

ENVIRONMENTAL ASSESSMENT AND ALTERNATIVE ROUTE ANALYSIS

for the proposed

**BIG HILL SUBSTATION – SAND LAKE SWITCH 765 kV TRANSMISSION LINE
PROJECT IN CRANE, CROCKETT, ECTOR, IRION, PECOS, REAGAN, REEVES,
SCHLEICHER, TOM GREEN, UPTON, WARD, WINKLER COUNTIES, TEXAS**

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ACRONYMS AND ABBREVIATIONS

AM	Amplitude Modulation
APLIC	Avian Powerline Interaction Committee
BEG	Bureau of Economic Geology
BGEPA	Bald and Golden Eagle Protection Act
BMP	Best Management Practice
BRACS	Brackish Resources Aquifer Characterization System
CCN	Certificate of Convenience and Necessity

CFR	Code of Federal Regulations
CR	County Road
DSL	Dunes Sagebrush Lizard
DoD	United States Department of Defense
DPS	Distinct Population Segment
e.g.	<i>Exempli Gratia</i> (for Example)
EA	Environmental Assessment
EMST	Ecological Mapping Systems of Texas
EIOD	Element Occurrence Identification
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESRI	Environmental Systems Research Institute
ESSS	Ecologically Significant Stream Segment
et al.	<i>Et Alia</i> (and Others)
etc.	<i>Et Cetera</i> (and the Rest or and so Forth)
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FEMA	Federal Emergency Management Agency
FM	Farm-to-Market Road (e.g., FM 1216)
FM	Frequency Modulation (e.g., FM tower)
GCD	Groundwater Conservation District
GIS	Geographic Information System
GLO	Texas General Land Office
Halff	Halff Associates, Inc.
HCP	Habitat Conservation Plan
HPA	High Probability Area
HTC	Historic Texas Cemeteries
i.e.	<i>Id est</i> (That is)
IH	Interstate Highway
IPaC	Information for Planning and Consultation
Integra	Integra Realty Resources, Inc.
ISD	Independent School District
Kimley-Horn	Kimley-Horn and Associates, Inc.
kV	Kilovolt
LCRA TSC	LCRA Transmission Services Corporation
MBTA	Migratory Bird Treaty Act
MLRA	Major Land Resource Area
NAIP	National Agriculture Imagery Program
NASS	National Agricultural Statistics Service

NCED	National Conservation Easement Database
NHD	National Hydrography Dataset
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
NWP	Nationwide Permit
Oncor	Oncor Electric Delivery Company LLC
OTHM	Official Texas Historical Marker
PCN	Pre-Construction Notification
Pro Tem	<i>Pro Tempore</i> (Temporarily)
PUCT	Public Utility Commission of Texas
ROW	Right-of-Way
RRC	Railroad Commission of Texas
RTEST	Rare, Threatened, and Endangered Species of Texas
SAL	State Antiquities Landmark
SDR	Submitted Drillers Reports
Section 404	Section 404 of the Clean Water Act
SGCN	Species of Greatest Conservation Need
sp.	Species
spp.	Multiple Species
ssp.	Subspecies
SWPPP	Stormwater Pollution Prevention Plan
TARL	Texas Archeological Research Laboratory
TASA	Texas Archeological Sites Atlas
TCAP	Texas Conservation Measures Action Plan
TCEQ	Texas Commission on Environmental Quality
THC	Texas Historical Commission
TPWD	Texas Parks and Wildlife Department
TWDB	Texas Water Development Board
TxDOT	Texas Department of Transportations
TXNDD	Texas Natural Diversity Database
U.S.	United States
USACE	United States Army Corps of Engineers
USC	United States Code
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
USWTDB	United States Wind Turbine Database

var. Variety
WHAB Wildlife Habitat Assessment Program

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1.0 PROJECT DESCRIPTION

1.1 Scope of the Project

Oncor Electric Delivery Company LLC (Oncor) and LCRA Transmission Services Corporation (LCRA TSC) propose to construct a single-circuit 765 kilovolt (kV) transmission line between a new LCRA TSC 765 kV Big Hill Substation that will be located in close proximity to LCRA TSC's existing Big Hill 345 kV Substation, located 13 miles northeast of the City of Eldorado in Schleicher County Texas, and the expansion of Oncor's existing Sand Lake Switch, located 6 miles northeast of the Town of Pecos City in Ward County, Texas. The proposed transmission line project will be approximately 197 to 228 miles in length depending on the route selected by the Public Utility Commission of Texas (PUCT). Each of these project endpoints is shown relative to the local road network and county boundaries on **Figure 1-1**.

Oncor and LCRA TSC retained Kimley-Horn and Associates, Inc. (Kimley-Horn) and Halff Associates, Inc. (Halff) to identify and evaluate alternative routes and to prepare an Environmental Assessment (EA) and Alternative Route Analysis report to support Oncor's and LCRA TSC's application to amend their Certificates of Convenience and Necessity (CCN) to construct, own, and operate the proposed project. This report has been prepared to provide information and address the requirements of Section 37.056(c)(4)(A)-(D) of the Texas Utilities Code, PUCT Procedural Rules Section 22.52(a)(4), PUCT Substantive Rules Section 25.101, the PUCT CCN application form for a proposed transmission line, and others commonly required of CCN amendment applicants before the PUCT. This report may also be used in support of local, state, or federal permitting activities that may be required for the proposed project.

To assist Kimley-Horn and Halff in the evaluation of the proposed project, Oncor and LCRA TSC provided Kimley-Horn and Halff with information regarding the project need, construction practices, and right-of-way (ROW) requirements for the proposed project. Oncor and LCRA TSC also provided information regarding the engineering and design requirements for the routing study.

The following sections include descriptions of the proposed project (**Section 1.0**), the methodology used to select alternative routes (**Section 2.0**), the existing environmental and social conditions in the study area (**Section 3.0**), and the preliminary alternative routes that were developed by this process (**Section 4.0**). This document includes a description of the public involvement program (**Section 5.0**), a discussion of changes to and finalization of the proposed route links following public involvement (**Section 6.0**), an evaluation of expected environmental impacts (**Section 7.0**), followed by a list of report preparers (**Section 8.0**), and bibliographical references used in preparing this report (**Section 9.0**). The appendices include copies of agency correspondence (**Appendix A**), public participation meeting information (**Appendix B**), changes to links made after the public participation meetings (**Appendix C**), link composition of proposed alternative routes (**Appendix D**), proposed alternative route and link environmental data (**Appendix E**), tables listing certain constraints within range of the proposed project (**Appendix F**), and an environmental and land use constraints map (**Appendix G**).

1.2 Need for the Project

Oncor and LCRA TSC will provide support for the purpose and need for the proposed project as part of the CCN application.

1.3 Description of Proposed Construction

1.3.1 Transmission Line Design

For the proposed project, Oncor and LCRA TSC anticipate the use of self-supporting, single-circuit, steel lattice towers (**Figure 1-2**). Design criteria will comply with applicable statutes, the appropriate edition of the National Electrical Safety Code, and both Oncor and LCRA TSC's standard design practices. The typical structure height for LCRA TSC's structures is anticipated to be 140-170 feet with a maximum anticipated height of 198 feet. The typical structure height for Oncor's structures is anticipated to be 155-160 feet with a maximum anticipated height of 198 feet. However, tower height will vary depending on terrain and other engineering constraints. The results of site-specific geotechnical and engineering studies will be used to determine the appropriate design and placement of the structures.

1.3.2 Right-of-Way Requirements

The ROW width for the proposed project will be approximately 200 feet in most circumstances. The ROW normally extends an equal distance on both sides of the transmission line centerline. Additional ROW may be required to accommodate engineering or terrain-related constraints.

1.3.3 Clearing Requirements

Trees, brush and undergrowth within the ROW will be removed and maintained as necessary for access within the ROW and for clearances required for the safe and reliable operation of the proposed project facilities. In areas that contain federally protected species or have the potential for federally protected species, brush or other low growing vegetation may be allowed to remain so long as such vegetation does not interfere with the safe and reliable operation of the transmission line. For areas requiring hand-clearing, vegetation that needs to be removed will generally be cut level with the ground. Trees located in a fence line and having a diameter greater than four inches will generally be cut even with the top of the fence. Stumps located on hillsides or uneven ground will be cut so that a mowing machine can pass over the ROW without striking any stumps, roots, or snags.

1.3.4 Support Structure Assembly and Erection

Foundations for the steel lattice towers will be completed before erecting the structures. Four holes will be augered to the required depth into the ground (i.e., one hole per tower footing) at each tower location. The holes will be filled with steel-reinforced concrete to form piers to hold the structure securely in place. Stub angles for anchoring the tower will be embedded at the center of the concrete foundations. Depth and diameter of the foundation will vary depending on the design of the structure specific to that location.

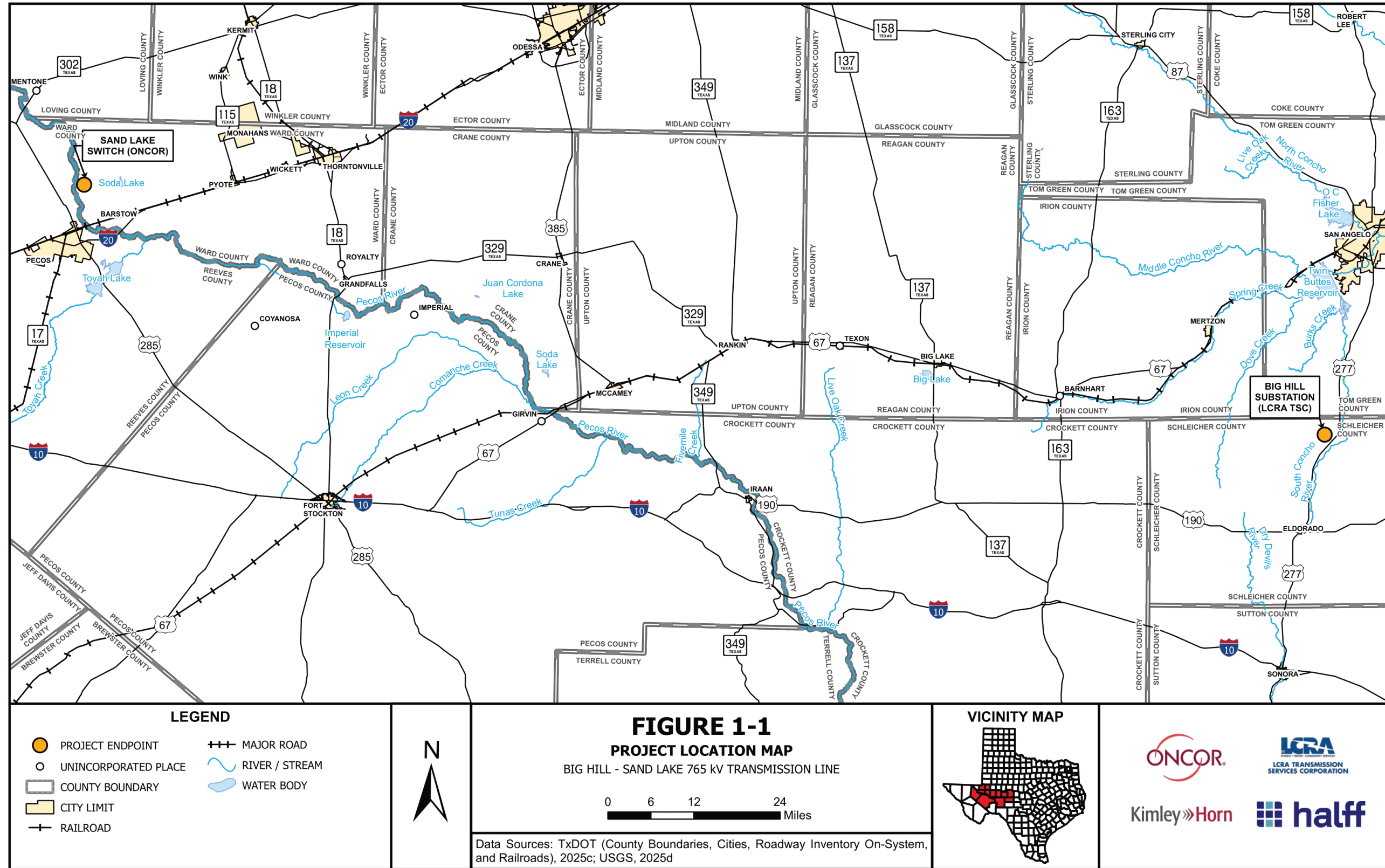
Each steel lattice tower will be assembled on the ground near its designed location. Tower assemblies will then be lifted by crane and aligned with and attached to foundation stub angles with structure arms oriented perpendicular to the transmission line centerline. For angle structures, towers will be set with structure arms oriented on the angle bisector.

1.3.5 Conductor Stringing

Once a series of structures has been erected along the transmission line centerline, the conductor stringing phase can begin. Specialized equipment, including helicopters, will be used to properly support and protect the conductor during the pulling, tensioning, and sagging operations. Once conductors and shield wires are in place and tension and sag have been verified, conductor and shield wire hardware will be installed at each suspension point to maintain conductor position. Conductor stringing will continue until the transmission line construction is complete. All construction equipment, temporary water crossings, and construction-related environmental controls previously installed will be removed after construction is complete.

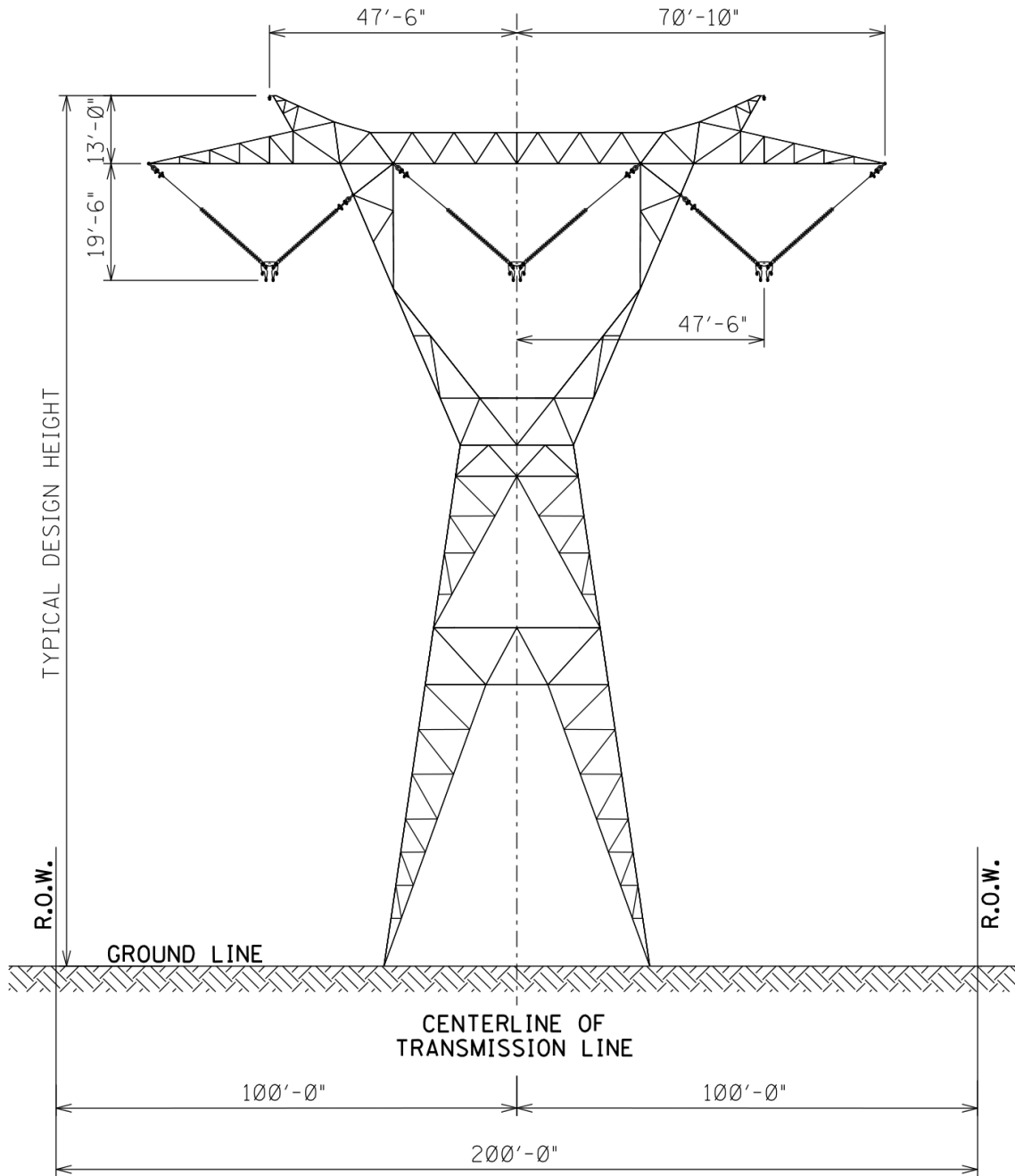
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Figure 1-1: Project Location Map



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Figure 1-2: Typical 765 kV Steel Lattice Tangent Tower



TYPICAL 765KV TANGENT TOWER

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2.0 ROUTE ASSESSMENT METHODOLOGY

The objective of this study is to identify and evaluate alternate transmission line routes for the proposed project. Throughout this EA and Alternative Route Analysis, the terms “environment” or “environmental” are intended to include the human environment and the natural environment. Kimley-Horn and Halff utilized a comprehensive transmission line routing methodology to identify and evaluate alternative transmission line routes. Potential routes were identified and evaluated in accordance with Section 37.056(c)(4)(A)-(D) of the Texas Utilities Code, PUCT Procedural Rule Section 22.52(a)(4), PUCT Substantive Rule Section 25.101, the PUCT CCN application form for a proposed transmission line, and other requirements commonly required of CCN amendment applicants before the PUCT.

The following subsections describe the route selection methodology, including study area delineation, data collection, reconnaissance surveys, constraints mapping, identification of preliminary alternative route links, public involvement program, adjustment of preliminary alternative route links following input from the public involvement program and reconnaissance surveys, and evaluation of the alternative routes.

2.1 Study Area Delineation

The first step in the identification of the alternative route links was to select a study area. The area needed to encompass the proposed project endpoints, Big Hill Substation and Sand Lake Switch, and be large enough that a reasonable number of forward-progressing, geographically diverse alternative routes could be investigated and identified in support of Oncor and LCRA TSC’s joint CCN application. Delineating the study area establishes boundaries and limits for the information gathering process (i.e., identifying environmental and land use constraints) and allows Kimley-Horn and Halff to focus their evaluation within a specific area.

Kimley-Horn and Halff reviewed recent aerial photography (Environmental Systems Research Institute [ESRI] World Imagery Basemap, 2025; National Agriculture Imagery Program [NAIP], 2024) and the counties’ appraisal districts’ land parcel boundary maps (Texas Geographic Information Office, 2024) to develop and refine the study area boundary for the proposed project. Kimley-Horn and Halff located and depicted the project endpoints on the various maps and identified significant features in the study area, such as oil/gas facilities and pipeline infrastructure; the Pecos River; United States (U.S.) Highway 67, Interstate 20, Texas State Highway 329, Texas State Highway 349; the municipalities of Pecos, McCamey, and Big Lake; and various other towns, cities, unincorporated places, and county roads. **Figure 2-1** shows the study area boundary Kimley-Horn and Halff delineated and general constraints resulting from the above-described process overlaid on aerial photography. The study area traverses approximately 25 miles, north to south, and approximately 180 miles, west to east at the widest point.

Figure 2-2 provides a map that details the study area more clearly in relation to the local road network. The study area’s northern boundary runs approximately 45 miles west to east and then approximately 135 miles northwest to southeast. The eastern boundary is approximately 25 miles and follows south along U.S. Highway 277. The southern boundary runs approximately 80 miles

east to west and then approximately 185 miles southeast to northwest. The western boundary is approximately 25 miles and runs west of the Town of Pecos City, Texas.

As shown in **Figure 2-2**, the public road network within the study area consists of an Interstate Highway (IH), U.S. highways, state highways, state-maintained roads, and county roads (not labeled).

Figure 2-1: Project Area Map

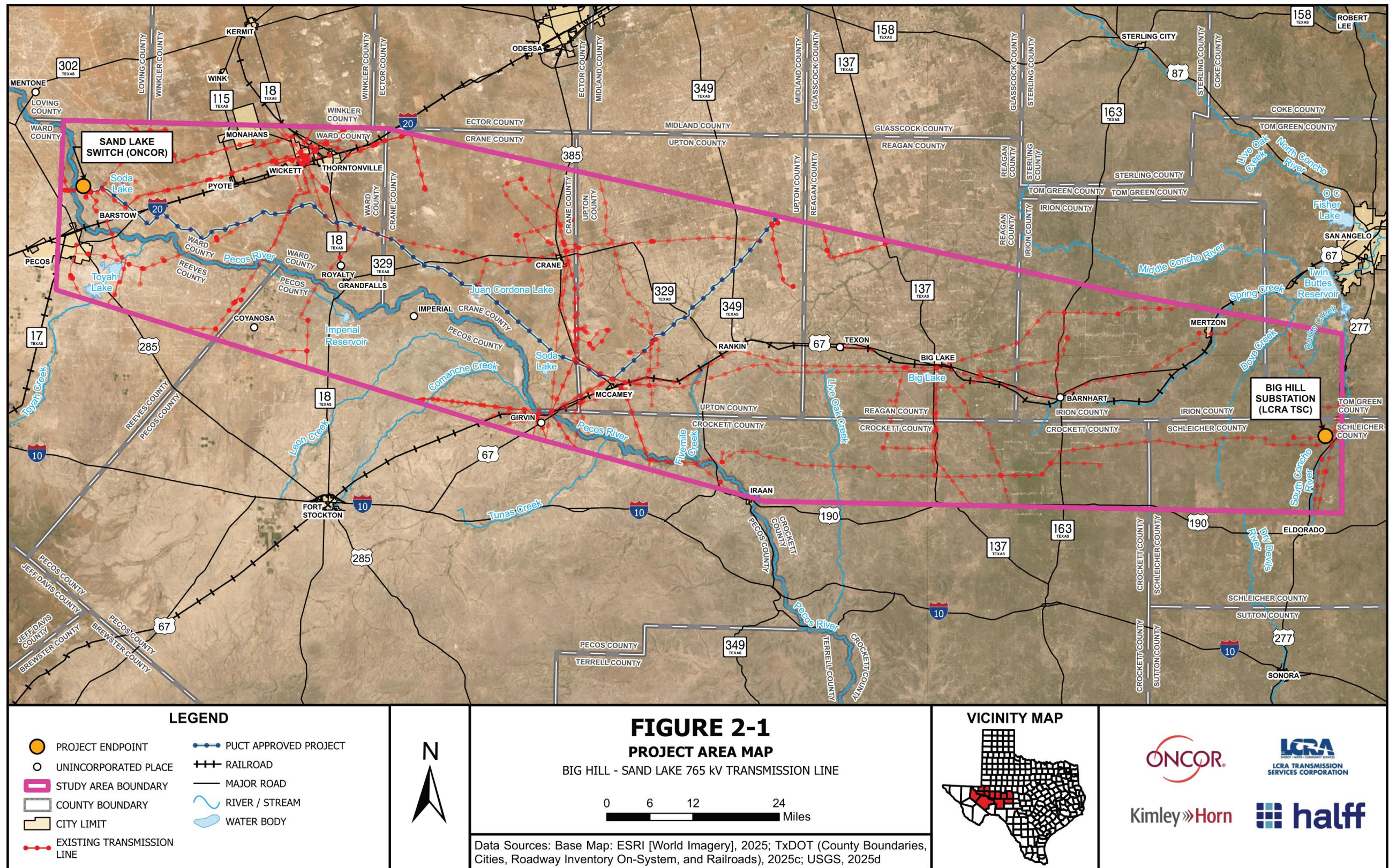
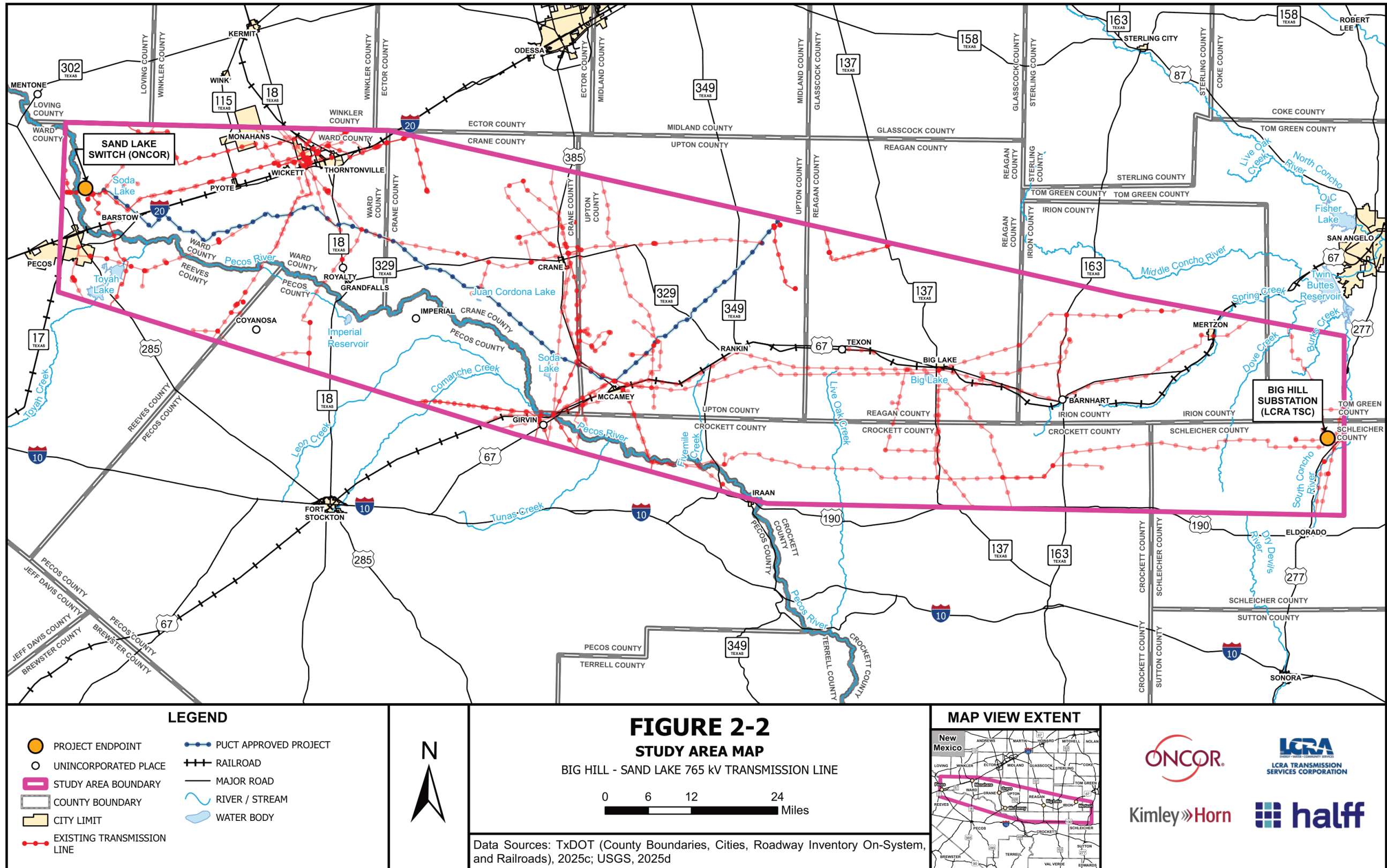


Figure 2-2: Study Area Map



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2.2 Data Collection

2.2.1 Solicitation of Information from Local, State, and Federal Officials and Agencies

Once the study area boundary was identified, Kimley-Horn and Halff initiated various data collection activities, including developing a list of officials to whom a consultation letter regarding the proposed project would be mailed. The purpose of the consultation letter was to inform various local, state, and federal officials and agencies of the proposed project and allow them to provide information relevant to the study area. Kimley-Horn and Halff utilized the Texas Municipal League and other regional planning websites, as well as confirmation via telephone calls, to identify local officials and state or federal agencies with potential permitting requirements or other interests in the proposed project (Texas Municipal League, 2025). Correspondence was sent to local, state, and federal agencies and officials listed below. Copies of all correspondence with these agencies and officials are included in **Appendix A**.

Federal Agencies

- Federal Aviation Administration (FAA) – Southwest Regional Administrator
- Federal Emergency Management Agency (FEMA) – Region VI Administrator
- U.S. Army Corps of Engineers (USACE) – Fort Worth District Regulatory Division Chief
- U.S. Department of Agriculture (USDA) – Natural Resources Conservation Service (NRCS) Texas State Conservationist and Alpine, Big Lake, Eldorado, Odessa, Ozona, Pecos, San Angelo, and Upper Pecos Natural Resource Managers
- U.S. Department of Defense (DOD) – Military Aviation and Installation Assurance Siting Clearinghouse – Office of the Assistant Secretary of Defense
- U.S. Fish and Wildlife Service (USFWS) – Austin Ecological Services Field Office, Texas Coastal and Central Plains Ecological Services Field Office

State Agencies

- Railroad Commission of Texas (RRC) – License and Permit Specialist
- Texas Archeological Research Laboratory (TARL) – University of Texas at Austin – Head of Records
- Texas Commission on Environmental Quality (TCEQ) – Border and Permian Basin Area Director, North Central and West Texas Area Director, Region 7 (Midland) and Region 8 (San Angelo) Directors
- Texas Department of Transportation (TxDOT) – Aviation Division Director, Odessa and San Angelo District Engineers
- Texas General Land Office (GLO) – Commissioner
- Texas Historical Commission (THC) – Executive Director
- Texas Parks and Wildlife Department (TPWD) – Habitat Assessment Program, Habitat Assessment Biologist
- Texas State Soil and Water Conservation Board – District 2: Crockett County, Eldorado-Divide, Middle Concho, Sandhills, Tom Green, Trans Pecos, Upper Pecos District Field Representatives
- Texas Water Development Board (TWDB) - Region 1F Field Representative

County Agencies

- Crane County Officials – County Judge, County Commissioners (Precincts 1-4)
- Crockett County Officials – County Judge, County Commissioners (Precincts 1-4)
- Ector County Officials – County Judge, County Commissioners (Precincts 1-4)
- Irion County Officials – County Judge, County Commissioners (Precincts 1-4)
- Pecos County Officials – County Judge, County Commissioners (Precincts 1-4)
- Reagan County Officials – County Judge, County Commissioners (Precincts 1-4)
- Reeves County Officials – County Judge, County Commissioners (Precincts 1-4)
- Schleicher County Officials – County Judge, County Commissioners (Precincts 1-4)
- Tom Green County Officials – County Judge, County Commissioners (Precincts 1-4)
- Upton County Officials – County Judge, County Commissioners (Precincts 1-4)
- Ward County Officials – County Judge, County Commissioners (Precincts 1-4)
- Winkler County Officials – County Judge, County Commissioners (Precincts 1-4)

City Agencies

- City of Barstow – Mayor, Mayor Pro Tempore (Pro Tem), Alderpersons, City Secretary
- City of Big Lake – Mayor, Mayor Pro Tem, City Council Members, City Administrator
- City of Crane – Mayor, City Council Members, City Administrator
- City of Grandfalls – Mayor, Alderpersons, City Secretary
- City of Iraan – Mayor, Alderpersons, City Secretary
- City of McCamey – Mayor, Mayor Pro Tem, Alderpersons, City Secretary
- City of Mertzson – Mayor, Mayor Pro Tem, City Council Members, City Administrator
- City of Monahans – Mayor, City Council Members, City Manager, Assistant City Manager
- City of Pecos – Mayor, Mayor Pro Tem, City Council Members, City Manager
- City of Pyote – Mayor, Mayor Pro Tem, City Council Members, City Secretary
- City of Rankin – Mayor, Mayor Pro Tem, Alderpersons, City Administrator
- City of Thorntonville – Mayor, Mayor Pro Tem, Alderpersons, City Secretary
- City of Wickett – Mayor, Mayor Pro Tem, City Council Members, City Secretary

School Districts

- Bartlett Independent School District (ISD) – Superintendent
- Crane ISD – Superintendent
- Grandfalls-Royalty ISD – Interim Superintendent
- Iraan-Sheffield Collegiate ISD – Superintendent
- Irion County ISD – Superintendent
- McCamey ISD – Superintendent
- Monahans-Pyote-Wickett ISD – Superintendent
- Pecos-Barstow-Toyah ISD – Superintendent
- Rankin ISD – Superintendent
- Reagan County ISD – Superintendent

In addition to soliciting comments from agencies and officials, Kimley-Horn and Halff reviewed available local, state, and federal records, published literature, and a variety of publicly available Geographic Information System (GIS) data, including recent aerial photography (ESRI World Imagery Basemap, 2025; NAIP, 2024), U.S. Geological Survey (USGS) topographic maps (USGS, 2025a), and various spatial datasets identifying ecological, cultural, and infrastructure features within the study area. The findings of these data collection activities are detailed in **Section 3.0**.

2.2.2 Reconnaissance Surveys

Kimley-Horn and Halff performed field reconnaissance surveys within the study area between March 3-11, 2025 and between June 9-12, 2025. The field reconnaissance surveys were conducted by visual observation of the study area characteristics from public roads located within the study area. Reconnaissance survey information was noted in the field and geographically referenced against digital aerial photography base maps, as necessary. Toward the latter stages of the routing study, Oncor and LCRA TSC commissioned an independent aerial reconnaissance survey, which occurred on September 1-3, 2025. The aerial reconnaissance survey allowed Kimley-Horn and Halff to confirm the findings of the above-mentioned research and data collection activities and to identify existing conditions or constraints that may not have been previously noted.

The data collection for the EA and Alternative Route Analysis report started with gathering information from public sources and continued until all alternative routes were finalized. Results of the various data collection activities are included in **Section 3.0** and **Section 7.0** of this report.

2.3 Constraints Mapping

The data and information collected from the activities outlined above were used to develop an environmental and land use constraints map. The constraints map, public maps, aerial photography, reconnaissance surveys, and other research were used to identify and select potential preliminary alternative route links within the study area. In this context, constraints are land use or landscape features that may affect the location of a transmission line. The goal of this approach is to identify areas where constraints are absent or fewer and areas with a lower likelihood of containing existing natural or human resources that could be affected by a transmission line. The geographic locations of different constraints within and adjacent to the study area were located and considered during the impact analysis. For linear projects such as these, crossing over or near certain constraints is often unavoidable. In these instances, special consideration or mitigation measures may be used, even though there is no law or regulation that would otherwise prohibit the proximity of the transmission line. The recent aerial photography (ESRI World Imagery Basemap, 2025; NAIP, 2024) used during this analysis has an accuracy of approximately 15-20 feet.

2.4 Identification of Preliminary Alternative Route Links

After completion of the data collection and constraints mapping process, preliminary alternative route links to connect the project endpoints were identified. Kimley-Horn and Halff utilized the following sources of information to identify the preliminary alternative route links:

- Input received from correspondence with agencies and local officials, as described in **Section 2.2.1**;
- Results from the visual reconnaissance surveys of the study area;
- Review of recent aerial photography;
- Findings of publicly available data collection activities;
- Environmental and land use constraints map;
- Apparent property boundaries;
- Existing compatible corridors;
- Locations of existing developments; and
- Other information.

Preliminary alternative route links were identified in accordance with Section 37.056(c)(4)(A)-(D) of the Texas Utilities Code and PUCT Substantive Rules Section 25.101, including the PUCT policy of prudent avoidance, and other requirements commonly required of CCN amendment applicants before the PUCT. The intent was to identify an adequate number of geographically diverse alternative routes, which were environmentally acceptable considering factors such as: community values; park and recreational areas; historical and aesthetic values; vegetation, wildlife, and water resources; environmental quality; length of route parallel to existing compatible corridors; length of route parallel to apparent property boundaries; and the PUCT policy of prudent avoidance. A more detailed discussion of the development of alternative route links is presented in **Section 4.0**.

2.5 Public Involvement Program

Once the preliminary alternative route links were identified, three public participation meetings were held in accordance with PUCT Procedural Rule Section 22.52(a)(4), which requires Oncor and LCRA TSC to hold at least one public meeting if 25 or more persons would be entitled to receive direct mail notice of the CCN application. Three meetings were held in municipalities near the project endpoints and proposed route links within the study area. The first public participation meeting was held on June 9, 2025, from 5:00 p.m. to 7:00 p.m. at Reagan County High School in Big Lake, Texas. The second public participation meeting was held on June 10, 2025, from 5:00 p.m. to 7:00 p.m. at McCamey 4-H and Community Center in McCamey, Texas. The third public participation meeting was held on June 11, 2025, from 5:00 p.m. to 7:00 p.m. at Reeves County Civic Center in Pecos, Texas.

The purpose of the public participation meetings was to:

- Solicit comments and input from residents, landowners, public officials, and other interested parties concerning the proposed project, preliminary alternative route links, and the overall transmission line routing process;
- Promote a better understanding of the proposed project, including the need, purpose, potential benefits, potential impacts, and the CCN certification process;
- Inform the public regarding the anticipated project schedule and the decision-making process; and
- Identify the values and concerns of the public and community leaders.

Oncor and LCRA TSC directed written notice of the public participation meetings to be mailed to owners of property crossed by or within 500 feet of the centerline of the preliminary alternative route links in accordance with PUCT criteria. In consideration of the horizontal accuracy limitations of the appraisal district data and aerial photography interpretation used to develop the preliminary alternative route links, notification to property owners was expanded to include properties crossed by or within 520 feet of the preliminary alternative route link centerlines. Oncor and LCRA TSC also directed notices to be provided to select federal, state, and local agencies. The DoD Military Aviation and Installation Assurance Siting Clearinghouse and certain oil and gas pipeline operators and associations were also included in the notification process of the public meetings. In addition, notices were also published in local newspapers detailing the time, location, and purpose of the public participation meetings. A summary of newspapers that published the public meeting notices and the dates of publication is shown in **Table 2-1**, and a copy of the notices can be found in **Appendix B**.

Table 2-1: Newspapers and Publication Dates for Notices of Public Participation Meetings

Newspaper	County/Counties	Publish Date
Crane News	Crane	Thursday, May 29, 2025
San Angelo Standard-Times	Irion and Tom Green	Thursday, May 29, 2025
Fort Stockton Pioneer	Pecos	Thursday, May 29, 2025
Big Lake Wildcat	Reagan and Crockett	Thursday, May 29, 2025
Pecos Enterprise	Reeves	Thursday, May 29, 2025
Eldorado Success	Schleicher	Thursday, May 29, 2025
Midland Reporter-Telegram	Upton	Wednesday, May 28, 2025
Monahans News	Ward	Thursday, May 29, 2025

At each public participation meeting, Oncor, LCRA TSC, Kimley-Horn, and Halff set up information stations in the meeting room. Each station was devoted to a particular aspect of the proposed project and was staffed by representatives from Oncor, LCRA TSC, Kimley-Horn, Halff, and Integra Realty Resources, Inc. (Integra) – the property abstractor Oncor and LCRA TSC engaged for this project. Each station displayed maps, illustrations, photographs, and/or text explaining a specific topic. Attendees were encouraged to visit each station 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 receive the information in a relaxed manner; to focus on their particular area of interest; and to ask specific questions. Furthermore, the one-on-one discussions with the utility representatives encouraged more interaction from attendees who might be hesitant to speak in a speaker/audience forum. Utility representatives were available at the public meetings to assist attendees with locating their property of interest on constraints maps or at GIS workstations.

Visitors were invited to sign in upon arrival and were given an information packet including an explanation of the proposed project, a map of the preliminary alternative route links, and a questionnaire. The information packet included answers to frequently asked questions, a drawing of the proposed typical transmission structure, a flow chart of the CCN certification process for new transmission lines, and the State of Texas Landowners' Bill of Rights. The questionnaire solicited comments on the proposed project and invited attendees to evaluate the information presented at the public participation meetings. Copies of the information packet and questionnaire can be found in **Appendix B**.

Concurrent with holding the public meetings, Oncor and LCRA TSC activated public facing project websites to describe the project and the CCN process. Oncor and LCRA TSC also set up project email addresses and dedicated phone numbers to continue gathering input and answering questions about the project following the public meetings. Upon request, Oncor and LCRA TSC representatives agreed to meet with individual landowners or their representatives to better understand their specific concerns and continue gathering input for evaluation of potential adjustments to the preliminary alternative route links.

2.6 Adjustments to the Alternative Route Links Following the Public Meetings

Following the public participation meetings, and based upon the public input received, modifications were made to several of the preliminary alternative route links presented at the public meetings. The addition, removal, and modification of links were the result of (1) Kimley-Horn's, Halff's, Oncor's, and LCRA TSC's further evaluation of the preliminary alternative route links in consideration of comments received during and after the public meetings and (2) changes within the study area observed during field and aerial reconnaissance. The modified route links are located throughout the study area and are further described and discussed in **Section 6.0**.

2.7 Evaluation of the Proposed Project

Through a proprietary Kimley-Horn/Halff route generating software tool, possible alternative route combinations were generated after making the route link adjustments noted previously and then evaluated in detail by Kimley-Horn and Halff. In evaluating the alternative routes, Kimley-Horn and Halff considered various environmental and land use factors. The analysis of the alternative routes involved tabulating data related to multiple environmental and land use evaluation factors. Factors included the length of an alternative route that parallels existing compatible corridors, such as apparent property boundaries, and the distance of the alternative route from certain features. Other factors require counting the number of certain types of features that are within a

specified distance of the proposed alternative route centerlines. The number, quantity, or value for each factor was determined by reviewing recent aerial photography (ESRI World Imagery Basemap, 2025; NAIP, 2024) and USGS topographic maps (USGS, 2025a), data collected from the aerial reconnaissance, analyzing GIS constraints data, and where possible, verifying with visual observations during field reconnaissance. The proposed alternative routes' potential environmental and land use impacts are addressed in **Section 7.0**.

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3.0 ENVIRONMENTAL ASSESSMENT OF THE STUDY AREA

3.1 Constraints Mapping

Once the study area boundary was delineated for the project, Kimley-Horn and Halff initiated the information-gathering process to identify the locations of environmentally sensitive areas and other land use constraints within the study area, which are mapped on recent aerial photography (ESRI World Imagery Basemap, 2025; NAIP, 2024) in **Figures 3-1A through 3-1L (Appendix G)**. The information obtained and reviewed to complete this EA and Alternative Route Analysis, and the environmental and land use constraints depicted in these figures, is described in detail in the following sections.

3.2 Physiography and Geology

3.2.1 Major Land Resource Area Descriptions

The study area lies within the Southern High Plains and Edwards Plateau physiographic regions of Texas (Bureau of Economic Geology [BEG], 1996). The Southern High Plains region is characterized by a flat topography with many playas and local dune fields. The elevation of the Southern High Plains region ranges from 2,200 to 3,800 feet above sea level. The Edwards Plateau region is characterized by a flat upper surface with box canyons and bedrock composed of limestone and dolomite. The elevation within the Edwards Plateau region ranges from 450 to 3,000 feet above sea level (BEG, 1996).

The USDA has grouped the United States into areas called Major Land Resource Areas (MLRAs). The MLRA is the second largest hierarchical segmentation of land areas and combines these regions based on physiography, geology, climate, water resources, soils, biological resources, and land use (USDA, 2022a). The study area overlaps portions of four MLRAs: Pecos and Canadian River Basins (70B); Southern High Plains, Southwestern Part (77D); Edwards Plateau, Western Part (81A); and Edwards Plateau, Central Part (81B) (USDA, 2022a). The MLRAs will be utilized to provide the geology discussion below and are depicted in **Figures 3-2A, 3-2B, and 3-2C**.

The Pecos and Canadian River Basins MLRA (70B) can be divided into the following subdivisions: basin alluvium, Mesozoic bedrock, sand sheets, and Permian red beds. The basin alluvium subdivision has three types of sediment-deposited landforms characterized by deeper soils: piedmont remnants, alluvial aprons, and riverine valley deposits. The Mesozoic bedrock subdivision is characterized by shallower soils that formed over Mesozoic-age bedrock. On the east side of the river basins, adjacent to the margin of the High Plains, sand sheets have accumulated due to prevailing west winds. Permian red beds consist of soils that formed in or over materials from Permian-age shales of Artesia Group geology, sandstones, and anhydrites (USDA, 2022a).

