D. 1700, the region's population grew to include Lipan Apache, various bands of Comanche and, it is supposed remnants of the original bands of the indigenous hunters and gatherers. The introduction of the horse and European firearms allowed the Comanche to function as the dominant cultural groups until the late 1870s.

Unlike previous occupants of the area, the Comanche lived in seasonal encampments and did not construct permanent dwellings. Their mobile society followed the plains herd animals on seasonal migrations. This is not to imply that the Comanche did not come together in large groups. By necessity, multiple bands would gather in the summer and fall for large-scale bison hunts (Cruse, et al., 1993). Other important inhabitants of this region during this time where undoubtedly the Comancheros, ciboleros, and pastores who came from New Mexico into *Comancheria* (Abbe and Anderson, 2008)

All of the counties that now comprise the Texas Panhandle were the Indians' domain until the Red River War of 1874-75 (Abbe and Anderson, 2006). During this military campaign, the United States Army was commanded to drive the Indians still in the Texas Panhandle to the Indian Territory. Comanche, Kiowa, and Southern Cheyenne Indians joined forces to fight against the army but in the end they were forcibly removed from Texas. The result of the Indians' removal was that the buffalo hunters moved in and exterminated the great herds on which the Indians had depended, and the Anglo ranchers moved into the area (Cruse, 2008).

From the mid-1870s to the early 1880s, "pastores" from New Mexico began moving into this portion of Texas in search of grazing land and water for their sheep. Most pastores herded their flock on a seasonal basis along the upper Canadian River (Anderson, 2008). The pastores and their flocks followed old Indian trails and utilized the old cibolero and Comanchero campsites on which they erected crude rock shelter. After the Red River War, an increasing number of pastores began entering the area. The pastores' yearly migration into the region contributed significantly to the population and economy of the Texas panhandle in the early 1880s. However, shortly thereafter cattlemen began moving in the region in large numbers and began forcing the pastores out of the area by buying them out or restricting their grazing lands by fencing the previously free range.

Dallam County was named for James W. Dallam, a Republic of Texas lawyer and newspaper editor. The county was originally a part of the Bexar District and it was separated in 1876; however, no settlement occurred in the county until 1882. On January 10, 1882, about two-thirds of the county was deeded to the Capitol Freehold Land and Investment Company (Abbe and Anderson, 2008). The first headquarters for the XIT Ranch were in the northern part of Dallam County at Buffalo Springs. The XIT was among one of the largest ranches in the Texas Panhandle at the time (Anderson, 2008). For several years the only settlers in the county were XIT cowboys. The county was officially organized in 1891, with Texline as the county seat. In 1903 a new county seat, Dalhart, was selected.

By the early 1900s farming and industry were added to ranching as the mainstays of the economy of the Texas Panhandle. The foundation of the farming industry was wheat, but corn, milo, and millet are also grown in the county. The advent of modern irrigation, railroads, and its strategic location on two major U.S. highways has all contributed to the economy of the county.

Sherman County was established by the Texas State Legislature in 1876 from area taken from Bexar County; however, it was not organized until 1889. The county was named after Sidney Sherman, a veteran of the Texas Revolution. During the period prior to 1889 it was administered as part of Oldham County. Population growth in the county was slow primarily due to limited surface water and the lack of permanent settlements. The first settlement in the county was Coldwater, founded by the Loomis family. In 1890 Coldwater was designated by county seat. The first courthouse was built in 1891.

Large ranches were soon established by Dick Pincham, J.M. Turner, and William B. Slaughter, who settled on claims under the Four-Section Act. Ranching dominated the economy until the early twentieth century. During the first years of the 1900s, farmers moved into the area, and due to the construction of a railroad and the introduction of mechanized water-well drilling, crop production continued to expand (Pendleton, 2008).

3.7.1.5 Previous Investigations

Professional archaeological investigations in this part of the southern Great Plains are not numerous. Some of the earliest work conducted in the Texas Panhandle was in conjunction with watershed projects (Hood and Hughes, 1975; Hughes and Hood, 1976; Hughes et al., 1977; Hughes et al., 1978) or transportation projects (SDHPT, 1975a, 1975b, 1975c, 1975d, 1988; TxDOT, 1990, 1993, 1995). An archaeological reconnaissance was completed for the USACE by the Kilgore Research Center at West Texas State University. A total of 77 sites were recorded but none of them were recommended for further work after recordation. The sites dated from the Paleoindian period to the Late Prehistoric Period and types of sites represented included campsites, quarry/workshop, and a burial (Hughes, 1973).

Dallam County archeological investigations have primarily been conducted for oil and gas projects (Baker, et al., 1981; Brett and Beck, 1981; Johnson, 1980) or for activities conducted by the Rita Blanca Ranger District, Cibola National Forest (Hamilton, 1985; Hamilton and Childress, 1981, 1985; Hamilton and Reagan, 1982; 1983; 1984; 1985). Other surveys have also been conducted for fiber optic or seismic lines (Holan, 1981; Landis, 1985,; 1988; Brett and Beck, 1981, 1982; Cojeen, 1982).

Currently, Alternative Route 5 of the Dallam to Sherman project has been surveyed. The field investigations resulted in the identification of three newly recorded sites, of which two are prehistoric lithic scatters and one is an historic garage and associated storm cellar. None of the cultural resources identified appear to meet the criteria warranting NRHP inclusion. However, the THC has not had opportunity to review and comment on this project.

3.7.2 Results of the Literature/Records Review

The county record files at Texas Archeological Research Laboratory (TARL) identified six previously recorded archeological sites in Sherman County. According to the records the first site was recorded in 1989 and no sites have been recorded since 2003 when the last two sites, 41SH5 and 41SH6 were recorded during the Seaboard Farms survey. The THC's on-line Atlas did not identify any State Archeological Landmark (SAL) designated sites of NRHP listed properties in Sherman County. The Whaley Cemetery is the only cemetery in the county designated as a Texas Historic Cemetery. Additionally, the THC Atlas identifies four Official Texas Historical Markers (OTHMs) in the county.

Dallam County files identified 43 previously recorded archaeological sites in the county, one NRHP listed property, the Dallam County Courthouse, six historic markers (two of which are NRHP eligible because they are 1936 Centennial Markers), and four Texas Historic Cemeteries. No SAL sites are designated in the county.

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4.0 ENVIRONMENTAL IMPACTS OF THE ALTERNATIVE ROUTES

4.1 IMPACTS ON PHYSIOGRAPHY AND GEOLOGY

Construction of the proposed transmission line will have no significant effect on geologic features or resources within the study area. The erection of the support structures will require the removal and/or disturbance of small amounts of near-surface materials, but will have no measurable impact on geologic resources or features along any of the alternative routes.

4.2 IMPACTS ON SOILS

4.2.1 Soils

The construction and operation of transmission lines normally create very few long-term adverse impacts on soils. The primary potential impact upon soils from any transmission line construction will be erosion and soil compaction. The hazard of soil erosion is generally greatest during the initial clearing (where necessary) of the ROW. To provide adequate space for construction activities and to minimize corridor maintenance and operational problems, the removal of most woody vegetation is necessary within the ROW. In these areas, the necessary movement of heavy equipment will disturb only the remaining leaf litter and a small amount of herbaceous vegetation. The most important factor in controlling soil erosion associated with construction activities is revegetating areas that have potential erosion problems immediately following construction. Revegetation of a majority of the ROW would occur through natural succession. To maximize the protection of land and water resources, vegetation on the stream banks will remain intact to the greatest extent possible. SPS will inspect the ROW during and after construction to identify problem erosion areas, and will take special precautions to minimize vehicular traffic over areas with very shallow soils.

4.2.2 Prime Farmland

The Secretary of Agriculture, in 7 U.S.C. 4201(c)(1)(A), defines prime farmland soils as those soils that have the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops. The USDA recognizes the importance and vulnerability of prime farmlands throughout the nation, and therefore encourages the wise use and conservation of these soils where possible. Approximately 24.9% of Dallam and Sherman Counties soils are prime farmland (NRCS, 1979). The NRCS (2000a) classifies many of the soils in the southern half of the study area as prime farmland. Whenever feasible, the alignment of alternative routes follow existing roadways, property lines, fencelines, or other existing ROW, so as to minimize potential impacts (including those to prime farmland). Other than construction-related erosion, the primary impact of the project on prime farmland soils will be the physical occupation of small areas by the base of the support structures, which may slightly reduce the potential of those areas for agricultural production. The NRCS has stated on several previous occasions that they do not normally consider the construction of electric transmission lines to constitute a major impact, or conversion, of prime farmland, since the soils can still be used for farming following construction.