The surface of the Southern High Plains, Southwestern Part MLRA (77D) is covered primarily by eolian sediments of the Blackwater Draw Formation of Pleistocene Age and sand sheets and dunes of Quaternary Age. It is underlain by sand and gravel of the Miocene-Pliocene Ogallala

Formation. Thin alluvial deposits are in a few large draws and valleys. A few, isolated, thin, alluvial deposits of Cretaceous Age are around the larger salt-affected lake basins located throughout the MLRA (USDA, 2022a).

The Edwards Plateau, Western Part MLRA (81A) is underlain primarily by limestones of the Austin Chalk, Boquillas Flags, Devil’s River, Edwards, Buda, and Del Rio Clay Formations of Cretaceous Age. Quaternary alluvium is common within river valleys. The average annual precipitation is 15 to 26 inches in most of this area. Water is scarce throughout this area because of limited and erratic precipitation and few perennial streams. Most of the soils are well drained and generally shallow and rock outcrop makes up a significant portion of the area. Ranches managed for grazing and wildlife habitat make up nearly all of this area. Livestock grazing is the principal land use but some of the cropland is irrigated (USDA, 2022a).

The Edwards Plateau, Central Part MLRA (81B) is characterized by rolling to steep topography with shallow soils over limestone bedrock and a plant community of trees, shrubs, and short or mid grasses. This MLRA receives an average annual precipitation of 19 to 32 inches, with most of the rainfall occurring in spring and fall. The amount of water is limited throughout most of the area but is abundant along the spring-fed perennial streams. This area is underlain primarily by limestones of the Cretaceous age. The soils in the area are well drained and are generally shallow with rock outcrop making up a significant portion of the area. Nearly all of the MLRA is used for livestock grazing and wildlife habitat (USDA, 2022a).

Figure 3-2A: Major Land Resource Areas Map

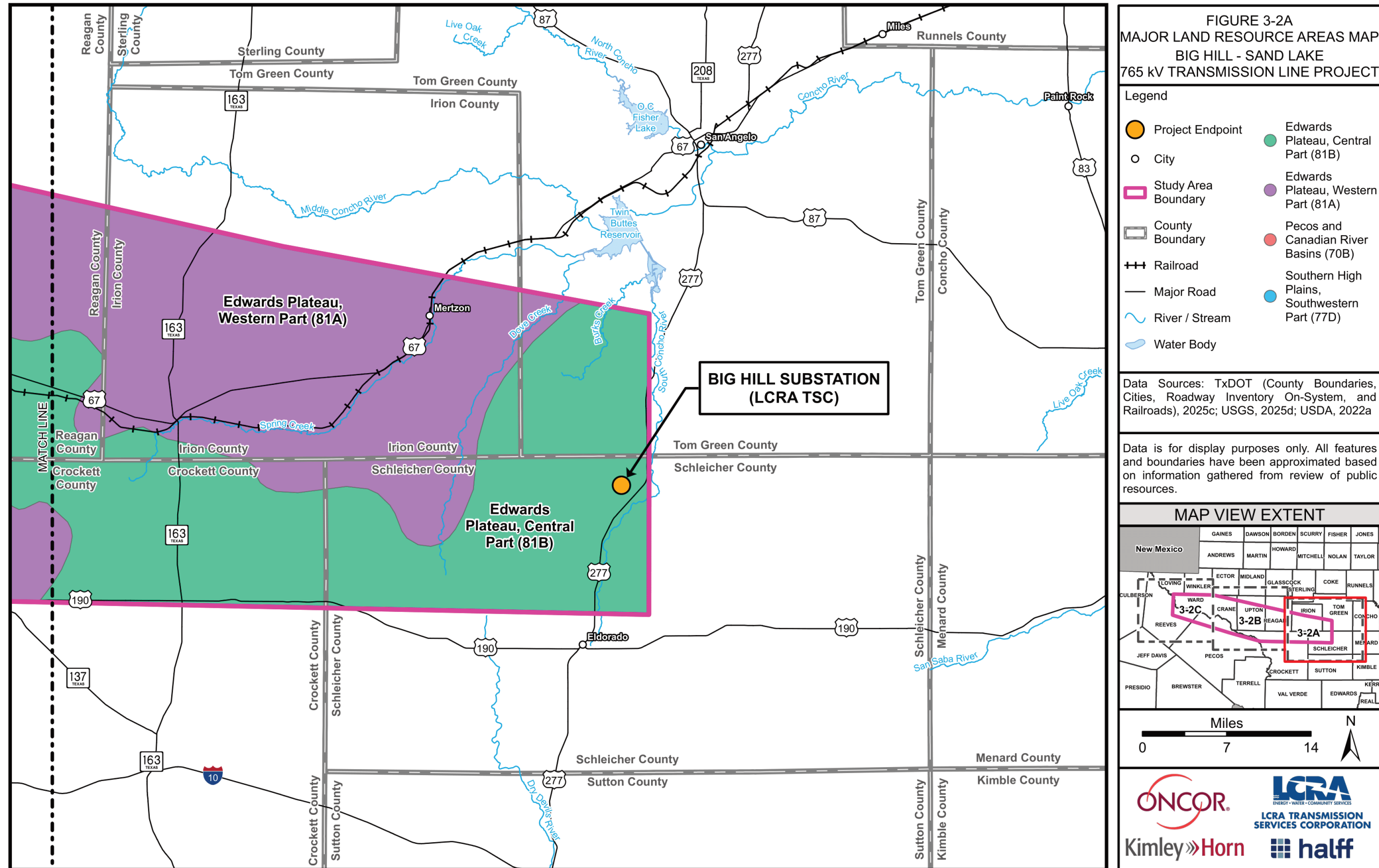


Figure 3-2B: Major Land Resource Areas Map

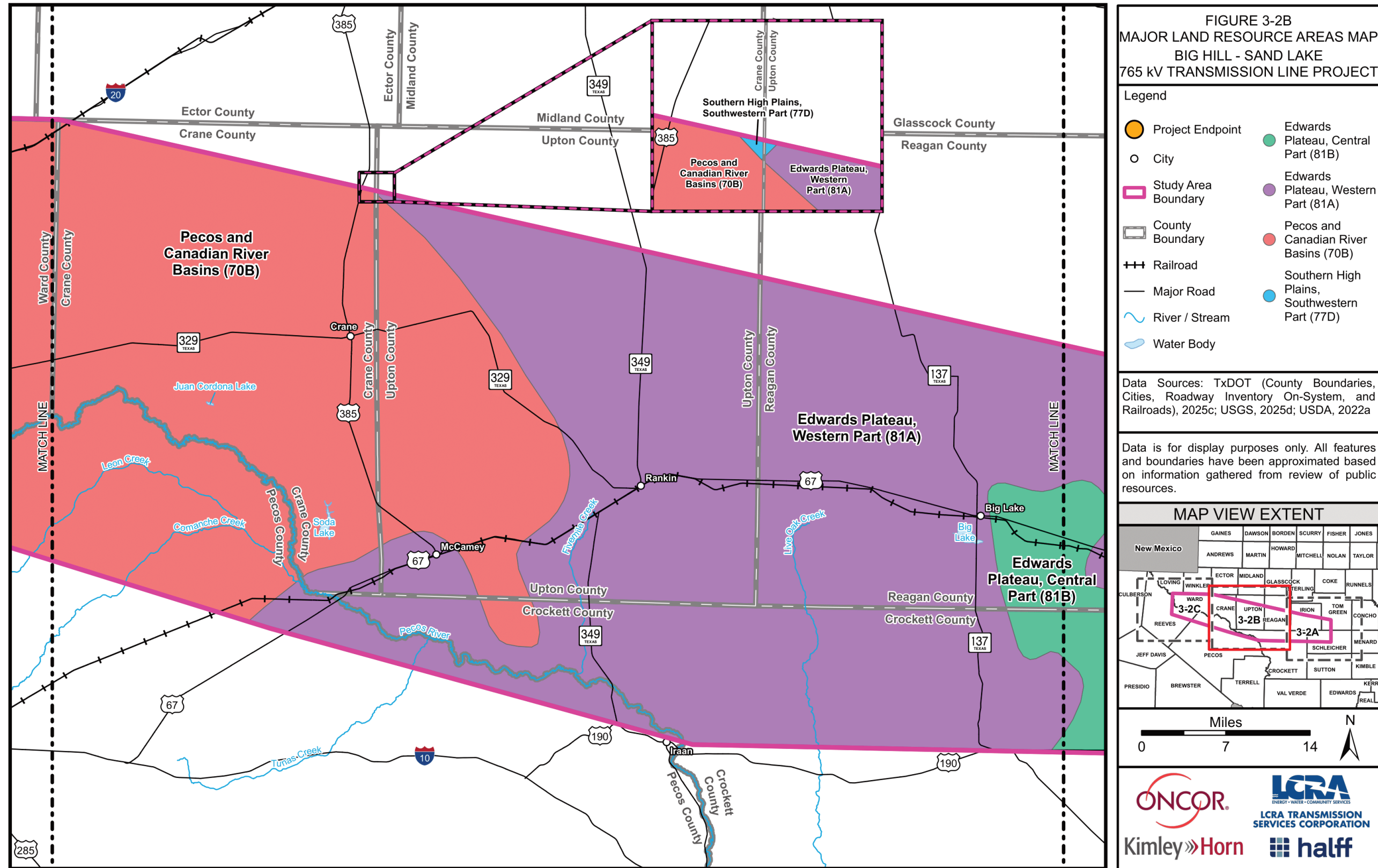
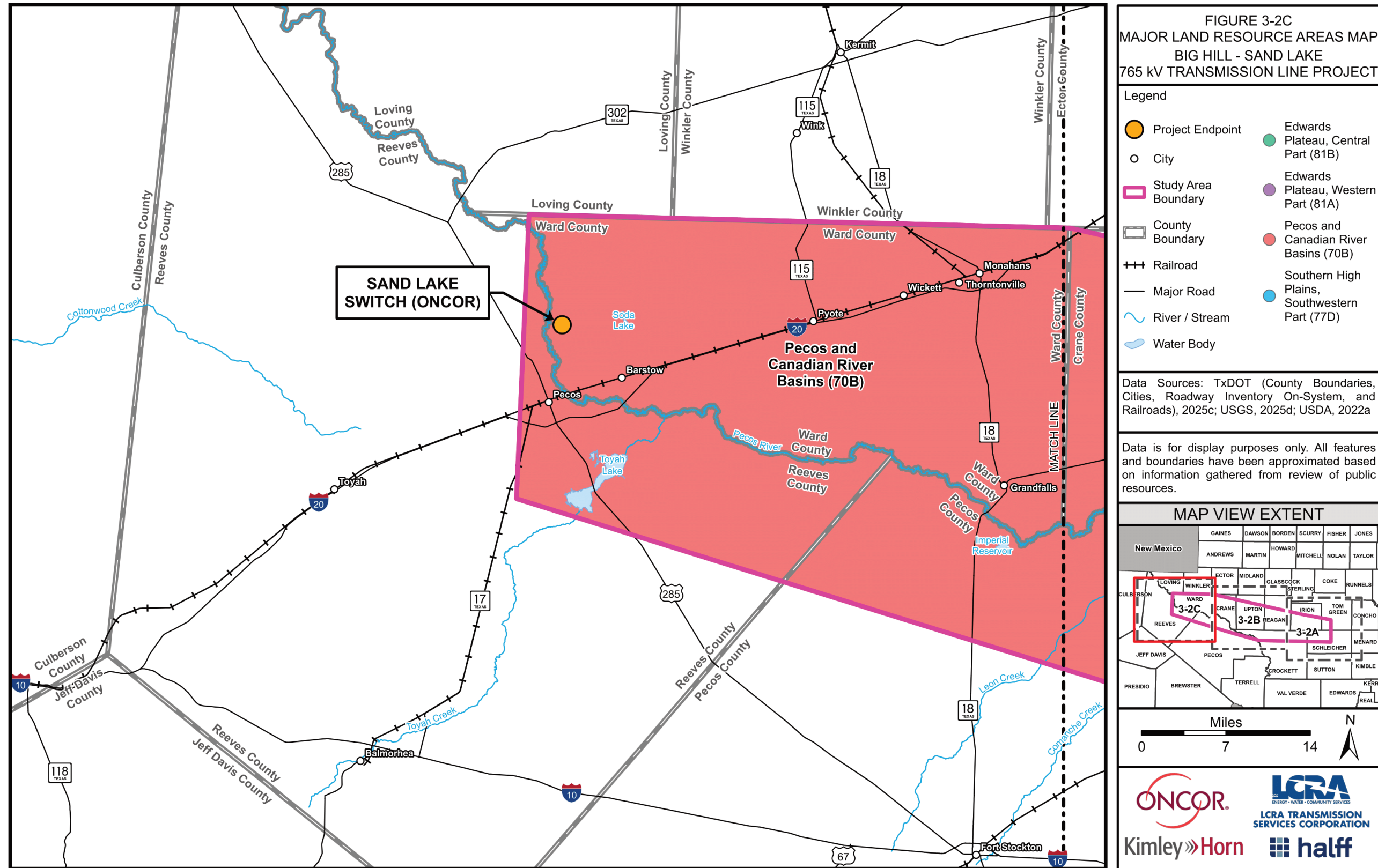


Figure 3-2C: Major Land Resource Areas Map



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3.2.2 Geologic Unit Descriptions

The Geologic Atlas of Texas is a database which depicts surface geology for the entire state of Texas (USGS, 2025b). The Atlas was completed in 1987 and has been updated to a web map viewer and a digital dataset containing more than 145,000 geologic features (USGS, 2014). According to the Geologic Atlas of Texas, there are 23 geologic units present within the study area. The geologic units are depicted in **Figures 3-3A, 3-3B, and 3-3C** and geologic unit descriptions within the study area are listed in **Table 3-1**.

Table 3-1: Geologic Units within the Study Area

Symbol	Name	Description	Figure Number
Ka	Antlers Sand	Geologic age dating to the Comanchean Epoch and consists of sandstone, sand, conglomerate, siltstone, and quartzite.	3-3A, 3-3B, 3-3C
Kbu	Buda Limestone	Geologic age dating to the Comanchean Epoch and consists of limestone.	3-3A, 3-3B
Kfr	Fredericksburg Group	Geologic age dating to the Comanchean Epoch and consists of limestone and shale.	3-3B, 3-3C
Kft	Fort Terrett Formation	Geologic age dating to the Comanchean Epoch and consists of limestone and shale.	3-3A, 3-3B
Ks	Segovia Formation	Geologic age dating to the Comanchean Epoch and consists of limestone and dolomite.	3-3A, 3-3B
Kw	Washita Group	Geologic age dating to the Comanchean Epoch and consists of clay, mud, and limestone.	3-3B, 3-3C
Qal	Alluvium	Geologic age dating to the Holocene Epoch and consists of clay and sand.	3-3A, 3-3B, 3-3C
Qao	Older Alluvial Deposits	Geologic age dating to the Pleistocene Epoch and consists of gravel, sand, and silt.	3-3B, 3-3C
Qap	Siliceous and Igneous Pebbles in Deposits of Uncertain Age	Geologic age dating to the Holocene and Pleistocene Epochs and consists of silica.	3-3C
Qc	Colluvium	Geologic age dating to the Holocene and Pleistocene Epochs and consists of evaporite.	3-3A
Qcc	Caliche	Geologic age dating to the Holocene and Pleistocene Epochs and consists of quartz, silty, calcareous, and caliche nodules.	3-3B, 3-3C
Qcs	Windblown Cover Sand	Geologic age dating to the Pleistocene Epoch and consists of silt and sand.	3-3B
Qg	Gatuna Formation	Geologic age dating to the Pleistocene Epoch and consists of sand, conglomerate, evaporite, limestone, siltstone, and shale.	3-3C
Qgy	Granular Gypsum, white to light gray, of several ages	Geologic age dating to the Holocene and Pleistocene Epochs and consists of evaporate.	3-3B, 3-3C
Qp	Playa Deposits	Geologic age dating to the Pleistocene Epoch and consists of clay, silt, and sand.	3-3A, 3-3B, 3-3C
Qs	Sand Sheet Deposits	Geologic age dating to the Holocene Epoch and consists of sand and silt.	3-3B, 3-3C
Qsd	Sand Dune Deposits	Geologic age dating to the Holocene Epoch and consists of sand and silt.	3-3B, 3-3C
Qsu	Sand Deposits, undivided	Geologic age dating to the Holocene Epoch and consists of clay, silt, and sand.	3-3B, 3-3C

Symbol	Name	Description	Figure Number
Qt	Terrace Deposits	Geologic age dating to the Pleistocene Epoch and consists of gravel, sand, and silt.	3-3B, 3-3C
Qta	Tahoka Formation	Geologic age dating to the Pleistocene Epoch and consists of clay, silt, sand, and gravel.	3-3B, 3-3C
Qu	Quaternary Deposits, undivided	Geologic age dating to the Holocene and Pleistocene Epochs and consists of sand, silt, clay, gravel, and caliche.	3-3A, 3-3B, 3-3C
Qun	Pond Deposits	Geologic age dating to the Pleistocene Epoch and consists of silt and sand.	3-3B, 3-3C
TRd	Dockum Group, undivided	Geologic age dating to the Upper Triassic Epoch and consists of shale, sandstone, siltstone, limestone, and gravel.	3-3B, 3-3C

Source: USGS, 2014; USGS, 2025b

The study area is located within three karst regions: the Central Edwards Plateau, the Stockton Plateau, and the Isolated Edwards Group Outliers (Texas Speleological Society, 2024). The southern part of the Central Edwards Plateau karst region allows for caves of significant vertical extent, but the total soluble limestone is thin within the study area, thereby limiting such development. In the Stockton Plateau karst region, the Pecos River has provided outlets for groundwater at the base of the thick soluble limestone sequence and have promoted development of some of Texas’ deeper caves. In the Isolated Edwards Group Outliers karst region, most caves are small, recently formed features. Karst features are subterranean habitats that include caves, subterranean voids, solution cavities, sinkholes, fractures, and other mesocavernous spaces that form via the solution of karst landscapes (USFWS, 2024). The study area is located within four karst types: carbonate rocks at or near the land surface in a dry climate, evaporite rocks at or near the land surface in a dry climate, gypsum, and unconsolidated calcareous or carbonate rocks at or near the land surface in a dry climate (TPWD, 2014a).

Figure 3-3A: Geologic Atlas of Texas Map

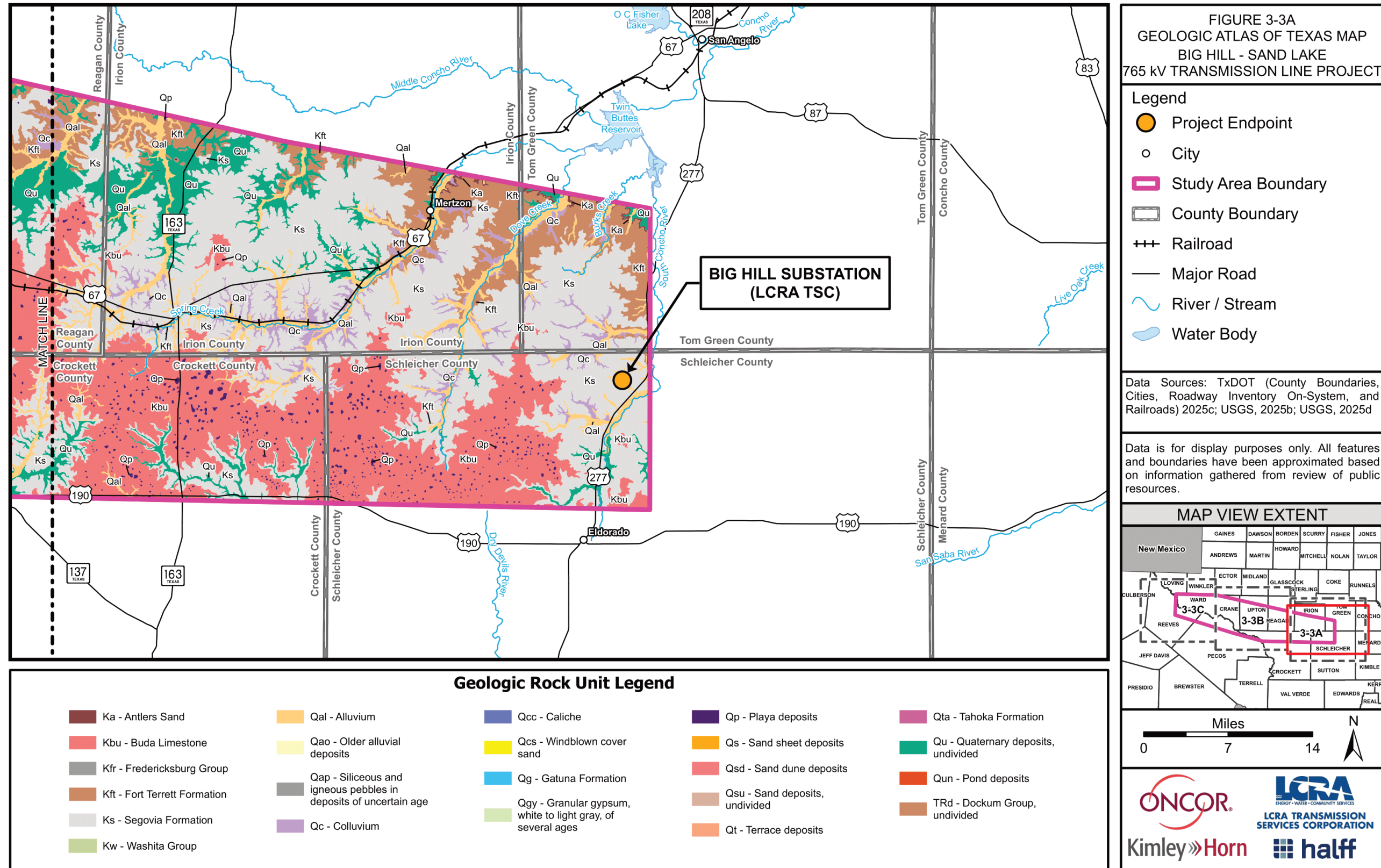


Figure 3-3B: Geologic Atlas of Texas Map

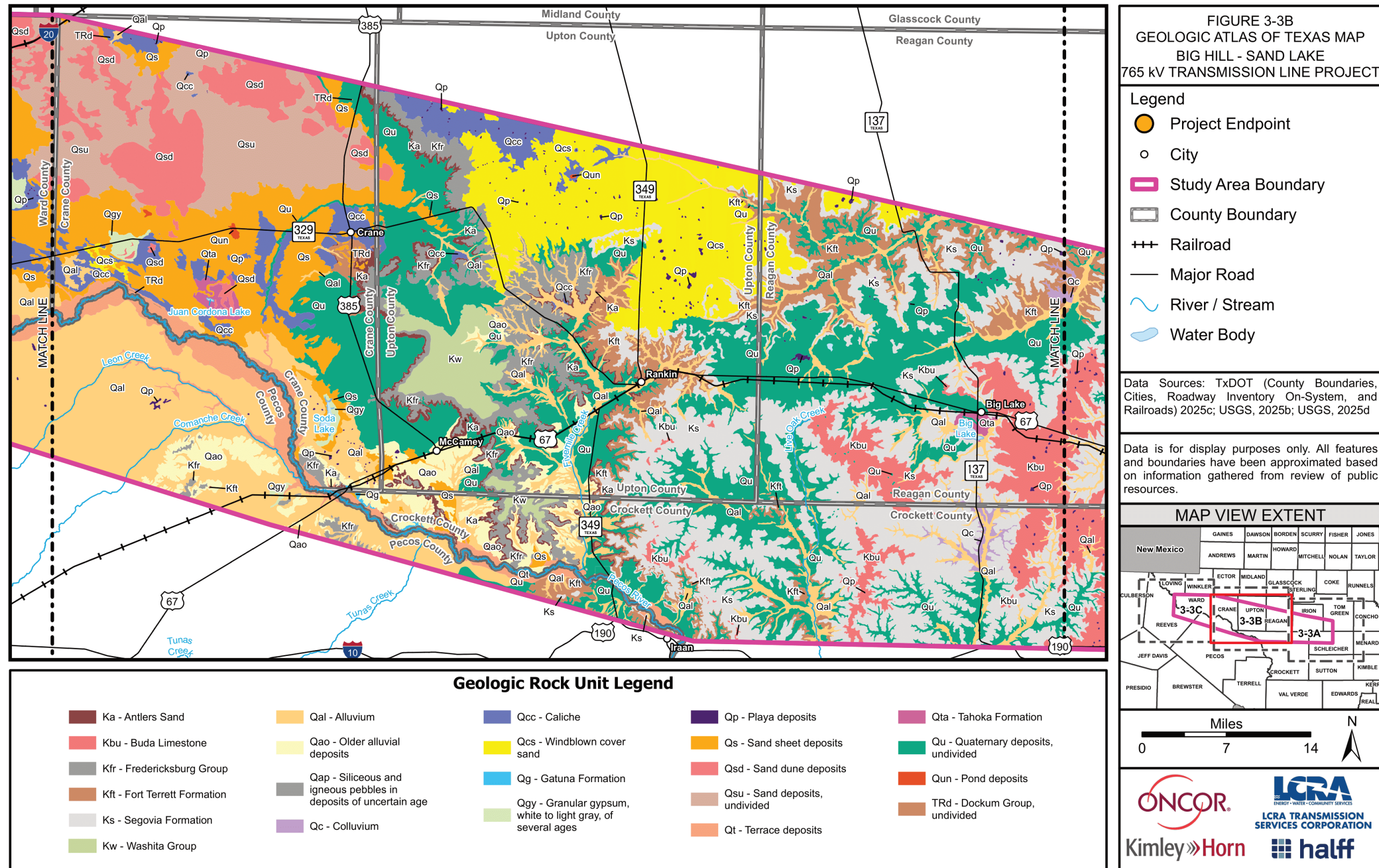
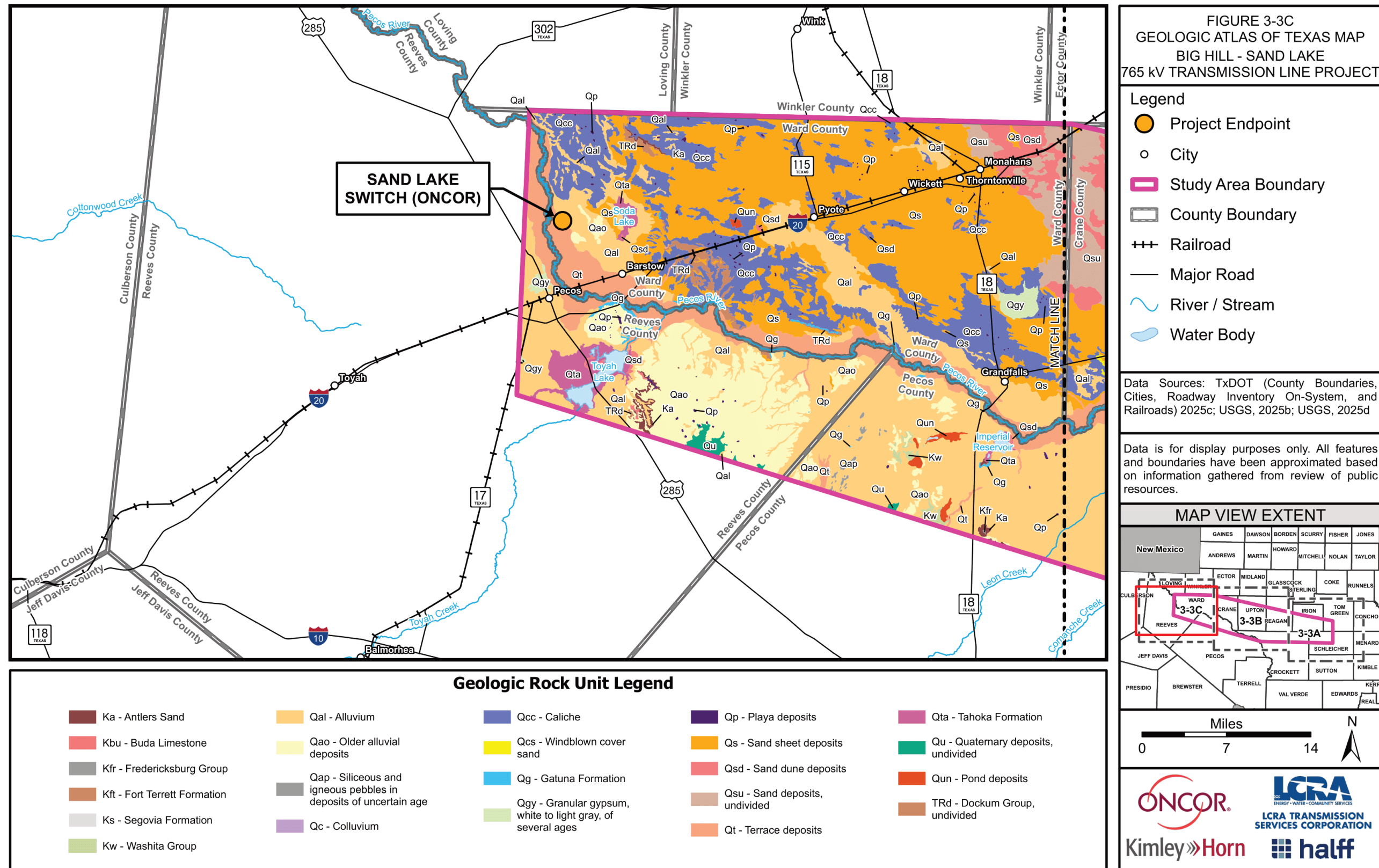


Figure 3-3C: Geologic Atlas of Texas Map



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3.3 Soils

3.3.1 Soil Associations

Data from the NRCS were utilized to characterize the soils within the study area. The NRCS published digital soil maps in 2005 and refreshes its publicly available soil survey database once per year (NRCS, 2022). Soils are classified based on their physical and chemical properties (NRCS, 2025a). Soil maps display a general overview of soil types within a specific area (NRCS, 2025b). An association is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the NRCS soil maps. According to the NRCS Web Soil Survey (NRCS, 2025b), 30 soil associations are mapped within the study area (**Figures 3-4A, 3-4B, and 3-4C**). Soil associations documented within the study area are listed in **Table 3-2**.

Table 3-2: Soil Associations within the Study Area

Soil Association Map Unit: Name	Description of Soil Unit	Figure Number
s7167 Cho-Angelo	The Cho series consists of very shallow or shallow, well drained soils formed in loamy calcareous gravelly alluvium. The Angelo series consists of deep or very deep, well drained, moderately slowly permeable soils formed in calcareous loamy and clayey alluvium derived from limestone.	3-4A, 3-4B
s7170 Reagan-Mereta-Conger-Angelo	The Reagan series consists of very deep, well drained, moderately or moderately slowly permeable calcareous soils that formed in alluvium and/or eolian deposits derived from limestone. The Mereta series consists of well drained, moderately slowly permeable soils that are shallow to a petrocalcic horizon. The Conger series consists of soils that are very shallow and shallow to a petrocalcic horizon. The Angelo series consists of deep or very deep, well drained, moderately slowly permeable soils formed in calcareous loamy and clayey alluvium derived from limestone.	3-4A, 3-4B
s7255 Tencee-Reagan-Conger	The Tencee series consists of shallow to petrocalcic, well drained, moderately permeable soils that formed in gravelly alluvium derived from mixed sources on terrace remnants and sides of ridges. The Reagan series consists of very deep, well drained, moderately or moderately slowly permeable calcareous soils that formed in alluvium and/or eolian deposits derived from limestone. The Conger series consists of soils that are very shallow and shallow to a petrocalcic horizon.	3-4B
s7280 Reakor-Nickel-Delnorte	The Reakor series is very deep, well drained soils that formed in loamy alluvium derived from mixed sources. The Nickel series consists of very deep, well drained soils that formed in alluvium from mixed rock sources. The Delnorte series consists of soils that are very shallow and shallow to a petrocalcic horizon.	3-4B, 3-4C
s7301 Ector-Angelo	The Ector series consists of very shallow to shallow, well drained soils that are moderately permeable above a moderately slowly permeable limestone bedrock. The Angelo series consists of deep or very deep, well drained, moderately slowly permeable soils formed in calcareous loamy and clayey alluvium derived from limestone.	3-4A, 3-4B
s7304 Rock outcrop-Ector	The Rock outcrop series consists of miscellaneous components. The Ector series consists of very shallow to shallow, well drained soils that are moderately permeable above a moderately slowly permeable limestone bedrock.	3-4A, 3-4B

Soil Association Map Unit: Name	Description of Soil Unit	Figure Number
s7305 Upton-Sanderson-Altuda	The Upton series consists of soils that are shallow to a petrocalcic horizon, well drained, and moderately permeable. The Sanderson series consists of very deep, well drained, moderately permeable soils formed in gravelly, calcareous loamy alluvium and/or colluvium derived from limestone. The Altuda series consists of very shallow and shallow, well drained, moderately and moderately slowly permeable soils that formed in loamy residuum and colluvium weathered from Permian limestone bedrock.	3-4B
s7373 Reeves-Reagan-Orla-Monahans-Hoban	The Reeves series consists of very deep soils that are moderately deep to gypsum material, well drained, moderately permeable soils that formed in calcareous and gypsiferous fine textured alluvium derived from gypsum beds. The Reagan series consists of very deep, well drained, moderately or moderately slowly permeable calcareous soils that formed in alluvium and/or eolian deposits derived from limestone. The Orla series consists of shallow, well drained, moderately permeable soils that developed in loamy gypsiferous materials of lacustrine or alluvial origin. The Monahans series consists of very deep, well drained, moderately permeable soils formed in ancient alluvium containing significant amounts of gypsum and calcium carbonate. The Hoban series consists of very deep, well drained, moderately permeable soils formed in calcareous loamy or clayey alluvium.	3-4B, 3-4C
s7375 Reeves-Holloman-Gypsum land	The Reeves series consists of very deep soils that are moderately deep to gypsum material, well drained, moderately permeable soils that formed in calcareous and gypsiferous fine textured alluvium derived from gypsum beds. The Holloman series consists of shallow and very shallow, well drained, moderately permeable soils that formed in loamy, calcareous, and gypsiferous sediments.	3-4B, 3-4C
s7385 Penwell-Jalmar	The Penwell series consists of very deep, excessively drained, and rapidly permeable soils that formed in sandy eolian deposits. The Jalmar series consists of very deep, well drained, moderately permeable soils.	3-4B, 3-4C
s7394 Tarrant-Kavett	The Tarrant series consists of soils that are very shallow and shallow to indurated limestone bedrock, interbedded with marl and chalk. The Kavett series consists of shallow, well drained, moderately slowly permeable soils that formed in calcareous, clayey residuum derived from limestone or limestone interbedded with chalk or marl.	3-3A, 3-4B
s7399 Pyote-Penwell-Kermit-Dune land	The Pyote series consists of very deep, well drained, moderately rapidly permeable soils formed in sandy and loamy sediments that have been modified by wind. The Penwell series consists of very deep, excessively drained, and rapidly permeable soils that formed in sandy eolian deposits. The Kermit series consists of very deep, excessively drained soils formed in eolian sands.	3-4B, 3-4C
s7443 Upton-Rock outcrop-Lozier	The Upton series consists of shallow to a petrocalcic horizon, well drained, and moderately permeable soils, formed in gravelly, calcareous, loamy, slope alluvium and/or colluvium derived from limestone and marl. The Rock outcrop series consists of miscellaneous components. The Lozier series consists of very shallow or shallow, well drained, moderate permeable soils over very slowly permeable bedrock.	3-4B
s7445 Upton-Reakor-Lozier	The Upton series consists of shallow to a petrocalcic horizon, well drained, and moderately permeable soils, formed in gravelly, calcareous, loamy, slope alluvium and/or colluvium derived from limestone and marl. The Reakor series is very deep, well drained soils that formed in loamy alluvium derived from mixed sources. The Lozier series consists of very shallow or shallow, well drained, moderate permeable soils over very slowly permeable bedrock.	3-4C

Soil Association Map Unit: Name	Description of Soil Unit	Figure Number
s7483 Monahans-Ima-Hodgins	The Monahans series consists of very deep, well drained, moderately permeable soils formed in ancient alluvium containing significant amounts of gypsum and calcium carbonate. The Ima series consists of deep, well drained soils formed in alluvium and eolian materials derived dominantly from sandstone and shale. The Hodgins series consist of very deep, calcareous, well drained, moderately permeable soils formed in calcareous, loamy materials.	3-4B, 3-4C
s7519 Saragosa-Orla	The Saragosa series consists of soils that are shallow to gypsiferous materials. The Orla series consists of shallow, well drained, moderately permeable soils that developed in loamy gypsiferous materials of lacustrine or alluvial origin.	3-4C
s7542 Pecos-Patrole-Gila-Arno	The Pecos series consists of very deep, moderately well drained, slowly permeable soils that formed in clayey alluvium. The Patrole series consists of very deep, well drained, very slowly permeable soils formed in stratified silty over clayey alluvium. The Gila series consists of very deep, well drained soils formed in stratified alluvium. The Arno series consists of very deep, moderately well drained, very slowly permeable soils formed in clayey alluvium.	3-4B, 3-4C
s7577 Wickett-Sharvana-Pyote	The Wickett series consists of soils that are moderately deep to a petrocalcic horizon. The Sharvana series consists of soils that are very shallow and shallow, well drained, and moderately permeable above a slowly permeable petrocalcic horizon. The Pyote series consists of very deep, well drained, moderately rapidly permeable soils formed in sandy and loamy sediments that have been modified by wind.	3-4B, 3-4C
s7588 Reakor-Ratliff-Holloman	The Reakor series is very deep, well drained soils that formed in loamy alluvium derived from mixed sources. The Ratliff series consists of very deep, well drained, moderately permeable soils. The Holloman series consists of shallow and very shallow, well drained, moderately permeable soils that formed in loamy, calcareous, and gypsiferous sediments.	3-4B
s7593 Reagan	The Reagan series consists of very deep, well drained, moderately or moderately slowly permeable calcareous soils that formed in alluvium and/or eolian deposits derived from limestone.	3-4B
s7594 Reagan-Iraan-Hodgins	The Reagan series consists of very deep, well drained, moderately or moderately slowly permeable calcareous soils that formed in alluvium and/or eolian deposits derived from limestone. The Iraan series consists of very deep, well drained, moderately slowly permeable soils formed in calcareous loamy alluvium derived from limestone. The Hodgins series consist of very deep, calcareous, well drained, moderately permeable soils formed in calcareous, loamy materials.	3-4A, 3-4B, 3-4C
s7603 Rioconcho-Dev-Broome-Angelo	The Rioconcho series consists of very deep, moderately well drained, slowly permeable soils that formed in clayey or silty alluvium derived from limestone. The Dev series consists of very deep, well drained, moderately rapidly permeable soils that formed in gravelly loamy alluvium derived from limestone. The Broome series consists of deep, well drained, moderately permeable soils formed in loamy calcareous sediments. The Angelo series consists of deep or very deep, well drained, moderately slowly permeable soils formed in calcareous loamy and clayey alluvium derived from limestone.	3-4A
s7604 Rioconcho-Broome-Angelo	The Rioconcho series consists of very deep, moderately well drained, slowly permeable soils that formed in clayey or silty alluvium derived from limestone. The Broome series consists of deep, well drained, moderately permeable soils formed in loamy calcareous sediments. The Angelo series consists of deep or very deep, well drained, moderately slowly permeable soils formed in calcareous loamy and clayey alluvium derived from limestone.	3-4A, 3-4B

Soil Association Map Unit: Name	Description of Soil Unit	Figure Number
s7646 Wickett-Simona-Sharvana-Delnorte	The Wickett series consists of soils that are moderately deep to a petrocalcic horizon. The Simona series consists of shallow and very shallow, well drained soils that formed in calcareous sandy sediments over fractured indurated caliche. The Sharvana series consists of soils that are very shallow and shallow, well drained, and moderately permeable above a slowly permeable petrocalcic horizon. The Delnorte series consists of soils that are very shallow and shallow to a petrocalcic horizon.	3-4B, 3-4C
s7669 Tarrant	The Tarrant series consists of soils that are very shallow and shallow to indurated limestone bedrock, interbedded with marl and chalk.	3-4A
s7676 Upton-Tencee-Sanderson-Reakor-Reagan	The Upton series consists of soils that are shallow to a petrocalcic horizon, well drained, and moderately permeable soils, formed in gravelly, calcareous, loamy, slope alluvium and/or colluvium derived from limestone and marl. The Tencee series consists of shallow to petrocalcic, well drained, moderately permeable soils that formed in gravelly alluvium derived from mixed sources on terrace remnants and sides of ridges. The Sanderson series consists of very deep, well drained, moderately permeable soils formed in gravelly, calcareous loamy alluvium and/or colluvium derived from limestone. The Reakor series is very deep, well drained soils that formed in loamy alluvium derived from mixed sources. The Reagan series consists of very deep, well drained, moderately or moderately slowly permeable calcareous soils that formed in alluvium and/or eolian deposits derived from limestone.	3-4B
s7688 Valera-Tobosa-Mereta-Kavett	The Valera series consists of soils that are moderately deep to a petrocalcic horizon underlain by indurated limestone bedrock. The Tobosa series consists of very deep, well drained, very slowly permeable soils formed in calcareous clayey alluvium derived from limestone. The Mereta series consists of well drained, moderately slowly permeable soils that are shallow to a petrocalcic horizon. The Kavett series consists of shallow, well drained, moderately slowly permeable soils that formed in calcareous, clayey residuum derived from limestone or limestone interbedded with chalk or marl.	3-4A, 3-4B
s7702 Upton-Reagan	The Upton series consists of soils that are shallow to a petrocalcic horizon, well drained, and moderately permeable soils, formed in gravelly, calcareous, loamy, slope alluvium and/or colluvium derived from limestone and marl. The Reagan series consists of very deep, well drained, moderately or moderately slowly permeable calcareous soils that formed in alluvium and/or eolian deposits derived from limestone.	3-4B
s7706 Verhalen-Toyah-Reakor-Delnorte-Dalby	The Verhalen series consists of very deep, moderately well drained, very slowly permeable soils formed in calcareous clayey alluvium. The Toyah series consists of very deep, well drained, moderately permeable, soils that formed in calcareous loamy alluvium. The Reakor series is very deep, well drained soils that formed in loamy alluvium derived from mixed sources. The Delnorte series consists of soils that are very shallow and shallow to a petrocalcic horizon. The Dalby series consists of very deep, well drained, very slowly permeable soils that formed in calcareous clayey alluvium.	3-4C
s7724 Wickett-Triomas-Kinco-Jalmar	The Wickett series consists of soils that are moderately deep to a petrocalcic horizon. The Triomas series consists of very deep, well drained, moderately permeable soils that formed in sandy and loamy eolian deposits. The Kinco series consists of very deep, well drained, moderately rapidly permeable soils formed in calcareous loamy material of eolian or alluvial origin. The Jalmar series consists of very deep, well drained, moderately permeable soils.	3-4B

Source: NRCS, 2014; NRCS, 2025b

Figure 3-4A: Soil Associations Map

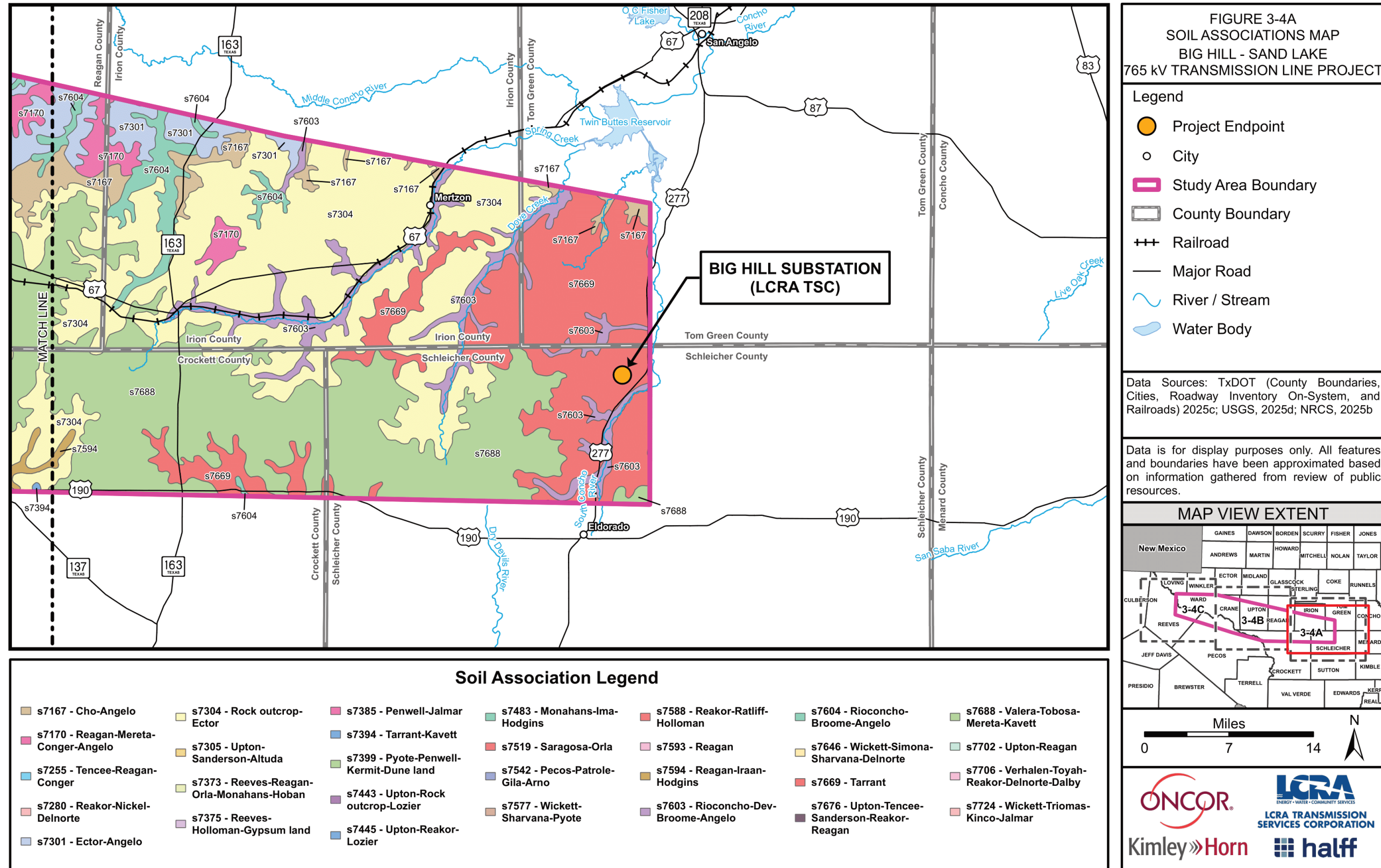


Figure 3-4B: Soil Associations Map

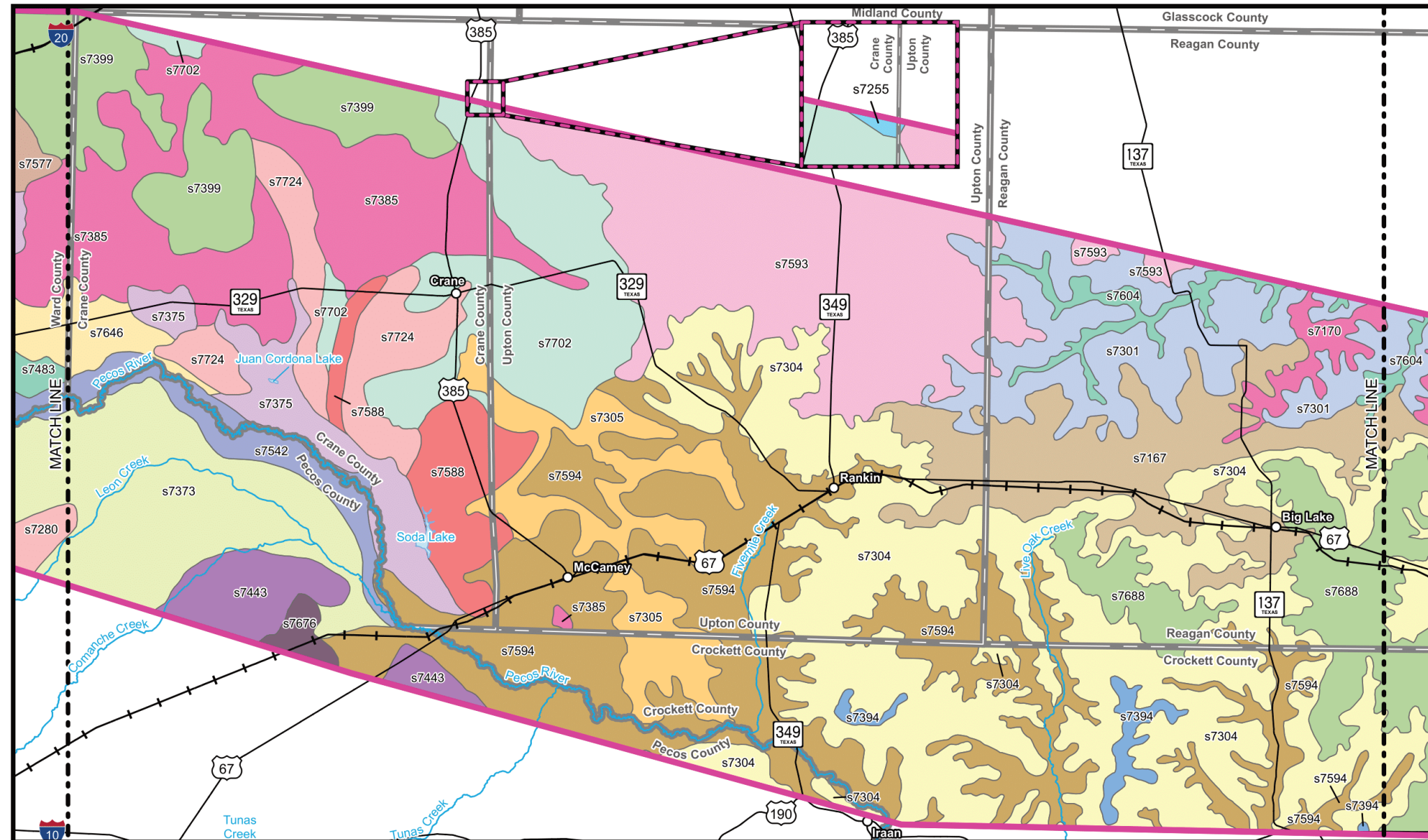


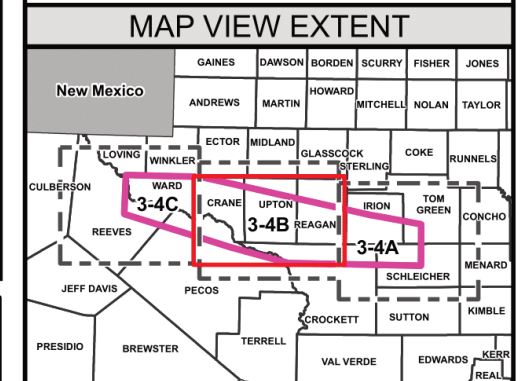
FIGURE 3-4B
SOIL ASSOCIATIONS MAP
BIG HILL - SAND LAKE
765 kV TRANSMISSION LINE PROJECT

Legend

- Project Endpoint
- City
- Study Area Boundary
- County Boundary
- + + + Railroad
- Major Road
- ~ River / Stream
- Water Body

Data Sources: TxDOT (County Boundaries, Cities, Roadway Inventory On-System, and Railroads) 2025c; USGS, 2025d; NRCS, 2025b

Data is for display purposes only. All features and boundaries have been approximated based on information gathered from review of public resources.



Soil Association Legend

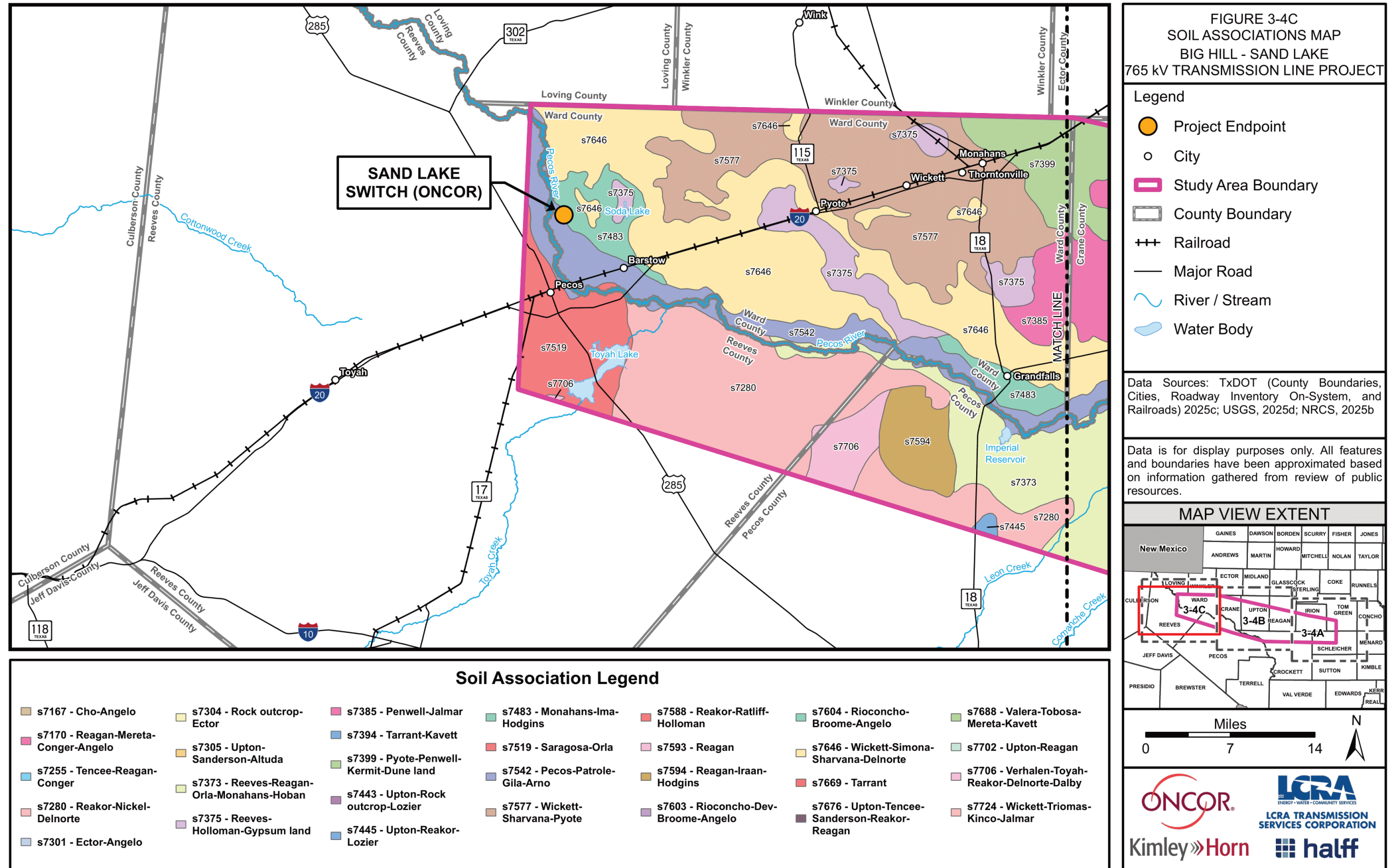
 s7167 - Cho-Angelo	 s7304 - Rock outcrop-Ector	 s7385 - Penwell-Jalmar	 s7483 - Monahans-Ima-Hodgins	 s7588 - Reakor-Ratliff-Holloman	 s7604 - Rioconcho-Broome-Angelo	 s7688 - Valera-Tobosa-Mereta-Kavett
 s7170 - Reagan-Mereta-Conger-Angelo	 s7305 - Upton-Sanderson-Altuda	 s7394 - Tarrant-Kavett	 s7483 - Monahans-Ima-Hodgins	 s7519 - Saragosa-Orla	 s7646 - Wickett-Simona-Sharvana-Delnorte	 s7702 - Upton-Reagan
 s7255 - Tencee-Reagan-Conger	 s7373 - Reeves-Reagan-Orla-Monahans-Hoban	 s7399 - Pyote-Penwell-Kermit-Dune land	 s7542 - Pecos-Patrole-Gila-Arno	 s7594 - Reagan-Iraan-Hodgins	 s7669 - Tarrant	 s7706 - Verhalen-Toyah-Reakor-Delnorte-Dalb
 s7280 - Reakor-Nickel-Delnorte	 s7443 - Upton-Rock outcrop-Lozier	 s7577 - Wickett-Sharvana-Pyote	 s7445 - Upton-Reakor-Lozier	 s7603 - Rioconcho-Dev-Broome-Angelo	 s7676 - Upton-Tencee-Sanderson-Reakor-Reagan	 s7724 - Wickett-Triomas-Kinco-Jalmar
 s7301 - Ector-Angelo	 s7375 - Reeves-Holloman-Gypsum land					



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Figure 3-4C: Soil Associations Map



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3.3.2 Prime Farmland

Section 4201(c)(1)(A) of Title 7 of the U.S. Code (USC) defines prime farmland soils as those soils that have the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, oilseed, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor, and without intolerable soil erosion (U.S., 1981). Prime farmland designations are applied to individual soil units. According to the NRCS (NRCS, 2025b), there are many soil associations mapped within the study area that are considered prime farmland, predominantly in the eastern portion of the study area.

3.4 Water Resources

3.4.1 Surface Water and Floodplains

A review of USGS data reveals the study area is located within thirteen watersheds (USGS, 2025c) across the Rio Grande and Colorado River basins (TWDB, 2025d). Watersheds are defined by the USGS as an area that drains all streams and rainfall to a common outlet such as a river, lake, or ocean (USGS, 2018). There are four ecologically significant stream segments (ESSS) within the study area: Leon Creek (No Segment ID), Pecos River (Segment ID: 2311), Spring Creek (Segment ID: 1423A), and Toyah Creek (No Segment ID) (TPWD, 2025a). The Pecos River, which intersects the central and western portion of the study area, represents the most prominent of these features. As tributaries of the Pecos River, ESSS represented by Leon Creek and Toyah Creek extend from the Pecos River to their headwater reaches. The ESSS of Spring Creek originates near the common corner of Schleicher, Irion, and Crockett counties and extends northeast of the study area through Tom Green County. Aerial imagery (ESRI World Imagery Basemap, 2025; NAIP, 2024) supports that the Pecos River has perennial flow while the other streams support intermittent flow. These water features generally drain to the east.

There are several lakes and reservoirs within the study area including Imperial Reservoir, Big Lake, and Toyah Lake. Imperial Reservoir, located in the western portion of the study area, is the most prominent of these water features. Owned and operated by Pecos County Water Improvement District Number 2, it is not currently at full capacity and has a dwindling water supply since the water is pumped from the Pecos River. Big Lake and Toyah Lake are ephemeral lakes as they are typically dry and only hold water temporarily after significant rainfall. During field reconnaissance in 2025, Big Lake and Toyah Lake were confirmed to not be at full capacity. Several smaller streams, ponds, wetlands, and lake features are scattered throughout the study area, including Juan Cordona Lake, Soda Lake, Blair Lake, and Mosquito Lake.

According to the USGS National Hydrography Dataset (NHD), surface waters in the study area include over 6,000 mapped flowline features, many of which are ephemeral draws where a defined bed and bank may not always be present (USGS, 2025d). The dataset includes over 1,500 mapped waterbodies, many of which are playa depressions, stock ponds, or man-made features (USGS, 2025d). According to the USFWS National Wetlands Inventory (NWI) data, there are over 300 mapped features within the study area (USFWS, 2025a). **Table 3-3** details the broad

categories of NWI features within the study area and their descriptions based on classifications by USFWS Office of Biological Services (Cowardin et al., 1979).

Table 3-3: NWI Features within the Study Area

NWI Feature	Description
Riverine	A system contained within a channel bounded on both sides by upland habitat.
Freshwater Emergent Wetland	In this wetland class, emergent plants are the tallest lifeform with at least 30% coverage. This vegetation is present for the growing season and is usually dominated by perennial plants.
Freshwater Forested/Shrub Wetland	In forested wetlands, trees are the dominant life form with at least 30% aerial composition. Scrub/shrub wetlands are dominated by woody plants.
Freshwater Pond	Small, shallow, permanent, or intermittent water bodies.
Lake	Extensive areas of deep water with considerable wave action.
Other	Features that do not satisfy the criteria above

Source: Cowardin et al., 1979; USFWS, 2025a

According to FEMA Flood Map Service Center (FEMA, 2025), studies to determine flood hazards for the portions of the study area within Crane, Irion, Pecos, Reagan, Reeves, Schleicher, Upton, and Winkler counties have not been completed. Although FEMA Flood Hazard Maps may not be available, flood hazard areas may be present in these counties within the study area (ESRI World Imagery Basemap, 2025; NAIP, 2024). According to the FEMA Flood Hazard data for Crockett, Ector, Tom Green, and Ward counties and 1985 Flood Insurance Rate Maps for unincorporated places, most of the study area is located within unshaded Zone X, Area of Minimal Flood Hazard. However, areas adjacent to major riverine features include mapped portions of hatched Zone A: 100-Year Floodplain (FEMA, 2025). No USACE managed lakes, dams, or other structures are present within the study area (USACE, 2025).

The TCEQ's Texas Integrated Report - Texas 303(d) List (Category 5) identifies the waterbodies in Texas for which stream segments exhibit a total maximum daily load impairment or for which other water quality management measures may be required (TCEQ, 2024). Based on this report and visual data from TCEQ Surface Water Quality Segment Viewer, there are impaired water features within the study area (TCEQ, 2025). **Table 3-4** lists the segments listed on the 2024 Texas Integrated Report which are located within the study area.

Table 3-4: Impaired Segments within the Study Area on the Texas Integrated Report

Segment Name	Segment ID	Total Maximum Daily Load	Counties
Upper Pecos River	2311	Yes	Crane, Crockett, and Pecos
Spring Creek	1423A	No	Crockett and Irion

Source: TCEQ, 2024, TCEQ, 2025

3.4.2 Groundwater/Aquifer

There are two major aquifers within the study area: the Edwards-Trinity and Pecos Valley aquifers (TWDB, 2011). The Edwards-Trinity Aquifer is located within the eastern and central portions of the study area. The Edwards-Trinity Aquifer extends across the southwestern part of Texas and ranges in depth from less than 100 feet in the north to greater than 800 feet to the south. It is primarily composed of limestone and dolomite of the Edwards Group and sands of the Trinity Group. Springs occur along the margins of the aquifer (TWDB, 2021). The Pecos Valley Aquifer is located within the far northwest portion of the study area. The Pecos Valley Aquifer in west Texas is comprised of sediments including alluvial and windblown deposits with an average saturated thickness of about 250 feet (TWDB, 2021).

In addition, there are four minor aquifers within the study area: the Capitan Reef Complex, Dockum, Lipan, and Rustler Aquifers (TWDB, 2011). **Table 3-5** below lists the major and minor aquifers within the study area, their primary use, and general coverage by county.

Table 3-5: Major and Minor Aquifers within the Study Area

Aquifer Name	Primary Use	Counties
Major Aquifers		
Edwards-Trinity	Irrigation, municipal, and livestock supplies	Crane, Crockett, Ector, Irion, Pecos, Reagan, Reeves, Schleicher, Tom Green, Upton, Winkler
Pecos Valley	Irrigation, municipal, industrial, and power generation	Crane, Crockett, Ector, Pecos, Reeves, Upton, Ward, Winkler
Minor Aquifers		
Capitan Reef Complex	Oil reservoir flooding in Ward County and a small amount is used to irrigate salt-tolerant crops in Pecos County	Pecos, Reeves, Ward, Winkler
Rustler	Irrigation, livestock, and water flooding operations in oil-producing areas	Pecos, Reeves, Ward
Dockum	Irrigation, municipal, oil field waterflooding operations	Crane, Crockett, Ector, Irion, Pecos, Reagan, Reeves, Tom Green, Upton, Ward, Winkler
Lipan	Irrigation, livestock, municipal, domestic, and manufacturing use	Irion, Schleicher, Tom Green

Source: TWDB, 2011

The study area is located within two TWDB groundwater management areas: #3 and #7 (TWDB, 2025a). Groundwater management areas were established to provide for the conservation, protection, preservation, recharging, and prevention of waste of groundwater or groundwater reservoirs (TWDB, 2025a). The study area is located within seven Groundwater Conservation Districts (GCDs) (TWDB, 2019). GCDs are required to develop and implement a management plan for the effective management of groundwater resources. **Table 3-6** below lists the GCDs within the study area and where they are located.

Table 3-6: Groundwater Conservation Districts within the Study Area

Groundwater Conservation District Name	County
TWDB Management Area #3	
Reeves County Groundwater Conservation District	Reeves
Middle Pecos Groundwater Conservation District	Pecos
TWDB Management Area #7	
Middle Pecos Groundwater Conservation District	Pecos
Santa Rita Underground Water Conservation District	Reagan
Glasscock Groundwater Conservation District	Reagan
Irion County Water Conservation District	Irion
Crockett County Groundwater Conservation District	Crockett
Plateau Underground Water Conservation and Supply District	Schleicher
Lipan-Kickapoo Water Conservation District	Tom Green

Source: TWDB, 2019

The TWDB Groundwater Database, Submitted Drillers Reports (SDR) Database, and Brackish Resources Aquifer Characterization System (BRACS) Program Points Dataset, identify over 16,000 groundwater wells within the study area (TWDB, 2025b). The SDR Database identified wells utilized for closed-loop geothermal use, domestic use, monitoring, irrigation, public supply, rig supply, stock use, testing, and other uses (TWDB, 2025c). The Groundwater Database detailed wells that are used for dewatering, domestic use, industrial use, irrigation, public supply, or stock use (TWDB, 2025d).

3.5 Ecology

3.5.1 Vegetation

The study area includes four MLRAs as mentioned in **Section 3.2.1**: Pecos and Canadian River Basins (70B); Southern High Plains, Southwestern Part (77D); Edwards Plateau, Western Part (81A); and Edwards Plateau, Central Part (81B) (USDA, 2022a).

The Pecos and Canadian River Basins MLRA (70B) has an average annual rainfall of 10 to 19 inches. Water resources include both surface waters, such as streams and reservoirs, and groundwater. Most areas within this MLRA are dominated by warm-season short grasses with a few mid-grasses and a smaller fraction of forbs and scattered shrubs. Mid-grasses grow in areas that receive extra moisture. Forbs vary greatly from year to year depending on amount and timing of precipitation. The most common species are black grama (*Bouteloua eriopoda*), blue grama (*Bouteloua gracilis*), alkali sacaton (*Sporobolus airoides*), sideoats grama (*Bouteloua curtipendula*), little bluestem (*Schizachyrium scoparium*), galleta (*Pleuraphis jamesii*), needle and thread (*Hesperostipa comata*), New Mexico feathergrass (*Hesperostipa neomexicana*), and purple threeawn (*Aristida purpurea*) (USDA, 2022a). Small soapweed yucca (*Yucca glauca*), sand sagebrush (*Artemisia filifolia*), and winterfat (*Krascheninnikovia lanata*) are the dominant shrubs in the northern part of the MLRA while the southern part of the MLRA is dominated by shrubs

such as broom snakeweed (*Gutierrezia sarothrae*), fringed sagewort (*Conocephalum salebrosum*), mormon tea (*Ephedra viridis*), and juniper (*Juniperus species (sp.)*) (USDA, 2022a). The Southern High Plains, Southwestern Part MLRA (77D) averages 14 to 16 inches of precipitation annually, but this varies greatly from year to year. The northeastern part of this area predominantly supports short and mid-grasses. Woody shrubs particularly yucca (*Yucca sp.*), catclaw (*Uncaria tomentosa*), and sand sagebrush make up five percent or less of the plant community. On sandy soils, grasses include tall grasses, such as little bluestem and sand bluestem (*Andropogon hallii*), as well as woody shrubs, specifically sand sagebrush, shin oak (*Quercus havardii*), and skunkbush (*Rhus trilobata*) (USDA, 2022a).

Rainfall in the Edwards Plateau, Western Part MLRA (81A) ranges from 15 to 25 inches per year. Water is scarce throughout the area because of limited precipitation and few perennial streams. This area supports a vegetative community of shrubs and short or mid-grasses including juniper, honey mesquite (*Prosopis glandulosa*), lotebush (*Ziziphus obtusifolia*), shin oak, sumac (*Rhus sp.*), Texas pricklypear (*Optuntia engelmannii*), tasajillo (*Cylindropuntia leptocaulis*), kidneywood (*Eysenhardtia sp.*), agarito (*Berberis trifoliata*), yucca, Lindheimer's silktassel (*Garrya ovata*), sotol (*Dasyilirion wheeleri*), catclaw, Mexican persimmon (*Diospyros texana*), sideoats grama, purple threeawn, Texas grama (*Bouteloua rigidiseta*), hairy grama (*Bouteloua hirsuta*), curly mesquite (*Hilaria belangeri*), buffalograss (*Bouteloua dactyloides*), and hairy tridens (*Erioneuron pilosum*) (USDA, 2022a).

Average precipitation within the Edwards Plateau, Central Part MLRA (81B) ranges from 19 to 32 inches annually. Water is limited throughout the area but is abundant along perennial streams. The vegetation ranges from trees, shrubs, to short or mid-grasses. Vegetation includes escarpment live oak (*Quercus fusiformis*), juniper, Texas red oak (*Quercus buckleyi*), shin oak, cedar elm (*Ulmus crassifolia*), netleaf hackberry (*Celtis reticulata*), flameleaf sumac (*Rhus copallinum* var. *lanceolata*), agarito, Mexican persimmon, Texas prickly pear (*Optuntia engelmannii*), kidneywood, saw greenbrier (*Smilax bona-nox*), Texas wintergrass (*Nassella leucotricha*), little bluestem, curly mesquite, Texas grama, Hall's panicum (*Panicum hallii*), purple threeawn, hairy tridens, cedar sedge (*Carex plnostachys*), two-leaved senna (*Senna roemeriana*), mat euphorbia (*Euphorbia maculata*), and rabbit-tobacco (*Pseudognaphalium obtusifolium*) (USDA, 2022a).

The TPWD Ecological Mapping Systems of Texas (EMST) was developed from 10-meter resolution image objects generated from aerial imagery (Elliott, 2014). The EMST is a vegetative database and is based off of ground data samples, landform modeling efforts, and aerial photography. The vegetation database has an accuracy of 74% to 90% (TPWD, 2014b). Based on the TPWD EMST and the Descriptions of Systems, Mapping Subsystems, and Vegetation Types for Texas (Elliott, 2014), 95 vegetation types occur in the study area (TPWD, 2014b). **Table 3-7** details the EMST vegetation types and their descriptions for terrestrial vegetation (**Section 3.5.1.1**) and aquatic/hydric vegetation (**Section 3.5.1.2**). For clarity, 95 vegetation types were synthesized into eight land cover types, which are depicted on **Figures 3-5A, 3-5B, and 3-5C**. The four most prevalent vegetation types in the study area and their percentages of

coverage are: Shrubland (61%), Grassland (32%), Barren (5%), Wetland/ Riparian (1%) (TPWD, 2014b).

3.5.1.1 Terrestrial Vegetation

The Shrubland and Grassland land cover types are most common in the study area and typically occur over alluvial and sand sheet deposits. While both classes support upland species, the Shrubland class features a more prominent shrub component, while the Grassland class is characterized by a sparse or absent shrub component and a prominent herbaceous layer. Common terrestrial vegetation species in the Shrubland class include Ashe juniper (*Juniperus ashei*), honey mesquite, plateau live oak (*Quercus fusiformis*), sideoats grama, and Torrey's yucca (*Yucca torreyi*). Common terrestrial vegetation species in the Grassland class include bermudagrass (*Cynodon dactylon*), Johnsongrass (*Sorghum halepense*), kleingrass (*Panicum coloratum*), little bluestem, and purple threeawn.

3.5.1.2 Aquatic/Hydric Vegetation

Hydric habitats have potential to occur within the riverine, lake, pond, and wetland habitats within the study area. NWI data was utilized to identify areas where jurisdictional wetlands may occur. According to the NWI data, wetlands are located within the study area (USFWS, 2025a). Common hydric vegetative species include rushes (*Juncus sp.*), sedges (*Carex sp.*), cattail (*Typha sp.*), smartweeds (*Polygonum sp.*), and spikerushes (*Eleocharis sp.*).

Aquatic and hydric vegetation communities occur within the study area, particularly along riparian corridors and low-lying areas associated with the Pecos River, Leon Creek, Spring Creek, Toyah Creek, and their tributary networks. These habitats were identified from aerial imagery (ESRI World Imagery Basemap, 2025; NAIP, 2024) and mapped resources such as the NWI (USFWS, 2025a). Not all riparian areas and associated wetlands meet the criteria of jurisdictional waters of the U.S. under USACE guidance, and site-specific surveys are required to confirm the status of these resources.

Figure 3-5A: Land Cover Map

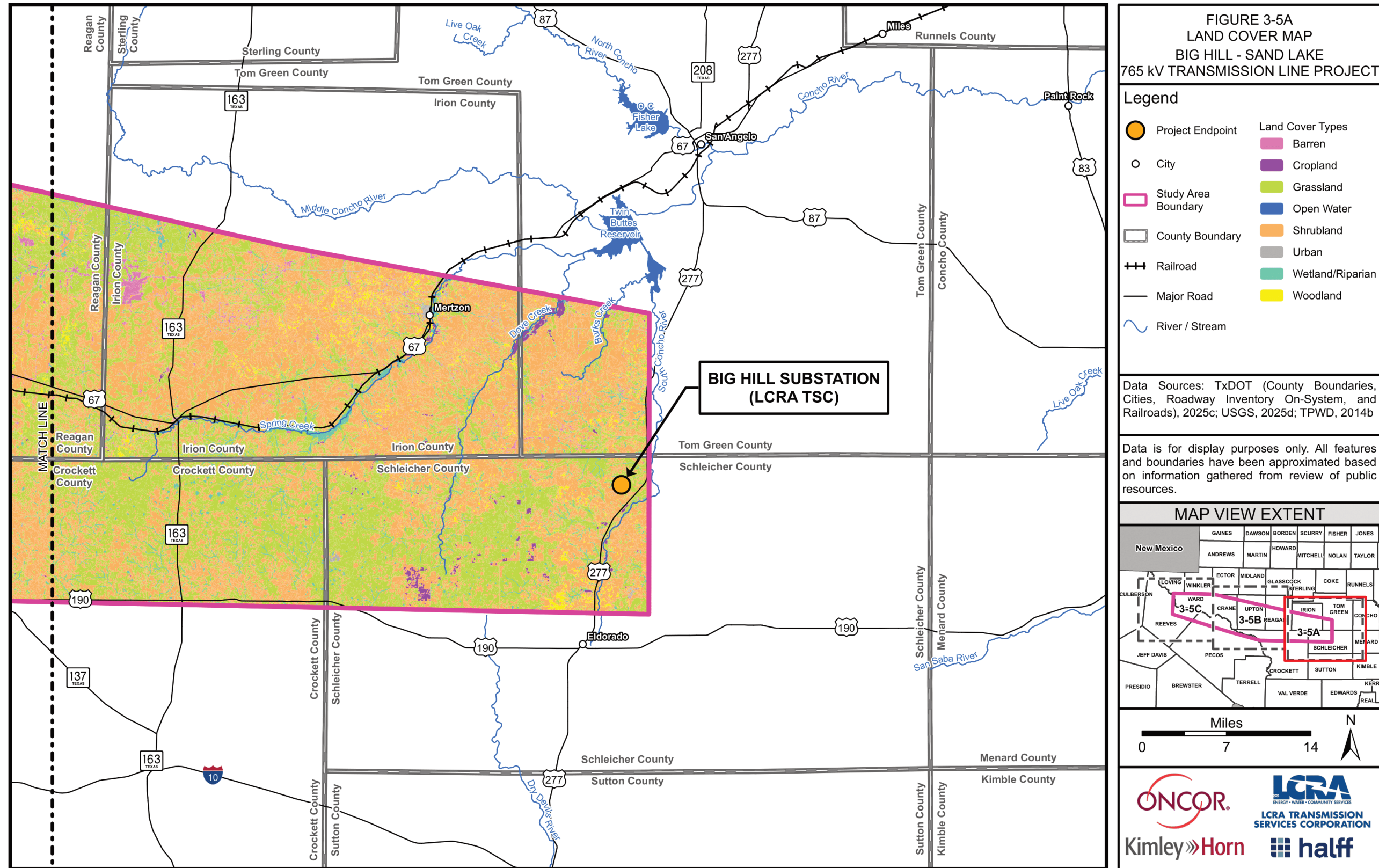


Figure 3-5B: Land Cover Map

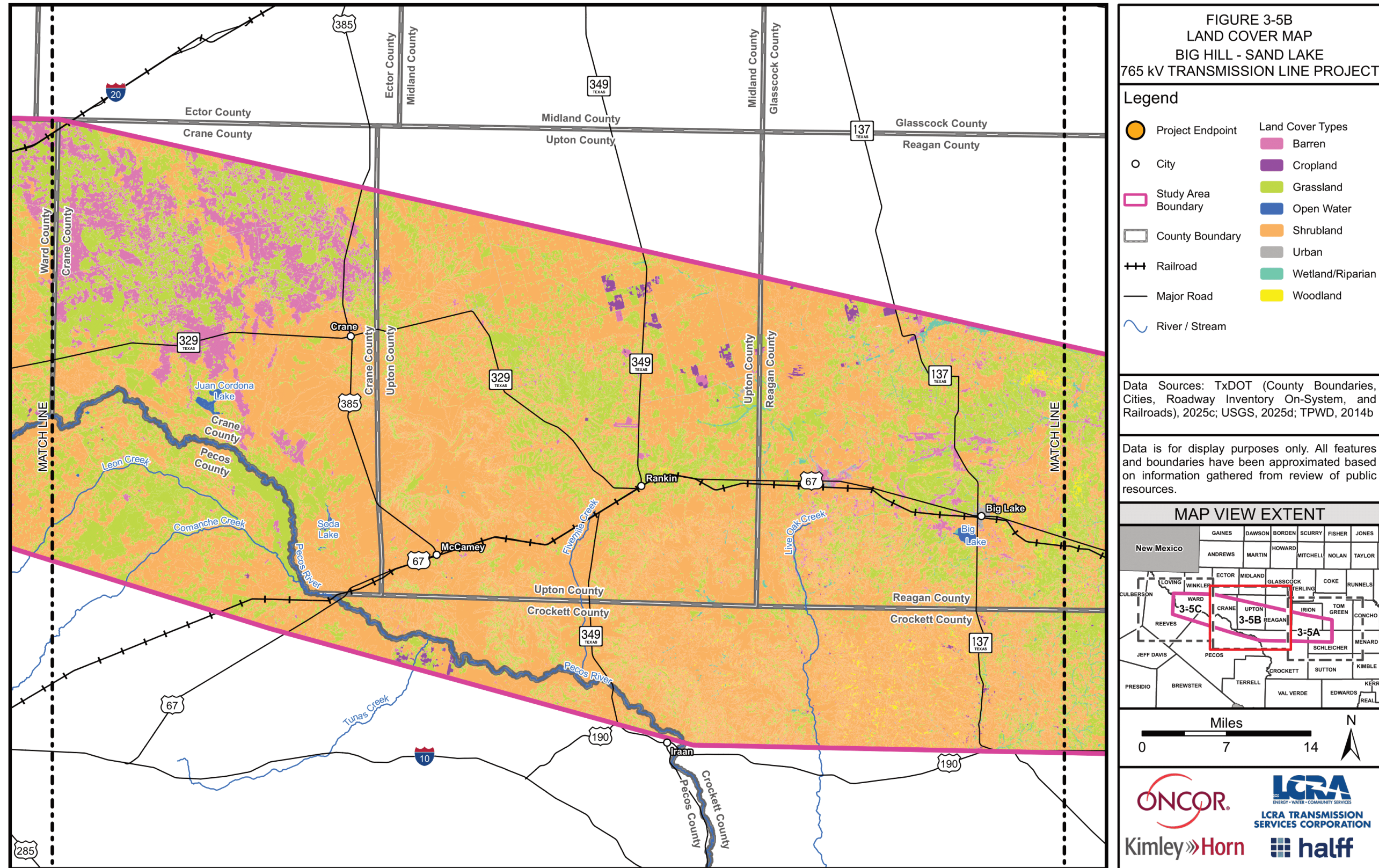
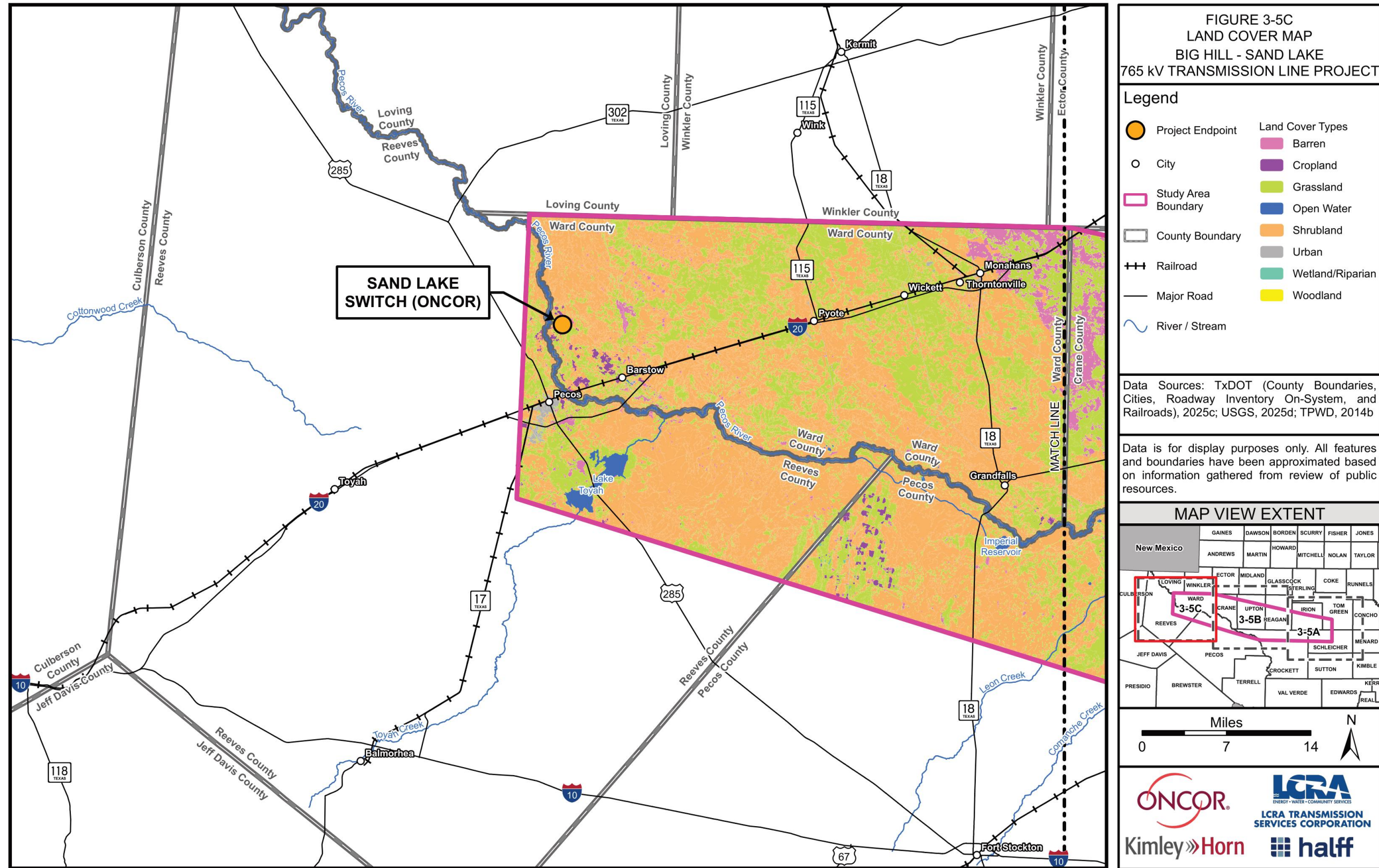


Figure 3-5C: Land Cover Map



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Table 3-7: Description of Vegetation Types within the Study Area

Vegetation Type	Description
Land Cover: Barren	
Barren	This type includes areas where little or no vegetative cover existed at the time of image data collection. Large areas cleared for development are included, as well as rural roads and buildings and associated clearings in primarily rural areas. Stream beds with exposed gravel or bedrock, rock outcrops, quarries, and mines may be mapped as this type. Fallow fields or areas within cropland blocks that remain barren throughout one growing season or heavily grazed pastures where bare soils are dominant may also be mapped as barren.
Edwards Plateau: Barren or Grassy Cliff/Bluff	This vegetation type generally lacks significant vegetative cover due to the limited potential for soil development on such steep surfaces. These cliffs or bluffs may have development of some lichen and patchy grass clumps in limited areas where soil can remain stable. Sparse shrubs and herbaceous cover may be present.
Edwards Plateau: Floodplain Barrens	Sparsely vegetated gravel bars, sand bars, or bare rock with scattered individual or small areas of little walnut (<i>Juglans microcarpa</i>), desert willow (<i>Chilopsis linearis</i>), baccharis (<i>Baccharis sp.</i>), brickellbush (<i>Brickellia sp.</i>), or other species.
Edwards Plateau: Riparian Barrens	Sparsely vegetated gravel bars, sand bars, or bare rock with scattered individuals or small areas of little walnut, desert willow, baccharis, brickellbush, or other species.
High Plains: Active Sand Dunes	Areas on deep sand and sandhill site types lacking significant vegetative cover.
High Plains: Sandhill Shinnery Duneland	Shrublands on deep sand or sandhill sites that typically lack Havard’s shin oak (<i>Quercus havardii</i>) as the dominant, though this species may be present. Species such as sand sage (<i>Artemisia filifolia</i>), Chickasaw plum (<i>Prunus angustifolia</i>), honey mesquite (<i>Prosopis glandulosa</i>), western soapberry (<i>Sapindus saponaria var. drummondii</i>), and skunkbush sumac (<i>Rhus trilobata</i>) dominate the shrub layer.
Rolling Plains: Breaks Canyon	Areas of the breaks and canyons that lack significant vegetative cover.
Trans-Pecos: Desert Pavement	Unvegetated to very sparsely vegetated sites on level to gently rolling, gravelly landscapes. These sites are often characterized by harsh, high temperature conditions often leading to the development of gravels coated with “desert varnish”. This vegetation type may occur on alluvial flats or the level portions of bajada fans at low elevations. Creosotebush (<i>Larrea tridentata</i>) often occurs as widely scattered shrubs.
Trans-Pecos: Desert Wash Barren	Sparsely vegetated sandy, gravelly, rocky stretches of desert drainages.
Trans-Pecos: Gypsum Barrens	Sparsely vegetated gypsum sites.
Trans-Pecos: Riparian Barren	Sparsely vegetated gravel bars, sand bars, or bare rock with scattered individuals or small areas of little walnut, desert willow, baccharis, brickellbush, or other species.
Land Cover: Cropland	
Row Crops	All cropland where fields are fallow for some portion of the year. Some fields may rotate in and out of cultivation frequently, and year-round cover crops are generally mapped as grassland.
Land Cover: Grassland	
Conservation Reserve Program / Other Improved Grassland	Grasslands of highly managed areas, sometimes dominated by non-native grasses such as bermudagrass (<i>Cynodon dactylon</i>), Johnsongrass (<i>Sorghum halepense</i>), and kleingrass (<i>Panicum coloratum</i>).