4.3 IMPACTS ON WATER RESOURCES

4.3.1 Surface Water

All of the proposed alternative routes cross surface water features, including named and unnamed streams, wetlands, and stock tanks; however, the construction of the proposed 115-kV transmission line should have little adverse impact on the surface water resources of the study area. The main potential impact on surface waters from any major construction project is siltation resulting from erosion and potential pollution from the accidental spillage of petroleum products (e.g., fuel, lubricants, solvents, etc.) Vegetation removal could result in increased erosion potential of the affected areas, leading to the delivery of slightly higher-than-normal sediment yields to area streams during heavy rainfall events. However, these short-term effects should be minor because of the relatively small area to be disturbed at any particular time, the short duration of construction activities, the preservation of streamside vegetation where practicable, and SPS's efforts to control runoff from construction areas. In addition, the proposed project will likely require a SWPPP, including the filing of a NOI with the TCEQ.

All of the proposed routes will have one crossing of Coldwater Creek and two of Frisco Creek. Table 6-1 (in Section 6 of this document) presents the potential impacts to surface waters for each route, including the number of stream crossings.

The proposed project will likely span all study area streams and SPS will avoid or minimize the placement of supporting structures in the streambed of drainage features. If appreciable stream flow is present in any of the spanned streams, construction crews will transport machinery and equipment around these areas via existing roads to avoid direct crossings. This will eliminate the necessity of constructing temporary low-water crossing that may result in erosion, siltation, and disturbance of the stream and its biota. If a spanned stream is dry at the time of construction, some earth removal may be necessary to facilitate crossing; however, the area will undergo restoration to preconstruction contours. If clearing of vegetation is necessary at stream crossings, SPS will employ selective clearing (i.e., use of chainsaws instead of heavy machinery), to minimize erosion problems. Highly erodible areas adjacent to streams (stream banks) will not be cleared unless necessary.

Construction of the proposed transmission line could result in some temporary erosion or short-term disturbance resulting in siltation, but impacts will be minimal and localized because of the ephemeral or intermittent nature of the majority of the crossed streams. No long-term adverse effects are likely. SPS will make efforts during construction for proper control and handling of any petroleum or other chemical products. The most effective method for avoiding surface water impacts is the implementation of proper spill-prevention and spill-response plans.

None of the proposed routes intersect any known floodplains. Impacts on floodplains in the form of sedimentation or impedance of water flow will not occur from the construction of any of the proposed routes.

4.3.2 Groundwater

The construction, operation, and maintenance of the proposed transmission line should not adversely affect groundwater resources in the study area or vicinity. The effect of the proposed transmission line on groundwater resources will be negligible because the line will be above ground rather than buried. The amount of recharge area disturbed by construction is insignificant compared to the total amount of recharge area available for the aquifer systems in the region. No measurable alteration of aquifer recharge capacity should occur.

The main potential groundwater impact from construction activities associated with the proposed project is possible contamination from the accidental spillage of chemicals (e.g., fuels, lubricants, solvents, petroleum products, etc.). The most effective method to avoid groundwater impacts is the implementation of proper spill response plans. It is unlikely that polluted surface water run-off will contaminate any groundwater supplies; however, such control measures will be in place as additional precautionary measures during the construction phase of the project. In addition, the proposed project will require a SWPPP, including the filing of a NOI with the TCEQ.

4.4 IMPACTS ON ECOSYSTEMS

4.4.1 Terrestrial Vegetation

The main impact on vegetation within the study area will be the removal of herbaceous vegetation along the proposed transmission line ROW. The amount of vegetation cleared from the transmission line ROW is dependent upon the type of vegetation present. For example, the greatest amount of vegetation clearing would occur in wooded areas, whereas pasturelands would require little to no removal of vegetation. Areas currently used as pastureland or cropland may be temporarily unavailable for grazing or commercial crop production for the duration of the transmission line construction, but can usually be returned to previous land uses upon completion of construction.

During the vegetation clearing process, SPS will make efforts to retain native ground cover where possible, and to minimize impacts to local vegetation. Much of the undeveloped land along the alternative routes is pastureland and cropland and little to no clearing will be necessary. Clearing of woody vegetation will only occur where necessary to provide access and working space and to protect conductors. Soil conservation practices will benefit native vegetation and assist in successful restoration of disturbed areas. As soon as possible after the construction of the transmission line, SPS will reseed the ROW in herbaceous species or a cover of forage crop, if necessary to facilitate erosion control.

The interpretation of 1 inch = 1,000 ft color aerial photography provided the basis for quantifying the approximate impacts on vegetation associated with the proposed alternative routes. Limited field reconnaissance of the study area revealed pastureland and cropland along all of the proposed routes. None of the routes will require the removal of upland brushland or upland woodland. In addition, all of the routes will not affect riparian woodland. Table 6-1 (in Section 6 of this document) presents the potential impacts on vegetation communities for each route, including the length of ROW crossing pastureland, length of ROW crossing cropland, length of ROW crossing upland woodland/brushland, length of ROW crossing riparian woodland, and length of ROW crossing potential wetlands.

4.4.2 Aquatic/Hydric

Wetlands potentially affected by the proposed transmission line would generally be minor in extent because of the ephemeral nature of most surface water features in the region. The study area is known for its isolated wetlands that have no hydrologic connection to waters of the US. Most isolated wetlands within the study area are playa lakes and are not jurisdictional under the Clean Water Act unless hydrologic connectivity is proven. NWI maps indicate that potential wetland communities crossed by the preferred and alternative routes are generally palustrine and lagustrine communities. The preferred route and alternative routes 1, 2, and 3 do not cross any wetlands. Alternative route 4 would cross the greatest amount of potential emergent wetlands (1,353 ft). These potential wetlands consist of emergent wetlands that were previously either off channel ponds or playa lakes. Current aerial photography and topographic maps revealed no connectivity to waters of the US. If any jurisdictional wetlands do occur within the proposed ROW, it is likely that the aerial transmission line will easily span those features.

The removal or disturbance of streamside vegetation can result in an increased potential for erosion and sedimentation. Placement of erosion control devices downgradient of areas disturbed by construction activities would help to minimize runoff into local streams. In close proximity to streams, the positioning of erosion control measures between the disturbed area and the waterway will prevent or minimize siltation of streams. Placement of dredged or fill material within waters of the U.S. (including wetlands) is subject to USACE regulations. The proposed transmission line will likely span local streams and wetlands, therefore, there will be minimal impacts to surface water.

4.4.3 Endangered and Threatened Plant Species

The FWS and TPWD were consulted to determine the potential occurrence of federal- or state-listed endangered or threatened plant species within the study area. County-level endangered and threatened species lists prepared by TPWD's TXNDD (2008a) and FWS (2008) indicate that no federally and/or state-listed endangered or threatened plant species occur in Dallam and Sherman Counties. There would be no impact on these species. Copies of correspondence with FWS and TPWD are included in Appendix A.

4.4.4 Wildlife

The impacts of transmission lines on wildlife include short-term effects resulting from physical disturbance during construction, as well as long-term effects resulting from habitat modification. The net effect from transmission line construction on local wildlife is typically minor. The following section provides a general discussion of the effects of transmission line construction and operation on terrestrial wildlife, followed by a discussion of the possible impact of each proposed alternative route.

Any required clearing or other construction-related activities will directly and/or indirectly affect most animals that reside within or traverse the transmission line ROW. Heavy machinery may adversely affect smaller, low mobility species, particularly amphibians, reptiles, and small mammals.

If construction occurs during the breeding season (generally spring to fall), construction activities may adversely affect some species of birds. Heavy machinery may cause soil compaction, which may adversely affect fossorial animals (i.e., those that live underground). Mobile species, such as birds and larger mammals, may avoid initial clearing and construction activities and move into adjacent areas outside the ROW. Construction activities may temporarily deprive some animals of cover, and, therefore, potentially subject them to increased natural predation. Wildlife in the immediate area may experience a slight loss of browse or forage material during construction; however, the prevalence of similar habitats in adjacent areas and vegetational succession in the ROW following construction will minimize the effects of these losses.

The increased noise and activity levels during construction could disturb the daily activities (e.g., breeding, foraging, etc.) of species inhabiting the areas adjacent to the ROW. Dust and gaseous emissions should minimally affect wildlife. Although construction activities may disrupt the normal behavior of many wildlife species, little permanent damage to these populations should result. Periodic clearing along the ROW, while producing temporary negative impacts on wildlife, can improve the habitat for ecotonal or edge species through the increased production of small shrubs, perennial forbs, and grasses.

Several studies have indicated that forest fragmentation has a detrimental effect on some avian species that show a marked preference for large undisturbed forest tracts (Robbins et al., 1989; Terborgh, 1989). In general, the distribution of individual species is not random with regard to habitat size. In addition, area-sensitive species requiring forest interior habitat are typically more sensitive to fragmentation than edge-adapted species and are particularly vulnerable to predation, brood-parasitism, and other impacts on nesting success (Terborgh, 1989; Faaborg et al., 1992). The general lack of large, undisturbed forest/ woodland tracts along the preferred and alternative routes, however, lessens the potential impacts from forest fragmentation.

Transmission line structures could benefit some bird species, particularly raptors, by providing resting and hunting perches, particularly in open, treeless arid habitats (Avian Power Line Interaction Committee [APLIC], 2006). Raptor species, particularly the red-tailed hawk, often use the support structures as nesting sites. Vultures and ravens commonly use the structures as roosting sites and the wires and structures often serve as hunting or resting perches for species such as American kestrel, mourning dove, loggerhead shrike, and meadowlarks (*Sturnella* spp.). As a result, transmission lines have significantly increased raptor populations in several areas of the U.S. (APLIC, 2006). The danger of electrocution to birds will be insignificant because the distance between conductors or conductor and structure or ground wire on 115-kV transmission lines is usually greater than the wingspan of any bird in the area.

The transmission line (both structures and wires) could present a hazard to flying birds, particularly migrants. Collisions tend to increase in frequency during the fall and spring, when migrating flocks are denser and flight altitudes are lower in association with cold air masses, fog, and/or inclement weather. The greatest danger of mortality exists during periods of low ceiling, poor visibility, and drizzle when birds are flying low, perhaps commencing or terminating a flight, and may have difficulty seeing obstructions (Electric Power Research Institute [EPRI], 1993). Most migrant species, including passerines, should experience minimal adverse effects during migration since their normal flying altitudes are greater than the heights of the proposed transmission structures (Willard, 1978; Gauthreaux, 1978). For year-round or seasonal resident birds, those most prone to collision are often the largest and most common in a given area (Rusz et al., 1986; APLIC, 1994). Resident birds, or those in an area for an extended period, learn the location of power lines and become less susceptible to wire strikes (Avery, 1978). Raptors, typically, are uncommon victims of transmission line collisions because of their great visual acuity (Thompson, 1978). In addition, many raptors only become active after sufficient thermal currents develop, which is usually late in the morning when poor light is not a factor (Avery, 1978).

Power lines within daily use areas are responsible for most bird collisions. Waterfowl species are vulnerable because of their low altitude flight and high speed. Species that travel in large flocks, such as blackbirds and many shorebirds, are also vulnerable, because dense flocking makes movement around obstacles more difficult for individuals in the flock (APLIC, 1994).

Utility companies can employ several means to minimize transmission line impacts on birds in flight. The initial placement of a transmission line is the most important consideration (Avery, 1978; APLIC, 1994). The proximity of a transmission line to areas of frequent bird use is crucial. This is especially true for daily use areas, such as feeding areas or other areas where birds may be taking off or landing regularly (APLIC, 1994). The position of the individual structures can also help reduce collisions. Faanes (1987), in an in-depth study in North Dakota, found that birds in flight tend to avoid the transmission line structures, presumably because such structures are visible from a distance. Instead, most appear to fly over the lines in the mid-span region. In areas where the transmission line passes between roosting and foraging areas, the structures can be placed in the center of the flyway (i.e., where the birds are more likely to fly) to increase their visibility, in addition to heavily marking the wires.

Other considerations during the initial transmission line routing include the height of the surrounding vegetation and the topography of the area (APLIC, 1994). The height of transmission lines relative to the surrounding vegetation can help reduce the probability of collisions. Lines built at the height of the surrounding trees seldom are a problem for forest-dwelling birds, and large birds will avoid the tree line, thus avoiding the transmission line (Thompson, 1978; APLIC, 1994). Consideration of topographical features such as valleys, ridges, and mountain passes, can help avoid important flight paths.

Faanes (1987) reported that 97% of birds observed colliding with a power line did so with the ground (static) wire, largely because of attempts to avoid the conductors. Beaulaurier (1981) found that removal of the ground wire at two study sites in Oregon resulted in a reduction in collisions of 35% and 69%. Increasing the visibility of the wires by using markers such as orange aviation balls, black-and-white ribbons, or spiral vibration dampers, particularly at mid-span, can reduce the number of collisions. Beaulaurier (1981) reviewed 17 studies involving marking ground wires or conductors and found an average reduction in collisions of 45% when compared to unmarked lines. However, since overhead static wires are installed on transmission lines for safety and reliability reasons, SPS feels that increasing the visibility of wires is a better alternative, when necessary.

Waterfowl are among the birds most susceptible to wire strikes (Faanes, 1987) and yet, despite these hazards, it has been estimated that wire strikes (including distribution lines) account for less than 0.1% of waterfowl non-hunting mortality, compared to 88% from diseases and poisoning and 7.4% because of weather (Stout and Cornwell, 1976). In some areas, hunting affects 20 to 30% of waterfowl populations (Thompson, 1978). Suitable habitat for waterfowl within the study area is limited to small isolated ponds and playa lakes, therefore significant impacts are unlikely.

When considering impacts on wildlife, the ranking of the five alternative routes relates primarily to the degree of disturbance or loss of habitat. Other consideration include the length of ROW parallel to streams, impacts on wetlands, the number of stream crossings, and the length of line using existing transmission line ROW, or parallel to other compatible ROW.

None of the alternative routes would require clearing through upland brushland/woodland and riparian woodland. Pastureland and cropland is the predominant habitat type within the study area. All clearing of vegetation would be in the form of herbaceous removal for the construction of the poles. Alternative route 2 would cross the least distance of pastureland (55,880 ft), while alternative route 4 would cross the greatest distance of pastureland (133,332 ft). Alternative route 5 would cross the least distance of cropland (71,257 ft), while alternative route 2 would cross the greatest distance of cropland (119,376 ft). All of the routes will cross the same number of streams (3). None of the proposed routes parallel any streams. Alternative routes 5, 1, 2, and 3 would cross the least amount of potential wetlands (0 ft), while route 4 would cross the greatest amount of potential wetlands (1,353 ft).

None of the alternative routes would require clearing through upland brushland/woodland and riparian woodland. From a wildlife standpoint, the route with the least amount of vegetation clearing, the least amount of wetlands to be crossed, and the least amount of threatened/endangered species habitat to be crossed would be best. Alternative route 5 would be the preferred route from a wildlife standpoint, as it would impact the least amount of the aforementioned criteria. Alternative routes 1, 2, and 4 would follow. Alternative route 3 would be the least preferred from a wildlife standpoint, as it would likely result in the greatest total impact on the amount of vegetation to be cleared, and wetlands, and second-most total impact on threatened/endangered species habitat.

4.4.5 Endangered and Threatened Wildlife

The FWS and TPWD were consulted to determine the potential for occurrence (within the study area) of federal or state-listed endangered or threatened species. According to TXNDD (2008a) and FWS (2008), eight federal and/or state-listed endangered and threatened species potentially occur in Dallam and Sherman Counties. Copies of correspondence with the FWS and TPWD are included in Appendix A.

Two of the eight species listed in Table 3-1, the gray wolf and the black-footed ferret, no longer occur in Texas. Four of the species listed in Table 3-1 are unlikely to reside in the study area. These include the whooping crane, bald eagle, peregrine falcon, and black bear, which would likely occur only as migrants or transients. The proposed transmission line project is unlikely to result in adverse impacts on these species.

Species known to occur in the general area and that are likely present in suitable habitat include the state-listed (threatened) Texas horned lizard. The Texas horned lizard occurs in Dallam and Sherman Counties (Dixon, 2000) and is likely present throughout the study area in suitable habitat; however, the proposed transmission line project should not adversely affect the species.

According to TXNDD (2008b) and previous PBS&J studies in Dallam and Sherman Counties, known locations of black-tailed prairie dogs in the form of prairie dog towns, occur within and near the ROW of the proposed routes. Impacts on the prairie dog towns would occur during the drilling and setting of a pole within their known location. Due to the nature of the construction, these prairie dog towns will be minimally impacted and should not adversely affect the species.

4.4.6 Critical Habitat

No FWS-designated critical habitat for any federal listed endangered or threatened species occurs within Dallam and Sherman Counties. Therefore, there would be no impact.

4.5 IMPACTS ON AQUATIC ECOSYSTEMS

Impacts on aquatic ecosystems from transmission line construction are generally minor. Aquatic features within the study area, such as streams and ponds, are of limited extent. Those present are largely ephemeral and the proposed transmission line would likely span them. The implementation of sedimentation controls (an SWPPP will be in place) during construction will help to minimize erosion and sedimentation into area streams.

The main considerations regarding potential impacts on aquatic systems include the number of streams crossed and the amount of open water habitat crossed. Other considerations relevant to aquatic systems are associated with the amount of ROW that will require clearing, particularly through wetlands.

When considering impacts on aquatic ecosystems, the ranking of the five primary alternative routes relates primarily to the number of streams crossed and the amount of open water (i.e., wetlands) crossed. All of the proposed routes will cross streams, (see Table 6-1). The proposed transmission line will likely span all study area streams and wetlands. From an aquatic habitat standpoint, alternative routes 5, 1, 2, and 3 would create the least amount of impact, while alternative route 4 would be the least preferred due to the potential of impacting a wetland.