Vegetation Type	Description
Edwards Plateau: Floodplain Herbaceous Vegetation	Grasslands on floodplains, often dominated by bermudagrass and/or King Ranch bluestem (<i>Bothriochloa ischaemum</i> var. <i>songarica</i>). Native species that may be present, common, or dominant include switchgrass (<i>Panicum virgatum</i>), bushy bluestem (<i>Andropogon glomeratus</i>), Virginia wildrye (<i>Elymus virginicus</i>), Texas wintergrass (<i>Nassella leucotricha</i>), little barley (<i>Hordeum pusillum</i>), eastern gamagrass (<i>Tripsacum dactyloides</i>), Lindheimer muhly (<i>Muhlenbergia lindheimeri</i>), and creekoats (<i>Chasmanthium latifolium</i>).
Edwards Plateau: Semi-arid Grassland	These grasslands form the interstices of the shrubland matrix of the western portion of the Edwards Plateau, sometimes occurring as extensive areas with reduced cover of woody and succulent species (though scattered individuals of woody species may be present). Grasses such as purple threeawn (<i>Aristida purpurea</i>), red grama (<i>Bouteloua trifida</i>), sideoats grama (<i>Bouteloua curtipendula</i>), curly mesquite (<i>Hilaria belangeri</i>), hairy tridens (<i>Erioneuron pilosum</i>), slim tridens (<i>Tridens muticus</i>), Texas wintergrass, and/or silver bluestem (<i>Bothriochloa laguroides</i> subspecies (ssp.) <i>torreyana</i>) are common dominants.
High Plains: Alkali Sacaton Grassland	This type occurs in slightly drier soils than the High Plains: Salt Marsh type and may consist of low-diversity stands of alkali sacaton or may include more diverse areas with species such as honey mesquite, tobosa (<i>Pleuraphi mutica</i>), saltgrass (<i>Distichlis spicata</i>), foxtail barley (<i>Hordeum jubatum</i>), and fourwing saltbush (<i>Atriplex canescens</i>).
High Plains: Playa Grassland	This component includes areas of the playa lake dominated by grassland species such as western wheatgrass (<i>Pascopyrum smithii</i>), buffalograss (<i>Bouteloua dactyloides</i>), pale spikerush (<i>Eleocharis macrostachya</i>), vine mesquite (<i>Panicum obtusum</i>), blue-weed (<i>Helianthus ciliaris</i>), common frog-fruit (<i>Phyla nodiflora</i>), beakpod evening primrose (<i>Oenothera canescens</i>), narrowleaved goosefoot (<i>Chenopodium leptophyllum</i>), woollyleaf burr ragweed (<i>Ambrosia grayi</i>), Pennsylvania smartweed (<i>Polygonum pennsylvanicum</i>), and hierba del maranno (<i>Symphotrichum subulatum</i>), typically occupying drier portions of the playa or playas that have not been inundated for extended periods.
High Plains: Sand Prairie	These grasslands occupy deep sands/sandhills and are dominated by species such as giant dropseed (<i>Sporobolus giganteus</i>), sand dropseed (<i>Sporobolus cryptandrus</i>), sand bluestem (<i>Andropogon hallii</i>), big bluestem (<i>Andropogon gerardii</i>), little bluestem (<i>Schizachyrium scoparium</i>), thin paspalum (<i>Paspalum setaceum</i>), big sandreed (<i>Calamovilfa gigantea</i>), and common sandbur (<i>Cenchrus spinifex</i>). Some woody species may be present, including sand sage and Havard's shin oak.
High Plains: Shortgrass Prairie	On level to gently rolling uplands, with buffalograss and blue grama (<i>Bouteloua gracilis</i>) as common dominants. Other species that may be present include purple threeawn, sideoats grama, hairy grama (<i>B. hirsuta</i>), Texas grama (<i>B. rigidiseta</i>), fluffgrass, curly mesquite, and western wheatgrass.
Rolling Plains: Mixedgrass Prairie	Grassland dominated by species such as little bluestem, Texas wintergrass, sideoats grama, and silver bluestem.
Southwest: Tobosa - Mesquite Grassland	Swales and low basins with tight soils where honey mesquite forms a significant canopy over a grassland often dominated by tobosa.
Southwest: Tobosa Grassland	Grass dominated swales and basins with tight soils. This type is often dominated by tobosa.
Trans-Pecos: Desert Playa Grassland	This grassland forms in alternately wet and dry, internally draining, often clay-lined basins, sometimes over caliche. They tend to be sparsely vegetated, sometimes with open water, or herbaceous vegetation. High evaporation rates lead to high salinity and halophytic species may be common. Species that may be present include saltgrass, pickle-weed (<i>Allenrolfea occidentalis</i>), oreja de pero (<i>Tiquilia canescens</i>), seablite (<i>Suaeda</i> spp.), Russian thistle (<i>Salsola</i> spp.), and fourwing saltbush.

Vegetation Type	Description
Trans-Pecos: Desert Wash Grassland	Grass dominated desert drainages, though grass cover is typically not continuous and gravel, rock, or sand is usually visible. Species present may include sideoats grama, silver bluestem, alkali sacaton (<i>Sporobolus airoides</i>), bush muhly (<i>Muhlenbergia porteri</i>), deergrass (<i>Muhlenbergia rigens</i>), tobosa, and/or black grama (<i>Bouteloua eriopoda</i>).
Trans-Pecos: Gypsum Grassland	This type is mapped over gyp-influenced soils, usually at relatively low elevations. Important species may include gypgrass, gyp grama, rough coldenia, sand nama, threadleaf glowwort, alkali sacaton, and onion blanket-flower. Fourwing saltbush, Torrey’s ephedra, mesquite, creosotebush, and javelina bush are common shrubs.
Trans-Pecos: Hill and Foothill Grassland	This grassland sometimes occurs in association with Chihuahuan Mixed Desert and Thornscrub, and may have shrubs present. The herbaceous layer may be dense, but typically much bare ground or rock is visible. Graminoids dominate the layer with species such as black grama, sideoats gram, curlyleaf muhly (<i>Muhlenbergia setifolia</i>), chino grama (<i>Bouteloua ramosa</i>), bush muhly, sixweeks grama (<i>Bouteloua barbata</i>), fluffgrass, Arizona cottontop (<i>Digitaria californica</i>), and threeawns (<i>Aristida species (spp.)</i>). On some slopes, species such as smooth sotol (<i>Dasyllirion leiophyllum</i>), Texas sacahuista (<i>Nolina texana</i>), Engelmann pricklypear (<i>Opuntia engelmannii</i>), lechuguilla (<i>Agave lechuguilla</i>), Torrey’s yucca (<i>Yucca torreyi</i>) and/or ocotillo (<i>Fouquieria splendens</i>) may be conspicuous, though scattered elements.
Trans-Pecos: Loamy Plains Grassland	This grassland occupies level, deep loams of intermountain basins and is frequently invaded by honey mesquite, creosotebush, and tarbush (<i>Flourensia cernua</i>).
Trans-Pecos: Salty Desert Grassland	Saline sites with significant graminoid cover of species such as fourwing saltbush, pickle-weed, and big sacaton (<i>Sporobolus wrightii</i>). This vegetation type lacks or has sparse shrub canopy cover.
Trans-Pecos: Sandy Desert Grassland	Saline sites with significant graminoid cover of species mentioned above and lacking, or having sparse, shrub canopy cover.
Land Cover: Open Water	
High Plains: Salt Lake	Margins and center of salt lakes, either sparsely vegetated or open water.
Open Water	In addition to large lakes, rivers, and marine water, ephemeral ponds may be mapped as open water. Some mapped areas may support vegetation with pioneering species such as black willow (<i>Salix nigra</i>), eastern cottonwood (<i>Populus deltoides</i>), Chinese tallow (<i>Triadica sebifera</i>), seepweeds (<i>Suaeda spp.</i>), sea ox-eye daisy (<i>Borrchia frutescens</i>), saltwort (<i>Batis maritima</i>), rushes (<i>Juncus spp.</i>), sedges, cattails (<i>Typha spp.</i>), and spikerushes (<i>Eleocharis spp.</i>).
Land Cover: Shrubland	
Edwards Plateau: Ashe Juniper-Live Oak Shrubland	This is a commonly encountered type of shrub cover on the Edwards Plateau. It is usually dominated by Ashe juniper (<i>Juniperus ashei</i>), often to the almost total exclusion of other species.
Edwards Plateau: Deciduous Semi-arid Shrubland	This shrubland occurs within the more arid regions of the western portions of the Edwards Plateau. Dominant shrub species within this type include Texas persimmon (<i>Diospyros texana</i>), honey mesquite, Vasey shin oak (<i>Quercus vaseyana</i>), white shin oak (<i>Quercus sinuata var. breviloba</i>), shrubby blue sage (<i>Salvia ballotiflora</i>), agarito (<i>Berberis trifoliolata</i>), condalia (<i>Condalia sp.</i>), Texas mountain-laurel (<i>Sophora secundiflora</i>), and guajillo (<i>Acacia berlandieri</i>). Succulents, including Texas sotol (<i>Dasyllirion texanum</i>), Texas sacahuista, Lindheimer pricklypear (<i>Opuntia engelmannii var. lindheimeri</i>), and Lechuguilla, are commonly encountered in the driest, rockiest situations.
Edwards Plateau: Deciduous Semi-arid Slope Shrubland	Shrublands of the western portion of the Edwards Plateau occurring on slopes greater than 20% and dominated by deciduous shrub species.

Vegetation Type	Description
Edwards Plateau: Floodplain Ashe Juniper Shrubland	Ashe juniper dominated shrublands on floodplains.
Edwards Plateau: Floodplain Deciduous Shrubland	Shrublands on floodplains dominated by species in the shrub layer of the surrounding woodlands or other species such as honey mesquite, huisache (<i>Acacia farnesiana</i>), little walnut, western soapberry, agarito (<i>Mahonia trifoliolata</i>), black willow, and common buttonbush (<i>Cephalanthus occidentalis</i>).
Edwards Plateau: Juniper Semi-Arid Slope Shrubland	This shrubland occurs on slopes greater than 20% in the western portions of the Edwards Plateau. They are dominated by redberry juniper (<i>Juniperus pinchotii</i>) and/or Ashe juniper, but often have other deciduous shrub components, including honey mesquite, Texas persimmon, and guajillo.
Edwards Plateau: Juniper Semi-Arid Shrubland	This shrubland is commonly encountered on the western portions of the Edwards Plateau and is dominated by redberry juniper or Ashe juniper shrubs. Other shrub species commonly encountered include honey mesquite, agarito, Texas persimmon, cenizo (<i>Leucophyllum frutescens</i>), and guajillo. Lindheimer pricklypear and Texas sotol are commonly encountered succulents.
Edwards Plateau: Riparian Ashe Juniper Shrubland	Shrublands on riparian sites dominated by Ashe juniper.
Edwards Plateau: Riparian Deciduous Shrubland	A variety of small trees or shrubs such as black willow, sugar hackberry (<i>Celtis laevigata</i>), honey mesquite, desert willow (<i>Salix exigua</i>), baccharis, Texas persimmon, little walnut, or whitebrush (<i>Aloysia gratissima</i>) may dominate this broadly circumscribed type which is mapped mainly along first-order drainages.
Edwards Plateau: Shin Oak Shrubland	White shin oak may be the significant dominant in these shrublands, sometimes forming nearly monotypic stands. Plateau live oak (<i>Quercus fusiformis</i>), Ashe juniper, and other broad-leaved evergreen shrub species may be common components but are not dominant.
High Plains: Mesquite Shrubland	Honey mesquite is dominant, with shrub dominated occurrences with a scattered overstory component, if any.
High Plains: Salt Lake Shrubland	Shrublands surrounding salt lakes, often dominated by fourwing saltbush or salt cedar (<i>Tamarix spp.</i>). Honey mesquite is also commonly encountered.
Native Invasive: Juniper Shrubland	Various species of Ashe juniper dominate these shrublands. Eastern redcedar (<i>Juniperus virginiana</i>) is the primary dominant of these shrublands or low woodlands in the Blackland Prairie, Post Oak Savanna, and far northern Cross Timbers ecoregions. To the west, on the Rolling Plains, redberry juniper may be the dominant. In other areas, Ashe juniper may dominate these shrublands.
Native Invasive: Mesquite - Creosotebush Shrubland	Invasive shrublands dominated by honey mesquite and/or creosotebush. Other species such as tarbush, mariola (<i>Parthenium incanum</i>), whitethorn acacia (<i>Acacia constricta</i>), and fourwing saltbush are commonly encountered.
Native Invasive: Mesquite Shrubland	Honey mesquite is often the dominant species of this broadly defined type, but species such as huisache, sugar hackberry, Ashe juniper, cedar elm (<i>Ulmus crassifolia</i>), lotebush (<i>Ziziphus obtusifolia</i>), agarito, winged elm (<i>Ulmus alata</i>), sumacs, brasil (<i>Condalia hookeri</i>), common persimmon (<i>Diospyros virginiana</i>), Texas persimmon, granjeno, and Lindheimer pricklypear may also be important.
Non-native Invasive: Saltcedar Shrubland	Mainly invasive shrublands are characteristic of this type and salt cedars are the most common dominant. Species such as shrubby sumpweed (<i>Iva frutescens</i>), baccharis, honey mesquite, huisache, sugar hackberry, and sea ox-eye daisy may also be present.
Rolling Plains: Breaks Evergreen Shrubland	Herbaceous cover is usually dominated by mid- to short grasses such as purple threeawn, sideoats grama, silver bluestem, blue grama, hairy grama, and little bluestem. Also includes shrub cover with significant amounts of evergreen species such as redberry juniper or, to a lesser extent, Ashe juniper.

Vegetation Type	Description
Trans-Pecos: Desert Deep Sand and Dune Shrubland	Typically occupies dry slopes with significant exposed rock (typically limestone) or gravel. Shrub species such as creosotebush, mariola, skeleton-leaf golden eye (<i>Viguiera stenoloba</i>), agarito, and desert olive (<i>Forestiera angustifolia</i>) may be present, but succulents such as Torrey’s yucca, Texas sotol, lechuguilla, ocotillo, smooth sotol, candelilla (<i>Euphorbia antisyphilitica</i>), and pricklypears (<i>Opuntia spp.</i>) are conspicuous and are the aspect dominants. Overall cover is generally low and bare rock is easily visible in most occurrences. Herbaceous cover is low with grasses such as black grama, chino grama, and sideoats grama sometimes present. Fern and fern allies such as cloakferns (<i>Astrolepis spp.</i>), lipferns (<i>Cheilanthes spp.</i>), and resurrection plant (<i>Selaginella lepidophylla</i>) are often common.
Trans-Pecos: Succulent Desert Scrub	This type is mapped at low elevations on relatively steep slopes. Shrub, succulent, and grass diversity is often relatively high though vegetative cover may be low. Succulents may include species such as Torrey’s yucca, Texas sotol, lechuguilla, pricklypear species, and candelilla. Shrubs such as ocotillo, creosotebush, mariola, whitethorn acacia, leatherstem, skeleton-leaf golden eye, honey mesquite, and desert olive are common. Grasses may include species such as chino grama, black grama, sideoats grama, slim tridens, and threeawns.
Trans-Pecos: Creosotebush Scrub	This is the typical expression for the vegetation type occupying large areas of the intermontane basins and with creosotebush as the clear, often monotypic dominant.
Trans-Pecos: Desert Deep Sand and Dune Scrub	Shrubby sites on coppice dunes associated with aeolian sands of the Trans-Pecos, often resulting from degradation of grasslands of the North American Warm Desert Active and Stabilized Dunes or the Chihuahuan Sandy Plains Semi-Desert Grassland. Honey mesquite and sand sage are the commonest dominants, but other woody species include soaptree yucca (<i>Yucca elata</i>), tree cholla (<i>Cylindropuntia imbricata</i>), fourwing saltbush, and mormon-tea (<i>Ephedra spp.</i>).
Trans-Pecos: Desert Wash Evergreen Shrubland	Desert drainages with evergreen shrub cover, with species such as redberry juniper.
Trans-Pecos: Desert Wash Shrubland	Shrub dominated desert drainages sometimes with a sporadic emergent overstory of scattered trees.
Trans-Pecos: Gypsum Shrubland	Gypsum sites with significant shrub cover with species including fourwing saltbush, honey mesquite, creosotebush, javelina bush (<i>Condalia ericoides</i>), Torrey’s yucca, and/or Torrey jointfir (<i>Ephedra torreyana</i>).
Trans-Pecos: Mixed Desert Shrubland	In this Chihuahuan Desert of Texas, this vegetation type is widely distributed and often occupies foot slopes and hilly landforms of limestones, sandstones, and igneous strata, though it is best developed on limestones. This shrubland can occur in proximity to Apacherian – Chihuahuan Semi-Desert Grassland and Steppe, Chihuahuan Creosotebush Desert Scrub, and/or Chihuahuan Succulent Desert Scrub. Creosotebush, mariola, javelina bush, catclaw mimosa (<i>Mimosa aculeaticarpa var. biuncifera</i>), Torrey’s yucca, whitethorn acacia, lechuguilla, smooth sotol, skeleton-leaf golden eye, cenizo (<i>Leucophyllum spp.</i>), and honey mesquite are often present to dominant, but numerous shrub species may be present. It differs from Chihuahuan Creosotebush Desert Scrub in having a diversity of shrub species present and is not a nearly monotypic stand of creosotebush. Herbaceous cover is generally low with species such as black grama, chino grama, sideoats grama, red grama, purple threeawn, fluffgrass, and curlyleaf muhly.

Vegetation Type	Description
Trans-Pecos: Riparian Shrubland	Shrublands along drainages with species such as baccharis, brickellbush, and desert willow.
Trans-Pecos: Salty Desert Scrub	Usually occurs as an open-canopied shrubland surrounding saline basins, alluvial fans, and the salty bottomlands along the Pecos River. Substrates are fine-textured, alluvial, and saline. Species making up the often relatively sparse vegetative cover include fourwing saltbush, pickle-weed, desert seepweed (<i>Suaeda suffrutescens</i>), tasajillo (<i>Cylindropuntia leptocaulis</i>), western honey mesquite, southern Jimmy-weed (<i>Isocoma pluriflora</i>), winged sea purslane (<i>Sesuvium verrucosum</i>), allthorn (<i>Koeberlinia spinosa</i>), tubercled saltbush (<i>Atriplex acanthocarpa</i>), tarbush, and lotebush. Non-native halophiles such as prickly Russian thistle (<i>Salsola tragus</i>), camelthorn (<i>Alhagi maurorum</i>), African rue (<i>Peganum harmala</i>), and salt cedars are commonly encountered to dominant. Graminoids commonly found, and sometimes constituting significant cover, include Sporobolus alkali sacaton (<i>airoides</i>), big sacaton, saltgrass, false Rhodes grass (<i>Trichloris crinita</i>), pink pappusgrass (<i>Pappophorum bicolor</i>), tobosa and burrograss.
Trans-Pecos: Sparse Creosotebush Scrub	This type occupies areas of the intermontane basin plains with low vegetative cover, often with significant desert pavement under a sparse canopy of almost monotypic creosotebush.
Land Cover: Urban	
Urban High Intensity	This type consists of built-up areas and wide transportation corridors that are dominated by impervious cover.
Urban Low Intensity	Includes areas that are built-up but not entirely covered by impervious cover, including most of the area within cities and towns.
Land Cover: Wetland/ Riparian	
Edwards Plateau: Riparian Hardwood Forest	Woodlands with a canopy dominated by deciduous species such as plateau live oak, American sycamore (<i>Platanus occidentalis</i>), baldcypress (<i>Taxodium distichum</i>), Texas ash (<i>Fraxinus texensis</i>), green ash (<i>Fraxinus pennsylvanica</i>), cedar elm, sugar hackberry, boxelder, mesquite, Texas oak (<i>Quercus buckleyi</i>), Ashe juniper, black willow, and/or western soapberry.
Edwards Plateau: Riparian Herbaceous Vegetation	Riparian sites dominated by upland herbaceous vegetation, often including species such as bushy bluestem, switchgrass, sawgrass (<i>Cladium mariscus var. jamaicense</i>), eastern gamagrass, southwestern bristlegass (<i>Setaria scheelei</i>), Texas wintergrass, spikerush, brickellbush, American water-willow, water penny, and/or Lindheimer muhly.
Edwards Plateau: Riparian Herbaceous Wetland	Riparian sites dominated by wetland herbaceous vegetation, often including species such as bushy bluestem, switchgrass, sawgrass, eastern gamagrass, southwestern bristlegass, Texas wintergrass, spikerush, brickellbush, American water-willow, water penny, and/or Lindheimer muhly.
High Plains: Depressional Marsh	This vegetation type is composed of lowland depressions; it also occurs along lake borders that have more open basins and a permanent water source through most of the year, except during exceptional drought years. A variety of species are part of this vegetation type, including emergent species of cattails, carex (<i>Carex</i>), spikerushes, rushes, and bulrushes (<i>Schoenoplectus</i>), as well as floating genera such as pondweed (<i>Potamogeton</i>), arrowhead (<i>Sagittaria</i>), or hornwort (<i>Ceratophyllum</i>).
High Plains: Playa Lake	Areas in the vicinity of playa lakes that either lack significant vegetative cover or are covered by water.

Vegetation Type	Description
High Plains: Riparian Herbaceous Vegetation	Grassland or marsh of riparian situations, including species such as tobosa, Texas wintergrass, silver bluestem, and little bluestem.
Marsh	Areas mapped as marsh are small, and consist of wet or alternately wet and dry soils with herbaceous vegetation. These are often near tanks or ponds, and may contain cattails, spikerushes, bulrushes, other sedges, smartweeds and grasses such as Johnsongrass or bermudagrass as important species. Some shrubs such as common buttonbush and black willow may be important in this mapped type.
Trans-Pecos: Desert Cienega Marsh	This type circumscribes desert marsh or wet grassland areas that may be more or less wet and more or less salty. Different water regimes cause zonation in some of the larger cienegas, with wetter areas dominated by bulrushes, slightly drier areas dominated by saltgrass, and drier areas still dominated by alkali sacaton. Other common species include big sacaton, alkali muhly (<i>Muhlenbergia asperifolia</i>), sea purslane (<i>Sesuvium portulacastrum</i>), desert horse purslane (<i>Trianthema portulacastrum</i>), and seepweeds. Honey mesquite, fourwing saltbush, and saltcedars are common woody components.
Trans-Pecos: Marsh	Vegetation occupying depressions, margins of lakes, or margins of streams that are frequently or continuously inundated by freshwater. This vegetation type includes marshes occupying stock tanks and other man-made depressions, and other moist to wet sites other than marshes. The vegetation is dominated by herbaceous species including American bulrush (<i>Schoenoplectus pungens var. longispicatus</i>), hardstem bulrush (<i>Schoenoplectus acutus</i>), saw-grass (<i>Cladium mariscus ssp. jamaicense</i>), sand spikerush (<i>Eleocharis montevidensis</i>), rabbitfoot grass (<i>Polypogon monspeliensis</i>), barnyard grass (<i>Echinochloa crus-galli</i>), Bermudagrass, common reed (<i>Phragmites australis</i>), Carolina canary grass (<i>Phalaris caroliniana</i>), southern cattail (<i>Typha domingensis</i>), rushes, pondweeds, smartweeds, coontail (<i>Ceratophyllum demersum</i>), and stoneworts (<i>Chara spp.</i>).
Edwards Plateau: Playa	This type includes shallow wetlands formed over limestone on the Edwards Plateau of Texas. Dominant species may include tobosa, buffalograss, white tridens, widowsgrass (<i>Sedum pulchellum</i>), yellow stonecrop, poverty dropseed, hairy leavedaisy (<i>Chaetopappa bellidifolia</i>), western ragweed, whitlow-wort (<i>Paronychia spp.</i>), and blue-green algae (<i>Nostoc commune</i>).
Land Cover: Woodland	
Edwards Plateau: Ashe Juniper Motte and Woodland	These relatively closed woodlands are very common on uplands on limestone in the Edwards Plateau and adjacent ecoregions. Ashe juniper is the clear dominant in the canopy and a conspicuous component of the shrub layer as well. Eastern redcedar may be present in the canopy to the northeast, while redberry juniper may be present to the west. Occurrences containing thick stands of juniper are sometimes referred to as “cedar breaks”.
Edwards Plateau: Ashe Juniper Slope Forest	Forest or woodland of slopes generally greater than 20% on steep rocky sites with coniferous evergreen canopy cover. The canopy of these sites is dominated by Ashe juniper, but usually with plateau live oak and a deciduous component present (often Texas oak, white shin oak, or Lacey oak (<i>Quercus laceyi</i>), at least. The canopy is usually relatively closed and the sites are rocky, resulting in a sparse and depauperate shrub and herbaceous layer.
Edwards Plateau: Deciduous Oak - Evergreen Motte and Woodland	These woodlands are intermediate between those strongly dominated by the evergreen components Ashe juniper and plateau live oak and those dominated by deciduous components, particularly oaks such as Texas oak, white shin oak, and Lacey oak.

Vegetation Type	Description
Edwards Plateau: Floodplain Ashe Juniper Forest	These are forests and woodlands with a canopy dominated by Ashe juniper. Woody species in the subcanopy may include gum bumelia, wafer-ash (<i>Ptelea trifoliata</i>), roughleaf dogwood, red mulberry, Texas persimmon, Virginia creeper (<i>Parthenocissus quinquefolia</i>), grape (<i>Vitis spp.</i>), greenbrier (<i>Smilax bona-nox</i>), Roosevelt-weed (<i>Baccharis neglecta</i>), Turk's cap (<i>Malvaviscus arboreus var. drummondii</i>), and possumhaw (<i>Ilex decidua</i>).
Edwards Plateau: Floodplain Hardwood - Ashe Juniper Forest	These are forests and woodlands with a canopy dominated or co-dominated by evergreen and deciduous species such as pecan (<i>Carya illinoensis</i>), cedar elm, American elm, sugar hackberry, netleaf hackberry (<i>Celtis laevigata var. reticulata</i>), and/or plateau live oak.
Edwards Plateau: Floodplain Hardwood Forest	These are forests and woodlands with a canopy dominated or co-dominated by evergreen and deciduous species such as pecan, cedar elm, American elm, sugar hackberry, netleaf hackberry, and/or plateau live oak.
Edwards Plateau: Floodplain Live Oak Forest	These are forests and woodlands with a canopy dominated or co-dominated by plateau live oak. Deciduous species can be, and frequently are, common in the canopy, but plateau live oak clearly dominates. Ashe juniper may also be present.
Edwards Plateau: Live Oak Motte and Woodland	These relatively closed woodlands are common throughout the Edwards Plateau and adjacent ecoregions on limestone. Plateau live oak dominates the overstory, however other species such as white shin oak, cedar elm, Texas oak, hackberry (<i>Celtis spp.</i>), Lacey oak, post oak, and Vasey shin oak may also be present to common.
Edwards Plateau: Live Oak Slope Forest	Forest or woodland dominated by plateau live oak and occupying generally rocky sites on slopes greater than 20%. Ashe juniper is typically present and may be particularly conspicuous as an understory component. Deciduous species such as Texas oak, white shin oak, Lacey oak, cedar elm, and others may also be present in the canopy.
Edwards Plateau: Oak - Ashe Juniper Slope Forest	Forests or woodlands on steep rocky slopes, co-dominated by Ashe juniper and deciduous species such as Texas oak, Lacey oak, chinkapin oak, and white shin oak. Plateau live oak is also frequently conspicuous in the canopy. These sites are intermediate in dryness between juniper dominated slopes and those dominated by deciduous hardwood species. Ashe juniper may reach large sizes on such slopes.
Edwards Plateau: Oak - Hardwood Motte and Woodland	While Texas oak, hackberries, and cedar elm are significant elements of the canopy of nearby slope forests and woodlands, and they may also dominate upland sites.
Edwards Plateau: Oak - Hardwood Slope Forest	Forest or woodland on slopes generally greater than 20% on steep rocky sites with significant deciduous canopy cover. These sites tend to be somewhat more mesic than similar sites dominated by evergreen canopy. The overstory may be diverse, with species such as Texas oak, Lacey oak, white shin oak, chinkapin oak, cedar elm, netleaf hackberry, Texas ash, escarpment black cherry (<i>Prunus serotina var. eximia</i>), Arizona walnut (<i>Juglans major</i>), and others.
Edwards Plateau: Oak / Hardwood Motte and Woodland	While Texas oak, hackberries, and cedar elm are significant elements of the canopy of nearby slope forests and woodlands, they may also dominate upland sites.
Edwards Plateau: Riparian Ashe Juniper Forest	Forest or woodland on riparian sites dominated by Ashe juniper. Otherwise generally fitting the description of forest or woodland occurrences with some deciduous species and plateau live oak present in the canopy.
Edwards Plateau: Riparian Hardwood - Ashe Juniper Forest	Ashe juniper, redberry juniper, and plateau live oak are frequent dominant trees of this broadly defined mixed forest mapped along narrow upland drainages. American sycamore, sugar hackberry, cedar elm, and honey mesquite may be components.

Vegetation Type	Description
Edwards Plateau: Riparian Live Oak Forest	Forest or woodland on riparian sites dominated by plateau live oak. Otherwise, this vegetation type generally fits the description of forest or woodland occurrences of the vegetation type, with some deciduous species and Ashe juniper present in the canopy.
Edwards Plateau: Wooded Cliff/Bluff	Some of these sites may be mesic, accumulating moisture from nearby slopes in crevices within the limestone substrate, and seeps may be present. They often occur as long narrow bands. Seeps and mesic sites may have fairly dense cover of maidenhair fern (<i>Adiantum capillus-veneris</i>) with patches of Lindheimer's maidenhair fern (<i>Thelypteris ovata</i> var. <i>lindheimeri</i>) present. More xeric sites often have significant shrub cover, with species such as Texas butterfly bush (<i>Buddleja racemosa</i>), Mexican buckeye (<i>Ungnadia speciosa</i>), Texas persimmon, shrubby boneset (<i>Ageratina havanensis</i>), Lindheimer's silktassel (<i>Garrya ovata</i> ssp. <i>lindheimeri</i>), southwest bernardia (<i>Bernardia myricifolia</i>), mock orange (<i>Philadelphus</i> spp.), snowbell (<i>Styrax</i> spp.), and poison ivy (<i>Toxicodendron radicans</i> ssp. <i>eximium</i>).
High Plains: Mesquite Woodland	Areas where honey mesquite has invaded and grown to tree stature to dominate the canopy.
Native Invasive: Deciduous - Juniper Woodland	Woodlands, typically of disturbed sites, sharing dominance between junipers (<i>Juniperus</i> spp.) and deciduous species such as netleaf hackberry, western soapberry, honey mesquite, and the non-native Siberian elm (<i>Ulmus pumila</i>).
Native Invasive: Deciduous Woodland	This broadly-defined type may have sugar hackberry, water oak, cedar elm, sweetgum, winged elm, yaupon, huisache, ashes, or honey mesquite among the dominants.
Native Invasive: Juniper Woodland	This type may be dominated either by Ashe juniper in the northwest, over Edwards Plateau limestones, or by eastern redcedar in the northeast and east, or redberry juniper to the northwest. Plateau live oak is a common component, and species such as sugar hackberry and cedar elm occur throughout.
Non-native Invasive: Elm - Olive Woodland	This woodland typically occupies sites that do not naturally support woodland, but they may occur in floodplains or riparian sites as well. This type is often found on fence rows, home sites, and shelterbelt plantings typically of the High Plains and Rolling Plains. It is often dominated by Siberian elm and Russian olive, though honey mesquite and hackberries may also be present.
Non-native Invasive: Common Reed	Areas mapped within this type are often dominated by nearly pure stands of common reed on formerly disturbed soils.
Trans-Pecos: Riparian Woodland	Woodlands along drainages where the overstory may be composed of species such as willows (<i>Salix</i> spp.), cottonwoods (<i>Populus</i> spp.), western soapberry, netleaf hackberry, and/or honey mesquite. Some occurrences mapped as these woodlands may be dominated by saltcedar.

Source: TPWD, 2014b; Elliott, 2014

3.5.1.3 Commercially or Recreationally Important Vegetation

Traditional agriculture was observed within the study area during field reconnaissance. Based on field reconnaissance and a review of the MLRAs, the study area is dominated by rangeland and grazing. Agriculturally important crop species within the study area are cotton, alfalfa, grain sorghum, and wheat. Minor crops include forage sorghum and small grains (USDA, 2022b). During the reconnaissance surveys, active grazing, agricultural fields, and traveling irrigation systems were observed.

3.5.1.4 Endangered and Threatened Plant Species

The USFWS has the authority under the ESA to list and monitor species considered imperiled. The regulations implementing the ESA are codified and updated in 50 CFR Part 17 (U.S., 1975). The federal process identifies potential candidates based on their biological vulnerability, considering many factors within the species' range and using the best available scientific data. Data from the USFWS Information for Planning and Consultation (IPaC) tool was reviewed on November 12, 2025, and was used to identify federally listed species that may be expected to occur within the study area (USFWS, 2025b).

Species listed as threatened or endangered by the USFWS receive full protection under the ESA, including a prohibition on indirect take, such as the destruction of critical habitat (i.e., areas formally designated by USFWS in the Federal Register) or suitable habitat.

In Texas, endangered species legislation established in 1973 and subsequent amendments (TPWD, 1975) created a state regulatory program for managing and protecting endangered (species in danger of extinction) and threatened (likely to become endangered in the foreseeable future) species. Chapters 67 and 68 of the Texas Parks and Wildlife Code authorize the TPWD to create lists of threatened and endangered species and regulate their taking or possession. Under this authority, TPWD controls the taking, possession, transport, export, processing, selling, offering for sale, or shipping of state-listed threatened or endangered species (TPWD, 1975).

The TPWD maintains the Texas Natural Diversity Database (TXNDD) to track known occurrences of threatened, endangered, and otherwise rare plant and animal species throughout Texas. The TXNDD provides information about the locations and descriptions of rare habitats and areas that managed to achieve high species diversity as well as areas that provide quality habitat for common and rare wildlife species. Typically, information obtained from the TXNDD includes a descriptive record with Element Occurrence Identification (EOID) numbers corresponding with mapped locations of all rare habitats within the study area (TPWD, 2025b). The TXNDD data for the study area was provided by TPWD in March 2025 (TPWD, 2025c). **Figures 3-6A, 3-6B, and 3-6C** illustrate documented species occurrences from the TXNDD. Each EOID is represented as a circle or polygon, depending on the spatial information available. Circles indicate a generalized area of occurrence, with circle size based on location uncertainty, while polygons represent mapped boundaries where the species has been documented.

TPWD also maintains the Rare, Threatened and Endangered Species of Texas (RTEST) database for the state of Texas, which identifies federally listed, state-listed, or rare species based on the county. The RTEST provides habitat information for species within the database. Data from the RTEST was accessed in October 2025, and was used to identify federally listed, state-listed, and rare species that may occur within the study area (TPWD, 2025d).

The species listed by USFWS (2025b) and TPWD RTEST (TPWD, 2025d) as threatened or endangered, proposed, or candidate species were evaluated for likelihood of occurrence within the study area with consideration of documented species range, vegetation cover types as

identified previously, and TXNDD element occurrences for that species (TPWD 2025b). It is important to note that, because the TXNDD is based on the best data available to TPWD regarding rare species, these data cannot provide a definitive statement as to the current presence, absence, or condition of special species, natural communities, or other significant features in any area. EOIDs are based on at least one observation, and may represent multiple observations, of a species in a specific or general location. The EOID may be interpreted as a representation of a known recorded occurrence and, therefore, demonstrates that the species has potential to occur within the study area.

USFWS (2025b) and TPWD RTEST (2025c) identified 45 species (4 plant, 41 wildlife) listed or proposed as threatened or endangered with potential to occur in Crane, Crockett, Ector, Irion, Pecos, Reagan, Reeves, Schleicher, Tom Green, Upton, Ward, and Winkler counties. **Table 3-8** summarizes all federal or state-listed plant species with respect to their regulatory status, habitat criteria, EOID records, and a determination of whether potentially suitable habitat occurs in the study area and the species has potential to occur. Endangered and threatened wildlife species are discussed in **Section 3.5.2.4** and **Table 3-9**.

Given the small proportion of public versus private land in Texas, the TXNDD does not include a complete, representative inventory of rare resources in the state. There are gaps in coverage due to the lack of access to private land and lack of personnel to process data. **Table 3-8** below lists the state and federal endangered and threatened plant species with potential to occur within the study area.

Table 3-8: Federal and State Listed Plant Species

Common Name	Scientific Name	Listing Status ¹		Habitat Description	Potential Habitat within Study Area	Determination	TXNDD EOID	Figure Number
		USFWS	TPWD					
Dune Umbrella-sedge	<i>Cyperus onerosus</i>	-	T	Moist to wet sand in swales and other depressions among active or partially stabilized sand dunes; flowering/fruitleting late summer-fall.	Yes	The study area contains sand dune systems with swales and moist depressions that provide suitable habitat for dune umbrella-sedge. The species has potential to occur.	2140, 4140, 7470	3-6B, 3-6C

Common Name	Scientific Name	Listing Status ¹		Habitat Description	Potential Habitat within Study Area	Determination	TXNDD EOID	Figure Number
		USFWS	TPWD					
Pecos Sunflower	<i>Helianthus paradoxus</i>	T	T	Restricted to saline, calcareous, heavy-textured soils around cienegas (spring-fed wetlands); usually most abundant on perennially wet soils of subirrigated terraces just above the wettest sites; flowering August-November.	Yes	The study area is within the range of the Pecos sunflower and supports saline, calcareous soils and subirrigated terrace habitats that provide suitable conditions for establishment. The species has the potential to occur.	2641, 5789	3-6C
Leoncita False-foxtail	<i>Agalinis calycina</i>	-	T	Grasslands on perennially moist, heavy, alkaline/saline, calcareous silty clays and loams in and around cienegas and seeps; annual; flowering September-October.	No	While alkaline, calcareous soils are present in the study area, Leoncita false-foxtail is endemic to a few cienega habitats in far west Texas that are not present here. The species is not expected to occur.	-	-
Wright's Marsh Thistle	<i>Cirsium wrightii</i>	T	-	Cienegas in otherwise semi-arid to arid areas. It requires saturated soils with surface or subsurface water flow.	No	Although the study area includes springs and intermittent wetlands, it does not support cienega habitats with persistently saturated soils and continuous surface or subsurface hydrology required by Wright's marsh thistle. The species is not expected to occur.	-	-

Source: USFWS, 2025b; TPWD, 2025c; TPWD, 2025d

1. T = Threatened, severely depleted, or impacted; - = Not Listed

3.5.2 Fish and Wildlife

3.5.2.1 Terrestrial Wildlife

The study area is located within the Kansan, Balconian, and Chihuahuan Biotic Provinces (Blair, 1950). The Kansan Biotic Province includes areas of the Panhandle and red plains and primarily supports grassland plants and animals. The Texan Biotic Province is a broad ecotone that is characterized by the interdigitation of forest and grassland associations and species. The Chihuahuan Biotic Province includes all of Trans-Pecos Texas except the Guadalupe Mountains; this region varies from desert valleys and plateaus to wooded mountain slopes.

For the purposes of this discussion, “wildlife” refers to common animal species that are not protected by law, rare species, or species identified as Species of Greatest Conservation Need (SGCN). Terrestrial wildlife considered in this section includes reptiles, amphibians, mammals, and birds. The species lists provided are not exhaustive but represent common wildlife expected in the study area based on general ranges, vegetation types, and habitat associations. These examples are included to provide ecological context beyond those species afforded regulatory protections.

Reptiles

The landscape within the study area supports a range of reptile species representative of both desert and plateau environments. Common lizards include Texas spiny lizard (*Sceloporus olivaceus*), greater earless lizard (*Cophosaurus texanus*), and common spotted whiptail (*Aspidoscelis gularis*), typically found in open scrub and rocky slopes. Snakes likely to occur include the coachwhip (*Masticophis flagellum*), western rat snake (*Pantherophis obsoletus*), and gopher snake (*Pituophis catenifer*). Venomous snakes with potential to occur in the study area include the western diamond-backed rattlesnake (*Crotalus atrox*), mottled rock rattlesnake (*Crotalus lepidus lepidus*), prairie rattlesnake (*Crotalus viridis*), desert massasauga (*Sistrurus tergeminus edwardsi*), and Texas coral snake (*Micrurus tener*) (Dixon, 2013).

Amphibians

Amphibians within the study area are generally associated with temporary pools, stock tanks, and riparian corridors that form following seasonal rainfall. Common species include Gulf Coast toad (*Incilius nebulifer*), Great Plains toad (*Anaxyrus cognatus*), Chihuahuan green toad (*A. debilis*), and Rio Grande leopard frog (*Lithobates berlandieri*). Additional amphibians that potentially occur within the study area include smallmouth salamander (*Ambystoma texanum*), Couch’s spadefoot (*Scaphiopus couchi*), and yellow mud turtle (*Kinosternon flavescens*), all of which tolerate a wide range of moisture and temperature conditions typical of the region (Dixon, 2013).

Birds

Non-game bird species have potential to occur within the study area at various times of year and may be residents, breeding residents, winter residents, and migratory species. The study area is located within the Central Flyway, a specific flyway within the Atlantic oceanic route where migrating birds follow specific routes over long distances, which may provide migratory habitat for

bird species (TPWD, 2025e). Representative bird groups with potential to occur include ducks, geese, owls, hawks, egrets, herons, vultures, terns, doves, hummingbirds, woodpeckers, falcons, flycatchers, quail, turkey, swallows, and wrens (Lockwood and Freeman, 2014).

Most bird species native to the region, whether resident or migratory, are afforded the same level of protection under the Migratory Bird Treaty Act (MBTA). The bird species included in this section are not intended to represent an exhaustive list but rather highlight representative groups of bird species expected to utilize habitats within the study area, including those not afforded additional state or federal protections.

Mammals

Common mammalian species have potential to occur throughout the study area, which supports a mix of shrubland, grassland, riparian corridors, and human-modified habitats. These species are generally habitat generalists and are not protected under state or federal law. Representative species include opossums, armadillos, rabbits, shrews, bats, coyotes, foxes, bobcats, skunks, and raccoons (Schmidly and Bradley, 2016).

Bats are an especially important group, with several species utilizing caves, bridges, buildings, or mature trees for roosting. Brazilian (Mexican) free-tailed bats (*Tadarida brasiliensis*), one of the most abundant species in the region, provide significant ecological and economic benefits through pest control. Riparian areas, bridges, and other structures within and near the study area may provide roosting habitat (Davis et al. 1962; Scales and Wilkins 2007; Weaver et al., 2015).

This list above is not exhaustive but highlights representative mammals expected to occur in the study area beyond those species afforded regulatory protection.

3.5.2.2 Fish and Aquatic Wildlife

Aquatic wildlife considered in this section includes fish and mussels. As with terrestrial wildlife, the following lists are not intended to be comprehensive inventories. Instead, they highlight representative aquatic species with potential to occur in the study area, based on distribution ranges and habitat conditions, to provide an understanding of ecological communities beyond protected species.

There are over 300 freshwater mussel species known to reside within North America, more than 50 of which are native to Texas waters. Freshwater mussels are highly susceptible to habitat degradation and loss. In addition to native species, several exotic invasive mussels are prevalent and widespread within Texas waters, including the Asian clam (*Corbicula fluminea*), purple-nacre corbicula (*Corbicula sp.*), and zebra mussel (*Dreissena polymorpha*) (Howells, 2014).

Within the study area, aquatic habitats are supported by major waterways and spring-fed systems. Four ESSs, Leon Creek (No Segment ID), Pecos River (Segment ID: 2311), Spring Creek (Segment ID: 1423A), and Toyah Creek (No Segment ID) exist within the study area (TPWD, 2025a). There are numerous apparent streams, ponds, wetlands, and lakes based on aerial review and site reconnaissance. These aquatic habitats provide the potential for occurrence within

the study area for fish, mussels, and amphibians, including species of amphipods, bass, catfish, pupfish, slugs, toads, and turtles (TPWD, 2025d).

3.5.2.3 Commercially or Recreationally Important Wildlife Species

The study area contains the potential for commercially or recreationally important wildlife species. Some recreationally important species are utilized for sport hunting, while some are valuable for observation. Important recreational species with potential to occur within the study area are white-tailed deer, bobwhite quail, scaled quail, and various dove and turkey species (TPWD, 2025f; TPWD, 2025g).

The TPWD divides the counties of Texas into ecological areas for mule deer management, with all counties within the study area falling into TPWD Wildlife District 1 and Wildlife District 4, which primarily encompass the West-Texas, Trans-Pecos, and Hill Country habitats (TPWD, 2025f; TPWD, 2025g). Wildlife biologists work with landowners, land managers, hunters, sportsmen, educators, and the public to ensure proper management of wildlife and habitat resources. Other game species that have potential to occur within the study area include desert bighorn sheep, javelina, pronghorn, Gambel's quail, and Montezuma quail (TPWD, 2025f; TPWD, 2025g).

A few areas with opportunities for recreational fishing are scattered throughout the study area. Common fish species for recreation include largemouth bass (*Micropterus salmoides*), bluegill (*Lepomis macrochirus*), bullhead (*Ameiurus* spp.), and catfish (*Ictalurus* spp.) (TPWD, 2025h). According to TPWD, one Texas community fishing lake, Monahans Perch Pond, is located within the study area (TPWD, 2025i). There are no public access fishing lakes or commercial fisheries within the study area (TPWD, 2025j).