4.6 SOCIOECONOMIC IMPACTS

This section presents a summary of economic and demographic characteristics of Dallam and Sherman Counties and the State of Texas and briefly describes the socioeconomic environment of the study area. The study area is located entirely within Dallam and Sherman Counties. Literature sources reviewed include publications of the TWDB, TWC, the U.S. Census Bureau, and the BLS.

4.6.1 Population Trends

As shown in Table 4-1, the populations of both Dallam County and Sherman County experienced overall increases between 1990 and 2007. The population of Dallam County increased by approximately 14% between 1990 and 2000, while the population of Sherman County increased by approximately 11% during the same period. The populations of both counties decreased slightly between 2000 and 2007, by 1.6% (Dallam County) and 8.9% (Sherman County). Meanwhile, the State of Texas's population increased consistently from 1990 to 2007, from 16,986,510 persons in 1990 to an estimated 23,904,380 persons in 2007 (an increase of 41%) (U.S. Census Bureau, 1990, 2000, 2009).

According to population projections published by the TWDB, the populations of Dallam and Sherman Counties, and the state are expected to increase consistently between 2000 and 2030. The state's population is expected to increase by 38% between 2000 and 2030, while Dallam County's population is expected to increase by 26%, and Sherman County's population is expected to increase by 34% (TWDB, 2006).

Table 4-1

Population Trends and Projections

Place	Population					
	1990	**2000**	**2007 (est.)**	**2010**	**2020**	**2030**
Dallam County	5,461	6,222	6,125	6,851	7,387	7,724
Sherman County	2,858	3,186	2,905	3,469	3,770	3,886
Texas	16,986,510	20,851,820	23,904,380	24,915,388	29,117,537	33,052,506
	% change 90-00	**% change 2000-2007**	**AAI 90-2007**	**Projected Increase 2000-30**	**AAI 2000-30**	
Dallam County	13.94%	-1.56%	0.72%	26.11%	0.87%	
Sherman County	11.48%	-8.82%	0.10%	33.77%	1.13%	
Texas	22.76%	14.64%	2.40%	38.27%	1.28%	

4.6.2 Employment

As shown in Table 4-2, the labor forces of Dallam and Sherman Counties have fluctuated since 2000, while the state's labor force has steadily increased. The labor forces in Dallam and Sherman Counties each decreased between 2000 and 2005, and then experienced increases between 2005 and December of 2008. Overall, during the eight-year period, Dallam County's labor force increased by 7%, while Sherman County's labor force decreased by 10%. The state's labor force increased consistently between 2000 and December 2008, for an overall increase of 14% (BLS, 2009).

The unemployment rates of both counties and the state experienced similar changes between 2000 and December 2008. All experienced an increase between 2000 and 2005, and then decreased between 2005 and December 2008 (BLS, 2009).

4.6.3 Leading Economic Sectors

Covered employment data incorporates jobs that are located within the county and state. It includes workers who are covered by state unemployment insurance and most agricultural employees. The employment count includes all corporation officials, executives, supervisory personnel, clerical workers, wage earners, pieceworkers, and part-time workers. The data excludes employment covered by the Railroad Retirement Act, self-employed persons, and unpaid family workers. A comparison of third quarter covered employment data between 2003 and 2008 show the total number of jobs in Dallam County increased from 3,291 to 3,857 (an increase of 17%), while the total number of jobs within

Table 4-2

Civilian Labor Force and Unemployment

	Labor Force			Unemployment Rate		
	2000	**2005**	**2008 (Dec.)**	**2000**	**2005**	**2008 (Dec.)**
Dallam County	3,277	3,099	3,502	4.4%	5.4%	3.2%
Sherman County	1,624	1,397	1,467	2.8%	4.2%	3.7%
State of Texas	10,347,847	11,196,284	11,809,216	4.4%	5.4%	5.0%

	Civilian Labor Force		
		% annual Increase 2000-2005	**% increase 2000-present**
Dallam County		-1.09%	6.87%
Sherman County		-2.80%	-9.67%
State of Texas		1.64%	14.12%

Sherman County decreased from 774 to 747 (a decrease of approximately 4%). During the same five-year period, covered employment at the state level increased from 9,178,177 to 10,427,514 (an increase of approximately 14%) (TWC, 2009).

As shown in Table 4-3, the leading economic sectors in the third quarter of 2008 for Dallam County were natural resources and mining (25%), trade, transportation, and utilities (21%), and federal, state, and local government (15%). The leading sectors for Sherman County were federal, state, and local government (43%), and natural resources and mining (28%). For the State of Texas, the leading economic sectors were trade, transportation, and utilities (21%), federal, state, and local government (16%), and professional and business services (13%) (TWC, 2009).

4.6.4 Community Values

For the purposes of evaluating the effects of the proposed transmission line, PBS&J has defined the term community values as a "shared appreciation of an area or other natural or human resource by a national, regional or local community." Adverse effects upon community values are defined as aspects of the proposed project which would significantly and negatively alter the use, enjoyment or intrinsic value attached to an important area or resource by a community. This definition assumes that community concerns are identified with the location and specific characteristics of the proposed transmission line and do not include possible objections to electric transmission lines per se.

Impacts on community values can be classified into two areas: (1) direct effects, or those effects which would occur if the location and construction of a transmission line results in the removal or loss of public access to a valued resource; and (2) indirect effects, or those effects which would result from a loss in the enjoyment or use of a resource due to the characteristics (primarily aesthetic) of the proposed line,

Table 4-3

Covered Employment and Wages
3rd Quarter 2003 and 2008

Dallam County

Employment Sector	3rd Quarter Emp.		% Total Employment		% Change
	2003	2008	2003	2008	2003-2008
Natural Resources & Mining	674	958	20.48%	24.84%	42.14%
Construction	134	227	4.07%	5.89%	69.40%
Manufacturing	55	347	1.67%	9.00%	530.91%
Trade, Transportation & Utilities	837	792	25.43%	20.53%	-5.38%
Information	20	69	0.61%	1.79%	245.00%
Financial Activities	187	148	5.68%	3.84%	-20.86%
Professional & Business Services	136	111	4.13%	2.88%	-18.38%
Education & Health Services	52	52	1.58%	1.35%	0.00%
Leisure & Hospitality	274	471	8.33%	12.21%	71.90%
Other Services	86	98	2.61%	2.54%	13.95%
Unclassified	7	5	0.21%	0.13%	-28.57%
Federal/State/Local Government	829	579	25.19%	15.01%	-30.16%
Total Employment	**3,291**	**3,857**			**17.20%**

Sherman County

Employment Sector	3rd Quarter Emp.		% Total Employment		% Change
	2003	2008	2003	2008	2003-2008
Natural Resources & Mining	250	210	32.30%	28.11%	-16.00%
Construction	23	15	2.97%	2.01%	-34.78%
Trade, Transportation & Utilities	143	105	18.48%	14.06%	-26.57%
Financial Activities	41	30	5.30%	4.02%	-26.83%
Professional & Business Services	45	34	5.81%	4.55%	-24.44%
Education & Health Services	0	17	0.00%	2.28%	NA
Other Services	38	18	4.91%	2.41%	-52.63%
Federal/State/Local Government	234	318	30.23%	42.57%	35.90%
Total Employment	**774**	**747**			**-3.49%**

State of Texas

Employment Sector	3rd Quarter Emp.		% Total Employment		% Change
	2003	2008	2003	2008	2003-2008
Natural Resources & Mining	210,034	291,705	2.29%	2.80%	38.88%
Construction	556,431	677,104	6.06%	6.49%	21.69%
Manufacturing	898,003	927,828	9.78%	8.90%	3.32%
Trade, Transportation & Utilities	1,901,894	2,132,463	20.72%	20.45%	12.12%
Information	234,857	216,948	2.56%	2.08%	-7.63%
Financial Activities	578,894	642,972	6.31%	6.17%	11.07%
Professional & Business Services	1,044,815	1,340,320	11.38%	12.85%	28.28%
Education & Health Services	1,025,801	1,196,690	11.18%	11.48%	16.66%
Leisure & Hospitality	875,280	1,022,257	9.54%	9.80%	16.79%
Other Services	274,608	296,039	2.99%	2.84%	7.80%
Unclassified	10,772	7,490	0.12%	0.07%	-30.47%
Federal/State/Local Government	1,566,788	1,675,698	17.07%	16.07%	6.95%
Total Employment	**9,178,177**	**10,427,514**			**13.61%**

structures, or ROW. Impacts on community values, whether direct or indirect, can be more accurately gauged as they affect recreational areas or resources and the visual environment of an area (aesthetics). Impacts in these areas are discussed in detail in sections 4.5.2 and 4.5.3 of this report.

4.7 LAND USE, AESTHETICS, AND RECREATION

4.7.1 Land Use

Land-use impacts from transmission construction are determined by the amount of land (of varying use) displaced by the actual ROW and by the compatibility of electric transmission line ROW with adjacent land uses. During construction, temporary impacts on land uses within the ROW could occur due to the movement of workers and materials through the area. Construction noise and dust, as well as temporary disruption of traffic flow, may also temporarily affect residents and businesses in the area immediately adjacent to the ROW. Coordination between SPS and landowners regarding access to the ROW and construction scheduling should minimize these disruptions.

The primary criteria considered to measure potential land use impacts for this project included proximity to habitable structures (e.g., residences, businesses, schools, churches, hospitals, nursing homes, etc.), length of existing transmission line ROW paralleled or utilized, length parallel to other compatible ROW, length parallel to property lines, and the overall length of each route.

Generally, one of the most important measures of potential land-use impact is the number of habitable structures located within a specified distance of an alternative route centerline. Habitable structures are defined by the PUC as … “single-family and multifamily dwellings and related structures, mobile homes, apartment buildings, commercial structures, industrial structures, business structures, churches, hospitals, schools, or other structures normally inhabited by humans or intended to be inhabited by humans on a daily or regular basis.” PBS&J staff determined the number and distance of habitable structures within 300 ft of each route by the interpretation of aerial photographs, backed up by field reconnaissance, where possible. Of the five primary alternative routes being evaluated, route 4 has the fewest number of habitable structures within 300 ft of the ROW (14), followed by route 1 (17), route 5 (21), route 3 (22), and route 2 (23).

The least impact on land use generally results from locating new lines either within or parallel to existing transmission line ROW. Existing transmission line ROW located north of Dalhart provided an opportunity to parallel existing transmission line ROW along Link OO. As such, each of the five primary alternative routes parallel the same amount of existing transmission line ROW (approximately 8,377 ft).

Paralleling other existing compatible ROWs (roads, highways, pipelines, etc.) is also generally considered to be a positive routing criterion, one that usually results in fewer impacts than establishing new ROW, and is included in the PUC’s transmission line certification criteria. As such, route 3 parallels the greatest amount of roadway/highway ROW (approximately 163,491 ft, or 74.3% of its total length), followed by route 5 (160,364 ft, or 81.3%), route 2 (154,004 ft, or 71.2%), route 1 (146,788 ft, or 68.5%), and route 4 (145,758 ft, or 74.3%).

Paralleling property lines, where existing compatible ROW is not available, is another positive routing criterion, and was also recognized in the PUC's 2003 amendment to its substantive rules regarding transmission certification. From this perspective, route 4 parallels the greatest amount of existing corridors including apparent property lines (236,789 ft), followed by Route 3 (212,836 ft), Route 2 (211,879 ft), and route 1 (201,669 ft). Route 5 parallels the least amount of existing corridors including property lines with approximately 189,007 ft.

Finally, the overall length of a particular alternative route can be an indicator of the relative level of land use impacts. Generally, all other things being approximately equal, the shorter the route, the less land is crossed, which would usually result in fewer potential impacts. In this regard, route 5 is the shortest alternative (approximately 197,209 ft), while route 4 (approximately 247,161 ft) is the longest route.

Agriculture, especially farming, constitutes a significant percentage of land use throughout the study area, especially the southern and eastern portions. Potential impacts on agricultural land uses include the disruption or preemption of farming activities. Disruption may include the time lost going around, or backing up to, structures in order to cultivate as much area as possible, and the general loss of efficiency compared to plowing or planting unimpeded in straight rows. Preemption of agricultural activities refers to the actual amount of land lost to production directly under the structures. The type and location of transmission line structures used in agricultural areas determine the nature and degree of potential impacts on farming operations. Generally, single-pole structures impact agricultural land less than H-frame or lattice towers because they present a smaller obstacle and take up less actual acreage at the foundation. Structures (and routes) located along field edges (property lines, roads, drainage ditches, etc.) generally present fewer problems for farming operations than a route running across an open field.

Construction-related activities could slightly impact agricultural production, depending upon the timing of construction related to the local planting and harvesting schedule. However, due to the relatively small area affected (beneath the structures), and the short duration of construction activities at any one location, such impacts should be both temporary and minor. Since the ROW for this project will not be fenced or otherwise separated from adjacent lands, there will be no significant long-term displacement of grazing or farming activities. Most existing agricultural land uses may be resumed following construction.

Impacts to agricultural lands can generally be ranked by degree of potential impact, with the least potential impact occurring in areas where grazing is the primary use (pasture or rangeland), followed by cultivated cropland, with forested/wooded land (orchards, commercial timber, etc.) having the highest degree of potential impact. In this regard, the length across grazing land/pastureland ranges from a high of approximately 133,332 ft (53.9% of its total length) on route 4, to a low of approximately 55,880 ft (25.8%) on route 2. In addition, route 5 would cross the least amount of cropland with approximately

71,257 ft (36.1%), while route 2 would cross the greatest amount of cropland with approximately 119,376 (55.2%).

A portion of each primary alternative route crosses cropland irrigated by circle-pivot or other above-ground mechanical means (see Figure 4-1, map pocket). Route 4 has the greatest length of ROW that crosses cropland irrigated by mechanical systems with approximately 16,677 ft (6.7% of its total length), followed by route 1 with 14,388 ft (6.7%), while route 3 has the least possible impact with approximately 2,960 (1.3%). Each alternative route would be developed to have a minimal impact on mobile irrigation systems. The transmission line poles will be positioned as not to span the mobile systems, and thereby minimize any potential impact.

4.7.2 Aesthetics

Aesthetic impacts, or impacts upon visual resources, exist when the ROW, lines, and/or structures of a transmission line system create an intrusion into, or substantially alter the character of, an existing scenic view. The significance of the impact is directly related to the quality of the view, in the case of natural scenic areas, or to the importance of the existing setting in the use and/or enjoyment of an area, in the case of valued community resources and recreational areas.

In order to evaluate aesthetic impacts, field surveys were conducted to determine the general aesthetic character of the area and the degree to which the proposed transmission line would be visible from selected areas. These areas generally include those of potential community value; parks and recreational areas; particular scenic vistas that were encountered during the field survey; and US and state highways that traverse the study area. Measurements were made to estimate the length of each alternative route that would fall within recreational, major highway, or church, school, or cemetery foreground visual zones (½ mile, unobstructed). The determination of the visibility of the transmission line from various points was calculated from USGS maps and aerial photographs.

Construction of the proposed transmission line could have both temporary and permanent aesthetic effects. Temporary impacts would include views of the actual construction (assembly and erection of the structures) and any clearing of the ROW. Where limited clearing is required in wooded areas, the brush and wood debris could have a temporary negative impact on the local visual environment. Permanent impacts from the project would include the views of the structures and lines themselves as well as views of cleared ROW.

The foreground visual zone is defined as that part of the transmission line within one-half mile of an observer, which is also visible (i.e., not obstructed by terrain or vegetation). Portions of each alternative route would be located within the foreground visual zone of the study area’s US and state highways. Alternative route 5 would have the greatest amount (158,222 ft, 80.2% of its total length), followed by route 1 (143,915 ft, or 67.2%), route 2 (114,985 ft, or 53.1%), route 3 (113,506 ft, or 51.5%), and route 4 (60,685 ft, or 24.6%). Additionally, route 4 would have approximately 46,140 ft of ROW located within the foreground visual zone of the Rita Blanca National Grassland.

4.7.3 Recreational and Park Areas

Potential impacts on recreational land use include the disruption or preemption of recreational activities. Although there are numerous recreational sites within the study area, attempts were made to avoid these lands when defining the alternative routes, and therefore no such areas were crossed. However, a portion of route 4 is located within 1,000 ft of the Rita Blanca National Grasslands. Because this route does not cross the National Grassland's boundary, there would be no interference with any potential recreational activities. This alternative, however, could potentially have some aesthetic impacts, which is discussed in Section 4.5.3.

4.7.4 Transportation/Aviation

Potential impacts on transportation could include temporary disruption of traffic and conflicts with proposed roadway and/or utility improvements, and may include increased traffic during construction of the proposed project. However, such impacts are usually temporary and short-term. In this regard, the number of US and state highway crossings ranges from seven (routes 5, 2, and 3), to five (routes 1 and 4). Additionally, route 4 would have the least number of FM road crossings (2), while routes 1, 2, 3, and 5 would have the greatest number of FM crossings (3). SPS will acquire road-crossing permits from TxDOT for all state-maintained roads/highways crossed by the proposed transmission line. These include all US, state, and FM roads and highways.