3.5.2.4 Endangered and Threatened Wildlife Species

Federal and State-Listed Species

A review of the USFWS (2025b) and TPWD RTEST (2025c) databases identified a total of 41 wildlife species that are federally or state-listed as threatened or endangered, or are proposed for deferral listing as threatened or endangered (TPWD, 2025c; TPWD, 2025d; USFWS, 2025b). Of these, 41 wildlife species, 23 have the potential to occur within the study area based on current ranges and available habitat. **Table 3-9** lists these species, their habitat descriptions, and suitable habitat determinations within the study area. It should be noted that inclusion in the table does not imply that a species is known to occur in the study area but only acknowledges the potential for occurrence. A determination for the likelihood of a species to occur within the study area is based on the analysis as described in **Section 3.5.1.4** unless otherwise noted. According to the USFWS (2025b), there are no proposed or designated critical habitats within the study area that would require special management and protection. As demonstrated in **Table 3-9**, 14 wildlife species that are federally listed or proposed for federal listing (some of which may include a state-designation) and 9 state-listed wildlife species (no deferral designation) are identified as having potential habitat within the study area.

Table 3-9: Federal and State Listed Wildlife Species

Common Name	Scientific Name	Listing Status ¹		Habitat Description	Potential Habitat within Study Area	Determination	TXNDD EOID	Figure Number
		USFWS	TPWD					
Birds								
Common Black-Hawk	<i>Buteogallus anthracinus</i>	-	T	Cottonwood-lined rivers and streams; willow tree groves on the lower Rio Grande floodplain; formerly bred in south Texas.	Yes	The study area is within the documented range of the species, and a TXNDD record confirms occurrence in the region. Although the species is primarily associated with cottonwood-willow riparian woodlands along the Rio Grande and is considered rare in west Texas, riverine and riparian corridors within the study area could provide suitable habitat. Therefore, potential to occur is recognized.	5900	3-6A
Interior Least Tern	<i>Sterna antillarum athalassos</i>	-	E	Sand beaches, flats, bays, inlets, lagoons, islands. Subspecies is listed only when inland (more than 50 miles from a coastline); nests along sand and gravel bars within braided streams, rivers; also known to nest on man-made structures (inland beaches, wastewater treatment plants, gravel mines, etc.); eats small fish and crustaceans, when breeding forages within a few hundred feet of colony.	No	While the study area contains rivers and reservoirs, it lacks the broad, sparsely vegetated sand and gravel bars or similar open substrates that support interior least tern nesting colonies. Accordingly, the species is not expected to occur.	-	-

Common Name	Scientific Name	Listing Status ¹		Habitat Description	Potential Habitat within Study Area	Determination	TXNDD EOID	Figure Number
		USFWS	TPWD					
Northern Aplomado Falcon	<i>Falco femoralis septentrionalis</i>	E	-	Open country, especially savannah and open woodland, and sometimes in very barren areas; grassy plains and valleys with scattered mesquite, yucca, and cactus; nests in old stick nests of other bird species.	Yes	The study area represents the northern limits for this species based on recent sightings, the nearest of which occurred near the City of Balmorhea (Cornell Lab of Ornithology, 2025). Savannah, open woodland, open country- including barren areas, grassy plains and valleys with mesquite, yucca and cactus occur within the study area.	-	-
Piping Plover	<i>Charadrius melodus</i>	T	-	This migratory species overwinters in Texas, where it occurs on beaches, ephemeral sand flats, barrier islands, sand, mud, algal flats, wash over passes, salt marshes, lagoons, and dunes along the Gulf Coast and adjacent offshore islands, including spoil islands in the Intracoastal Waterway. Sand flats appear to be preferred habitat, but algal flats appear to be the highest quality habitat because of their relative inaccessibility and their continuous availability throughout all tidal conditions.	No	The study area is not located within known range for this species.	-	-

Common Name	Scientific Name	Listing Status ¹		Habitat Description	Potential Habitat within Study Area	Determination	TXNDD EOID	Figure Number
		USFWS	TPWD					
Rufa Red Knot	<i>Calidris canutus rufa</i>	T	T	The species is a winter resident and migrant in Texas. It is primarily found in marine habitats such as sandy beaches, salt marshes, lagoons, mudflats of estuaries and bays, and mangrove swamps during winter months. It primarily occurs along the Gulf Coast on tidal flats and beaches and less frequently in marshes and flooded fields. It has occasionally been observed along shorelines of large lakes and freshwater marshes.	No	The study area is not located within known range for this species.	-	-
Southwestern Willow Flycatcher	<i>Empidonax traillii extimus</i>	E	-	Inhabits riparian habitats of the desert southwest where dense groves of willows, arrowweed, buttonbush, tamarisk, Russian olive, or other plants are present, often with a scattered overstory of cottonwood. These riparian communities provide nesting, foraging, and migratory habitat throughout the breeding range of the flycatcher.	Yes	The study area is located within the known range for this species. Riparian habitats in the study area likely contain dense shrub groves with willows, buttonbush, and Russian olive with a cottonwood overstory. The species has potential to occur.	-	-
Tropical Parula	<i>Setophaga pitiayumi</i>	-	T	Semi-tropical evergreen woodland along rivers and resacas. Texas ebony, anacua and other trees with epiphytic plants hanging from them. Dense or open woods, undergrowth, brush, and trees along edges of rivers and resacas; breeding April to July.	No	The study area is outside the species' known breeding range and lacks the semi-tropical riparian woodlands with Texas ebony, anacua, and associated vegetation required for nesting. The species is not expected to occur.	-	-

Common Name	Scientific Name	Listing Status ¹		Habitat Description	Potential Habitat within Study Area	Determination	TXNDD EOID	Figure Number
		USFWS	TPWD					
White-faced Ibis	<i>Plegadis chihi</i>	-	T	The county distribution for this species includes geographic areas that the species may use during migration. Time of year should be factored into evaluations to determine potential presence of this species in a specific county. Prefers freshwater marshes, sloughs, and irrigated rice fields, but will attend brackish and saltwater habitats; currently confined to near-coastal rookeries in so-called hog-wallow prairies. Nests in marshes, in low trees, on the ground in bulrushes or reeds, or on floating mats.	No	Although the species may migrate through the region, the study area lacks the marshes, rice fields, and coastal rookeries required for breeding or sustained use. Accordingly, the species is not expected to occur.	-	-
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	T	-	In Texas, the populations of concern are found breeding in riparian areas in the Trans Pecos (know as part of the Western Distinct Population Segment [DPS]). It is the Western DPS that is on the U.S. ESA threatened list and includes the Texas counties Brewster, Culberson, El Paso, Hudspeth, Jeff Davis, and Presidio. Riparian woodlands below 6,000 feet in elevation consisting of cottonwoods and willows are prime habitat. This species is a long-distant migrant that summers in Texas, but winters mainly in South America. Breeding birds of the Trans Pecos populations typically arrive on their breeding grounds possibly in late April but the peak arrival time is in May. Threats to preferred habitat include hydrologic changes that don't promote the regeneration of cottonwoods and willows, plus livestock browsing and trampling of sapling trees in sensitive riparian areas.	Yes	The study area is within the broader migratory range of the yellow-billed cuckoo and contains riparian woodlands with cottonwood and willow that could provide suitable stopover or breeding habitat. Although the Western DPS listing applies only to designated Trans-Pecos counties, potential for occurrence in the study area is recognized.	-	-

Common Name	Scientific Name	Listing Status ¹		Habitat Description	Potential Habitat within Study Area	Determination	TXNDD EOID	Figure Number
		USFWS	TPWD					
Zone-tailed Hawk	<i>Buteo albonotatus</i>	-	T	Arid open country, including open deciduous or pine-oak woodland, mesa or mountain country, often near watercourses, and wooded canyons and tree-lined rivers along middle-slopes of desert mountains; nests in various habitats and sites, ranging from small trees in lower desert, giant cottonwoods in riparian areas, to mature conifers in high mountain regions.	Yes	The study area lies within the known range of the species and includes arid open landscapes, riparian woodlands, and canyon habitats consistent with its nesting and foraging ecology. Accordingly, the species has potential to occur.	-	-
Crustaceans								
Diminutive Amphipod	<i>Gammarus hyaloides</i>	E	E	Known only from Phantom Lake Spring; omnivorous; amphipods are active mostly at night and spend daylight hours hiding under vegetation and other cover; vulnerable to reduction of springflow resulting from declining levels of groundwater.	No	The diminutive amphipod is endemic to Phantom Lake Spring in Jeff Davis County and is not known from other locations. The study area does not encompass that spring or provide potential habitat, so the species is not expected to occur.	-	-
Pecos Amphipod	<i>Gammarus pecos</i>	E	E	Omnivorous; amphipods are active mostly at night and spend daylight hours hiding under vegetation and other cover; vulnerable to reduction of springflow resulting from declining levels of groundwater.	Yes	The study area includes spring systems within Reeves and Pecos counties where the species is known to occur. Given its dependence on perennial springflow and aquatic vegetation, potential habitat is present, and the species has potential to occur.	-	-

Common Name	Scientific Name	Listing Status ¹		Habitat Description	Potential Habitat within Study Area	Determination	TXNDD EOID	Figure Number
		USFWS	TPWD					
Fish								
Comanche Springs Pupfish	<i>Cyprinodon elegans</i>	E	E	Restricted to small series of springs and their outflows, and man-made irrigation canals in the area of Balmorhea, Texas, including Phantom Springs (Jeff Davis County), San Solomon Springs, Giffin Springs and Toyah Creek (Reeves County). Native range: Comanche, Phantom Cave, San Solomon springs (Pecos and Reeves counties). Prefers fast-flowing water. Originally in Comanche Springs, San Solomon, and Phantomn Cave, presently restricted to San Solomon and Phantom Cave and associated springs, and downstream irrigation canals; found in constantly discharging springs and in swift-flowing water of canals and earthen ditches.	No	Although Reeves County is within the study area, the Comanche Springs pupfish is restricted to San Solomon Springs, Phantom Cave Springs, and associated canals near Balmorhea. The study area does not encompass these occupied spring systems, and potential habitat is not present.	-	-
Headwater Catfish	<i>Ictalurus lupus</i>	-	T	Originally throughout streams of the Edwards Plateau and the Rio Grande basin, currently limited to Rio Grande drainage, including Pecos River basin; springs, and sandy and rocky riffles, runs, and pools of clear creeks and small rivers.	Yes	Given the recorded observation (TXNDD EOID 13982), this species may be present in the study area.	13982	3-6C

Common Name	Scientific Name	Listing Status ¹		Habitat Description	Potential Habitat within Study Area	Determination	TXNDD EOID	Figure Number
		USFWS	TPWD					
Leon Springs Pupfish	<i>Cyprinodon bovinus</i>	E	E	This species is endemic to Leon Creek and Diamond Y Spring in Pecos County. Preferred habitat includes spring-fed marshes, pools, and slow-flowing waters, usually near edges with minimal growth of vegetation.	Yes	The study area includes a portion of Leon Creek in Pecos County. Suitable habitat may be present within the study area.	-	-
Pecos Gambusia	<i>Gambusia nobilis</i>	E	E	Inhabit spring fed pools, runs, and downstream areas having relatively abundant overhead cover, sedge-covered marshes, and gypsum sinkholes with no surface flow. Species is capable of inhabiting a variety of habitats provided factors such as temperature and salinity are suitable.	Yes	The study area is located within the known historic and current species range. Suitable aquatic habitat may be present within the study area.	14202	3-6B
Pecos Pupfish	<i>Cyprinodon pecosensis</i>	PT	T	The species can be found in the Pecos River system from the mouth of Independence Creek.	Yes	The study area is not located within known range for this species, but the study area includes the Pecos River system where this species is found. Suitable habitat may be present within the study area.	937, 694, 2065, 2968, 3158, 6429, 6156, 7903, 5456, 3314, 14192, 14218	3-6B, 3-6C
Proserpine Shiner	<i>Cyprinella proserpina</i>	-	T	Limited range includes Devils and lower Pecos rivers, Las Moras, Pinto, and San Felipe creeks, and Independence Creek in the Rio Grande watershed in western Texas. Associated with spring-fed tributaries and spring-runs. May be found in flowing pools, swift runs, and riffles.	Yes	Given the recorded observation (TXNDD EOID 13178), this species may be present in the study area.	13178	3-6B

Common Name	Scientific Name	Listing Status ¹		Habitat Description	Potential Habitat within Study Area	Determination	TXNDD EOID	Figure Number
		USFWS	TPWD					
Rio Grande Darter	<i>Etheostoma grahami</i>	-	T	Essentially restricted to the mainstream and spring-fed tributaries of the Rio Grande and the lower Pecos River downstream to the Devils River and Dolan, San Felipe and Sycamore creeks. Gravel and rubble riffles.	No	Although the Pecos River occurs within the study area, the Rio Grande darter is confined to the lower Pecos River and Rio Grande drainage downstream of the Devils River. The species is not expected to occur in the study area.	-	-
Rio Grande Shiner	<i>Notropis jemezanus</i>	-	T	Rio Grande drainage. Occurs over substrate of rubble, gravel and sand, often overlain with silt.	No	The study area is outside the known distribution of the Rio Grande shiner, which is restricted to the Rio Grande and lower Pecos River. The species is not expected to occur.	-	-
Roundnose Minnow	<i>Dionda episcopa</i>	-	T	Pecos River and Limpia Creek. Restricted to clear, spring-fed waters having little temperature variation.	No	While the Pecos River occurs within the study area, the roundnose minnow is limited to spring-fed reaches with stable flows and temperatures. These conditions are absent within the study area, so the species is not expected to occur.	-	-
Speckled Chub	<i>Macrhybopsis aestivalis</i>	-	T	Found throughout the Rio Grande and lower Pecos River but occurs most frequently between the Rio Conchos confluence and the Pecos River. Flowing water over coarse sand and fine gravel substrates in streams; typically found in raceways and runs.	Yes	Given the recorded observation (TXNDD EOID 13512), this species may be present in the study area.	13512	3-6C

Common Name	Scientific Name	Listing Status ¹		Habitat Description	Potential Habitat within Study Area	Determination	TXNDD EOID	Figure Number
		USFWS	TPWD					
Tamaulipas Shiner	<i>Notropis braytoni</i>	-	T	Restricted to the Rio Grande basin in Texas including the lower Pecos River. Typically found in large rivers and creeks associated with a variety of flowing-water habitats such as runs and riffles over gravel, cobble, and sand.	Yes	The study area includes reaches of the Pecos River within the Rio Grande basin, where flowing-water habitats such as runs and riffles over gravel, cobble, and sand occur. The species has potential to occur.	-	-
Insects								
Monarch Butterfly	<i>Danaus plexippus</i>	PT	-	<p>Found statewide. Adults are found in a variety of habitats including native prairies, pastures, open woodlands and savannas, desert scrub, roadsides, and other habitats with abundant nectar plants, including urbanized areas. Although adults may be present year-round, they are primarily encountered between March and November and are most commonly observed in the summer and fall during breeding and migration. Caterpillars are found on various species of the family Asclepiadaceae (occasionally treated as a subfamily of Apocynaceae). Common host plants in Texas include milkweeds (<i>Asclepias</i> spp.), milkvines (<i>Matelea</i> spp.), twinevines (<i>Funastrum</i> spp.), swallowworts (<i>Cynanchum</i> spp.) and anglepod (<i>Gonolobus suberosus</i> [<i>Matelea gonocarpus</i>]). Caterpillars are most frequently observed between April and September.</p>	Yes	This species is a habitat generalist, and suitable habitat may be present along vegetated roadsides and other open areas with nectar plants, species of host plants in the Asclepiadaceae family, and/or other desirable species. This species has potential to occur.	-	-

Common Name	Scientific Name	Listing Status ¹		Habitat Description	Potential Habitat within Study Area	Determination	TXNDD EOID	Figure Number
		USFWS	TPWD					
Mammals								
Black Bear	<i>Ursus americanus</i>	-	T	Generalist. Historically found throughout Texas. In Chisos, prefers higher elevations where pinyon-oaks are predominant; also occasionally sighted in desert scrub of Trans-Pecos (Black Gap Wildlife Management Area) and Edwards Plateau in juniper-oak habitat. For ssp. <i>luteolus</i> , bottomland hardwoods, floodplain forests, upland hardwoods with mixed pine; marsh. Bottomland hardwoods and large tracts of inaccessible forested areas.	Yes	The study area is within the broader historical range of the black bear, and habitats such as oak-juniper woodlands, riparian corridors, and desert scrub provide potential cover and forage. TXNDD records confirm occurrences in the region. While presence is likely infrequent or transient rather than indicative of a resident breeding population, the species has potential to occur.	5651	3-6B
Tricolored Bat	<i>Perimyotis subflavus</i>	PE	-	In Texas, tricolored bats may be found year-round. In the spring, summer, and fall they primarily nest on leaves or bark of live and dead trees, or epiphytic vegetation such as Spanish moss (<i>Tillandsia usneoides</i>). They may also roost among ferns and crevices on limestone and sandstone bluffs and cliffs during this time. From late winter to early spring, they may roost in culverts, abandoned buildings, and large hollow trees. In central Texas caves serve as important roost sites. Tricolored bats typically roost alone or in small groups. During the winter they may go into periods of torpor during colder temperatures however they will emerge to feed on warm evenings. Foraging habitat consists of open woodlands, riparian corridors, and forest edge.	Yes	Trees, abandoned buildings, and/or culverts may be present within the study area. Therefore, this species may be present within the study area.	-	-

Common Name	Scientific Name	Listing Status ¹		Habitat Description	Potential Habitat within Study Area	Determination	TXNDD EOID	Figure Number
		USFWS	TPWD					
White-nosed Coati	<i>Nasua narica</i>	-	T	Woodlands, riparian corridors and canyons. Most individuals in Texas are probably transients from Mexico; diurnal and crepuscular; very sociable; forages on ground and in trees; omnivorous; may be susceptible to hunting, trapping, and pet trade.	No	Although riparian corridors and canyons are present within the study area, the white-nosed coati in Texas is generally limited to the Rio Grande borderlands and Big Bend region. With no element occurrence records in the study area, the species is not expected to occur.	-	-
Mollusks								
Balcones Spike	<i>Fusconaia iheringi</i>	E	-	Inhabits riffles and runs within streams and rivers, with sporadic observations in other habitats.	No	The study area is not located within known range for this species.	-	-
Diamond Y Springsnail	<i>Pseudotryoni adamantina</i>	E	E	This is an endemic snail species only known from the Diamond Y Spring and associated outflows in Pecos County. Preferred habitat includes mud substrates on the margins of small springs and seeps, marshes in flowing water associated with sedges and cattails. This species is presumed to be a fine particle feeder of detritus and periphyton within substrate.	No	The study area is located approximately 10 miles north of Diamond Y Spring. This species is not expected to occur.	-	-

Common Name	Scientific Name	Listing Status ¹		Habitat Description	Potential Habitat within Study Area	Determination	TXNDD EOID	Figure Number
		USFWS	TPWD					
Gonzales Tryonia	<i>Tryonia circumstriata</i>	E	E	This is an endemic snail species only known from the Diamond Y Spring and associated outflows in Pecos County. Preferred habitat includes mud substrates on the margins of small springs and seeps, marshes in flowing water associated with sedges and cattails. This species is presumed to be a fine particle feeder of detritus and periphyton within substrate.	No	The study area is located approximately 10 miles north of Diamond Y Spring. This species is not expected to occur.	-	-
Pecos Assiminea Snail	<i>Assiminea pecos</i>	E	E	Occur in close association with permanent spring run wetland habitats, near flowing springs and seeps. They are typically found near the surface of the soils under mats of vegetation.	Yes	Spring and seep fed wetlands may be present within the study area. The species has potential to occur.	-	-
Phantom Springsnail	<i>Pyrgulopsis texana</i>	E	E	Endemic aquatic snail; known only from three spring systems and associated outflows in Jeff Davis and Reeves counties; vulnerable to reduction of springflow resulting from declining levels of groundwater.	No	Although the study area overlaps Reeves County, the Phantom springsnail is restricted to three known spring systems and associated outflows. With no occupied springs of this type in the study area, the species is not expected to occur.	-	-

Common Name	Scientific Name	Listing Status ¹		Habitat Description	Potential Habitat within Study Area	Determination	TXNDD EOID	Figure Number
		USFWS	TPWD					
Phantom Tryonia	<i>Tryonia cheatumi</i>	E	E	Endemic aquatic snail; known only from three spring systems and associated outflows in Jeff Davis and Reeves counties; vulnerable to reduction of springflow resulting from declining levels of groundwater.	No	Although the study area overlaps portions of Reeves County, the Phantom tryonia is endemic to only three spring systems and their outflows in Jeff Davis and Reeves counties. These specific spring habitats are absent from the study area, and the species is not expected to occur.	-	-
Texas Fatmucket	<i>Lampsilis bracteata</i>	E	T	Reported to occur in slow to moderate current in sand, mud, and gravel substrates among large cobble, boulders, bedrock ledges, horizontal cracks in bedrock slabs, and macrophyte beds. Has also been observed inhabiting the roots of cypress trees and vegetation along steep banks. Past authorities have reported this species intolerant of reservoir conditions, but recent surveys suggest it may persist in some impoundment conditions.	Yes	Given the recorded observation (TXNDD EOID 9750), this species may be present in the study area.	9750	3-6A
Texas Fawnsfoot	<i>Truncilla macrodon</i>	T	T	Occurs in streams and rivers of the Trinity, Neches, and Sabine River drainages on substrates consisting of firm mud, sand, or finer gravel bottoms, in still to moderate flows.	Yes	Given the recorded observation (TXNDD EOID 9641), this species may be present in the study area.	9641	3-6A

Common Name	Scientific Name	Listing Status ¹		Habitat Description	Potential Habitat within Study Area	Determination	TXNDD EOID	Figure Number
		USFWS	TPWD					
Texas Hornshell	<i>Popenaias popeii</i>	E	E	Occurs in small streams to large rivers in slow to moderate current, often residing in rock crevices, travertine shelves, and under large boulders, where small-grained material, such as clay, silt, or sand gathers. Can also occur in riffles that are clean swept of soft silt; not known from reservoirs.	Yes	The study area includes portions of the Pecos River that contain rock crevices, travertine shelves, and boulder habitats in slow to moderate currents consistent with the Texas hornshell's requirements. Given this overlap, the species has potential to occur.	-	-
Texas Pimpleback	<i>Cyclonaias petrina</i>	E	E	Occurs in medium size streams to large rivers primarily in riffles and runs. Often found in substrates composed of sand, gravel, and cobble, including mud-silt or gravel-filled cracks in bedrock slabs.	No	The study area is not located within known range for this species.	-	-
Reptiles								
Brazos Water snake	<i>Nerodia harteri</i>	-	T	Aquatic: Shallow, fast-flowing water with a rocky or gravelly substrate preferred. Adults can be found in deep water with mud bottoms, such as large section of rivers and reservoirs. Riffle habitat is particularly important for this species.	No	The Brazos water snake is endemic to the Brazos River basin and does not occur outside of that drainage. As the study area lies entirely outside the Brazos basin, the species is not expected to occur.	-	-
Dunes Sagebrush Lizard (DSL)	<i>Sceloporus arenicolus</i>	E	E	Females utilize shinnery oak sand dunes and flats to navigate to find suitable nesting sites. Females often utilize more than one dune during the nesting season, laying eggs in nest chambers, in the moist soil below the surface.	Yes	Shinnery oak sand dunes and flats may be present within the study area. (Fitzgerald et al., 2011; Walkup et al., 2021). Therefore, there is potential for this species to occur.	1314, 3366, 16099	3-6B, 3-6C

Common Name	Scientific Name	Listing Status ¹		Habitat Description	Potential Habitat within Study Area	Determination	TXNDD EOID	Figure Number
		USFWS	TPWD					
Texas Horned Lizard	<i>Phrynosoma cornutum</i>	-	T	Terrestrial: Open habitats with sparse vegetation, including grass, prairie, cactus, scattered brush or scrubby trees; soil may vary in texture from sandy to rocky; burrows into soil, enters rodent burrows, or hides under rock when inactive. Occurs to 6000 feet but largely limited below the pinyon-juniper zone on mountains in the Big Bend area.	Yes	The study area contains sandy and shrubland habitats, including dune systems and open blowouts, that provide suitable conditions for the Texas horned lizard. The species has potential to occur.	1573, 1575, 15904, 16104, 16136, 16015, 15474, 15484, 15580, 15692	3-6A, 3-6B, 3-6C
Trans-Pecos Black-headed Snake	<i>Tantilla cucullata</i>	-	T	Terrestrial: Found rocky canyons or hillsides in mesquite-creosote and pinyon-juniper-oak forests, as well as grasslands.	Yes	The study area contains rocky canyon and hillside habitats with associated shrubland and woodland vegetation consistent with the ecological requirements of the Trans-Pecos black-headed snake. The species has potential to occur.	-	-

Source: USFWS, 2025b; TPWD, 2025c; TPWD, 2025d

1. E = Endangered; PE = Proposed Endangered; T = Threatened, severely depleted; PT = Proposed Threatened; “-” = Not Listed

Species of Greatest Conservation Need

Species designated as SGCN by TPWD whose geographic range includes Crane, Crockett, Ector, Irion, Pecos, Reagan, Reeves, Schleicher, Tom Green, Upton, Ward, and Winkler counties were reviewed. As referenced in TPWD’s March 26, 2025, response letter (**Appendix A**), SGCN are not species listed as threatened or endangered; however, TPWD stated the importance to “minimize impacts to such resources to reduce the likelihood of endangerment and preclude the need to list SGCN as threatened or endangered in the future”. Numerous state-listed SGCN and rare species were identified by TPWD in its response letter as having the potential to occur in the study area. These species are listed in **Table 3-10** along with any associated EOIDs in the study area (TPWD, 2025c; TPWD, 2025d).

An EOID record demonstrates that the SGCN species has potential to occur within the study area. SGCN species for which there is no recorded observation in any of the listed counties (indicated by a “-” in **Table 3-10**) may still be present within the study area. Many SGCN have broad, overinclusive habitat requirements or descriptions that are common to the study area. The likelihood that these species could occur in the study area may be summarily concluded without

the need for a detailed habitat description for each species. Terrestrial habitat descriptions for listed species may include grassland uplands, wooded floodplains, riparian zones, herbaceous vegetation, and native prairie vegetation, the latter of which provides essential resources for species dependent on a mix of open spaces and cover. Aquatic habitats include perennial and ephemeral streams and wetlands with varying substrates, such as rocky or sandy beds, which are crucial for species requiring both terrestrial and aquatic elements for their life cycles. The study area includes a variety of these terrestrial and aquatic habitat types which would be suitable for listed SGCN for which an EOID has not been recorded.

SGCN species do not receive additional protections aside from those provided to avian species under the Bald and Golden Eagle Protection Act (BGEPA) and the MBTA (discussed in **Section 3.5.2.1**). The BGEPA prohibits anyone without a permit issued by the Secretary of the Interior from "taking" bald eagles or golden eagles, including their parts, nests, or eggs. In addition to immediate impacts, the term "taking" includes "impacts that result from human-induced alterations initiated around a previously used nest site during a time when eagles are not present, if, upon the eagle's return, such alterations agitate or bother an eagle to a degree that interferes with or interrupts normal breeding, feeding, or sheltering habits, and causes injury, death or nest abandonment" (U.S., 1940).

The bald eagle is a large bird of prey native to North America, located year-round throughout most of the United States, including some parts of Texas. Bald eagles prefer to nest in habitats along coasts, rivers, lakes and reservoirs, and are most widespread during winter. According to the USFWS and TPWD, bald eagle habitat is limited, and no known bald eagles or bald eagle nests are located within or adjacent to the study area (Cornell Lab of Ornithology, 2025). However, the study area includes components of suitable habitat; therefore, the bald eagle may occur within the study area.

The golden eagle is a large bird found throughout North America, and they are year-round residents in the western United States. According to USFWS, there is a probability of presence for golden eagles in the months of November, December, February, and March, with a breeding season between January and August (USFWS, 2025b). Preferred nesting habitat includes mountains, hills, cliffs, grasslands, shrublands, coniferous forests, farmland, and areas along rivers and streams (Cornell Lab of Ornithology, 2025). According to the TPWD, no recordings of golden eagles or golden eagle nests are located within or adjacent to the study area (TPWD, 2025c). However, the study area includes components of suitable habitat; therefore, the golden eagle may occur within the study area.

Table 3-10 summarizes SGCN identified in the TPWD RTEST lists for Crane, Crockett, Ector, Irion, Pecos, Reagan, Reeves, Schleicher, Tom Green, Upton, Ward, and Winkler counties. In general, SGCN tend to occupy broader habitat types – such as prairies, open pasturelands, and woodlands – compared to threatened and endangered species, which often have more specialized habitat requirements. Given the large size of the study area and broad habitat requirements of SGCN species, the potential presence of many SGCN listed in **Table 3-10** may

be concluded without the need for a detailed habitat description for each species. Instead, these species are addressed through vegetation and habitat impact discussions in **Section 7.4**. Exceptions include SGCNs whose distributions are restricted to specific environments or elevation ranges beyond the limits of the study area; these species are identified with a footnote in the table.

Table 3-10: SGCN Species with Potential Suitable Habitat in the Study Area

Common Name	Scientific Name	TXNDD EOID(s) ¹	County(ies)	Figure Number
Amphibians				
Woodhouse's Toad	<i>Anaxyrus woodhousii</i>	. ²	-	-
Birds				
Bald Eagle	<i>Haliaeetus leucocephalus</i>	-	-	-
Baird's Sparrow	<i>Centronyx bairdii</i>	-	-	-
Bank Swallow	<i>Riparia riparia</i>	-	-	-
Black-capped Vireo	<i>Vireo atricapilla</i>	4828, 7882	Irion	3-6A
Brewer's Blackbird	<i>Euphagus cyanocephalus</i>	-	-	-
Cactus Wren	<i>Campylorhynchus brunneicapillus</i>	-	-	-
Chestnut-collared Longspur	<i>Calcarius ornatus</i>	-	-	-
Common Nighthawk	<i>Chordeiles minor</i>	-	-	-
Elf Owl	<i>Micrathene whitneyi</i>	-	-	-
Franklin's Gull	<i>Leucophaeus pipixcan</i>	-	-	-
Golden Eagle	<i>Aquila chrysaetos</i>	-	-	-
Lark Bunting	<i>Calamospiza melanocorys</i>	-	-	-
Least Tern	<i>Sternula antillarum</i>	-	-	-
Loggerhead Shrike	<i>Lanius ludovicianus</i>	-	-	-
Lucifer Hummingbird	<i>Calothorax lucifer</i>	-	-	-
Mountain Plover	<i>Charadrius montanus</i>	-	-	-
Northern Bobwhite	<i>Colinus virginianus</i>	-	-	-
Pyrrhuloxia	<i>Cardinalis sinuatus</i>	-	-	-
Sanderling	<i>Calidris alba</i>	-	-	-
Scaled Quail	<i>Callipepla squamata</i>	-	-	-
Snowy Plover	<i>Charadrius nivosus</i>	-	-	-
Sprague's Pipit	<i>Anthus spragueii</i>	-	-	-
Varied Bunting	<i>Passerina versicolor</i>	-	-	-
Virginia's Warbler	<i>Leiothlypis virginiae</i>	-	-	-
Western Burrowing Owl	<i>Athene cunicularia hypugaea</i>	-	-	-
Willet	<i>Tringa semipalmata</i>	-	-	-
Wilson's Warbler	<i>Cardellina pusilla</i>	-	-	-
Crustaceans				
Devil's Sinkhole Amphipod ³	<i>Stygotromus hadenoecus</i>	-	-	-
No accepted common name ³	<i>Texanobathynella bowmanu</i>	-	-	-
Fishes				
Guadalupe Bass	<i>Micropterus treculii</i>	4920, 13939	Irion, Tom Green	3-6A
Manantial Roundnose Minnow	<i>Dionda argentosa</i>	13225	Crockett	3-6B

Common Name	Scientific Name	TXNDD EOID(s) ¹	County(ies)	Figure Number
Texas Shiner	<i>Notropis amabilis</i>	13300, 13593	Irion, Tom Green	3-6A
Insects				
American Bumblebee	<i>Bombus pennsylvanicus</i>	-	-	-
Balmorhea Saddle-case Caddisfly ³	<i>Protophila balmorhea</i>	-	-	-
Monahans Lined June Beetle	<i>Polyphylla monahansensis</i>	-	-	-
No accepted common name	<i>Polyphylla pottsorum</i>	-	-	-
No accepted common name	<i>Trigonoscutoides texanus</i>	-	-	-
No accepted common name	<i>Anomala suavis</i>	-	-	-
Mammals				
Big Free-tailed Bat	<i>Nyctinomops macrotis</i>	-	-	-
Black-tailed Prairie Dog	<i>Cynomys ludovicianus</i>	9163, 9164, 9165, 9169, 9170, 9171, 9172, 9176, 9184, 9185, 9186, 9187, 9188, 9189, 9195, 9197, 9198, 9200, 11196	Crane, Crockett, Pecos, Reagan, Upton, Ward	3-6B, 3-6C
California Myotis	<i>Myotis californicus</i>	-	-	-
Cave Myotis Bat	<i>Myotis velifer</i>	-	-	-
Davis Mountains Cottontail ³	<i>Sylvilagus robustus</i>	-	-	-
Eastern Spotted Skunk	<i>Spilogale putorius</i>	-	-	-
Fringed Myotis ³	<i>Myotis thysanodes</i>	-	-	-
Ghost-faced Bat	<i>Mormoops megalophylla</i>	-	-	-
Gray-footed Chipmunk ³	<i>Tamias canipes</i>	-	-	-
Greater Western Mastiff Bat	<i>Eumops perotis californicus</i>	-	-	-
Hoary Bat	<i>Lasiurus cinereus</i>	-	-	-
Hooded Skunk	<i>Mephitis macroura</i>	12735	Pecos, Ward	3-6C
Jones's Pocket Gopher	<i>Geomys knoxjonesi</i>	-	-	-
Kit Fox	<i>Vulpes macrotis</i>	1216, 4808, 4125, 6340, 6866, 1217	Crockett, Pecos, Regan	3-6A, 3-6B, 3-6C
Long-legged Myotis Bat ³	<i>Myotis volans</i>	-	-	-
Mountain Lion	<i>Puma concolor</i>	-	-	-
Pale Townsend's Big-eared Bat	<i>Corynorhinus townsendii pallescens</i>	-	-	-
Plains Spotted Skunk	<i>Spilogale interrupta</i>	-	-	-
Pocketed free-tailed bat	<i>Nyctinomops femorosaccus</i>	-	-	-
Pronghorn	<i>Antilocapra americana</i>	-	-	-
Swift Fox	<i>Vulpes velox</i>	1304	Crane, Crockett, Pecos	3-6B
Townsend's Big-eared Bat	<i>Corynorhinus townsendii</i>	-	-	-
Western Pipistrelle	<i>Parastrellus hesperus</i>	-	-	-
Western Small-footed Myotis Bat ³	<i>Myotis ciliolabrum</i>	-	-	-
Yuma myotis	<i>Myotis yumanensis</i>	-	-	-
Mollusks				
Brune's Tryonia ³	<i>Tryonia brunei</i>	-	-	-

Common Name	Scientific Name	TXNDD EOID(s) ¹	County(ies)	Figure Number
Mapleleaf	<i>Quadrula quadrula</i>	-	-	-
No accepted common name	<i>Holospira mesolia</i>	-	-	-
Pistolgrip	<i>Tritogonia verrucosa</i>	-	-	-
Stockton Plateau Threeband ³	<i>Humboldtiana texana</i>	-	-	-
Tampico Pearlymussel	<i>Cyrtornaias tampicoensis</i>	-	-	-
Reptiles				
Concho Water Snake	<i>Nerodia paucimaculata</i>	494, 5744	Irion, Tom Green	3-6A
Gray-checked Whiptail	<i>Aspidozelis dixonii</i>	-	-	-
Plateau Spot-tailed Earless Lizard	<i>Holbrookia lacerata</i>	9454, 9484, 9605, 9606, 9531, 9565, 9640, 9446, 9451, 9459, 9600, 9964, 9965,	Crockett, Irion, Tom Green, Reagan, Schleicher, Ward	3-6A, 3-6B
Rio Grande River Cooter	<i>Pseudemys gorzugi</i>	-	-	-
Smooth Softshell	<i>Apalone mutica</i>	-	-	-
Texas Map Turtle	<i>Graptemys versa</i>	16273	Irion	3-6A
Western Box Turtle	<i>Terrapene orate</i>	16140, 16060	Crockett, Pecos, Ward	3-6B, 3-6C
Western Massasauga	<i>Sistrurus tergeminus</i>	15745	Irion	3-6A
Plants				
Alkali Spurge	<i>Euphorbia astyla</i>	3923	Pecos	3-6C
Bigelow's Desert Grass	<i>Blepharidachne bigeloyii</i>	-	-	-
Broadpod Rushpea	<i>Pomaria brachycarpa</i>	-	-	-
Broadpod Twistflower	<i>Streptanthus platycarpus</i>	-	-	-
Bushy Wild-buckwheat	<i>Eriogonum suffruticosum</i>	-	-	-
Cienega False Clappia-bush	<i>Pseudocappia arenaria</i>	2381, 5445, 8238	Reeves	3-6C
Correll's Green Pitaya	<i>Echinocereus viridiflorus var. carrellii</i>	-	-	-
Cory's Ephedra	<i>Ephedra coryi</i>	-	-	-
Cory's Woolly Locoweed	<i>Astragalus mollissimus</i>	10303, 9984, 9989, 10222, 9985, 10447	Crockett, Irion, Reagan, Upton	3-6A, 3-6B
Cox's Dalea	<i>Dalea bartonii</i>	-	-	-
Dense Cory Cactus	<i>Escobaria dasyacantha</i>	-	-	-
Desert Night-blooming Cereus ³	<i>Peniocereus greggii</i>	-	-	-
Devils River Rock-daisy	<i>Perityle lindheimeri</i>	-	-	-
Dwarf Broomspurge	<i>Euphorbia jejuna</i>	2242	Pecos	3-6C
Dune Unicorn-plant	<i>Proboscidea sabulosa</i>	2607, 6210, 3218	Crane, Ward	3-6B, 3-6C
Grayleaf Rock-daisy	<i>Perityle cinerea</i>	3713, 4032, 7813	Crockett, Pecos, Reeves, Ward	3-6B, 3-6C
Guadalupe Beardtongue	<i>Penstemon guadalupensis</i>	-	-	-
Gyp Locoweed	<i>Astragalus gypsodes</i>	-	-	-
Havard Plum	<i>Prunus havardii</i>	-	-	-
Havard Trumpets	<i>Acleisanthes acutifolia</i>	-	-	-
Heller's Beardtongue	<i>Penstemon tridlorus</i>	-	-	-

Common Name	Scientific Name	TXNDD EOID(s) ¹	County(ies)	Figure Number
Hester's Cory Cactus	<i>Escobaria hesteri</i>	-	-	-
Hill Country Wild-mercury	<i>Argythamnia aporoides</i>	4921	Tom Green	3-6A
Hinckley's Spreadwing	<i>Eurytaenia hinckleyi</i>	10245, 10111, 10404	Crane, Ward	3-6B, 3-6C
Irion County Wild-buckwheat	<i>Eriogonum nealleyi</i>	3214, 5868, 5439, 6323, 5869	Irion	3-6A
Jones' Selenia	<i>Selenia jonesii</i>	902, 5995, 6678, 7562, 7934	Crockett, Reagan	3-6A, 3-6B
Leafy Rock-daisy	<i>Perityle rupestris</i>	-	-	-
Longstalk Heimia	<i>Ammannia grayi</i>	-	-	-
Lyreleaf Twistflower	<i>Streptanthus carinatus</i> ssp. <i>carinatus</i>	-	-	-
Mexican Mud-Plantain	<i>Heteranthera mexicana</i>	8396	Reagan	3-6B
McVaugh's Bladderpod ³	<i>Physaria mcvaughiana</i>	-	-	-
Neglected Sunflower	<i>Helianthus neglectus</i>	1544, 1258, 4613, 6574, 7143	Crane, Crockett, Reeves, Ward, Winkler	3-6B, 3-6C
Orcutt's Senna	<i>Senna orcuttii</i>	-	-	-
Prairie Butterfly-weed	<i>Oenothera triangulata</i>	-	-	-
Rayless Rock-daisy	<i>Perityle angustifolia</i>	10416	Crockett, Reagan	3-6B
Rock Grape	<i>Vitis rupestris</i>	-	-	-
Sticky Tansy Aster	<i>Xanthisma viscidum</i>	-	-	-
Tall Plains Spurge	<i>Euphorbia strictior</i>	-	-	-
Texas Almond	<i>Prunus mimutiflora</i>	10719	Irion	3-6A
Texas Claret-cup Cactus	<i>Echinocereus coccineus</i>	-	-	-
Tharp's Blue-star	<i>Amsonia tharpii</i>	-	-	-
Threeflower Penstemon	<i>Penstemon triflorus</i>	-	-	-
Turner's Hawthorn	<i>Crataegus turnerorum</i>	-	-	-
Two-bristle Rock-daisy	<i>Perityle bisetosa</i>	-	-	-
Warnock's Water-willow	<i>Justicia warnockii</i>	-	-	-
Watson's False Clappia-bush	<i>Pseudoclapia watsonii</i>	-	-	-
Waterfall's Milkvetch	<i>Astragalus waterfallii</i>	10048	Reagan	3-6B
White Column Cactus	<i>Escobaria albicolumnaria</i>	-	-	-
Wright's Beardtongue ³	<i>Penstemon wrightii</i>	-	-	-
Wright's Trumpets	<i>Acleisanthes wrightii</i>	-	-	-
Wright's Water-willow ³	<i>Justicia wrightii</i>	-	-	-

Source: TPWD, 2025c; TPWD, 2025d

Note:

1. A hyphen symbol (-) indicates that no EOIDs for the species have been recorded within the study area; however, this does not indicate that the species cannot be found within the study area, and EOIDs occurring within studied counties but outside of the study area boundary are not listed.
2. The NDD data provided by TPWD includes recorded occurrences of this species within the study area; however, no corresponding EOIDs were provided.
3. This species is limited to specific environments or elevation ranges beyond the limits of the study area.