According to Federal Aviation Regulations, Part 77, notification of the construction of the proposed transmission line will be required if structure heights exceed the height of an imaginary surface extending outward and upward at a slope of 100-to-1 for a horizontal distance of 20,000 ft from the nearest point of the nearest runway of a public or military airport having at least one runway longer than 3,200 ft (FAA, 1975). If a runway is less than 3,200 ft, notification would be required if structure heights exceed the height of an imaginary surface extending at a slope of 50-to-1 for a distance of 10,000 ft. Notification is also required for structure heights exceeding the height of an imaginary surface extending outward and upward at a slope of 25-to-1 for a horizontal distance of 5,000 ft from the nearest point of the nearest landing and takeoff area for heliports.

According to PBS&J's preliminary calculations, construction of the proposed transmission line along any of the alternative routes would meet the above criteria, and thus notification of the FAA would be required. There are a total three FAA-registered airports located within 20,000 ft of the alternative routes (the Dalhart Municipal Airport, the Stratford Field Airport, and the Pronger Brothers Ranch Airport [see figure 4-1, map pocket]). Routes 5, 1, and 4 are each located within 20,000 ft of the Dalhart Municipal Airport, and Stratford Field Airport. The Dalhart Municipal Airport, located south of the study area's boundary, is within approximately 17,000 ft of Link OO, and, therefore, each alternative route. The Stratford Field Airport is located approximately 6,508 feet southwest of the Sherman County Substation, and, therefore, within 20,000 feet of each alternative route. Finally, routes 2 and 3 are located within 20,000 ft of three FAA-registered airports. The Pronger Brothers Ranch Airport is located approximately

12,322 ft east of routes 2 and 3. In addition, one private landing strip (Miller Field Airport) is located approximately 6,997 ft south of routes 5, 2, and 3. No other private airfields are located within 10,000 ft of the alternative routes.

4.7.5 Communication Towers

The proposed transmission line project should have a minimal effect on communication operations in the study area. One AM tower (KXIT), located in Dalhart, is located within 10,000 ft of all five primary alternative routes. This tower is located approximately 2,903 ft west of Link I. Additionally, the total number of electronic communication towers located within 2,000 ft of the primary routes ranges from zero on route 4, to two on routes 5, 2, and 3.

4.8 CULTURAL RESOURCES IMPACTS

Any construction activity has the potential for adversely impacting cultural resource sites. The impacts may occur through changes in the quality of the historical, architectural, archaeological, or cultural characteristics of that cultural entity. These impacts may occur when an undertaking alters the integrity of location, design, setting, materials, construction, or association of the property that contributes to its significance according to the National Register criteria. Impacts may be direct or indirect.

As discussed in 36 CFR 800, adverse impacts to National Register or eligible properties may occur under conditions that include, but are not limited to:

1) destruction or alteration of all or part of a property;
2) isolation from or alteration of the property's surrounding environment (setting); or
3) introduction of visual, audible, or atmospheric elements that are out of character with the property or alter its setting.

4.8.1 Direct Impacts

Direct impacts to known or unknown cultural resources sites may occur during the construction phase of any proposed project. Direct impacts are caused during the construction phase of the project or through increased vehicular and pedestrian traffic during the construction phase. The increase in vehicular traffic may damage surficial or shallowly buried sites, while the increase in pedestrian traffic may result in vandalism of some sites. Additionally, the integrity of the character of any unrecorded, significant historic structures could also be visually impacted by the construction of this proposed transmission line.

4.8.2 Indirect Impacts

Indirect impacts include those caused by the undertaking that occur later in time or are further removed in distance but are reasonably foreseeable. These indirect impacts may include alteration in the pattern of land use, changes in population density, accelerated growth rates, or increased pedestrian or vehicular traffic. All of these may have an adverse impact on properties of historical, architectural, archaeological or cultural significance. Historical sites and landscapes, if any, might be adversely impacted by the visibility of the transmission towers and lines.

4.8.3 Mitigation

The preferred form of mitigation for cultural resources is avoidance. An alternative form of mitigation of direct impacts can be developed for archaeological and historical sites with the implementation of a program of detailed data retrieval. Additionally, relocation may be possible for some historic structures. Indirect impacts on historical properties and landscapes can be lessened through careful design considerations and landscaping.

4.8.4 Summary of Cultural Resources Impacts

Five proposed transmission line routes were evaluated for this project. Each of the proposed routes is made up of a combination of 28 links. Each of the links was individually assessed for its likelihood for containing previously unrecorded archeological or historical sites. Each of the routes was then assessed as a whole and the rankings below are a result of this comparison. The variables usually used to evaluate the potential for the presence of unrecorded cultural resources included the number and type of previously recorded sites within 1,000 feet of the proposed alignments, the amount of high probability area (HPA) identified along each of the routes, and the number, if any, of previously recorded sites that are crossed by the line. Because none of the links cross or are located within 1,000 feet of previously recorded archeological sites, the basis for determining route rank is based solely one the amount of HPA identified within each of the routes.

HPA are areas defined as possessing the greatest potential for containing cultural resource sites. Potential site integrity is also presumed to be highest in the HPAs. HPA's were identified using criteria such as topography and landforms, distance to water, available natural resources, and previously recorded sites in the area. For this particular area an HPA consists of all areas within 300 meters (984.25 ft) of a mapped creek, all upland areas within 300 meters (984.25 ft) of a valley edge, and all upland areas within 300 meters (984.25 ft) from playas mapped on USGS topographic quadrangle sheets. Once in the field, additional HPAs may be identified based on conditions observed during the survey. Previous investigations within this region of Texas indicate that a variety of site types may be expected within the project area such as prehistoric lithic scatters, Late Prehistoric habitation sites, prehistoric rockshelters, and historic erosion-control check dams.

There are five transmission line alignments, the preferred route, route 5, and four alternative routes, 1, 2, 3, and 4. The only HPA delineations that have been field verified are those for the alternative route 5. The HPA delineations for the four alternative routes are based on measurements taken from USGS topographic maps.

Based on the amount of HPA delineated along each of the alignments and the least potential impact, route 5 is ranked first of the others from a cultural resources perspective. Route 5 has about 6.6 miles of HPA, which is the least amount of all the alignments. Route 2 is next with about 8.3 miles of HPA, followed by route 4 with approximately 8.9 miles of HPA. The two lowest ranked routes are routes 3 and 1 with about 9.1 miles and 9.3 miles of HPA, respectively.

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5.0 PUBLIC INVOLVEMENT ACTIVITIES

5.1 CORRESPONDENCE WITH AGENCIES/OFFICIALS

PBS&J contacted the following local, state, and federal agencies and officials by letter in March 2008 to solicit comments, concerns, and information regarding potential environmental impacts, permits, or approvals for the construction of the proposed 115-kV transmission line in Dallam and Sherman Counties, Texas. A map of the study area was included with each letter. Sample copies of PBS&J's letters and responses received as of the publication of this report are included in Appendix A.

- Bureau of Land Management, Amarillo Field Office
- Cluck Ranch Airport
- County Farm Bureau
- County Historical Commission
- Dalhart Area Chamber of Commerce
- Dalhart Assistant City Manager
- Dalhart City Manager
- Dalhart Independent School District
- Dallam County Commissioner Precinct 1
- Dallam County Commissioner Precinct 2
- Dallam County Commissioner Precinct 3
- Dallam County Commissioner Precinct 4
- Dallam County Judge
- Director of Parks and Recreation of Stratford
- Director of Parks and Recreation of Dalhart
- FEMA
- Mayor of Dalhart

- Mayor of Stratford
- Mayor of Texhoma
- Miller Airfield
- NRCS
- Sherman County Commissioner Precinct 1
- Sherman County Commissioner Precinct 2
- Sherman County Commissioner Precinct 3
- Sherman County Commissioner Precinct 4
- Sherman County Development Committee
- Sherman County Judge
- Stratford Chamber of Commerce
- Stratford City Engineer
- Stratford City Manager
- Stratford Independent School District
- Texas Airport Development Office (FAA)
- Texas General Land Office
- Texas Historical Commission
- Texas Parks and Wildlife Department
- Texas Water Development Board
- Texhoma Chamber of Commerce
- Texhoma Independent School District
- Texhoma Public Works Authority
- Texhoma Water Superintendent

- TxDOT, Amarillo District
- TxDOT, Aviation Division
- TxDOT, Environmental Affairs Division
- U.S. Fish and Wildlife Service - Amarillo
- USACE, Tulsa District

5.2 PUBLIC MEETING

SPS and PBS&J held a public open-house meeting in the study area in Dalhart, Texas, on June 24, 2008. The intent of the meeting was to solicit comments from citizens, landowners, and public officials concerning the proposed project. The meetings had the following objectives:

- Promote a better understanding of the proposed project including the purpose, need, and potential benefits and impacts,
- Inform and educate the public with regard to SPS's routing procedures, schedule, and decision process, and
- Ensure that the decision-making process accurately identifies and considers the values and concerns of the public and community leaders.