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Figure 3-6A: Element Occurrence Map

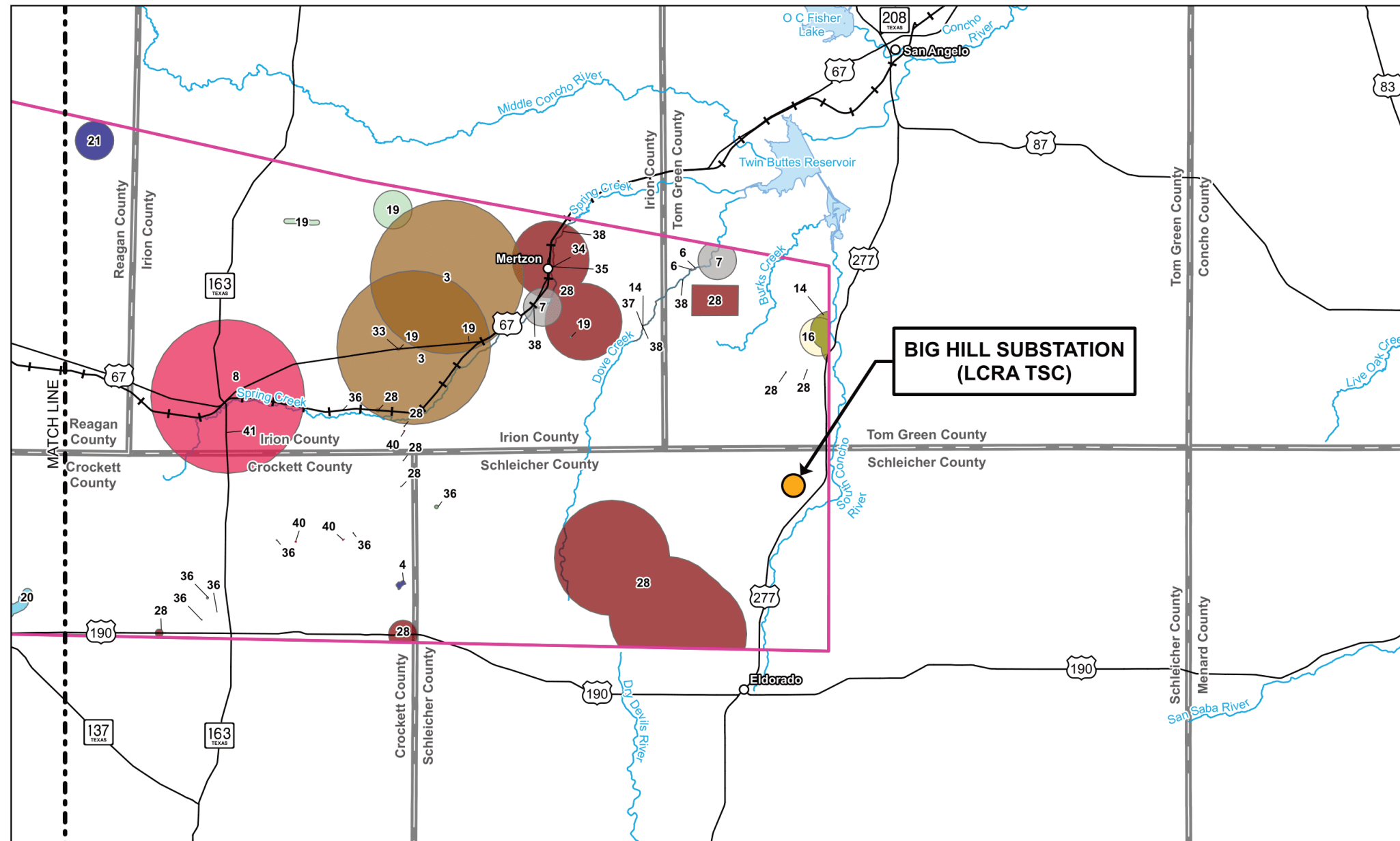


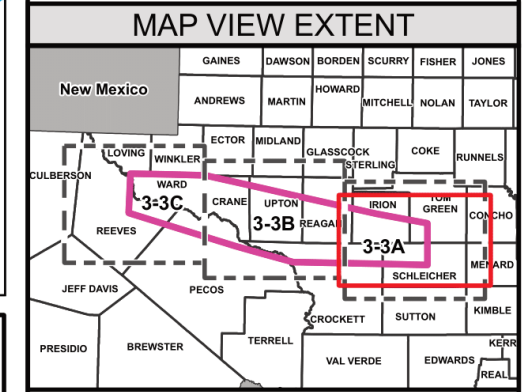
FIGURE 3-6A
ELEMENT OCCURRENCE MAP
BIG HILL - SAND LAKE
765 kV TRANSMISSION LINE PROJECT

Legend

- Project Endpoint
- City
- Study Area Boundary
- County Boundary
- Railroad
- Major Road
- ~ River / Stream
- ~ Water Body

Data Sources: TxDOT (County Boundaries, Cities, Roadway Inventory On-System, and Railroads), 2025c; USGS, 2025c; TPWD, 2025d; USFWS, 2025b

Data is for display purposes only. All features and boundaries have been approximated based on information gathered from review of public resources.



Plant and Wildlife Species Legend

<ul style="list-style-type: none"> ● 1 - Alkali Spurge ● 2 - Black Bear ● 3 - Black-Capped Vireo ● 4 - Black-Tailed Prairie Dog ● 5 - Cienega False Clappia-Bush ● 6 - Common Black-Hawk 	<ul style="list-style-type: none"> ● 7 - Concho Water Snake ● 8 - Cory's Woolly Locoweed ● 9 - Dune Umbrella-sedge ● 10 - Dune Unicorn-Plant ● 11 - Dunes Sagebrush Lizard ● 12 - Dwarf Broomspurge 	<ul style="list-style-type: none"> ● 13 - Grayleaf Rock-Daisy ● 14 - Guadalupe Bass ● 15 - Headwater Catfish ● 16 - Hill Country Wild-Mercury ● 17 - Hinckley's Spreadwing ● 18 - Hooded Skunk 	<ul style="list-style-type: none"> ● 19 - Irion County Wild-Buckwheat ● 20 - Jones' Selenia ● 21 - Kit Fox ● 22 - Manantial Roundnose Minnow ● 23 - Mexican Mud-Plantain 	<ul style="list-style-type: none"> ● 24 - Neglected Sunflower ● 25 - Pecos Gambusia ● 26 - Pecos Pupfish ● 27 - Pecos Sunflower ● 28 - Plateau Spot-Tailed Earless Lizard ● 29 - Proserpine Shiner 	<ul style="list-style-type: none"> ● 30 - Rayless Rock-Daisy ● 31 - Speckled Chub ● 32 - Swift Fox ● 33 - Texas Almond ● 34 - Texas Fatmucket ● 35 - Texas Fawnsfoot ● 36 - Texas Horned Lizard 	<ul style="list-style-type: none"> ● 37 - Texas Map Turtle ● 38 - Texas Shiner ● 39 - Waterfall's Milkvetch ● 40 - Western Box Turtle ● 41 - Western Massasauga
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Miles
0 7 14

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Figure 3-6B: Element Occurrence Map

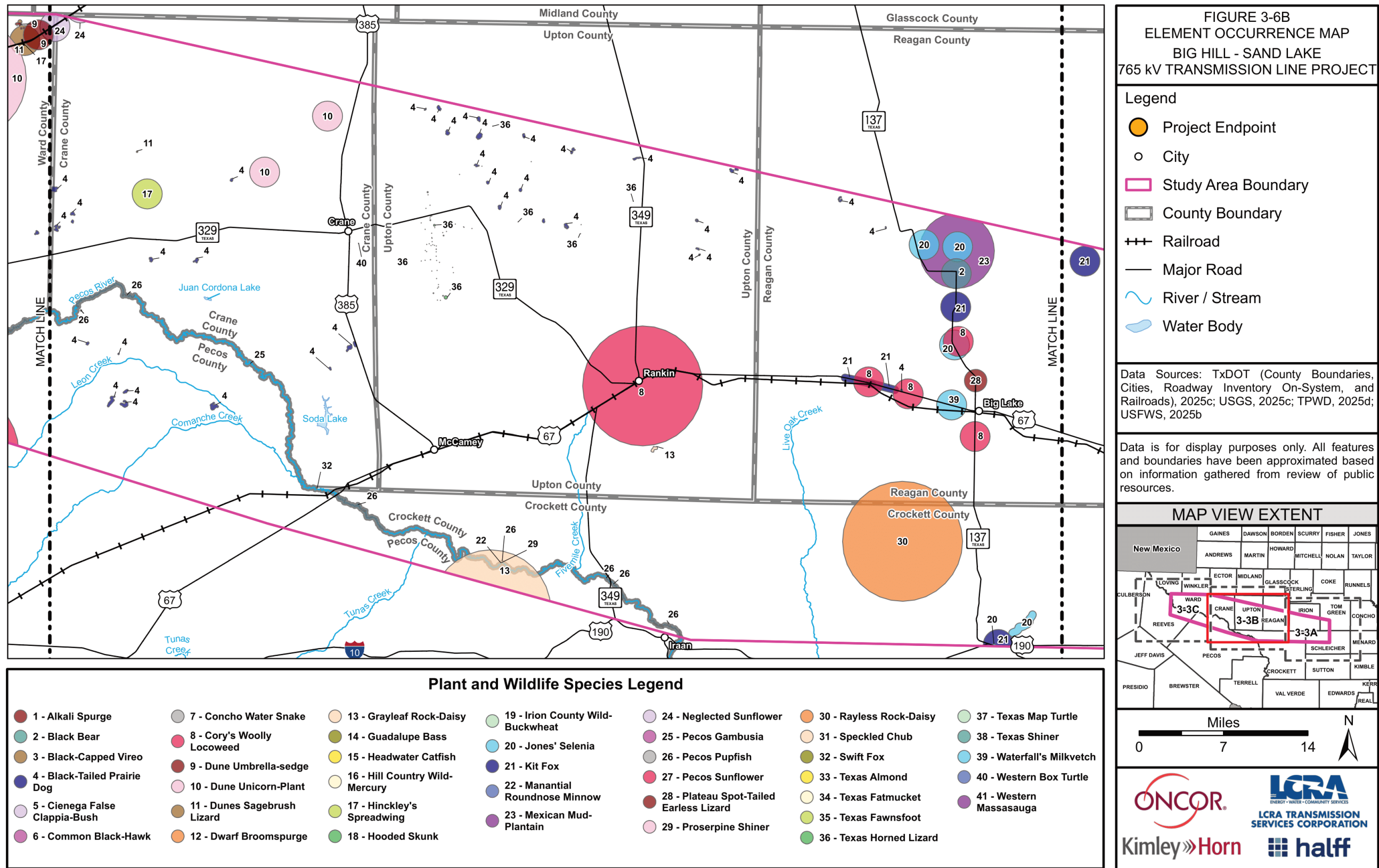
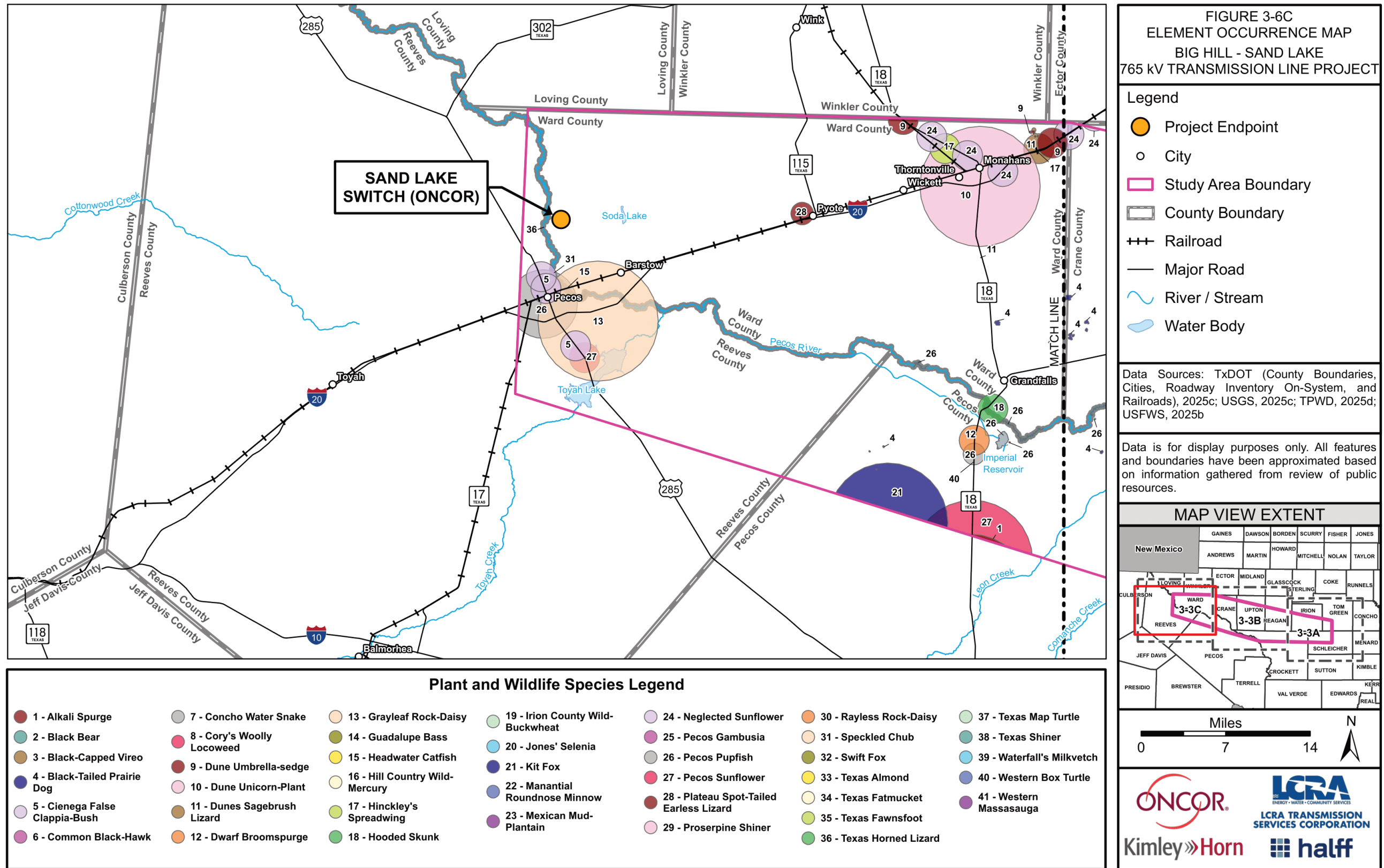


Figure 3-6C: Element Occurrence Map



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3.6 Community Values and Community Resources

The term "community values" is included as a factor for the consideration of transmission line certification under Section 37.056(c)(4)(A)-(D) of the Texas Utilities Code. The PUCT's CCN application requires consideration of values and resources essential to a local community, such as an assessment of the following:

- Approvals or permits required from other governmental agencies;
- Habitable structures within 500 feet of the centerline of the preliminary route links;
- Amplitude Modulation (AM), Frequency Modulation (FM), microwave, and other electronic installations in the study area;
- FAA-registered airstrips, private airstrips, and heliports located in the study area;
- Irrigated pasture or croplands utilizing center-pivot or other traveling irrigation systems; and
- Comments received from community leaders and members of the public.

In addition to the above-listed items, Kimley-Horn and Halff evaluated the proposed project for community resources that may not be listed by the PUCT but may be important to communities. Kimley-Horn and Halff have defined "community resource" as an area or other natural or human resource recognized by a national, regional, or local community. Examples of a community resource include parks or recreational areas, historical and archeological sites, or scenic vistas. As previously discussed in **Section 2.2.1** and **Section 2.5**, Kimley-Horn and Halff emailed consultation letters to various local elected and appointed officials and hosted public participation meetings to identify and collect information regarding community values and community resources. The above-listed community values and community resources are discussed in the following sections of this document.

3.7 Land Use

Kimley-Horn and Halff solicited information regarding environmental and land use constraints within the study area from municipalities and county officials, as mentioned in **Section 2.2.1**. Kimley-Horn and Halff also solicited information from school districts and various state and federal regulatory agencies. Copies of the consultation letters and agency responses are available in **Appendix A**. Several agency responses are noted where appropriate within **Section 3.0** and **Section 7.0** of this report. The following summaries illustrate the general responses received that address potential land use constraints:

- The GLO responded via letter on February 10, 2025, stating that the project appears to have no issues or constraints necessitating coordination with their agency but recommended future coordination to rule out the need for an easement to cross stream beds or Permanent School Fund land.
- The DoD Military Aviation and Installation Assurance Siting Clearinghouse responded via informal review letter on March 5, 2025, assigning project number 2025-1-T-DEV-40 and

stating that the project will have minimal impact on military operations conducted in the area.

- The TPWD responded via email with an attached letter PDF on March 26, 2025, assigning TPWD project number 54447 and providing an overview of wildlife preservation recommendations, including migratory birds, threatened/endangered species, and species of greatest concern, as well as aquatic, vegetation, and construction recommendations.

3.7.1 Urban/Residential Areas

The study area is situated across approximately 6,000 square miles within Crane, Crockett, Ector, Irion, Pecos, Reagan, Reeves, Schleicher, Tom Green, Upton, Ward, and Winkler counties, Texas. The study area encompasses several cities, towns, and unincorporated places. Mertzon and Big Lake are located in the eastern portion of the study area. Crane and McCamey are located within the central portion of the study area. The western portion of the study area extends to the Town of Pecos City and encompasses the incorporated municipalities of Grandfalls, Monahans, Thortonville, Wickett, Pyote, and Barstow. Numerous highways, state-maintained roads, county roads, and private roads are located within the study area. Major highways include, but are not limited to, Interstate 20, Texas State Highway 329, Texas State Highway 349, U.S. Highway 67, Texas State Highway 137, and Texas State Highway 163. Commercial, residential, and industrial developments are scattered throughout the study area, concentrated within urban centers and along major highways.

3.7.2 Recreation Areas

A review of federal, state, and local websites, maps, and field reconnaissance surveys identified numerous recreational areas located within the study area. There are over 25 listed conservation easement areas within the study area which are associated with city parks, golf courses, aquatic parks, and state parks (National Conservation Easement Database [NCED], 2025). A review of the National Park Service (NPS) website indicates there are no NPS parks, wild and scenic rivers, national monuments, national recreation areas, national preserves, national battlefields, or other national historic sites open to the public within the study area (NPS, 2025a; NPS, 2025b). A portion of the Butterfield Overland National Historic Trail traverses the study area, following the Pecos River until it crosses the Pecos River and continues northeast. (NPS, 2025a; NPS, 2025b). This trail extends almost 3,300 miles from the Mississippi River to California. However, this trail is not a continuous traditional path from end to end. Rather, it is comprised of various trail traces, structures, landmarks, and markers left on the landscape (NPS, 2025a; NPS, 2025b). There is one Texas State Park within the western portion of the study area: Monahans Sandhills State Park (TPWD, 2025k). No TPWD Wildlife Management Areas are located within the study area (TPWD, 2025l). Additionally, there are numerous facilities within the study area designated as town/city park areas, golf courses, and public use areas (pools, playgrounds, etc.). Other facilities include private recreational areas for the general public.

3.7.3 Agriculture

The study area is located within Districts 60 (Trans-Pecos) and 70 (Edwards Plateau) of the National Agricultural Statistics Service ([NASS], 2022). Crops produced in the eastern portion of the study area (Crockett, Irion, Reagan, and Tom Green counties) are oats, cotton, and grain sorghum (USDA, 2022b). The western portion of the study area (Crane, Ector, Pecos, Reeves, Schleicher, Upton, Ward, and Winkler counties) produces mainly cotton, cantaloupe, and watermelon (USDA, 2022b). There are over 944,000 head of cattle within the eastern portion of the study area and over 288,000 head of cattle within the western portion (NASS, 2024). Traveling irrigation systems were noted on aerial photography and observed during field reconnaissance, with isolated concentrations in the western and eastern portions of the study area.

3.7.4 Industry

Common industries within the study area include educational services, healthcare and social assistance, agriculture, forestry, fishing and hunting, and mining (U.S. Census Bureau, 2023). The largest industries in Crockett, Ector, Pecos, Reeves, Tom Green, and Ward counties are education services and healthcare and social assistance. The largest industries in Crane, Irion, Reagan, Upton, and Winkler counties are agriculture, forestry, fishing and hunting, and mining. Educational services and healthcare and social assistance industries are concentrated near populated areas. Agriculture, forestry, fishing and hunting, and mining industries tend to be located within more rural areas.

The oil and gas industry is prevalent throughout the study area. The RRC database includes numerous oil and gas wells within the study area (RRC, 2025). In addition, numerous supporting pipelines intersect the study area. Wind generation facilities are also present within the study area. Over 1,150 wind turbines are present throughout the study area and are mostly distributed within the central and eastern portions of the study area (United States Wind Turbine Database [USWTDB], 2025). Ten existing solar generation facilities are located within the study area, within Crane, Pecos, and Upton counties (USGS, 2023) with other facilities under construction.

3.7.5 Aesthetics

Aesthetics is included as a factor for consideration in the evaluation of transmission facilities in Section 37.056(c)(4)(A)-(D) of the Texas Utilities Code. For this study, the term aesthetics is utilized by Kimley-Horn and Halff to address the subjective perception of natural beauty in a landscape. This evaluation attempts to define and evaluate the study area's scenic qualities.

Consideration of the visual environment includes determining aesthetic values (where the significant 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).

Kimley-Horn and Halff 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 (grasslands, shrublands);
- Diversity of scenic elements;
- Degree of human development or alteration; and
- Overall uniqueness of the scenic environment compared with the larger region.

Based on recent aerial photography (ESRI World Imagery Basemap, 2025; NAIP, 2024) review, field reconnaissance, and general information, the aesthetics may be summarized as vast, arid desert ecosystems with the pronounced influence of the oil and gas industry. The landscape is a varied mosaic of open spaces, desert flora, geology, and the infrastructure of human development. The western third of the study area transitions from high desert and salt flats to expansive deposits of windblown sand dunes, represented by the Toyah Lake salt flat and Monahans Sandhills, respectively. The Pecos River is the dominant permanent water feature in the study area, with the most dramatic vistas found in southeastern Crane County. Oil and gas infrastructure is heaviest in this region, including electric transmission and distribution infrastructure. Vehicles servicing these sites are frequent and highly visible from public view.

Towards the central portion of the study area, the terrain transitions to rolling prairie dotted with native shrub species, with a more modest balance of oil and gas activity, agriculture, and ranchland. The eastern third of the study area features the most prominent terrain with a mixture of rolling and rugged, steep terrain and several USGS-named landmarks that may provide distinct visual features from the local road network. Modern wind farms strategically located at some of these higher elevations are a comparatively recent industrial aesthetic addition to the public viewshed. Spring Creek, Dove Creek, and other larger tributaries of the larger South Concho River watershed provide more prominent riparian corridors that contrast against the otherwise uniform ranchland.

Based on a review of the top 18 scenic drives in Texas, none of these drives were located within the study area (TripAdvisor, 2025). A review of the NPS website identified no Wild and Scenic Rivers, national parks, national monuments, or national battlefields within the study area (NPS, 2025a). As identified in **Section 3.7.2**, there is one Texas State Park within the study – Monahans Sandhills State Park (TPWD, 2025k). However, this state park is located in the northwestern section of the study area and is not representative of overall aesthetics throughout the region. No other aesthetic resources, designated scenic views, scenic roadways, or unique visual elements were identified.

3.7.6 Transportation/Aviation

Based on recent aerial photography (ESRI World Imagery Basemap, 2025; NAIP, 2024) review, there are numerous highways, state-maintained roads, county roads, and unpaved private roads throughout the study area. Major highways include, but are not limited to, Interstate 20, Texas State Highway 329, Texas State Highway 349, U.S. Highway 67, Texas State Highway 137, and Texas State Highway 163 as seen in **Figures 3-1A** through **3-1L (Appendix G)**. According to the TxDOT Project Tracker, there are many planned roadway maintenance projects within the study

area (e.g., overlay, seal coat, and rehabilitation of existing roads) (TxDOT, 2025a). Several active and historic railroads are located within the study area (RRC, 2025).

In the TxDOT Odessa District’s response letter dated March 13, 2025, TxDOT stated that it has no comment on potential environmental and land use impacts but recommended coordination with other state, federal, and local agencies. TxDOT also stated that utility installation requests are required for accommodation of utility facilities on state highway right of way and that driveway/access permits are required for access connections to the state highway system (**Appendix A**).

Field reconnaissance, coupled with a review of the FAA, AirNav, and Texas Airport Directory resources, was conducted to identify airports or airfields within or near the vicinity of the study area (FAA, 2025a; AirNav, 2025; and TxDOT, 2025b). This review resulted in the identification of 13 airports or airfields within 20,000 feet of the study area. No heliports were identified within 20,000 feet of the study area. **Table 3-11** lists these aircraft facilities within or near the study area.

In addition to registered aircraft facilities, Kimley-Horn and Halff identified numerous unregistered airstrips. The locations of these unregistered airstrips are depicted on **Figures 3-1A** through **3-1L (Appendix G)**.

Table 3-11: Aircraft Landing Facilities Within or Near the Study Area

Facility Name	FAA ID ¹	Facility Use	County	Relative Location	Figure Number
FAA Registered Airport with Runway Greater than 3,200 Feet within 20,000 feet of the Study Area					
Crane County Airport	E13	Open to the public	Crane	Northwest of Crane, along US Highway 385 North.	3-1E
Creekside Airport	03XS	Private Use	Irion	North of the study area within the 20,000-foot buffer. Located six miles northeast of Mertzou.	3-1A
Eldorado Airport	27R	Open to the public	Schleicher	South of the study area within the 20,000-foot buffer. Located one mile northwest of Eldorado.	3-1A
Evrige Farms Airport	94TT	Private use	Upton	Located within the north central portion of the study area, approximately 4,350 feet southeast of the intersection of CR 255 and CR 5.	3-1D
Hunter’s Creek Airport	5XA0	Private use	Tom Green	Located within the northeastern portion of the study area, approximately 8,950 feet southwest of the intersection of FM 2335 and CR 1633.	3-1A

Facility Name	FAA ID ¹	Facility Use	County	Relative Location	Figure Number
Iraan Municipal Airport	2FO	Open to the public	Pecos	Located south of study area, one mile southeast of Iraan.	3-1K
J-Bar Ranch Airport	8TE2	Private use	Crane	Located within the northwestern portion of the study area approximately 12 miles northwest of Crane.	3-1E
Pecos Municipal Airport	PEQ	Open to the public	Pecos	Located within the southwestern portion of the study area, approximately two miles southwest of Pecos.	3-1H
Reagan County Airport	E41	Open to the public.	Reagan	Located within Big Lake, Tx, along West United States Highway 67.	3-1C
Roy Hurd Memorial Airport	E01	Open to the public	Ward	Located in the northwestern portion of the study area, one mile southwest of Monahans.	3-1G
Upton County Airport	E48	Open to the public	Upton	Located within the southcentral portion of the study area, one mile southwest of McCamey.	3-1D
FAA Registered Airport with Runway Less than 3,200 Feet within 20,000 feet of the Study Area					
Keystone Ranch Airport	5TE6	Private use	Tom Green	Northeast of the study area within the 20,000-foot buffer.	3-1A
Rankin Airport	49F	Open to the public	Upton	Located within the central portion of the study area near the intersection of North State Highway 329 and West United State Highway 67.	3-1D

Source: FAA, 2025a; AirNav, 2025, TxDOT, 2025b

Note:

1. Identification code assigned to facilities registered with the FAA.

3.7.7 Communication Towers

Homeland Infrastructure Foundation-Level Data from the Federal Communications Commission (FCC) indicates there are FM and AM radio transmitters within the study area (FCC, 2025a; FCC, 2025b). There are 5 AM radio transmitters within 10,000 feet of the study area, and 9 FM transmitters within 2,000 feet of the study area. In addition, there are 168 communication towers which include a mix of cellular towers, microwave towers, and land mobile towers within the study area as shown in **Figures 3-1A through 3-1L (Appendix G)** (FCC, 2025b).

3.8 Cultural Resources

The ecological diversity of the study area reflects a range of physiographic and environmental conditions, characterized by distinct soil profiles, vegetation types, precipitation regimes, and

landform configurations that have directly influenced patterns of prehistoric and historic land use. The Ecoregions of Texas Level III and Level IV maps were prepared by a collaborative effort between the U.S. Environmental Protection Agency (EPA), TCEQ, and the NRCS (Griffith et al., 2007). This classification system analyzes the ecoregions at a finer scale than the MLRAs. **Table 3-12** lists the different ecoregions found within the study area, from greatest to least coverage.

Table 3-12: Archeological Ecoregions within the Study Area

Level III Ecoregion	Level IV Ecoregion	Description
Edwards Plateau	Semiarid Edwards Plateau	Flat, arid plateau
Chihuahuan Deserts	Chihuahuan Basins and Playas	Low elevation, arid, alluvial basins
	Stockton Plateau	Arid, sharply defined mesas
High Plains	Shinnery Sands	Sand beds dominated by shin oaks
	Arid Llano Estacado	Drier plains with varied topography

Source: Griffith et al., 2007

Similarly, the THC has developed recognized archeological regions linked by environmental and cultural similarities that have been commonly used for planning purposes (Brown et al., 1982; Kenmotsu and Perttula 1993; Mercado-Allinger et al., 1996). The majority of the study area, including Ward, Crane, Upton, and Reagan counties, is located within the Lower Plains Archeological Region which consists of lower density ground cover characterized by a mix of grasslands, low shrub thicket, and riparian woodlands. Prehistoric sites in the region often have moderate to high surface visibility, with visibility increasing to the west as ground cover becomes less dense. These sites include burned rock middens, lithic procurement sites, and campsites, and are occasionally found in rock shelters and in terrace deposits. Historic sites in this region often have greater surface visibility than prehistoric sites. These sites include surface features, including wells and buildings, with a higher density of artifacts and are found most frequently along old roads and uplands (Post, Buckley, Schuh & Jernigan, Inc. [PBS&J], 2008).

The eastern portion of the study area that includes Irion, Crockett, Tom Green, and Schleicher counties is located within the Central Texas Archeological Region. Due to the environmental and cultural similarities with the Lower Plains Archeological Region, the same methodology was applied to identified prehistoric and historic sites across both regions.

The southwestern portion of the study area that includes Reeves and Pecos counties is located within the Trans-Pecos Archeological Region. Prehistoric site types in this region include campsites, lithic procurement sites, and burned rock middens. Sites may occur in rock shelters or boulder overhangs and may be associated with pictographs or petroglyphs. Prehistoric sites in this region generally have high surface visibility due to very sparse ground vegetation. Sites in all settings are generally shallow, although they may be buried by shifting sand dunes in certain locations. Prehistoric sites are most frequent in level or sheltered areas close to water sources. Historic sites in this region also have high surface visibility because they are usually not buried, are associated with surface features, such as walls and buildings, and contain a much higher density of artifacts (PBS&J, 2008).

A records review of previously recorded archeological historical properties was conducted to determine the likelihood of impacts to cultural resources within the study area. The research was conducted using the THC Texas Archeological Sites Atlas (TASA) database, which contains published and unpublished data on prior cultural resources surveys, districts and properties listed in or eligible for the National Register of Historic Places (NRHP), State Antiquities Landmarks (SALs), Official Texas Historical Markers (OTHMs), cemeteries, and previously recorded archeological historical properties, including those listed in or eligible for listing in the NRHP or SAL (THC, 2025).

3.8.1 Previously Recorded Archeological Sites

A comprehensive records review (THC, 2025) identified over 1,880 previously recorded archeological sites within the study area. These resources span a broad cultural spectrum, including pre-contact lithic scatters, middens, and knapping stations, historic-period structures, railroad segments, artifact scatter, and homestead remnants. The presence of multicomponent sites, those exhibiting evidence of use across both pre-contact and historic periods, underscores the long-term and recurrent use of the landscape.

Of the documented sites in the study area, 76 have been determined eligible for inclusion in the NRHP. Many of these also have SAL designations as well. These NRHP-eligible sites represent a variety of resource types, including open campsites, burials, lithic quarries, and historically significant community features such as a military base and battlefield. The overall site density and diversity indicate high archeological sensitivity within the project area and support the likelihood of encountering additional unrecorded cultural resources during future investigations. **Table 3-13** provides a summary of the NRHP-eligible sites by county, along with their SAL designation.

Table 3-13: Previously Recorded NRHP-eligible Archeological Sites

Site ID	Ecoregion	Time Period	Site Type	SAL Designation
Crane County				
41CR1	Shinnery Sands	Paleoindian to post-contact	Burial site	No
Crockett County				
41CX20	Chihuahuan Basins and Playas	Late 19th Century	Occupation: military detachment	Yes
41CX110	Semiarid Edwards Plateau	Pre-contact	Open campsite with Petroglyphs	Yes
41CX791	Semiarid Edwards Plateau	Archaic to Pre-contact	Burned rock midden, lithic scatter	Yes
41CX792	Semiarid Edwards Plateau	Pre-contact	Burned rock midden	Yes
41CX793	Semiarid Edwards Plateau	Pre-contact	Open campsite, burned rock midden	Yes
41CX794	Semiarid Edwards Plateau	Pre-contact	Open campsite, burned rock midden	Yes
41CX821	Semiarid Edwards Plateau	Pre-contact	Campsite, burned rock midden	Yes
41CX822	Semiarid Edwards Plateau	Pre-contact	Open campsite	Yes
41CX823	Semiarid Edwards Plateau	Pre-contact	Open campsite, burned rock midden	Yes
41CX824	Semiarid Edwards Plateau	Pre-contact	Rock shelters	Yes

Site ID	Ecoregion	Time Period	Site Type	SAL Designation
41CX825	Semiarid Edwards Plateau	Late pre-contact to Neo-American	Campsite, lithic procurement, stone ring	Yes
41CX842	Semiarid Edwards Plateau	Archaic period	Burned rock midden	Yes
41CX843	Semiarid Edwards Plateau	Pre-contact	Campsite, burned rock midden, hearth	Yes
41CX844	Semiarid Edwards Plateau	Archaic period	Burned rock midden, hearth field	Yes
41CX845	Semiarid Edwards Plateau	Pre-contact	Burned rock midden, hearth field	Yes
41CX847	Semiarid Edwards Plateau	Pre-contact	Burned rock midden, hearth field	Yes
41CX848	Semiarid Edwards Plateau	Pre-contact	Burned rock midden, hearth field	Yes
41CX849	Semiarid Edwards Plateau	Archaic period	Burned rock midden, hearth field	Yes
41CX850	Semiarid Edwards Plateau	Pre-contact	Burned rock midden, hearth field	Yes
41CX851	Semiarid Edwards Plateau	Pre-contact	Hearth field	Yes
41CX852	Semiarid Edwards Plateau	Archaic period	Burned rock midden	Yes
41CX853	Semiarid Edwards Plateau	Pre-contact	Hearth field	Yes
41CX854	Semiarid Edwards Plateau	Paleo-Indian to Middle Archaic period	Campsite, burned rock midden	Yes
41CX855	Semiarid Edwards Plateau	Archaic period	Campsite, burned rock midden	Yes
41CX856	Semiarid Edwards Plateau	Pre-contact	Hearth field	Yes
41CX857	Semiarid Edwards Plateau	Pre-contact	Hearth	Yes
41CX858	Semiarid Edwards Plateau	Pre-contact	Burned rock midden, hearth, campsite	Yes
41CX859	Semiarid Edwards Plateau	Pre-contact	Burned rock midden	Yes
41CX860	Semiarid Edwards Plateau	Archaic period	Burned rock midden, bedrock mortars, stone alignments, hearths	Yes
41CX861	Semiarid Edwards Plateau	Pre-contact	Hearth, lithic scatter	Yes
41CX862	Semiarid Edwards Plateau	Pre-contact	Burned rock midden	Yes
41CX863	Semiarid Edwards Plateau	Pre-contact	Hearth, burned rock midden	Yes
41CX864	Semiarid Edwards Plateau	Pre-contact	Burned rock midden	Yes
41CX865	Semiarid Edwards Plateau	Pre-contact	Burned rock midden, hearth field	Yes
41CX869	Semiarid Edwards Plateau	Pre-contact	Burned rock midden	Yes
41CX870	Semiarid Edwards Plateau	Pre-contact	Campsite	Yes
41CX873	Semiarid Edwards Plateau	Pre-contact	Burned rock midden, hearth field	Yes
41CX879	Semiarid Edwards Plateau	Pre-contact to early 20th century	Burned rock midden	Yes
41CX880	Semiarid Edwards Plateau	Archaic period to late 1800s	Burned rock midden	Yes
41CX886	Semiarid Edwards Plateau	Pre-contact to post-contact	Burned rock midden, hearth	Yes
41CX887	Semiarid Edwards Plateau	Pre-contact	Burned rock midden	Yes
41CX888	Semiarid Edwards Plateau	Archaic period	Burned rock midden, hearth	Yes
41CX890	Semiarid Edwards Plateau	Pre-contact	Burned rock midden; hearths	Yes
41CX891	Semiarid Edwards Plateau	Archaic period	Burned rock midden; hearths	Yes
41CX892	Semiarid Edwards Plateau	Archaic period	Hearth	Yes
41CX894	Semiarid Edwards Plateau	Archaic period	Burned rock midden; hearths	Yes

Site ID	Ecoregion	Time Period	Site Type	SAL Designation
41CX895	Semiarid Edwards Plateau	Pre-contact	Hearth	Yes
41CX896	Semiarid Edwards Plateau	Pre-contact	Hearth	Yes
41CX897	Semiarid Edwards Plateau	Pre-contact	Burned rock midden, hearth	Yes
41CX902	Semiarid Edwards Plateau	Pre-contact	Burned rock midden	Yes
41CX903	Semiarid Edwards Plateau	Pre-contact	Burned rock midden; hearths	Yes
41CX904	Semiarid Edwards Plateau	Pre-contact	Burned rock midden	Yes
41CX905	Semiarid Edwards Plateau	Pre-contact	Campsite	Yes
41CX906	Semiarid Edwards Plateau	Pre-contact	Hearths, lithic scatter	Yes
Irion County				
41IR1	Semiarid Edwards Plateau	Archaic period	Burned rock midden	No
Pecos County				
41PC616	Chihuahuan Basins and Playas	Spanish Colonial through 1920s	Historic road	No
Reagan County				
41RG77	Semiarid Edwards Plateau	Post-contact: 1878 to 1882	Forts, battlefields and skirmishes	Yes
Reeves County				
41RV28	Chihuahuan Basins and Playas	Pre-contact	Campsite: thermal features, lithic artifacts, ground stone	No
Upton County				
41UT42	Stockton Plateau	Pre-contact	Rock shelter with rock art	No
41UT141	Stockton Plateau	Archaic period	Lithic scatter; burned rock midden; occupation	No
Ward County				
41WR75	Chihuahuan Basins and Playas	Historic; most likely between 1890 and 1910	Late 19 th – early 20 th century irrigation canal	No
41WR102	Chihuahuan Basins and Playas	Unknown	Lithic, historic, and FCR scatter, thermal features	No
41WR106	Chihuahuan Basins and Playas	Unknown	Lithic and FCR scatter, thermal features	No
41WR107	Chihuahuan Basins and Playas	Archaic period	Lithic and FCR scatter, thermal features	No
41WR108	Chihuahuan Basins and Playas	Unknown	Lithic, historic, and FCR scatter, thermal features	No
41WR109	Chihuahuan Basins and Playas	Pre-contact	Lithic and FCR scatter, thermal features	No
41WR11	Chihuahuan Basins and Playas	Paleoindian period	Open campsite	No
41WR13	Shinnery Sands	Pre-contact	Open campsite	Yes
41WR14	Shinnery Sands	Pre-contact	Open campsite	Yes
41WR15	Shinnery Sands	Pre-contact	Open campsite	Yes
41WR16	Shinnery Sands	Pre-contact	Open campsite	Yes
41WR17	Shinnery Sands	Pre-contact	Open campsite	Yes
41WR18	Shinnery Sands	Pre-contact	Open campsite	Yes
41WR19	Shinnery Sands	Pre-contact	Open campsite	Yes
41WR20	Shinnery Sands	Pre-contact	Open campsite	Yes

Site ID	Ecoregion	Time Period	Site Type	SAL Designation
41WR111	Chihuahuan Basins and Playas	20th century	Historic air base	No
41WR123	Chihuahuan Basins and Playas	Archaic to late pre-contact	Lithic scatter	No

Source: THC, 2025

3.8.2 Historic Sites

3.8.2.1 Cemeteries

Cemeteries, both formal and informal, represent a significant component of the cultural landscape within the study area. A total of 38 cemeteries have been documented within the study area, with at least nine designated as Historic Texas Cemeteries (HTCs) under the purview of the THC. These resources include community cemeteries, church-affiliated burial grounds, isolated family plots, and potential unmarked Indigenous burial areas.

Spatially, cemeteries are often associated with historic settlements, transportation corridors, and early ranching or agricultural operations. Many are in proximity to homesteads or rural churches, while others are situated in marginal or difficult-to-access terrain. Although most documented cemeteries appear on topographic maps or within local records, undocumented burial grounds, particularly pre-contact or underrepresented community sites, may also be present. Several smaller, private cemeteries for which location information rests with family members or property owners may also be within the study area. **Table 3-14** summarizes the number of cemeteries identified by THC records within the study area, by county, and of those cemeteries, the number that have historic cemetery designations by the THC.

Table 3-14: Recorded Cemeteries within the Study Area

County	Cemetery Count	HTC Cemetery Count	Figure Number
Crane	2	1	3-1E
Crockett	0	0	-
Ector	0	0	-
Irion	6	2	3-1A, 3-1B
Pecos	7	2	3-1D, 3-1F, 3-1G, 3-1K, 3-1L
Reagan	2	1	3-1C, 3-1I
Reeves	5	0	3-1H
Schleicher	1	0	3-1A
Tom Green	3	2	3-1A
Upton	5	1	3-1D, 3-1J
Ward	7	1	3-1G, 3-1H
Winkler	0	0	-

Source: THC, 2025

3.8.2.2 Official Texas Historical Markers

The THC records provide 99 OTHMs within the study area. These markers provide early history and commemorate early community members, cemeteries, churches, trails, buildings, and other cultural elements that were important to past settlements. Additionally, some natural features such as the Bobcat Hills and King Mountain are also commemorated by markers (**Figure 3-1D**). Intended to improve the visibility and accessibility of historical elements within the state, marker locations are limited to physical structures or roadsides, the latter of which may refer to a broad or specific geographic location that may be distant from the location of the actual marker. **Table 3-15** summarizes the recorded OTHMs within the study area.

In addition to these locations, several other features identified during field reconnaissance and on various mapping sources could represent or contain historic resources. The expansive oil fields mapped on USGS maps each may contain historic-aged structures that could be recorded as archeological sites. Furthermore, windmills, railroads, bridges, and unmapped ranch features such as corrals, fences, and water storage features are likely present within the study area and could be considered historic sites if more than 50 years old.

Table 3-15: Recorded OTHMs within the Study Area

County	OTHM Count	Figure Number
Crane	12	3-1E, 3-1F
Crockett	3	3-1C, 3-1D, 3-1K
Ector	0	-
Irion	9	3-1A, 3-1B
Pecos	2	3-1F, 3-1K
Reagan	13	3-1C, 3-1I
Reeves	14	3-1H
Schleicher	3	3-1A
Tom Green	3	3-1A
Upton	26	3-1C, 3-1D
Ward	14	3-1G, 3-1H
Winkler	0	-

Source: THC, 2025

3.8.3 NRHP Properties and Districts

The study area includes a substantial number of heritage properties formally recognized through the NRHP and SAL designation program. These properties encompass a wide range of historic resource types, including rural residential structures, civic buildings, cultural landscapes, archeological sites (see **Table 3-13**), and transportation infrastructure. SALs, while fewer in number, represent some of the most significant heritage assets within the state and carry additional regulatory protections under the Texas Antiquities Code. NRHP listings may include individual properties as well as historic districts, the latter of which comprise multiple contributing resources that collectively convey historical significance. The presence of both NRHP properties and districts, and SAL properties across multiple

counties within the study area suggests a high potential for encountering additional eligible or landmark-caliber resources, particularly in areas that have not undergone systematic survey. **Table 3-16** summarizes NRHP sites identified by THC records within the study area.

Table 3-16: Recorded NRHP Properties and Districts within the Study Area

County Name	NRHP Type	Number of Records	Figure Number
Crane	Property	0	-
	District	0	-
Crockett	Property	1 (Camp Melvin Site ¹)	3-1D
	District	0	-
Ector	Property	0	-
	District	0	-
Irion	Property	1 (Irion County Courthouse)	3-1A
	District	0	-
Pecos	Property	0	-
	District	0	-
Reagan	Property	1 (Old Reagan County Courthouse)	3-1C
	District	0	-
Reeves	Property	0	-
	District	0	-
Schleicher	Property	0	-
	District	0	-
Tom Green	Property	0	-
	District	0	-
Upton	Property	0	-
	District	0	-
Ward	Property	0	-
	District	0	-
Winkler	Property	0	-
	District	0	-

Source: THC, 2025

Note:

1. The Camp Melvin site is an archaeological site with a secure location in THC records. For protection of the site, it is not labeled on the map.

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4.0 IDENTIFICATION OF PRELIMINARY ALTERNATIVE ROUTE LINKS

4.1 Routing Considerations

Upon completion of the various data collection activities and constraints mapping process, the next step for the proposed project was to identify preliminary alternative route links to connect the Sand Lake Switch to the Big Hill Substation. Potential alternative route links were plotted on recent aerial photography (ESRI World Imagery Basemap, 2025; NAIP, 2024) based on the findings from reconnaissance surveys; information from local, state, and federal officials; property boundary maps; and other environmental and land use constraints data. The initial property boundary maps utilized to locate apparent property boundaries consisted of GIS data from the county tax offices and appraisal districts. Digital gas and petroleum pipeline data obtained from the RRC (2025) were used to identify pipeline corridors and other oil and gas facilities (e.g., natural gas pads, individual well sites). Where practical, Kimley-Horn and Halff verified the location of some of the pipelines and above-ground oil and gas facilities either by reviewing aerial photography or by field reconnaissance but did not alter the RRC digital data. The environmental and land use constraints maps in **Appendix G** show the locations of pipelines and oil and gas well sites based on the data received from the RRC.