Public involvement contributed both to the evaluation of issues and concerns by SPS and PBS&J, and to the selection of a preferred route for the project. Letters were sent inviting potentially affected landowners to the meeting. The letters stated the location, time, and purpose of the meeting. An example of the letter is included in Appendix B.

At the meeting, rather than a formal presentation in speaker-audience format, SPS and PBS&J staff used space by setting up several information stations. Each station was devoted to a particular aspect of the routing study and was manned by SPS and/or PBS&J staff. 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 allows them to focus on their particular area of interest and ask specific questions. More importantly, the one-on-one discussions with SPS/PBS&J staff encouraged more interaction from those citizens who might be hesitant to participate in a speaker-audience format.

PBS&J staff at the first station signed visitors in and handed out a questionnaire. The questionnaire solicited comments on citizen concerns as well as an evaluation of the information presented at the open house. Copies of the questionnaire are included in Appendix B. Completed questionnaires were received either at the meeting or later. Following is a description of the meeting and a summary of questionnaires received:

A total of 28 people signed in as attending the public open-house meeting. Eleven (11) individuals submitted questionnaires.

The most important considerations for most respondents who completed questionnaires included maintaining reliable electric service and for the proposed transmission to be along roads and railroads.

The questionnaires also provided space for respondents to include any general comments or remarks. A brief synopsis of comments, remarks, and concerns documented by the meeting attendees in either questionnaire or letter format include:

"We live in one of the prettiest places in Sherman Co. please do not ruin our beautiful view with an unnecessary line – it would mar our lovely sunsets and serves no useful purpose for us or our nearby neighbors."

"Open up the opportunity to access the lines thru REA etc."

"Get REA – Golden Spread to work with to fill other needs at same time."

"Need to make sure w/the new lines that Rita Blanca Electric upgrades their main lines to the customers for better Quality and Quantity power in the whole county."

"I feel this would effect my dairy operation on Hwy 297, Section 9, CDF Dalhart."

"Need more substations for distribution of transported power."

"We need capacity for consistent electricity. If wind power develops the need for transmission capacity will need to be there."

6.0 PREFERRED ROUTE SELECTION

6.1 PBS&J'S ENVIRONMENTAL EVALUATION

The purpose of this study was to identify and evaluate the most viable alternative routes for SPS's proposed 115-kV transmission line between the Dallam County Substation and the Sherman County Substation, and to recommend the routes having the least adverse impacts.

PBS&J completed the environmental analysis of the five primary alternative routes (Section 4.0), the results of which are shown in Table 6-1. The environmental evaluation was a comparison of alternatives from a strictly environmental viewpoint, based upon the measurement of 33 separate environmental criteria and the consensus opinion of PBS&J's group of evaluators. SPS used this information along with engineering, construction, maintenance, and operational factors to select a preferred route and several alternate routes. PBS&J's evaluation is discussed below.

PBS&J professionals with expertise in different environmental disciplines (wildlife biology, plant ecology, land use/planning, and archaeology) evaluated the five alternative routes based upon environmental conditions present along each route (augmented by aerial photo interpretation and field surveys, where possible) and the general routing methodology used by PBS&J and SPS. Each PBS&J staff person independently analyzed the routes and the environmental data presented in Table 6-1. The evaluators then discussed their independent results. The relationship and relative sensitivity among the major environmental factors were determined by the group as a whole. The group then selected a recommended preferred and alternate routes based strictly upon the environmental data.

During the initial discussion of the five primary alternative routes, it was the opinion of the group of evaluators that each of the alternative routes would be environmentally acceptable alternatives for this project. The final decision in the selection of a preferred route was reached by comparing the advantages and disadvantages of these routes and recommending one least-impacting route, and several alternate routes.

PBS&J's land use evaluator selected route 5 as the preferred route as it is the shortest alternative (approximately 3.2 miles shorter). It also parallel's the greatest percentage of roads/highways within the study area (81.3%), and crosses the least amount of cropland (approximately 13.5 miles). Route 1 was selected as the second route from the land use perspective because it is the second-shortest alternative, has only five habitable structures located within 300 ft, and crosses the second least amount of cropland. Route 3 was selected as the third route because it parallels the greatest length of roads/highways (30.9 miles), which is second in terms of percentage of length parallel (74.3%). Route 3 also crosses the least amount of cropland irrigated by mobile irrigation systems (2,960 ft). Route 2 was selected fourth, as it has the greatest number of habitable structures located within 300 ft (10) and crosses the greatest amount of cropland (22.6 miles). Route 4 was selected as the least preferred route from a land use perspective, because although it has the fewest habitable structures located within 300 ft (2), it is the longest alternative (46.8 miles), it parallels the least amount of roads/highways, it crosses the greatest amount of irrigated cropland, and is the only route crossing or within 1,000 ft of recreational land.

The ecological evaluation (vegetation, wildlife, and aquatic) focused on three primary factors: the amount of upland woodland/brushland crossed, the amount of bottomland/riparian woodland crossed, and the amount of existing ROW either used or paralleled (which reduces habitat clearing and fragmentation). Based on the data in these and other categories, the ecology evaluator selected route 5 as the preferred route, followed by routes 2, 1, and 3, because they cross no potential wetlands. Route 4 would be the least preferred from an ecological perspective as it crosses the greatest amount of potential wetlands.

Based on the amount of HPA delineated along each of the alignments, route 5 is ranked first from a cultural resources perspective. Route 5 has about 6.6 miles of HPA, which is the least amount of all the alignments. Route 2 is next with about 8.3 miles of HPA, followed by route 4 with approximately 8.9 miles of HPA. The two lowest ranked routes are routes 3 and 1 with about 9.1 miles and 9.3 miles of HPA, respectively.

Following the evaluation by discipline, the group of PBS&J evaluators discussed the relative importance and sensitivity of the various criteria as they applied to the five primary alternative routes and the study area. Among these alternatives, and considering the environmental and land use data in Table 6-1, it was the decision of the group that land use criteria should be the primary route selection factors. Following this decision, the group selected route 5 as the consensus-preferred route and then agreed on a consensus ranking for the remaining alternatives, starting with the least-impacting alternate route. This ranking is shown in Table 6-2. The decision to recommend the preferred route was based primarily on the following advantages for route 5 among the objective criteria.

- shortest alternative route
- least amount of mobile irrigation systems
- least amount of known habitat of endangered or threatened species
- least amount of high-probability areas crossed

And, like each of the primary alternative routes, route 5:

- crosses no open waters
- crosses no recorded cultural resource sites

PBS&J's project manager for the Dallam to Sherman 115-kV project reviewed all of the data and evaluations produced by the task managers and concurred with the rankings and recommendations for the alternative routes. Therefore, based upon its evaluation of this particular project and its experience and expertise in the field of transmission line routing, PBS&J recommends route 5 as the preferred route and the remaining routes as alternates. Considering all pertinent factors, it is PBS&J's opinion that these routes best satisfy the criteria specified in Section 37.056(c)(4) of the Texas Utilities Code for consideration in the granting of CCNs.

Table 6-1

Environmental Data For Alternative Route Evaluation
Dallam-Sherman 115 kV Transmission Line Project

	Route[3]				
	Alt. 1	**Alt. 2**	**Alt. 3**	**Alt. 4**	**Alt. 5**
1. Length of alternative route	214313	216349	220079	247161	197209
2. Length of route parallel, adjacent to, or utilizing existing transmission lines	8377	8377	8377	8377	8377
3. Length of route parallel and adjacent to existing public roads/highways	146788	154004	163491	145758	160364
4. Length of route parallel and adjacent to existing pipelines	0	0	0	0	0
5. Length of route parallel to apparent property boundaries	187101	211251	201953	233928	174294
6. Total length of route parallel to existing corridors (including apparent property boundaries)	201669	211879	212836	236789	189007
7. Total number of habitable structures[1] within 300 ft of the route centerline	17	23	22	14	21
8. Number of newly affected habitable structures[1] within 300 ft of route centerline	5	11	10	2	9
9. Length of route across parks/recreational areas[2]	5992	0	0	66340	5992
10. Number of additional parks or recreational areas within 1,000 ft of the route centerline	0	0	0	0	0
11. Length of route across pastureland	89395	55880	91175	133332	86883
12. Length of route across cropland	86718	119376	105339	91836	71257
13. Length of route across land with mobile irrigation systems	14388	7995	2960	16677	4538
14. Length of route across upland forest	0	0	0	0	0
15. Length of route across bottomland forest, including forested wetlands	0	0	0	0	0
16. Length of route across emergent wetlands	0	0	0	1353	0
17. Number of streams crossed by the route	3	3	3	3	3
18. Length of route parallel to streams (within 100 ft)	0	0	0	0	0
19. Number of known rare/unique plant locations within the ROW	1	0	0	1	1
20. Length of route through known habitat of endangered or threatened species	5658	2554	9909	8888	2554
21. Number of recorded cultural resource sites crossed by the route	0	0	0	0	0
22. Number of additional recorded cultural resource sites within 1,000 ft of the route centerline	0	0	0	0	0
23. Length of route across areas of high archaeological/historical site potential	0	0	0	0	0
24. Number of FAA-registered airstrips within 20,000 ft of the route centerline	2	3	3	2	2
25. Number of private airstrips within 10,000 ft of the route centerline	0	1	1	0	1
26. Number of heliports within 5,000 ft of the route centerline	0	0	0	0	0
27. Length of route across open water (lakes, ponds)	0	0	0	0	0
28. Number of commercial AM radio transmitters within 10,000 ft of route centerline	1	1	1	1	1
29. Number of FM radio transmitters, microwave relay stations, and other electronic installations w/in 2,000 ft	1	2	2	0	2
30. Number of U.S. or State Highways crossed by the route	5	7	7	5	7
31. Number of farm-to-market (FM) and ranch roads (RR) crossed by the route	3	3	3	2	3
32. Number of railroads crossed by the route	4	6	6	4	6
33. Length of route within visual foreground zone of park/recreational areas (½ mile unobstructed)	5270	0	0	65890	5270
34. Length of route within visual foreground zone of State and U.S. Highways (½ mile unobstructed)	143915	114985	113506	60685	158222