Consistent with the provisions of PUCT Substantive Rules Section 25.101 (b)(3)(B), Kimley-Horn and Halff considered existing corridors (e.g., existing electric utility rights-of-way, roadways, property lines) to develop preliminary alternative route links that, to the extent reasonable, moderate the impact to landowners and communities. Paralleling these corridors is a desirable routing approach because it serves to address the factors and guidelines detailed in Public Utility Regulatory Act Section 37.056 (c). For example, the structures and easement of an existing transmission line present an aesthetic, land use, and environmental setting consistent with construction of a new transmission line. However, in some instances, these existing corridors are not suitable for routing. An existing transmission line does not deter adjacent land uses. Oil and gas facilities, residences, commercial buildings, and other attendant structures are often constructed near or adjacent to the existing corridor, thereby precluding the placement of an additional adjacent transmission line. A similar relationship applies to roadways and property boundaries. Homes and businesses are often proximal to the roadway, which would preclude the location of a preliminary alternative route link. Furthermore, apparent property boundaries are often irregular and paralleling them over the course of an entire link or route to the exclusion of other factors would increase the length of the project on a landowner's property and the number of turns (and structures), both of which contribute to the effect on the local aesthetic and environmental setting. Kimley-Horn and Halff attempt to mitigate the latter effects by considering other natural or cultural features, consistent with PUCT guidelines, that may be within a larger property, such as paralleling an interior fence line, ranch road, or field transition. In sum, the routing process entails decisions that balance the routing guidelines established in PUCT Substantive Rules, the Commission's policy of prudent avoidance, land use, and the overall environmental setting over the course of an entire route.

In addition to PUCT routing guidelines, the study area includes two electric transmission line PUCT approved projects, but for which construction has not yet commenced and/or is not

completed. One project, the North McCamey - Sand Lake 345 kV transmission line, will connect near the proposed project's endpoint, and will interconnect with a different LCRA TSC station, located within the study area and shown in **Figures 3-1D through 3-1H (Appendix G)**. The North McCamey - Bearkat 345 kV transmission line project also intersects the proposed project's study area, shown in **Figures 3-1D and 3-1J (Appendix G)**, but does not connect to the proposed project endpoints. The development of preliminary alternative route links between the Sand Lake Switch and the Big Hill Substation considered both PUCT approved projects.

4.2 Routing Development

Oncor and LCRA TSC defined a specific point of origin at the Sand Lake Switch and the Big Hill Substation to which the terminal links would connect. The layout of each station defines each point of origin and the general route link progression from the station. A link is defined as a route segment that progresses generally in a forward direction, prior to diverging, or branching, in at least two different directions to form new links. Each branch location is defined as a node. Ultimately, Kimley-Horn and Halff identified numerous preliminary alternative route links that, when combined, form an assortment of preliminary alternative route links to connect the project endpoints.

Routing constraints are prevalent throughout the study area as one moves east from the Sand Lake Switch to the Big Hill Substation. Oil and gas pipelines and well sites are prevalent throughout the study area but present more routing challenges in the western portion of the study area when combined with other physical constraints. Therefore, the routing approach and link assignments started from the region of more constraints (i.e., Sand Lake Switch) and progressed to the region of fewer constraints (i.e., Big Hill Substation).

Eastern Corridor – Figures 3-1A and 3-1B (Appendix G)

As the routes progress west from the Big Hill Substation, oil and gas facilities are a common constraint. In addition, the presence of wind turbines was influential when considering alternative routes due to their high density along the local topography. Existing pipeline and electric transmission line corridors allowed for identification of preliminary alternative route links through these constraints.

Central Corridor – Figures 3-1C through 3-1F and 3-1I through 3-1K (Appendix G)

Routing in this region still required an evaluation of local topography so that structures could be placed in a constructable setting. Although crossing high terraces was ultimately required between drainage divides, preliminary alternative route link development often avoided crossing over point mesas and linear extensions of the more prominent ridgelines. Factors that further affected the routing process through this region include the expansive wind turbine developments along the higher ridges and solar farm arrays that occupied more level terrain. Western progression through the study area also factored the approach of the Pecos River which runs northwest-southeast.

Western Corridors – Figures 3-1G, 3-1H, and 3-1L (Appendix G)

In addition to the high density of oil and gas facilities, this portion of the study area marked a pronounced change in terrain, transitioning from rolling hills and in some cases, steep-sloped mesas to more gentle flats. Because of the tendency for many oil and gas facilities to align near property boundaries, routing attempted to utilize areas to the property interior where existing and permitted oil and gas facilities are absent or less frequent, thereby facilitating extended route links with fewer turns. The concentration of existing electric transmission lines was also considered in this portion of the study area. TxDOT requires new transmission lines to cross state or federal highways at a right-angle. This right-angle approach also applies to railroad crossings. Therefore, any link progressions to these types of transportation features had to consider constraints on both sides of the feature. For example, a routing opportunity on the north side of IH-20 must be paired with an opportunity, at a right-angle, on the south side of the highway. This routing scenario was applied in numerous locations throughout the study area, including FM roads, but was particularly influential where several types of constraints were concentrated along the IH-20 corridor. As shown in **Figure 3-1H (Appendix G)**, the high density of oil and gas facilities and pivot irrigation presented substantial routing constraints near the Sand Lake Switch.

Refinement of Preliminary Route Links

Oncor and LCRA TSC presented the preliminary route links at the public participation meetings, as further discussed in **Section 5.0**. The figures located in **Appendix B** depict the preliminary links that were presented at the public participation meetings. After the public participation meetings, Kimley-Horn and Halff made modifications to the preliminary route links considering public feedback received, updated property data, guidance from Oncor and LCRA TSC, and additional field investigations. **Section 6.0** provides a detailed description of the new route links and modifications to the preliminary route links that were made following the public participation meetings.

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5.0 PUBLIC INVOLVEMENT PROGRAM

5.1 Public Participation Meetings

The various data collection activities were utilized in the development of a constraints map and the ultimate selection of preliminary alternative route links were presented at the in-person public participation meetings as described in **Section 2.5**. Three public participation meetings were held in municipalities throughout the study area on: June 9, 2025, at the Reagan County High School in Big Lake, Texas; June 10, 2025, at the McCamey 4-H and Community Center in McCamey, Texas; and June 11, 2025, at the Reeves County Civic Center in Pecos, Texas. **Appendix B** presents figures that depict the location of the preliminary alternative route links that were presented at the public participation meetings, general information about the project, and a questionnaire soliciting input from notified landowners and meeting attendees.

At the public participation meeting held on June 9, 2025, 39 people signed in and four questionnaires were returned at the meeting. At the public participation meeting held on June 10, 2025, seven people signed in and three questionnaires were returned at the meeting. At the public participation meeting held on June 11, 2025, 14 people signed in and two questionnaires were returned at the meeting. In addition to the questionnaires that were turned in at the meetings, 19 questionnaires and/or letters were submitted by electronic mail at a later date to Oncor and LCRA TSC, which were ultimately provided to Kimley-Horn and Halff for review.

The questionnaire presented at the public participation meetings and available on the Oncor and LCRA TSC websites requested input concerning transmission line issues regarding land use, paralleling existing corridors, and community values/resources. Respondents were asked to rank different factors as the most important consideration in terms of land use, including ranking lists of habitable structures, community values, and other resources in order of importance as they pertain to maximizing the distance from the proposed project. The questionnaire also provided space for respondents to include any general comments or remarks. Completed questionnaires were received that provided a variety of comments, concerns, and requests for the transmission line routing. **Section 5.2** contains a summary of topics covered in the comments received.

5.2 Public Participation Meeting Comments

As noted, comments were received both during and after the public participation meetings. Those received after the meetings were received in a variety of formats, including:

- hard copy or electronic questionnaires from those who may have attended the public participation meetings;
- electronic questionnaires from those who obtained a copy of the questionnaire after the public participation meetings but did not attend the meetings; and
- electronic mail providing a statement or opinion summary regarding the project, with or without the questionnaire attached.

Sample comments or general comment summaries are presented to reflect the overall public response for a particular theme or topic. Comments usually covered many subjects in one response, and any statement excerpted from a comment to represent a particular subject does not reflect dismissal or a lack of regard for any other language or subject addressed in the comment. The approximate number of comments are provided for each theme or topic. Representative comments, remarks, and concerns submitted in either questionnaire or electronic mail format are grouped by topic below.

Topic: Environmental Concerns (6 comments)

- “I am against the proposed line South along the Pecos River. Other routes would be more tolerant to environmental concerns.”
- “...the proposed location of the transmission line on the Subject Tracts is on a sensitive limestone underground spring formation and recharge zone for the Dove Creek Spring, a perennial spring that flows year round and discharges approximately 2,500 gallons per minute of fresh water, and forms a material part of the water supply used by the nearby City of San Angelo.”
- “We sit on the divide between Dove [C]reek and Spring Creek a large transmission main project would impede our work to help improve [watershed] that feed major water supply lakes to San Angelo.”
- “Avoid crossing rivers and riparian areas as much as possible.”
- “The flow of water across these 4 sections is down toward the Dove Creek Spring.”

Topic: Aesthetics (4 comments)

- “My property is highly dependent on the view scape.”
- “It will be an eyesore every time I walk out of the front door of my house.”
- “The proposed line route is visible from my property.”
- “The project is estimated to impact 70% of [the tract's] viewshed.”

Topic: Archeological Sites (3 comments)

- “There was a lot of American Indian activity and archeological sites across the property.”
- “...has numerous Native American historic campsites”
- “This land is also very rich with Native American artifacts as well as extensive fossil collections that date back to the Permian [P]eriod.”

Topic: Residences (3 comments)

- “This line [J3] is proposed to go right through the area of my 3 family homes along with our feed lot and source of business income.”
- “We are strongly opposed to the proposed route [M3] coming so close to our home.”
- “...I am heartbroken at the idea of this powerline [M3] running so close to our home.”

Topic: Existing Transmission Lines (3 comments)

- “I am from Schleicher County, all of the lines that come through us run in the North Corner. Why can y’all put the line following 190 for future projects.”
- “I have 313 acres which if you cross my property (as I already have large transmission line cutting through it) it will devalue it even more.”
- “In these cases, we encourage you to leverage existing transmission/road/pipeline corridors, go along property boundaries, and avoid existing encumbrances...”

Topic: Health (2 comments)

- “We are also concerned about the potential health impacts of living in such close proximity to a high-voltage transmission line. Several studies have raised questions about long-term exposure to electromagnetic fields, especially for children and elderly individuals.”
- “That being said, its common knowledge that living in close proximity to said lines are cancerous, dangerous, loud, and an eye-sore to us and the wildlife currently living in the area of this proposed destruction!”

Topic: Ranching (2 comments)

- “I have a beautiful 2,260 acre Hill Country ranch with rolling hills and oak trees. I use it for deer hunting and cattle grazing with involved leases to third parties.”
- “Your proposed path of least resistance would devastate our property, leave question to cattle safety (beef quality), wildlife and residential areas.”

Topic: Transmission Line Routing: (1 comment)

- “The proposed route goes through Permanent University Fund land, which is managed by University Lands. University Lands would like to encourage buildout of 765 kV infrastructure on Permanent University Fund land. University Lands has a history of doing transmission, road, and pipeline easements.”

Topic: Aviation (1 comment)

- “There is a private airstrip, with 3 runways that runs through [tract numbers]. Ensuring safety measures are taken for private runways, giving a half mile clearance for traffic patterns on runways.”

Topic: Fish and Wildlife: (1 comment)

- “Additionally, we have confirmed the presence of Montezuma Quail [*Cyrtonyx montezumae*] on our property. This species is classified by Texas Parks and Wildlife as a Species of Greatest Conservation Need.”

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6.0 FINALIZATION OF THE ALTERNATIVE ROUTE LINKS

Based on input, comments, and information received by Halff, Kimley-Horn, Oncor, and LCRA TSC at and following the public participation meetings, Kimley-Horn and Halff considered revisions to preliminary alternative route links, removal of preliminary route links, and the addition of new alternative route links. The decision to address a comment by revision or addition of a link considered several factors. The study area is large and dynamic with real-time conditions outpacing what may be observed on aerial photography in some locations. Halff and Kimley-Horn conducted site visits of the study area after the public participation meetings to verify the status of potential property changes that were researched at the early stages of the routing study and to adjust the route network as necessary. Additional reconnaissance surveys were conducted after the public participation meetings to evaluate and field verify some of the input, comments, and information received at and following the public participation meetings. Aerial reconnaissance of the study area was also used to verify potential constraints. After considering new information and conducting further constraints analyses, revisions to the set of preliminary alternative route links were adopted and finalized, the results of which are described in detail in the following sections.

6.1 Route Link Additions

In consideration of comments received from throughout the study area, Oncor and LCRA TSC asked Halff and Kimley-Horn to expand the breadth of alternative route links to include routes parallel to existing transmission line corridors in the study area. This consideration also included the PUCT-approved North McCamey – Sand Lake 345 kV transmission line, which is currently under construction with an estimated in-service date of mid- to late-2026. Preliminary alternative routes were also added within the study area to improve overall geographic diversity. **Figure 6.0** in **Appendix C** is a map of the preliminary route links presented at the public participation meetings and links that were added in consideration of public comments and further constraints analysis. **Table 6-1** provides a brief description of these preliminary route links and their location within the study area and identifies which links may have been split by the addition of a new link. The route link additions described in **Table 6-1** are depicted overlain on aerial imagery in **Appendix C** and on the constraints map shown in **Figures 3-1A** through **3-1L** in **Appendix G**. Any links that were split and subsequently revised are addressed in **Section 6.2** and **Table 6-2**.

Table 6-1: Summary of Preliminary Route Link Additions

Figure ID ¹	Link ID	Description
Map Panel 1		
6-1	D3	Link D3 was added to parallel the North McCamey – Sand Lake 345 kV transmission line ² . This addition also provides another alternative to facilitate routing near the Sand Lake Switch where oil and gas infrastructure is a common and dynamic constraint. This addition splits Link B3 into Links B31 and B32, and Link D2 into Links D21 and D22.
6-2	H3	Link H3 was added to parallel the North McCamey – Sand Lake 345 kV transmission line ² . This addition splits Link G1 into Links G11 and G12.

Figure ID ¹	Link ID	Description
6-3	J4	Link J4 was added to parallel the North McCamey – Sand Lake 345 kV transmission line ² . This addition splits Link I3 into Links I31 and I32 which are shown in more detail on Figure 6-25 .
6-4	J6	Link J6 was added to provide potential routing connections between the original Link J2 (See Figure 6-5) and J3 corridors. The southern portion of this link splits Link J3 into Links J31 and J32.
Map Panel 2		
6-5	J4 (cont.), J5, J6 (cont.), and J8	Link J5 was a continuation of the Link J6 connection with the Link J2 corridor discussed in Figure 6-4 , thereby splitting Link J2 into Links J21 and J22. Link J7 is a continuation of Link J4 (see Figure 6-3) and is shown in further detail in Figure 6-6 . Link J8 was added to provide potential routing connections between the original Link J1 and J2 corridors. The northern portion of this link splits Link J1 into Links J11 and J12.
6-6	J6 (cont.) and J7	Link J7 is a continuation of Link J4, paralleling North McCamey – Sand Lake 345 kV transmission line ² . The southern portion of this link splits Link K2 into Links K21 and K22.
6-7	K5, K6, and K7	Links K5 and K6 were added to provide an additional alternative that parallels an existing transmission line, and to provide potential routing connections between the original Link L1 and K4 corridors. The addition of Links K5 and K6 split Link L1 into Links L11 and L12, and Link K4 into Links K42 and K43, respectively. Link K7 was added to provide a connection to the Link M4 corridor which is shown in further detail in Figure 6-9 . The addition of Link K7 splits Link L5 into Links L51 and L52.
6-8	K8, L6, and L7	Link K8 was added to provide an additional alternative that parallels an existing transmission line, together with Link M5 which is shown in more detail on Figure 6-10 . Links L6 and L7 were added to provide potential routing connections between the original Link K4-M2 and M3 corridors. The addition of Link L7 splits Link M3 into Links M31 and M32.
6-9	M4	Link M4 was added to provide an additional alternative that parallels an existing transmission line. The addition of Link M4 split Link L5 into Links L51 and L52 on the western side, and Link N1 into Links N11 and N12 on the eastern side.
6-10	M5	Link M5 is a continuation of Link K8 (see Figure 6-8) that provides an additional alternative that parallels an existing transmission line.
6-11	M6 and M7	Link M7 provides an additional alternative that parallels an existing transmission line in direct response to landowner comments affected by the original Link M3 alignment. Whereas Link M7 is a continuation of the Link M5 corridor (see Figure 6-10) in response to the request, Link M6 provides a potential routing connection from the southern Link M3 corridor to Link M7. The addition of Link M6 split Link M3 into Links M32 and M33.
6-12	O4	Link O4, which is also shown on Figure 6-13 , is the continuation of Link M7 (see Figure 6-11) which provides an additional alternative that parallels an existing transmission line.
Map Panel 3		
6-13	O4 (cont.)	Link O4, which is also shown on Figure 6-12 , is the continuation of Link M7 (see Figure 6-11) which provides an additional alternative that parallels an existing transmission line. The addition of this link splits Link P3 into Links P31 and P32 on its eastern end.
6-14	Q5	Link Q5 provides an additional alternative that parallels an existing transmission line between the original Link Q1 and Q2 corridors. Addition of this link splits Link Q2 into Links Q21 and Q22 on the western end, and Link Q1 into Links Q11 and Q12 on the eastern end.
6-15	Q6	Link Q6 is the continuation of Link O4 (see Figure 6-13) which provides an additional alternative that parallels an existing transmission line between the original Link P3 and R2 corridors. The addition of this link splits Link P3 into Links P31 and P32 on the western end, and Link R2 into Links R21 and R22 on the eastern end.

Figure ID ¹	Link ID	Description
6-16	R3	Link R3 is the continuation of Link Q6 (see Figure 6-15) which provides an additional alternative that parallels an existing transmission line between the original Link R2 corridor and its progression to the Big Hill Substation endpoint.
6-17	R4, R5, and Z.2	Link R5 is a continuation of Link R3 (see Figure 6-16) paralleling an existing transmission line to the modified Link T4 corridor, which is discussed in more detail in Figure 6-47 . Link R4 was added as a continuation of Link T3 as a routing alternative to Link T4.

Notes:

1. Please refer to **Appendix C, Preliminary Route Link Additions** for all map panel and figure references.
2. As noted in **Section 6.1**, the PUCT-approved North McCamey – Sand Lake 345 kV transmission line (labeled as PUCT Approved Project on figures) which is currently under construction with an estimated in-service date of mid- to late-2026.

6.2 Route Link Revisions

A route link revision is distinguished from a route link addition in that it is a reconfiguration of a portion of a link, the relocation of an entire link, or the addition or renaming of a link necessitated by other link additions or revisions along an existing link. Link revisions were made in direct response to information reflected in **Section 5.0**, in response to information received by Oncor and LCRA TSC directly from local officials or landowners or based on additional investigations identified routing constraints that necessitated a change. The route link revisions described in **Table 6-2** are depicted in **Appendix C** and incorporated into the final constraints maps in **Figure 3-1A** through **Figure 3-1L** in **Appendix G**.

Table 6-2: Summary of Preliminary Route Link Revisions

Figure ID ¹	Link ID	Description
Map Panel 1		
6-18	B3	Link B3, split into Links B31 and B32 by the addition of Link D3 (see Figure 6-1), was modified to avoid a new habitable structure identified along the north side of County Road (CR) 140 on Tract 108. The link was also shifted to the west in this same vicinity to account for a planned electric transmission substation (by others) between FM 516 and FM 873 along CR 155.
6-19	B3 (cont.), C1, C2, and D2	Link B3, split into Links B31 and B32 by the addition of Link D3 (see Figure 6-1), and Link C2 were modified to parallel a stretch of electric transmission line. Link C1 was shortened by the adjustment of the new Link B32, C1, and C2 node. Link D2, split into Links D21 and D22 by the addition of Link D3, was modified to route around a newly constructed pad site on Tract 189. The link was modified beginning from the original Link C2, D2, E3 node to cross the Pecos River in an optimal location.
6-20	D1	Link D1 was modified to avoid potential transmission line structure placement within oil and gas pipeline easements that were noticed from FM 2335 during field reconnaissance.
6-21	F2	Link F2 was modified to avoid crossing through the middle of a new pivot irrigation installation that was observed during aerial reconnaissance.
6-22	G1	Link G1, split into Links G11 and G12 by the addition of Link H3 (see Figure 6-2), was adjusted to better align with Link H3 and other links identified in Section 6.1 that were added to parallel the North McCamey – Sand Lake 345 kV transmission line ² .

Figure ID ¹	Link ID	Description
6-23	G2	Updated aerial imagery allowed for the verification of a pad site within the former Link G2 centerline. The link was shifted to the north to avoid crossing the pad site with the transmission line ROW.
6-24	H2	Link H2 was modified to align with the new node location that resulted from the addition of Link H3 (see Figure 6-2).
6-25	I2 and I3	Link I3, split into Links I31 and I32 by the addition of Link J4 (see Figure 6-3), was adjusted to best align with Links H3 and J4 that were added to parallel the North McCamey – Sand Lake 345 kV transmission line ² . Link I2 was shortened slightly because of the new Link H2, H3, I2, and I31 node.
6-26	J3	Link J3, split into Links J31 and J32 by the addition of Link J6 (see Figure 6-4), was shifted to parallel a property boundary and roadway at the request of a landowner to not cross the middle of their property (Tract 582).
Map Panel 2		
6-27	J1	Link J1, split into Links J11 and J12 by the addition of Link J8 (see Figure 6-5), was shifted to the west to avoid above-ground pipeline components identified from aerial reconnaissance imagery.
6-28	K2	Link K2, split into Links K21 and K22 by the addition of Link J7 (see Figure 6-6), was modified to adjust for the location of the new Link J7, K21, and K22 node.
6-29	L1	Link L1, split into Links L11 and L12 by the addition of Link K5 (see Figure 6-7), was modified in two separate locations where new pad sites were identified from aerial reconnaissance imagery.
6-30	L3, L4, and L5	Link L4 was shifted to the north in response to a landowner comment to avoid crossing through the middle of a property (Tract 892). The modified segment will parallel a strip of oil and gas wells that line the northern boundary of Tracts 891 and 892. Links L3 and L5, the latter of which was split into Links L51 and L52 by the addition of Link M4 (see Figure 6-9), were adjusted as necessary to account for the new Link L3, L4, and L51 node location.
6-31	M2	Updated aerial imagery identified new construction activities on Tract 1003 along the original Link M2 centerline. Link M2 was shifted to the southwest, in consideration of local terrain, to avoid these areas.
6-32	M2 (cont.)	A second reach of Link M2 was adjusted to increase the distance from two new pad sites on Tracts 1013 and 1014, and to avoid placement of the centerline coincident with a local drainage on Tract 1013.
6-33	M3	Link M3 was split into Links M31 and M32 by the addition of Link L7 (see Figure 6-8). Adjustments were coordinated with the landowner at the public meeting to cross Tract 537 in a manner that would minimize interruption to drip irrigation practices.
6-34	M3 (cont.)	Link M3 was split into Links M31 and M32 by the addition of Link L7 (see Figure 6-8). Link M3 was modified to parallel existing transmission lines in the region, beginning from the new Link L7, M31, and M32 node.
6-35	M3 (cont.)	Link M3 was split into Links M31 and M32 by the addition of Link L7 (see Figure 6-8). Adjustments were coordinated with the landowner at the public meeting to cross through a valley to minimize the aesthetic impacts to residences south of the original Link M3 alignment.
6-36	M3 (cont.)	Link M3 was split into Links M31 and M32 by the addition of Link L7 (see Figure 6-8). This reach was adjusted to the north to avoid a new wind turbine that was identified on updated imagery and confirmed with aerial reconnaissance imagery.
6-37	N1	Link N1, split into Link N11 and N12 by the addition of Link M4 (see Figure 6-9) was adjusted to avoid above-ground pipeline components that were identified from aerial reconnaissance imagery.
6-38	M3 (cont.), N2, and O3	Link M3, split into Links M32 and M33 by the addition of Link M6 (see Figure 6-11), was shifted to the south after the addition of Links M7 and O4 to improve geographic diversity between the two sets of links. Link O32 is a continuation of the new Link M33 alignment. Link N22 was extended to the new Link M33, N22, and O32 node location.

Figure ID ¹	Link ID	Description
Map Panel 3		
6-39	O1	Upon more careful inspection of aerial imagery and aerial reconnaissance imagery, the Link O1 was adjusted slightly to avoid the potential placement of an angle structure near the overbank of a local drainage.
6-40	O1 (cont.), P1, and Q1	The southeastern terminus of Link O1 was shifted to a new node location created by the modification of Link P1 shown in Figure 6-41 . Link Q1, split into Link Q11 and Q12 by the addition of Link Q5 (see Figure 6-14), was also shortened by these adjustments.
6-41	P1 (cont.)	Link P1 was shifted to the east in response to landowner comments to attempt to parallel an existing transmission line corridor and the SH 163 corridor. This modification required minor adjustments to Link O1 for the new Link O1, P1, and Q11 node location.
6-42	P2	The southeastern terminus of Link P2 was adjusted to account for the new Link P1, P2, and Q21 node location.
6-43	Q1 (cont.)	Link Q1, split into Link Q11 and Q12 by the addition of Link Q5 (see Figure 6-14) was shifted to the west to avoid a railroad bridge crossing of a local drainage identified from aerial reconnaissance imagery. This adjustment also increased the distance of a potential angle structure from Spring Creek.
6-44	Q1 (cont.)	Link Q1, split into Link Q11 and Q12 by the addition of Link Q5 (see Figure 6-14) was adjusted to parallel parcel boundaries at the request of landowner representatives for Tracts 1231, 1233, 1234, and 1235.
6-45	T3	Link T3 was shifted to the northern boundaries of Tracts 1622, 1625, and 1626 upon reviewing landowner comments regarding a private airstrip on Tracts 1624 and 1625.
6-46 & 6-47	T1, T4, Z	These two graphics combined show adjustments to the Link T1 and T4 corridors resulting from the finalization of the Bill Hill Substation terminus as defined by Link Z. The original Link Z was shifted west (now Link Z.2). Both Links T1 and T4 were shortened and rerouted to take a more direct approach to the new endpoint, generally aligned with existing transmission lines (Link T1.2) and apparent property boundaries (Links T4.21 and T4.22).

Notes:

1. Please refer to **Appendix C, Preliminary Route Link Revisions** for all map panel and figure references.
2. As noted in **Section 6.1**, the PUCT-approved North McCamey – Sand Lake 345 kV transmission line (labeled as PUCT Approved Project on figures) which is currently under construction with an estimated in-service date of mid- to late-2026.

6.3 Alternative Route Development

Upon completion of all route link revisions, it was Halff, Kimley-Horn, Oncor, and LCRA TSC's intent to provide alternative route links that when combined, would form an adequate number of reasonable and geographically diverse alternative routes. Of the 106 adopted route links, several thousand alternative routes were possible. Through an iterative process that considered route length, constraints data, input from public meetings, information from local, state, and federal officials, and other data, Halff, Kimley-Horn, Oncor, and LCRA TSC reduced the total number of route combinations to a smaller subset of geographically diverse and forward progressing alternative routes, as defined in **Table 7-1 (Appendix D)**, for a more detailed evaluation analysis as provided in **Table 7-2** and **Table 7-3 (Appendix E)**. The subset of alternative routes uses each of the 106 alternative links in at least one route.

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7.0 EVALUATION OF THE ALTERNATIVE ROUTES

The environmental evaluation presented in this section addresses impacts to the environment in consideration of the requirements of Section 37.056(c)(4)(A)-(D) of the Texas Utilities Code; PUCT Substantive Rule Section 25.101, including the PUCT’s policy of prudent avoidance; Kimley-Horn and Halff’s environmental analysis and reconnaissance surveys; and information and responses received from local, state, and federal agencies. National aerial imagery (ESRI World Imagery Basemap, 2025; NAIP, 2024) was used to take measurements for the environmental data.

Kimley-Horn and Halff professionals with expertise in different environmental disciplines (e.g., geology/soils, hydrology, terrestrial ecology, wetland ecology, and land use/aesthetics) evaluated the proposed transmission line routes based upon environmental conditions present along each route. In addition, Kimley-Horn and Halff evaluated potential impacts to archeological and other historical sites. Each researcher independently analyzed the transmission line routes presented in **Table 7-1 (Appendix D)** and the environmental and land use data, which is presented by route and by route link in **Table 7-2** and **Table 7-3 (Appendix E)**, respectively, for the researcher’s technical discipline. Evaluations of the impacts are discussed below.

7.1 Impacts on Physiography and Geology

Construction of the proposed project would have no significant effect on the physiographic or geologic features of the area. Site-specific geotechnical and engineering studies, as discussed in **Section 1.3.1**, will be performed to determine the placement of structures. The depth and diameter of the foundation will vary depending on the design of the structure specific to that location. The construction of the proposed project would require removal of soil and/or minor surface disturbance. However, it would have no significant impact on the geologic resources or features along the proposed project, and no geologic hazards are anticipated.

7.2 Impacts on Soils

7.2.1 Soil Associations

Typically, the construction and operation of transmission lines does not create long-term adverse impacts to soils within the limits of disturbance. However, soil erosion is common in portions of the study area where ecosystems exhibit dry climates. Potential for soil erosion is likely highest during the initial clearing of the project ROW.

The potential for soil erosion is likely highest during the initial clearing of the project ROW when vegetation removal is necessary to provide adequate space for construction. In areas where most woody vegetation is removed from the ROW, and only leaf litter and small amounts of herbaceous vegetation remain, movement of heavy equipment during construction may create the greatest potential for erosion.

To reduce potential impacts to soils, Oncor and LCRA TSC will use a stormwater discharge Construction General Permit (TXR150000) administered by TCEQ and develop a Stormwater

Pollution Prevention Plan (SWPPP), which will detail measures to minimize potential soil erosion and downstream sedimentation. In accordance with the Construction General Permit, ROW inspections will be performed during and after construction to ensure erosion-prone areas are identified, stabilized, and restored according to permit conditions.

Project-specific (Best Management Practices) BMPs may also be developed in consideration of recommendations provided by TPWD (**Appendix A**), as appropriate. These measures may include additional erosion and sediment control techniques and maintenance of existing vegetation where feasible.

Taking into consideration that the landscape varies across the study area, the final suite of BMPs will be tailored to site-specific conditions and informed by design-level planning to minimize erosion, maintain slope stability, and protect adjacent vegetation and water resources during and after construction. Following completion of construction, disturbed areas will be allowed to reestablish with low growing vegetation through natural succession from adjacent plant communities and/or revegetated via methods such as hydroseeding with native forbs and grasses. With the implementation of appropriate erosion control and stabilization measures, disturbed areas are expected to recover following construction; therefore, no significant impacts to soils are anticipated as a result of the proposed project.

7.2.2 Prime Farmland

As discussed in **Section 3.3.2**, there are multiple NRCS soil unit classifications designated as prime farmland, if irrigated, within much of the study area (NRCS, 2025b). Several of the proposed alternative route links, predominantly within the eastern portion of the study area, cross soil associations considered prime farmland, if irrigated. A review of aerial photography (ESRI World Imagery Basemap, 2025; NAIP, 2024), suggests that agricultural cropland is common within the study area and all proposed routes would cross some length of agricultural cropland.

The installation of transmission lines is considered a minimal activity by the NRCS and exempt from provisions of the Farmland Protection Policy Act (U.S., 1981). Other than potential construction-related erosion (mitigated per the SWPPP), impacts to prime farmland soils are anticipated to be minimal and limited to small areas occupied by the base of support structures. Therefore, no significant impacts to prime farmland soils are anticipated as a result of the proposed project.

7.3 Impacts on Water Resources

7.3.1 Surface Water and Floodplains

The construction of the proposed project would have minimal adverse impacts on surface water resources. According to the NWI, potential riverine features are present along the proposed alternative routes. As discussed in **Section 3.4.1** and **Section 3.5.2.2**, segments of Leon Creek, the Pecos River, Spring Creek, and Toyah Creek within the study area are considered ESSs (TPWD, 2025a). Links that cross ESSs within the study area include:

- Links J31, J6, and J32 (Leon Creek);
- Links L7, J32, J6, M31, and M32 (Pecos River);
- Links P31, Q22, and Q12 (Spring Creek); and
- Link E3 (Toyah Creek).

Links C2, D21, F3, G3, and I1 cross portions of the Pecos River that aren't considered ESS.

Additionally, water features designated as impaired by TCEQ are present within the study area, included within **Table 3-4**, several of which are crossed by proposed alternative route links. Surface waters crossed by the proposed alternative routes would be spanned by supporting structures placed outside the stream bed to minimize disturbance of these aquatic resources. Therefore, adverse impacts to these areas will be avoided.

Other potential impacts to surface waters include erosion from construction activities and spills of petroleum products (e.g. fuel or lubricants) or other chemicals. Vegetation removal could result in soil runoff into surface waters. However, the impacts of vegetation removal will be limited, due to: (1) preservation of vegetation along streams where practical; (2) Oncor and LCRA TSC's efforts to manage runoff from construction areas through the use of BMPs; and (3) implementation of a SWPPP.

In addition to spanning surface waters, TPWD, in their March 26, 2025 response (**Appendix A**), recommended implementing erosion control measures in disturbed riparian areas to prevent sediment runoff until disturbed areas are permanently revegetated with site-specific native vegetation. Oncor and LCRA TSC will revegetate disturbed areas after construction is completed as specified in the Construction General Permit (TXR150000) for stormwater discharges.

Although routing efforts have been made to avoid placing infrastructure within major streams and surface waters, a large portion of the NHD-mapped water features in the study area reflected in **Tables 7-2 and 7-3 (Appendix E)** are associated with ephemeral streams, and dry erosional swales that may only have flowing water after substantial rain events. Total avoidance of these features would not be practical.

In addition, it is still possible that transmission line structures would be located within mapped floodplains as the mapped 100-year and 500-year floodplains are often associated with unnamed ephemeral streams throughout the proposed project area. As discussed in **Section 3.4.1**, floodplain and analysis of floodplain data provided by FEMA Flood Map Service Center (FEMA 2025) for Crockett, Tom Green, and Ward counties informs that proposed links cross portions of unshaded Zone X, Area of Minimal Flood Hazard. Additionally, in areas adjacent to mapped riverine features, there are portions of hatched Zone A: 100-Year Floodplain. Along these routes, some transmission line structures would be located within FEMA-designated 500-year floodplains and 100-year floodplains. In its February 3, 2025, response letter, FEMA requested that the community floodplain administrator be contacted for the review and possible permit requirements

for this project (**Appendix A**). No alternative routes cross USACE managed lakes, dams, or other structures (USACE, 2025).

If it becomes necessary to locate transmission line structures within a floodplain, the structures would be designed and constructed so as not to impede the flow of water or create any hazard during flooding. Also, if structures are to be located within floodplains, Oncor and LCRA TSC would coordinate in advance with the appropriate county floodplain administrators. Construction of the proposed project should not have significant impacts on the function of floodplains, nor should it adversely affect adjacent or downstream properties.

The USACE regulates the discharge of dredged and fill material into waters of the U.S., including wetlands, under Section 404 of the Clean Water Act (Section 404) (U.S., 1972). USACE regulations implementing Section 404 include specific authorization under Nationwide Permit (NWP) 57 for Electric Utility Line and Telecommunication Activities (86 Federal Register 2744, January 13, 2021). NWP 57 authorizes the construction, maintenance, repair, and removal of electric utility lines (including overhead transmission lines), telecommunication lines, and associated foundations, access roads, and substations, in all jurisdictional water features. Under NWP 57, an overhead transmission line must not result in a loss greater than 0.5 acre of waters of the U.S. Generally, transmission lines are designed to span stream or wetland crossings in most instances, thereby minimizing impacts to waters of the U.S. NWP 57 specifies certain conditions that necessitate filing a pre-construction notification (PCN) with the USACE and obtaining written approval before construction activities begin. NWP 57 requires the submittal of a PCN with the USACE if either (i) a Section 10 permit is required or (ii) the discharge will result in the loss of greater than 0.1 acre of waters of the U.S. NWP General Condition 18 states that a PCN must be submitted to the USACE if any federally listed species, or species proposed for listing, might be affected or is in the vicinity of the construction activity. In addition, NWP General Condition 20 requires coordination with the USFWS and/or the National Marine Fisheries Service to ensure compliance with the ESA when such species or critical habitat may be present.

The USACE Fort Worth District responded via email (**Appendix A**) noting that they would need additional information to generate a formal review. The project was assigned project number SWF-2025-00070. Based on the documented presence of multiple federally listed species or species proposed for federal listing within the study area, any fill activities in water features within the study area, such as temporary and permanent low water crossings, would be subject to a PCN requirement under the NWP program. Further coordination with USACE will occur during the design process, if required.

Field verification will be required to determine the presence of waters of the U.S. that would require permitting under the Section 404 program. If wetlands are cleared during construction of the proposed project, there should be no change in pre-construction contours or local drainage patterns, and wetlands should eventually re-establish within the ROW. Consistent with TPWD guidance (**Appendix A**), the location of the proposed project minimizes impacts to waterways, associated floodplains, riparian corridors, and wetlands, and maintains buffers to these features

by minimizing fragmentation and utilizing/paralleling existing disturbed corridors where available. During the routing process, Kimley-Horn and Halff carefully considered the locations of Leon Creek, Spring Creek, Pecos River, and Toyah Creek to minimize disturbance to these resources. Oncor and LCRA TSC will develop a SWPPP, which will detail measures to minimize impacts to surface waters during construction of the proposed project. Oncor and LCRA TSC will also comply with any compensatory mitigation requirements that may be required as part of the Section 404 permitting process. From a water resources perspective, the proposed project is anticipated to have minimal impact on surface water.

7.3.2 Groundwater/Aquifer

The proposed project's construction, operation, and maintenance are not expected to adversely affect groundwater resources within the proposed project or its vicinity. The Trinity-Edwards Aquifer and the Pecos Valley Aquifer are in the study area. The project has the potential to impact these aquifers if groundwater flowpaths are intercepted during bedrock excavation. Based on water levels recorded at wells in the study area and the maximum anticipated depth of excavation, the project is not anticipated to intercept groundwater.

The project has the potential to impact the aquifers by disturbing the recharge area of the aquifers. Although springs have been identified within the study area within the Dove Creek watershed and associated with the Pecos River watershed, the alternative routes do not intersect these documented springs. Based on the project footprint, the amount of recharge area disturbed by construction would be insignificant compared with the total amount of recharge area available for the groundwater systems in the region. No measurable alteration of aquifer recharge capacity would occur, and the likelihood of groundwater contamination would not be significant.

The main potential impact on groundwater resources from large construction projects is pollution resulting from the accidental spillage of petroleum or other chemical products. Industry standard BMPs will be identified in the SWPPP and implemented during construction for proper control and handling of any surface spillage. Oncor and LCRA TSC will take all necessary precautions to avoid the occurrence of these spills. Therefore, the project should have no significant impacts to groundwater resources within the study area.

7.4 Impact on Ecosystems

Oncor developed a Habitat Conservation Plan (HCP) for Maintenance and Construction Activities which is used as a framework guide to promote consistency in environmental protection and the development of BMPs, and focuses specifically on the avoidance, minimization, and mitigation measures for threatened and endangered species or their habitats. Oncor's HCP that was approved by the USFWS in 2011 under Section 10(a)(1)(B) of the Endangered Species Act (ESA) (Oncor, 2011). The HCP establishes a 30-year incidental take permit that authorizes Oncor to construct, operate, and maintain its transmission facilities across a defined 100-county permit area of Texas. The study area traverses twelve counties, nine of which (Crane, Ector, Pecos,

Reagan, Reeves, Tom Green, Upton, Ward, and Winkler) fall within the HCP permit area. The counties within the study area that are not included in the HCP are Crockett, Irion, and Schleicher.

The HCP identifies “covered species” which are federally listed species for which incidental take is authorized under the permit, and “species of special interest,” which are species of conservation concern addressed through voluntary consideration of avoidance and minimization practices but without take authorization. Oncor’s obligations under the HCP apply only within the permit area, in locations where covered species or their habitats may be affected.

LCRA TSC developed a HCP for Maintenance and Construction Activities that was approved by the U.S. Fish and Wildlife Service in 2019 under Section 10(a)(1)(B) of the ESA (SWCA, 2019). The HCP establishes a 30-year incidental take permit that authorizes LCRA TSC to construct and maintain its transmission facilities across a defined 241-county permit area of Texas. All counties traversed by the study area fall within the LCRA TSC HCP permit area.

LCRA TSC’s HCP outlines specific avoidance, minimization, and mitigation measures within suitable or occupied habitat of 23 covered species, including 22 federally listed species and one species that was previously petitioned for listing. The HCP also includes 16 federally listed plant species occurring in portions of the permit area that overlap with covered species, for which LCRA TSC voluntarily implements avoidance and minimization practices.

The proposed project will be implemented in smaller components, each reviewed during subsequent design and permitting phases to ensure that avoidance and minimization measures remain appropriate and practicable for site-specific conditions.

7.4.1 Vegetation

7.4.1.1 Terrestrial Vegetation

The construction and maintenance of the proposed transmission line will necessitate clearing woody and herbaceous vegetation within the ROW to facilitate access for structure installation, line stringing, and future maintenance. While efforts will be made to minimize impacts on existing groundcover, some vegetation removal is unavoidable. Additional clearing may also be required for temporary easements outside the ROW during construction. Future maintenance activities might include periodic mowing and/or herbicide applications to maintain an herbaceous vegetation layer within the ROW.

Table 7-2 (Appendix E) presents the length of different land cover types crossed by each of the alternative routes. All alternative routes would require some clearing of woody vegetation. As shown in the table, most of each alternative route crosses rangeland pasture, which consists of a mixture of upland grasses and shrub growth but insufficient woody structure to provide a canopy that would generally be associated with a forested type. Similarly, riparian areas crossed by the alternative routes may also contain woody shrub growth. Most riparian areas are associated with crossings of the Pecos River, Spring Creek, and the numerous draws within the study area. The

clearing of these communities could cause some degree of habitat fragmentation and will be limited to the minimum area necessary for access and construction. Existing rights-of-way and previously disturbed corridors will be used whenever feasible.

As discussed in **Section 3.5.1**, the predominant land cover types within the study area include shrubland, grassland, barren, and riparian/wetland systems, followed by smaller areas of woodland, cropland, urban development, and open water. These upland and transitional communities provide structural and ecological diversity that supports soil stability, hydrologic balance, and wildlife connectivity. Construction of new linear facilities would require limited vegetation clearing and temporary and localized ground disturbance, potentially altering these functions at localized scales (TPWD, 2014b; Elliott, 2014). Below is a summary of potential impacts to each land cover:

Shrubland and grassland systems are susceptible to fragmentation, soil compaction, and invasion following disturbance, while barren and sparsely vegetated habitats—though low in apparent cover—often support dune- and wash-specialist species whose microhabitats can be disproportionately affected by surface disruption (TPWD, 2014b; Elliott, 2014). However, disturbance will be confined to the ROW and temporary work areas, and surrounding habitat will remain intact. Following construction, disturbed areas will be stabilized and allowed to revegetate naturally and/or restored through seeding with native forbs and grasses. These communities typically recover rapidly through natural succession, and no long-term or landscape-scale impacts are anticipated.

Riparian corridors, associated with the Pecos River, Spring Creek, and local draws, provide essential bank stability, shading, and aquatic habitat connectivity; disturbance or canopy reduction along these systems can increase erosion, sedimentation, and thermal loading (Laurance & Yensen, 1991; TPWD, 2014b). Where crossings, as discussed in **Section 7.3.1**, are unavoidable, vegetation disturbance will be minimized through use of existing access points and dry construction methods. Any temporarily disturbed vegetation will be stabilized and allowed to recover following construction.

Woodland patches, though limited, may experience localized canopy loss and altered microclimates where clearing is required for structures or access (Fahrig, 2003; Haddad et al., 2015). Routing of the alternative links was conducted to avoid woodlands, where possible.

Cropland and developed/urban land covers generally present lower ecological sensitivity than intact native classes; however, new edges adjoining native remnants can propagate invasive species and alter local drainage, so soil stabilization will remain important where these areas interface with native vegetation. Invasive species will be addressed as practicable through standard vegetation management practices to support successful site stabilization and native revegetation.

As shown in **Table 7-2 (Appendix E)**, most of each alternative route crosses rangeland pasture, which consists of a mixture of upland grasses and shrub growth but insufficient woody structure to provide a canopy that would generally be associated with a forested type. For areas of rangeland pasture crossed by alternative routes that are used for grazing, the project ROW might be temporarily unavailable for grazing during construction. The only land permanently lost to grazing would be that which is occupied by the base of the transmission line structures.