[1] Structures normally inhabited by humans or intended to be inhabited by humans on a daily or regular basis. Habitable structures include but are not limited to single-family and multi-family dwellings and related structures, mobile homes, apartment buildings, commercial structures, industrial structures, business structures, churches, hospitals, nursing homes, and schools.
[2] Defined as parks and recreational areas owned by a governmental body or an organized group, club, or church.
[3] Alt. 1 = XX-VV-TT-OO-E-F-I-J-QQ-M-N-P-T-Y-CC-HH-II, Alt. 2 = XX-VV-TT-OO-NN-RR-H-QQ-M-N-P-K-V-DD-HH-II, Alt. 3 = XX-VV-TT-OO-NN-RR-H-KK-ZZ-YY-N-P-K-V-Y-CC-HH-II, Alt. 4 = XX-VV-TT-OO-E-F-I-L-U-DD-HH-II, Alt. 5 = XX-VV-TT-OO-NN-RR-H-QQ-M-N-P-T-Y-CC-HH-II
Note: All length measurements in feet. All linear measurements were obtained from aerial photography flown in 2005, with the exception of areas of high archaeological/historical site potential which were measured from the USGS Topographic Quadrangles.
The aerial photography was ortho-rectified to National Map Accuracy Standards of +/- 15 feet.

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Table 6-2

Environmental Ranking Of Primary Alternative Routes

Category/Ranking	Alternative Route				
	1	2	3	4	5
Land Use	2nd	4th	3rd	5th	1st
Ecology	3rd	2nd	4th	5th	1st
Cultural Resources	5th	2nd	4th	3rd	1st
Project Manager	3rd	2nd	4th	5th	1st
Group Consensus	3rd	2nd	4th	5th	1st

6.2 SPS'S PREFERRED ROUTE SELECTION

To select a preferred route for the Dallam to Sherman Project, SPS based their review on potential environmental impacts, land use, engineering constraints, maintenance and construction considerations, public input/community values, estimated costs, system operations, and landowner/agency concerns and preferences. Based on this review and evaluation, SPS determined that each of the primary routes was a feasible and acceptable alternative from an engineering and cost perspective. Following consideration of each of the above factors, SPS selected route 5 as their preferred route.

SPS's preferred and alternate routes are illustrated on Figure 6-1 (map pockets). Tables 6-3 through 6-7 present detailed information for habitable structures and other land use features in the vicinity of the preferred and alternate routes.

Table 6-3

Habitable Structures in the Vicinity of SPS's Preferred Route 5
Dallam to Sherman 115-kV Transmission Line Project

Map Number	Structure	Approximate Distance from Centerline	Direction
45	Single Family Dwelling	207.00	S
47	Business Structure	60.62	N
48	Single Family Dwelling	133.55	S
49	Mobile Home	78.34	S
50	Mobile Home	81.79	S
51	Mobile Home	85.07	S
52	Mobile Home	88.20	S
54	Single Family Dwelling	268.01	S
55	Mobile Home	126.57	N
56	Mobile Home	84.38	N
58	Mobile Home	94.44	S
59	Mobile Home	1.96	S
60	Business Structure	27.91	E
86	Single Family Dwelling	228.64	SE
89	Single Family Dwelling	55.51	NW
90	Business Structure	225.02	SE
91	Single Family Dwelling	64.49	SE
92	Business Structure	145.08	SE
95	Single Family Dwelling	292.44	N
101	Single Family Dwelling	180.71	N
102	Single Family Dwelling	8.56	N

Table 6-4

Habitable Structures in the Vicinity of Alternative Route 1
Dallam to Sherman 115-kV Transmission Line Project

Map Number	Structure	Approximate Distance from Centerline	Direction
47	Business Structure	60.62	N
48	Single Family Dwelling	133.55	S
49	Mobile Home	78.34	S
50	Mobile Home	81.79	S
51	Mobile Home	85.07	S
52	Mobile Home	88.20	S
54	Single Family Dwelling	268.01	S
55	Mobile Home	126.57	N
56	Mobile Home	84.38	N
58	Mobile Home	94.44	S
59	Mobile Home	1.96	S
60	Business Structure	27.91	E
91	Single Family Dwelling	64.49	SE
92	Business Structure	145.08	SE
95	Single Family Dwelling	292.44	N
101	Single Family Dwelling	180.71	N
102	Single Family Dwelling	8.56	N

Table 6-5

Habitable Structures in the Vicinity of Alternative Route 2
Dallam to Sherman 115-kV Transmission Line Project

Map Number	Structure	Approximate Distance from Centerline	Direction
45	Single Family Dwelling	207.00	S
47	Business Structure	60.62	N
48	Single Family Dwelling	133.55	S
49	Mobile Home	78.34	S
50	Mobile Home	81.79	S
51	Mobile Home	85.07	S
52	Mobile Home	88.20	S
54	Single Family Dwelling	268.01	S
55	Mobile Home	126.57	N
56	Mobile Home	84.38	N
58	Mobile Home	94.44	S
59	Mobile Home	1.96	S
60	Business Structure	27.91	E
86	Single Family Dwelling	228.64	SE
89	Single Family Dwelling	55.51	NW
90	Business Structure	225.02	SE
91	Single Family Dwelling	64.49	SE
92	Business Structure	145.08	SE
98	Single Family Dwelling	290.38	W
99	Mobile Home	117.64	W
100	Single Family Dwelling	6.52	W
101	Single Family Dwelling	180.71	N
102	Single Family Dwelling	8.56	N

Table 6-6

Habitable Structures in the Vicinity of Alternative Route 3
Dallam to Sherman 115-kV Transmission Line Project

Map Number	Structure	Approximate Distance from Centerline	Direction
45	Single Family Dwelling	207.00	S
47	Business Structure	60.62	N
48	Single Family Dwelling	133.55	S
49	Mobile Home	78.34	S
50	Mobile Home	81.79	S
51	Mobile Home	85.07	S
52	Mobile Home	88.20	S
54	Single Family Dwelling	268.01	S
55	Mobile Home	126.57	N
56	Mobile Home	84.38	N
58	Mobile Home	94.44	S
59	Mobile Home	1.96	S
60	Business Structure	27.91	E
86	Single Family Dwelling	228.64	SE
89	Single Family Dwelling	55.51	NW
90	Business Structure	225.02	SE
92	Business Structure	145.08	SE
98	Single Family Dwelling	290.38	W
99	Mobile Home	117.64	W
100	Single Family Dwelling	6.52	W
101	Single Family Dwelling	180.71	N
102	Single Family Dwelling	8.56	N

Table 6-7

Habitable Structures in the Vicinity of Alternative Route 4
Dallam to Sherman 115-kV Transmission Line Project

Map Number	Structure	Approximate Distance from Centerline	Direction
47	Business Structure	60.62	N
48	Single Family Dwelling	133.55	S
49	Mobile Home	78.34	S
50	Mobile Home	81.79	S
51	Mobile Home	85.07	S
52	Mobile Home	88.20	S
54	Single Family Dwelling	268.01	S
55	Mobile Home	126.57	N
56	Mobile Home	84.38	N
58	Mobile Home	94.44	S
59	Mobile Home	1.96	S
60	Business Structure	27.91	E
101	Single Family Dwelling	180.71	N
102	Single Family Dwelling	8.56	N

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7.0 LIST OF PREPARERS

This EA was prepared for SPS by PBS&J. SPS provided most of the information in Section 1.0, Description of the Proposed Project, and portions of Section 6.2, SPS's Preferred Route Selection. PBS&J staff with primary responsibilities for preparation of this document include the following:

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Appendix A

Agency Correspondence

Appendix B

Public Involvement