Vegetation impacts will be minimized through implementation of avoidance and minimization measures to reduce soil disturbance, preserving mature vegetation when practical, and promptly stabilizing disturbed areas using native seed mixes or existing groundcover.

Erosion and sedimentation controls will be used, as appropriate, to maintain soil stability and prevent sediment transport into adjacent habitats. Oncor and LCRA TSC will develop a SWPPP, which will detail measures to minimize impacts to surface waters during construction of the proposed project. These practices will substantially reduce the extent and duration of vegetation disturbance. As a result, long-term effects on terrestrial vegetation are expected to be minor, with most areas expected to recover through natural succession and stabilization following construction.

Overall, effects to terrestrial vegetation would be minimized through proper vegetation management and application of standard BMPs informed by the SWPPP, TPWD recommendations (**Appendix A**), and in consideration of the Oncor and LCRA TSC HCPs where applicable. Thus, adverse impacts to terrestrial vegetation are not anticipated.

7.4.1.2 Aquatic/Hydric Vegetation

Based on interpretation of aerial photography and topographic imagery (ESRI World Imagery Basemap, 2025; NAIP, 2024), as well as review of NWI maps (USFWS, 2025a), the approximate impacts associated with each of the alternative routes were measured in linear feet and miles. Potential wetlands identified along the alternative routes generally correspond with riparian systems; however, NWI data provide only a generalized indication of potential wetland presence. Determination of jurisdictional status under the Clean Water Act requires a site-specific delineation assessing hydrophytic vegetation, hydric soils, and wetland hydrology in accordance with USACE protocols.

As indicated in **Section 7.3.1**, aquatic and riparian areas will be avoided to the greatest extent practicable during project siting and construction. Where crossings or disturbances of surface waters are unavoidable, the Oncor and LCRA TSC HCPs recommend minimizing channel and bank alteration, preserving natural flow patterns, and maintaining riparian vegetation to protect water quality and aquatic habitat integrity.

Construction activities within or adjacent to aquatic systems would employ temporary erosion and sediment controls, limit in-stream work to dry or low-flow conditions, and ensure timely

stabilization and revegetation of disturbed banks. These measures are designed to reduce degradation to the vegetation that supports aquatic habitats and are consistent with section 404 permitting and the BMP standards outlined in the Oncor and LCRA TSC HCPs. Through implementation of BMPs during construction and consideration of HCP-related conservation measures, adverse impacts to aquatic habitats and vegetation are expected to be minimal, localized, and recoverable. No long-term adverse effects on aquatic vegetation are anticipated.

7.4.1.3 Commercially or Recreationally Important Vegetation

As stated in **Section 3.5.1.3**, multiple agriculturally important plant species are known to occur within the study area. Temporary impacts to row and forage cropland areas are anticipated by the proposed project during the construction phase. However, once construction is completed, crop production is anticipated to fully resume. In comparison with the size of the study area, the impacts from alternative route crossings of crop production should not be significant.

7.4.1.4 Endangered and Threatened Plant Species

Review of USFWS (2025b) data identified two federally listed plant species, of which only one species, the Pecos sunflower, has the potential to occur within the study area (**Table 3-8, Section 3.5.1.4**). This species occurs in Pecos and Reeves counties and is covered by the Oncor HCP.

Pecos Sunflower (*Helianthus paradoxus*)

The Pecos sunflower, which is federally- and state-listed as threatened, is restricted to saline, calcareous soils around cienegas and subirrigated terraces adjacent to wetland sites. These conditions occur within Pecos and Reeves counties, and potential habitat is present within the study area where saline wetlands and marshy depressions may occur. Although the Pecos sunflower has recorded observations within the study area in the TXNDD, no proposed alternative route link would cross in the vicinity of the recorded occurrences. Ground disturbance, grading, or hydrologic alteration within suitable habitats could degrade conditions necessary for germination and survival of the Pecos sunflower. Ground disturbance, hydrologic modification, or changes to surface flow could degrade or eliminate suitable habitat within the study area. Prior to construction, Oncor and LCRA TSC will evaluate mapped wetlands and depressional areas for potential Pecos sunflower habitat. Avoidance, minimization, and mitigation measures as outlined in **Sections 7.4.1.1 and 7.4.1.2** will be followed to protect the Pecos sunflower and its habitat to the extent feasible. Additional measures, coordination, and mitigation avenues are outlined in the Oncor HCP. Through implementation of these measures, impacts to the Pecos sunflower are expected to be avoided or minimized to the extent practicable.

State-Listed Threatened and Endangered Plant Species

Review of TPWD (2025b) data identified two state-listed plant species, of which only one species, the dune umbrella-sedge, has the potential to occur within the study area in Ward County (**Table 3-8, Section 3.5.1.4**). Coordination for state-listed plant species will occur through TPWD's Wildlife Habitat Assessment Program (WHAB), which provides recommendations for survey needs, avoidance, and conservation measures under the Texas Conservation Measures Action Plan (TCAP).

Dune Umbrella-sedge (*Cyperus onerosus*)

The dune umbrella-sedge, state-listed as threatened, occurs in moist interdunal swales and depressions within active or partially stabilized sand dunes dominated by shinnery oak. Suitable dune systems occur within Winkler and Ward counties, primarily in grassland areas that provide the open sandy microhabitats required for growth. Although the dune umbrella-sedge has recorded observations within the study area in the TXNDD, no proposed alternative route link would cross in the vicinity of the recorded occurrences. Construction activities that compact soils, modify surface drainage, or promote dune stabilization could reduce the extent and quality of potential habitat. Prior to construction, Oncor and LCRA TSC will evaluate dune habitats intersecting the PUCT-approved route to determine presence of dune umbrella-sedge. Avoidance, minimization, and mitigation measures as outlined in **Sections 7.4.1.1. and 7.4.1.2.** and as identified through the WHAB Program will be followed to further protect the dune umbrella-sedge. Through implementation of these measures, impacts to the dune umbrella-sedge are expected to be avoided or minimized to the extent practicable.

Species of Greatest Conservation Need

Other plant species identified by the TPWD RTEST list for the region are recognized only as SGCN species (**Table 3-10**). These SGCN species have the potential to occur within the study area in grasslands, open oak shrublands, and mesquite woodlands. SGCNs with known occurrence within the study area include alkali spurge, cienega false clappia-bush, cory’s woolly locoweed, dune unicorn-plant, dwarf broomspurge, grayleaf rock-daisy, hill country wild-mercury, Hinckley’s spreadwing, Irion County wild-buckwheat, Jones’ selenia, Mexican mud-plantain, neglected sunflower, rayless rock-daisy, Texas almond, Waterfall’s milkvetch, and Watson’s false clappia-bush. Among the SGCN plants with EOIDs, several mapped EOIDs would be crossed by proposed links as shown in **Table 7-4** below:

Table 7-4: Known SGCN Plant Occurrences Crossed by Proposed Alternative Route Links

SGCN Plant Name	EOID	Link ID
Cory’s Woolly Locoweed	9984	K7
		L51
		L52
		M4
	9985	P1
		P2
		Q21
		Q5
		Q22
Dune Unicorn-plant	3218	G12
		H1
		H2
	6210	J12

SGCN Plant Name	EOID	Link ID
Grayleaf Rock-daisy	4032	B32
		C1
		C2
		D21
		E3
	7813	K8
		M31
Irion County Wild-buckwheat	6323	Q5
Jones' Selenia	5995	O32
Rayless Rock-daisy	10416	M2
		M7
		N12
		N21
		O2
		O4

TPWD included several recommendations for plant species in its response letter (**Appendix A**). Avoidance, minimization, and mitigation measures as outlined in **Sections 7.3.1, 7.4.1.1., and 7.4.1.2.** and as recommended by TPWD and in the Oncor and LCRA TSC HCPs, will be considered, as practical, to further protect SGCN plant species. Through implementation of these measures, impacts to SGCN plant species are expected to be avoided or minimized to the extent practicable.

7.4.2 Fish and Wildlife

7.4.2.1 Terrestrial Wildlife

As discussed in the preceding sections, avoidance and minimization measures implemented to stabilize soils, protect water quality, and restore vegetation will also reduce potential effects on terrestrial wildlife. These include limiting the extent of clearing, maintaining vegetative buffers, implementing erosion and sediment controls, and promoting natural revegetation of disturbed areas.

The primary impact of construction activities on wildlife is expected to be habitat alteration from ROW vegetation clearing and associated ground disturbances. Increased noise and activity during construction may temporarily displace wildlife beyond the immediate work area. Short-term impacts from construction and long-term changes to habitat may occur; however, the overall wildlife impacts associated with transmission line corridors are usually minimal. Potential impacts are greatest where ROW intersects brushland pasture, riparian areas, or wetlands. These effects will be minimized by paralleling existing ROW to the greatest extent practicable and implementing site-specific BMPs. The terrestrial vegetation avoidance, minimization, and restoration measures described in **Section 7.4.1**, together with the soil and water protection measures outlined in **Sections 7.2.1 and 7.3.1**, respectively, will help reduce potential impacts

on terrestrial fauna that depend on these habitats. Below is a summary of project-related impacts with respect to wildlife.

Species with low mobility, such as reptiles, amphibians, young birds, and small mammals, are more susceptible to impacts from machinery and ground disturbance. Nesting and young birds may be affected if vegetation clearing occurs within the breeding season, and burrowing species may be impacted by soil compaction or excavation. More mobile species, such as deer, foxes, and other medium-sized mammals, would likely shift into adjacent habitats. The presence of similar vegetation types outside the ROW would minimize long-term effects. Native revegetation and routine vegetation maintenance can create edge habitat beneficial to some species (TPWD, 2025m).

Following construction, recolonization is expected as grasses, forbs, and shrubs are allowed to recover within the ROW area. Routine vegetation maintenance may cause some localized impacts, particularly if clearing coincides with the breeding seasons, but these effects are expected to be temporary. Increased light penetration following clearing can promote the growth of grasses and forbs, creating edge conditions that benefit some wildlife species (TPWD, 2025m).

Most avian species are protected under the MBTA, which prohibits the take of migratory birds, active nests, and eggs except under a valid USFWS permit (U.S., 1918). To minimize impacts, clearing is recommended outside the peak nesting season (March through August) or after nest abandonment (U.S., 1918). Birds that are less agile in flight, or those that travel in flocks, are more susceptible to collision with transmission lines (Avian Powerline Interaction Committee [APLIC], 2012). These birds are less able to maneuver around obstacles. Use of line-marking devices, as recommended by the APLIC (2012), reduces this risk. TPWD included several recommendations for avoidance of risks to bird species in its response letter (**Appendix A**). The proposed project will be constructed in compliance with applicable state and federal wildlife regulations, including the MBTA. Oncor and LCRA TSC will conduct pre-construction inspections of the ROW for active nests prior to vegetation clearing to ensure compliance with MBTA protections.

Transmission line structures may also provide benefits to some raptor species by providing resting and hunting perches, especially in open treeless habitats (APLIC, 2012). Study area resident raptors, such as the American kestrel (*Falco sparverius*) and the red-tailed hawk (*Buteo jamaicensis*), often utilize the support structures as nesting sites, as well as hunting or resting perches. The danger of electrocution to birds is minimal because conductor spacing on the proposed 765 kV structures exceeds the wingspan of local raptors. In addition, it is Oncor and LCRA TSC's standard practice to install devices at appropriate locations to deter bird landings on the insulator between the conductor and structure. This standard practice is consistent with agency-recognized guidelines for minimizing bird collision risks (APLIC, 2012).

Temporary disturbance during construction is expected to diminish as habitats stabilize and revegetate, and wildlife use of the right-of-way is expected to return to pre-construction levels

over time. With the implementation of the avoidance, minimization, and restoration measures described in this and preceding sections, with consideration of the TPWD response letter and the measures outlined in the Oncor and LCRA TSC HCPs, no significant long-term impacts to terrestrial wildlife are anticipated.

7.4.2.2 Fish and Aquatic Wildlife

Potential impacts to aquatic systems with the construction of transmission lines involve mainly the effects of increased erosion and sedimentation. Land clearing and/or construction may result in increased suspended solids entering streams traversed by the transmission line, which in turn may negatively affect many aquatic organisms that require relatively clear water for feeding and reproduction. The proposed project would span aquatic features such as lakes, streams, and ponds, and erosion controls would be utilized to minimize any impacts to aquatic systems. In evaluating impacts to aquatic systems, factors taken into consideration include the amount of potential wetlands crossed, the amount of ROW within 100 feet of streams, the number of stream crossings, and the amount of open water crossed.

Physical habitat loss or modification could result whenever temporary or permanent access roads cross a perennial stream, or through sedimentation due to erosion, increased suspended solids loading, or accidental petroleum spills directly into a stream. The primary aquatic ecosystems that could be directly affected by the proposed project are the Pecos River, Spring Creek, the few seasonally flooded reaches of their larger tributaries, and the scattered man-made ponds within the study area.

Water quality degrades as a result of particulate loading caused by construction within stream beds, by clearing of riparian vegetation, and by siltation from erosion in newly disturbed areas. Particularly sensitive in this respect are gravel, riffle, and sand bottom habitats. Blanketing of these areas by fine sediments could eliminate habitats important for fish spawning; resident benthic invertebrates; the aquatic nymphal stages of dragonflies, mayflies and caddisflies; and freshwater mussels. These impacts would be largely, if not completely, prevented through the use of appropriate industry-standard construction techniques. No heavy equipment will operate in flowing stream segments, and it is anticipated that temporary or permanent road crossings of perennial stream features within the project area will not be required. Herbicides or other chemicals will not be used in areas where they might enter the aquatic ecosystems and cause significant adverse impacts to the aquatic communities therein. In addition, implementation of a SWPPP would further minimize any potential impacts to aquatic communities.

Routing efforts have been implemented to minimize the amount of stream impacts by orienting alternative routes perpendicular to streams where practical, thereby minimizing the amount of stream habitat affected. Most of the Spring Creek, Pecos River, Leon Creek, and Toyah Creek channels within the study area have been avoided by routing alternative links through locations that will minimize the disturbance to these stream ecosystems. As outlined in **Section 7.3.1**, alternative routes may cross some open water associated with the spanning of Spring

Creek, Pecos River, Leon Creek, and Toyah Creek, with consideration of the flow regime during construction.

Site-specific evaluations will be performed if potential karst features, springs, and aquatic resources intersect the ROW. Impacts to aquatic habitat are expected to be minimal and localized using appropriate industry-standard construction techniques and measures as outlined in Oncor and LCRA TSC HCPs. Implementation of a SWPPP would further minimize any potential impacts to aquatic communities.

Overall, the proposed project is not expected to adversely affect regional aquatic communities or habitat availability within the study area. Effects will be temporary and confined to the immediate construction footprint, and disturbed areas will naturally recover following completion of work. In consideration of avoidance measures used to plan and construct the proposed project, no significant impacts to aquatic wildlife are anticipated.

7.4.2.3 Commercially or Recreationally Important Fish and Wildlife Species

Construction of the proposed project would not adversely impact commercially or recreationally important species occurring within the study area. Game species are highly mobile and will most likely temporarily abandon the area during project construction. As mentioned in **Section 7.4.1.2**, impacts to aquatic habitat would be minimal, thereby minimizing any impacts to fish in the study area.

7.4.2.4 Endangered and Threatened Fish and Wildlife Species

Federally Listed Threatened and Endangered Terrestrial Species

Review of USFWS (2025b) data identified eight terrestrial wildlife species that are federally listed or proposed for federal listing, of which six have potential habitat within the study area (**Table 3-9**). These habitats include riparian woodlands, desert scrub, grasslands, and cliff habitats. Following PUCT approval of a final route, habitat-based surveys will be conducted as practical, and coordination with USFWS will establish survey protocols and conservation measures where suitable habitat is identified. Construction activities, such as vegetation clearing, access road development, tower siting, and line spans across riparian corridors, could affect these species. Measures to reduce collision and electrocution risk will follow APLIC guidance. Below is a description of the six federally-listed terrestrial wildlife species with the potential to occur in the study area:

Northern aplomado falcon (*Falco femoralis septentrionalis*), southwestern willow flycatcher (*Empidonax traillii extimus*), and yellow-billed cuckoo (*Coccyzus americanus*)

The northern aplomado falcon, southwestern willow flycatcher, and yellow-billed cuckoo are federally protected bird species with potential to occur in or near the study area. The northern aplomado falcon is federally endangered and typically associated with grassland habitats, including desert and coastal grasslands with scattered shrubs and yucca. While its primary breeding range is concentrated in south Texas, historic records and dispersal events extend into Reeves County within the study area. Open grasslands and scrub within the study area may

provide suitable foraging and nesting conditions. Transmission line spans across open valleys can increase collision risk for low-flying raptors, and tower placement in proximity to nest sites may result in disturbance (APLIC, 2012). The southwestern willow flycatcher, also federally endangered, inhabits riparian forest along perennial streams and rivers dominated by willow–cottonwood. Suitable conditions are present along portions of the Pecos River and its tributaries in Crane, Crockett, Pecos, Reeves, Schleicher, and Ward counties, where fragmented riparian corridors could support breeding or migratory use. Project activities such as ROW clearing, increased human activity, and noise within riparian habitats could reduce available nesting substrate or cause nest abandonment.

The yellow-billed cuckoo is federally listed as threatened within its western DPS. Although the designated DPS counties do not overlap with the study area, migrants may still use riparian forest habitat throughout the study area as stopover habitat. Temporary noise and disturbance from construction could displace individuals during migration, even if breeding is unlikely.

If required, Oncor and LCRA TSC may conduct habitat-based surveys, focusing on riparian areas along the Pecos River, tributaries, and associated corridors prior to construction. Avoidance, minimization, and mitigation measures as outlined in **Section 7.4.2.1**, as recommended by TPWD’s response letter (**Appendix A**), and as outlined in Oncor and LCRA TSC HCPs, will also be considered, as practical, to protect the northern aplomado falcon, southwestern willow flycatcher, and yellow-billed cuckoo. Through implementation of these measures, impacts to the northern aplomado falcon, southwestern willow flycatcher, and yellow-billed cuckoo are expected to be avoided or minimized to the extent practicable.

Monarch Butterfly (*Danaus plexippus plexippus*)

The monarch butterfly is proposed for federal listing as threatened due to widespread population declines linked to habitat loss, herbicide and pesticide use, and climate variability along its migratory pathway. This species depends on milkweed (*Asclepias* spp.) for larval development and require diverse nectar sources during migration. The study area lies within the central flyway and contains grassland and cropland habitats where host (milkweed) and nectar plants may be found throughout the study area providing potentially suitable stopover habitat during spring and fall migrations. ROW vegetation management, including mowing and herbicide application, could reduce milkweed and nectar availability if not carefully managed. USFWS guidance recommends restoring disturbed areas with native seed mixes that include nectar-producing plants and avoiding herbicide use in sensitive areas. Construction and maintenance scheduling should also account for and avoid peak migration periods as practical. These recommendations in conjunction with avoidance, minimization, and mitigation measures as outlined in **Section 7.4.1.1** will protect the monarch butterfly and its habitat to the extent feasible. While this species is not currently protected by the ESA as a listed species, the avoidance, mitigation, and minimization measures recommended herein would reduce impacts to the species. If the monarch butterfly were to be listed before completion of the project, coordination with the USFWS would occur.

Tricolored Bat (*Perimyotis subflavus*)

The tricolored bat is proposed for federal listing as endangered due to severe population declines associated with white-nose syndrome and other stressors. In Crockett, Irion, Pecos, Reagan, Schleicher, Tom Green, and Upton counties, Texas, tricolored bats may roost year-round in tree foliage, cavities, bark, bridges, culverts, and abandoned structures. While caves provide important roosts in the Edwards Plateau ecoregion, this habitat is limited in the Trans-Pecos portion of the study area.

Project impacts may include the loss of roosting habitat from vegetation clearing, disturbance to roosts in bridges or culverts if modified or removed, and temporary displacement from construction noise and vibration. While this species is not currently protected by the ESA as a listed species, state and federal regulatory agencies may still require avoidance and mitigation measures to minimize the potential effect to the species. The study area is in the tri-colored bat Year-Round Active Zone 1, and seasonal restrictions during construction may apply. Upon approval of a route by the PUCT, Oncor and LCRA TSC will coordinate with the USFWS to evaluate potential restriction and survey protocols, if necessary, and other appropriate mitigation measures.

Dunes Sagebrush Lizard (DSL) (*Sceloporus arenicolus*)

The DSL is federally- and state-listed as endangered due to its narrow habitat specialization and restricted distribution in shinnery oak sand dune systems of southeastern New Mexico and Crane and Ward counties in western Texas. The species is confined to wind-sculpted blowouts and interdunal hollows within these dune complexes, typically identified as occurring within grasslands, which provide the open sand microhabitats necessary for survival. Connectivity between blowouts is critical to maintaining viable populations, and even small losses of habitat can have disproportionate effects on persistence.

There are several recorded observations of the DSL within the study area. Kimley-Horn and Halff supplemented EOID data with results from habitat survey models (Fitzgerald et al., 2011; Walkup et al., 2021) to better reflect the known habitat area for this species. Although no alternative route links are proposed to cross these areas, suitable habitat for this species is associated with dune conditions that occur in the northwest portion of the study area (USGS, 2025b). Links H1, H2, H3, I32, I4, J12, and J4 cross areas where dune habitat may be suitable to support the species.

Potential project impacts to the DSL include habitat loss or fragmentation from infrastructure development, caliche pad construction, or unauthorized vehicle access. Such activities can compact soils, alter dune geomorphology, and reduce connectivity between occupied blowouts. Prior to construction, coordination with USFWS will confirm potential habitat intersections and define survey protocols, if needed.

Project routing and design prioritized minimization of links across dune areas, with proposed routes located along existing disturbance corridors where feasible. New permanent roads or pads within dune complexes will be avoided to the extent practicable, and access will be restricted to designated routes to prevent incidental crusting of dune surfaces and associated vegetation

change. Where impacts cannot be fully avoided, seasonal timing may reduce disturbance during peak DSL activity periods. Through implementation of these measures and coordination with the USFWS, the project will ensure that impacts to DSL and its habitat are minimized to the extent practicable.

State Listed Threatened and Endangered Terrestrial Species

Review of TPWD (2025b) data identified 10 terrestrial wildlife species that are state-listed (without a federal listing), of which five have potential habitat within the study area (see **Table 3-9**). These species include raptors, mammals, and reptiles associated with upland, canyon, and grassland habitats. Coordination for state-listed terrestrial species will occur through TPWD's WHAB Program, which provides recommendations for survey needs, avoidance measures, and conservation practices under the broader Wildlife Diversity Program and TCAP.

Zone-tailed hawk (*Buteo albonotatus*) and common black-hawk (*Buteogallus anthracinus*)

The zone-tailed hawk and common black-hawk are state-listed as threatened by TPWD. Both species occupy upland forest, riparian forest, and canyon drainages. The zone-tailed hawk nests in both riparian cottonwoods and upland conifers while the common black-hawk is more tightly tied to mature cottonwood–willow gallery forests along perennial or spring-fed streams. Portions of the study area found in Crockett, Pecos, Reeves, and Tom Green counties, contain suitable riparian and canyon habitat that may provide nesting and foraging opportunities for these species.

Project-related clearing, construction near riparian corridors, or disturbance during the breeding season (generally March–August) could result in nest abandonment, reduced productivity, or loss of foraging habitat for these raptor species (and other bird species in general). Indirect effects may also include reduction of prey and roosting opportunities from vegetation removal. Avoidance, minimization, and mitigation measures as outlined in **Sections 7.3.1, 7.4.1.1., 7.4.1.2., and 7.4.2.1.** will be followed to protect these avian species and their habitats to the extent feasible.

Black Bear (*Ursus americanus*)

The black bear has been federally delisted since 2016 and is currently state-listed as threatened. This species persists in the Trans-Pecos region, where it uses desert scrub, canyon woodlands, and oak-juniper uplands, with core populations in the Chisos Mountains. While black bears are mobile and capable of avoiding localized disturbance, the riparian forested areas throughout the study area contain potentially suitable habitat for this species, though presence is likely transient.

Construction activities could temporarily disturb foraging or movement corridors. Indirect impacts may arise from increased human presence or fragmentation if new disturbance corridors are established. Coordination with TPWD through the WHAB will guide minimization strategies for the black bear. Project design has emphasized routing along existing disturbed corridors to limit new habitat fragmentation. It is anticipated the proposed project will have no effect on this species.

Texas Horned Lizard (*Phrynosoma cornutum*)

The Texas horned lizard is state-listed as threatened due to declines associated with habitat loss, invasive grasses, and the reduction of harvester ants, its primary food source. It may occupy grasslands and rangeland pasture habitats throughout the study area. Link K42 would cross in the vicinity of a known occurrence with no corresponding EOID of the Texas horned lizard.

Potential impacts from project activities include direct mortality from vegetation clearing or vehicle traffic, soil compaction in sandy areas, and degradation of native vegetation communities that support harvester ants. TPWD recommends the use of a biological monitor during construction, or alternative measures to allow observed species to vacate areas during construction, and special construction provisions during cold weather (**Appendix A**). Other avoidance, minimization, and mitigation measures related to vegetation outlined in **Sections 7.4.1.1, 7.4.1.2, and 7.4.2.1** would further minimize potential effects to this species.

Trans-Pecos Black-headed Snake (*Tantilla cucullata*)

The Trans-Pecos black-headed snake is state-listed as threatened and may occur in the upland forests and grasslands of Pecos County. It is fossorial, living beneath rocks, loose soils, and litter, and is seldom observed except during or after rainfall events. Within the study area, rocky slopes and shrublands may provide suitable cover and foraging habitat. Due to the species' limited dispersal ability and reliance on microhabitats, even small-scale disturbance can affect local individuals.

Project activities may impact the species through disturbance of rocky slopes, soil compaction, or removal of surface cover. To minimize impacts, pre-construction reconnaissance may be used to identify high-quality habitat, and disturbance to rocky slopes will be avoided where practicable. Equipment use will be restricted to designated routes, and construction personnel may be briefed on the protected status of the species and trained to avoid harm if individuals are encountered.

Federally Listed Threatened and Endangered Aquatic Species

Review of USFWS (2025b) data identified 16 aquatic species federally listed of which eight have the potential to occur within the study area (see **Table 3-9** in **Section 3.5**). These include species restricted to spring-fed systems and intermittent and perennial river reaches of the Pecos River basin. As noted herein, transmission line routing carefully considered approaches to stream corridors and all stream crossings will be spanned without the placement of any structures within the channel.

Leon Springs Pupfish (*Cyprinodon bovinus*), Pecos Gambusia (*Gambusia nobilis*) and Pecos Pupfish (*Cyprinodon pecosensis*)

The Leon Springs pupfish, which is federally and state-listed as endangered, is endemic to Leon Creek and Diamond Y Spring in Pecos County. Preferred habitat includes spring-fed marshes, pools, and slow-flowing waters, usually near edges with minimal growth of vegetation. Although no TXNDD occurrences of the Leon Springs pupfish exist within the study area, Links J31, J6, and J32 are proposed to cross Leon Creek, which would provide suitable habitat for this species.

The Pecos gambusia is federally and state-listed as endangered, and the Pecos pupfish is proposed to be federally-listed as threatened and is state-listed as threatened. Both species are restricted to isolated spring systems and associated wetland and open water outflows within the Pecos River Basin. The Pecos gambusia is found in Reeves and Pecos counties and is particularly vulnerable to groundwater declines and habitat modification, while the Pecos pupfish inhabits saline spring systems, cienegas, and stream reaches with stable flows found in Ward, Reeves, Pecos, Crockett, and Crane counties. Both species rely on aquatic vegetation and consistent spring discharge to provide cover, foraging resources, and spawning habitat. Links C1 and G3 would cross in the vicinity of three recorded observations of the Pecos pupfish. Although two prior recorded observations of the Pecos gambusia were identified within the study area, no alternative route link would cross near these records.

Potential project impacts to these fish species include groundwater withdrawal or disturbance that reduces spring discharge, contamination or sedimentation that degrades aquatic habitat, and vegetation removal that decreases cover. Avoidance, minimization, and mitigation measures as outlined in **Sections 7.3 and 7.4**, as well as recommendations outlined by TPWD (**Appendix A**) and Oncor's HCP, will be followed as necessary to protect the Leon Springs pupfish, Pecos gambusia, and Pecos pupfish and their habitat to the extent feasible.

Pecos Amphipod (*Gammarus pecos*)

The Pecos amphipod is federally and state-listed as endangered and occurs only in spring-fed habitats associated with wetlands and open waters of Pecos County in the Pecos River Basin. It occupies submerged vegetation, algal mats, and rocky substrates in perennial outlets, pools, and runs. The species is highly dependent on stable groundwater discharge and is sensitive to even minor alterations in spring flow. No TXNDD occurrences of this species exist within the study area.

Potential project impacts include direct disturbance of spring outlets, alteration of flow regimes, and increased sedimentation or turbidity from nearby construction. If encountered, protective buffers should be maintained around spring-fed habitats, and standard BMPs outlined in **Section 7.3.1** will be implemented to preserve hydrologic integrity, prevent sedimentation, and maintain water quality. Through implementation of these measures, impacts to the Pecos amphipod are expected to be avoided or minimized to the extent practicable.

Pecos Assiminea Snail (*Assiminea pecos*)

The Pecos assiminea snail is federally and state-listed as endangered and is restricted to spring-fed wetlands, cienegas, and saturated soil margins of Reeves and Pecos counties within the wetlands and open waters associated with the Pecos River Basin. It occurs in shallow seeps, algal mats, and moist soils associated with persistent spring discharge. No TXNDD occurrences of this species exist within the study area.

Potential impacts from the project include trampling or compaction of saturated soils, sedimentation of spring habitats, and hydrologic changes that reduce or eliminate discharge. If the Pecos assiminea snail is encountered, protective buffers should be maintained around spring-

fed habitats, and standard BMPs outlined in **Section 7.3.1** will be implemented to preserve hydrologic integrity, prevent sedimentation, and maintain water quality. Through implementation of these measures, impacts to the Pecos assiminea snail are expected to be avoided or minimized to the extent practicable.

Texas Hornshell (*Popenaias popeii*), Texas Fawnsfoot (*Truncilla macrodon*), and Texas Fatmucket (*Lampsilis bracteata*)

The Texas hornshell is federally and state-listed as endangered, the Texas fawnsfoot is federally and state-listed as threatened, and the Texas fatmucket is federally listed as endangered and state-listed as threatened. All three mussel species occur in perennial rivers and tributaries associated with wetlands and open waters of the Rio Grande Basin, including the Pecos River. They inhabit sand, gravel, and rocky substrates in flowing water, where they depend on stable flow regimes and clean substrates. TXNDD records exist within the study area for the Texas fatmucket and Texas fawnsfoot; however, no links would cross known occurrences of these species.

In Crane, Crockett, Reeves, Pecos, and Ward counties, perennial reaches of the Pecos River may support suitable mussel habitat. Potential project impacts include sedimentation and erosion from construction near waterways, substrate disturbance from in-channel work, and localized alterations to flow.

Avoidance, minimization, and mitigation measures as outlined in **Sections 7.3.1 and 7.4.2.2** will be followed to protect the mussel species and their habitat to the extent feasible. If habitat disturbance cannot be avoided, USFWS and TPWD will determine survey protocols and, if required, relocation of mussels prior to construction.

State Listed Threatened and Endangered Aquatic Species

Review of TPWD (2025b) data identified seven aquatic species that are state-listed (without a federal listing) of which four have the potential to occur within the study area (see **Table 3-9** in **Section 3.5**). These include fishes associated with the Pecos River and spring-fed tributaries. Coordination for state-listed aquatic species will occur through TPWD's WHAB Program, which provides recommendations for survey needs, avoidance measures, and conservation practices under the broader Wildlife Diversity Program and TCAP.

Tamaulipas Shiner (*Notropis braytoni*), Speckled Chub (*Macrhybopsis aestivalis*), Proserpine Shiner (*Cyprinella proserpina*), and Headwater Catfish (*Ictalurus lupus*)

These fishes are listed as threatened by TPWD and occur in the Rio Grande basin, including associated wetlands, and open water portions of and surrounding the Pecos River and its associated tributaries. They are typically associated with flowing water habitats, including runs and riffles with gravel, cobble, and sand substrates, as well as spring-fed creeks and perennial river reaches. TXNDD records exist within the study area for the headwater catfish, Proserpine shiner, and speckled chub; however, no alternative route links would cross the locations recorded for these occurrences.

Within the study area, suitable perennial and spring-fed habitats may occur in Crockett, Reeves, Pecos, and Ward counties. Potential project impacts include sedimentation, turbidity, and localized flow alterations associated with construction near stream crossings or other aquatic habitats. Indirect impacts may also result from erosion, stormwater runoff, or changes to groundwater inputs sustaining perennial flows. Avoidance, minimization, and mitigation measures as outlined in **Sections 7.3.1** and **7.4.2.2.** in conjunction with the WHAB program will be considered to protect these state-listed fish species.

Species of Greatest Conservation Need

Many of the SGCN species with recorded occurrences within the study area are highly mobile and would disperse during construction activities. These species include: the black-capped vireo (*Vireo atricapilla*), hooded skunk (*Mephitis macroura*), kit fox (*Vulpes macrotis*), and swift fox (*Vulpes velox*).

In addition, reptiles and amphibians, including the plateau spot-tailed earless lizard (*Holbrookia lacerata*), Texas map turtle (*Graptemys versa*), western box turtle (*Terrapene ornata*), Woodhouse's toad (*Anaxyrus woodhousii*), Concho water snake (*Nerodia paucimaculata*), and western massasauga (*Sistrurus tergeminus*) could potentially be impacted by construction of the transmission line due to ground disturbance because they are less likely to avoid construction activities. TXNDD records for the Concho water snake, plateau spot-tailed earless lizard, Texas map turtle, western box turtle, and western massasauga exist within the study area. Although no proposed alternative route links would cross in the vicinity of known occurrences of the Concho water snake, Texas map turtle, western box turtle, or western massasauga, Links Q4, R22, S1, T2, and T3 cross in the vicinity of two known occurrences of the plateau spot-tailed earless lizard. Any potential impacts to these species would be short-term and limited to the construction phase of the proposed project, for which conservation measures outlined in the LCRA TSC HCP would be adhered.

The black-tailed prairie dog (*Cynomys ludovicianus*) is a ground-dwelling species with the potential to occur within the proposed project. Link J31 would cross in the vicinity of a known occurrence of this species. The overall impact to this ground-dwelling mammal is anticipated to be short term and limited to the construction phase of the proposed project.

Aquatic species have the potential to occur within the proposed project area, including the Manantial roundnose minnow (*Dionda argentosa*), Texas shiner (*Notropis amabilis*), and Guadalupe bass (*Micropterus treculii*). TXNDD records exist within the study area for all three of these species. Although Link Q12 would cross in the vicinity of an occurrence of the Texas shiner along Spring Creek, no other links would cross in the vicinity of known occurrences of SGCN fish and mollusks.

These species are limited to very specific aquatic habitats that can be easily avoided during construction and through implementation of BMPs as described in **Sections 7.3.1, 7.4.1.2., and 7.4.2.2.**

As mentioned in **Section 3.5.2.4**, the BGEPA prohibits anyone without a permit issued by the Secretary of the Interior from "taking" bald eagles or golden eagles, including their parts, nests, or eggs. Based on recent aerial photography (ESRI World Imagery Basemap, 2025; NAIP, 2024) and field reconnaissance, the study area has the potential to exhibit habitat for the golden eagle. Data provided by USFWS indicates that there are no known golden eagles or golden eagle nests within the study area. However, if golden eagles or golden eagle nests are observed during construction activities, coordination with USFWS would occur.

As discussed in **Section 3.5.2.4**, no bald eagles, bald eagle nests, or habitat for bald eagles were observed within the study area; therefore, the proposed project is not anticipated to impact this species. However, in the unlikely event that a bald eagle or a bald eagle nest is observed during construction activities, coordination with USFWS would occur, and appropriate buffers may be required to be established (USFWS, 2007).

Endangered, threatened, or SGCN species listed in **Tables 3-8** through **3-10**, but not mentioned in this section, are unlikely to occur within the proposed project. These species are unlikely to be impacted by the construction and operation of the proposed project.

7.5 Summary of Natural Resources Impacts

Natural resources in the study area have been evaluated to determine the potential ecological impacts of the proposed project. For the proposed project, potential natural resource impacts included potential impacts to vegetation and wildlife. Although all alternative routes intersect natural resources to some degree, no significant impacts to these resources are anticipated under the avoidance, minimization, and restoration measures identified in this environmental assessment.

Based on current data from the USFWS and the TPWD, the total number of plant and wildlife species recognized by USFWS and TPWD with potential occurrence in Crane, Crockett, Ector, Irion, Pecos, Reagan, Reeves, Schleicher, Tom Green, Upton, Ward, and Winkler counties is 45. Of these, two plant species (one federally listed and one state-listed) and 23 wildlife species (14 federally listed and nine state-listed) wildlife species have been determined (**Table 3-8** and **Table 3-9**) to have the potential to occur within the study area based on current ranges and available habitat.

Given the project's large geographic extent and variable ecological conditions, the environmental constraints identified in this EA will be re-evaluated prior to construction once a route is approved by the PUCT using the most recent EOID data, updated habitat mapping, and field verification methods. This review will also consider the timing and sequencing of construction activities and apply guidance from the Oncor and LCRA TSC HCPs. Such adaptive review will help determine whether additional coordination, species-specific surveys, or BMPs are warranted to ensure continued protection of sensitive resources.

7.6 Impacts on Community Values and Community Resources

Impacts on community resources, whether direct or indirect, can be more accurately gauged based on how they affect recreation areas, recreational resources, or aesthetics. Community resources can be impacted by either direct effects resulting in the removal of a valued resource or indirect effects resulting from a loss in the enjoyment or use of the resource due to characteristics (primarily aesthetic) of the proposed project. The following sections discuss impacts to community values and community resources.

7.7 Land Use Impacts

Land use impacts from transmission line construction are determined by the amount of land (of any use) displaced by the actual ROW and the compatibility of the transmission line ROW with adjacent land uses. During construction, temporary impacts to land uses within the ROW could occur due to the movement of workers and materials through the area. Noise and dust from construction, as well as disruption of traffic flow, may also temporarily affect residents and businesses in the area immediately adjacent to the ROW. Coordination between Oncor, LCRA TSC, its contractors, and landowners regarding access to the ROW and construction scheduling should minimize these disruptions. Most existing land uses may continue during construction.

The primary factors for measuring potential land use impacts from the proposed project include overall route length, proximity to habitable structures, and length parallel to existing corridors including apparent property boundaries, as discussed below.

7.7.1 Urban/Residential Areas

Important measures of potential land use impacts include the number of habitable structures and their proximity to each alternative route. As instructed in the CCN application, Kimley-Horn and Halff identified and listed the number and distance of habitable structures located within 500 feet of the centerline of each alternative route through interpretation of aerial imagery (ESRI World Imagery Basemap, 2025; NAIP, 2024) and verification during field reconnaissance, where practical. To account for photographic interpretation limitations such as shadows, tree canopies, and horizontal accuracy of the photography, Kimley-Horn and Halff identified all habitable structures within a measured distance of 520 feet of any alternative route link. The number of habitable structures spatially related to nearby routes and links are documented in **Table 7-2** and **Table 7-3 (Appendix E)**, respectively. The distance from the link centerline to each listed habitable structure and a general description of each habitable structure is provided in **Table 7-5 (Appendix F)**. **Figures 3-1A** through **3-1L (Appendix G)** show identified and listed habitable structures within 520 feet of any link on the routing constraints map. Listed habitable structures include a mixture of single-family residences, mobile living units, and barn/garage/shed facilities that could be occupied on a regular basis. The greatest concentration of habitable structures occurs along Link O2, some of which include RV-type mobile living units, the number, duration, and location of which may be temporary. Habitable structure measurements reflect conditions that were confirmed from aerial reconnaissance as of September 2025.

PUCT Substantive Rules Section 25.101(b)(3)(B) requires, among other things, the PUCT to consider whether new transmission line routes parallel existing compatible ROW, property lines, or other natural or cultural features when selecting a route. For the proposed project, the length of alternative routes parallel to existing compatible ROW (including apparent property boundaries and transmission lines) ranges between 20 to 71 percent of the total route length. Pipelines were not considered compatible corridors and were not calculated in the route length parallel to compatible ROW.

7.7.2 Recreation Areas

Parks and recreation areas are identified as areas owned by a governmental body or an organizational group, club, or church. Potential impacts to recreation areas include the disruption or preemption of recreation activities. The study area includes one state recreational area, a portion of one national historic trail, numerous town/city park areas, golf courses, and public use areas. Although portions of the national historic trail are located within 1,000 feet of several alternative route links, no other parks and recreation areas are located within 1,000 feet of the proposed alternative routes.

There are multiple recreational areas located within the study area. As stated in **Section 3.7.2**, there is one Texas State Park, Monahans Sandhills State Park, located within the study area. However, this state park is located over five miles away from the nearest proposed alternative route, H1. Although a portion of the Butterfield Overland National Historic Trail traverses the study area, following the Pecos River until crossing it and continuing northeast (NPS, 2025a), this trail is not a continuous traditional path from end to end. Instead, this trail is comprised of various trail traces, structures, landmarks, and markers left on the landscape. A review of aerial photography (ESRI World Imagery Basemap, 2025; NAIP, 2024), in addition to field reconnaissance, confirmed that no signs of permanent trail features are located within the study area. Although alternative route links are proposed to cross the Butterfield Overland National Historic Trail as depicted on **Figures 3-1C** through **3-1L (Appendix G)**, any portion of the trail that would be crossed by a proposed alternative link would be spanned, and no supporting structures would be placed within the trail route.

Due to the distance from the proposed alternative routes and lack of permanent trail features within the study area, adverse impacts to recreational areas and their purpose are not anticipated as a result of the proposed project. Consistent with TPWD recommendations (**Appendix A**), the NCED database (NCED, 2025) was reviewed to identify any conservation or mitigation easements within the study area. No conservation or mitigation easements identified in the NCED database are crossed by an alternative route link.

7.7.3 Agriculture

Impacts to agricultural lands can generally be ranked by degree of potential impact, with the least potential impacts occurring in areas where grazing is the primary use (pasture or rangeland) and the highest degree of potential impact occurring where cultivated cropland is the primary use. The route crosses a large length of desert shrub/scrub land, and minimal agricultural cropland was

observed. Because Oncor and LCRA TSC will not fence the ROW for the proposed project or otherwise separate the ROW from adjacent lands, there would be no long-term or significant displacement of current grazing activities within pasturelands and rangelands. Most existing land uses may be resumed following construction.

Four mobile irrigation systems in the far western portion of the study area are crossed by alternative route links. As depicted on **Figure 3-1H (Appendix G)**, the Sand Lake Switch and a portion of Link A are situated on top of a mobile irrigation system already acquired by Oncor. Link B1 crosses two mobile irrigation systems, one of which is also crossed by Link C1. An additional mobile irrigation system is crossed by Link C1 south of this location. The three mobile irrigation systems not yet acquired by Oncor will be spanned by supporting structures on the outer edge of the system, with no anticipated disturbance to the mobile irrigation system. Therefore, adverse impacts to these areas will be avoided. Furthermore, no above-ground mechanical components (e.g., windmills or water troughs) will be adversely affected as a result of the proposed project.

7.7.4 Industry

As discussed in **Section 3.7.4**, quarrying, oil and gas extraction, educational services, transportation and warehousing, and construction are industries prevalent throughout the study area. These industries are largely concentrated in urban centers that are not near the alternative route links and are therefore not anticipated to be affected by the proposed project. Numerous oil and gas facilities are located within the study area consisting of well locations, pipelines, electric lines, and other associated above-ground appurtenances. No known oil or gas well locations will be crossed by any alternative route for the proposed project. Where feasible, Oncor and LCRA TSC attempt to cross existing pipelines and electric transmission lines at a right angle. Construction of the proposed project will have no significant adverse impacts to oil and gas infrastructure that may be crossed by any alternative route.

Furthermore, wind turbines and solar power facilities exist within the study area. No wind turbines and no solar power facilities within the study area will be crossed by any alternative route. The construction of the proposed project will cause no significant impacts on wind or solar power infrastructure.

7.7.5 Aesthetics

Aesthetic impacts exist when structures alter the character of the existing visual environment. The impact to this resource is related to the quality of the view, in the case of natural scenic areas. In the case of valued community resources and recreation areas, the significance of the impact is related to the existing use of the area.

Construction of the proposed project could have temporary and permanent aesthetic effects. Temporary impacts would include the assembly and construction of the structures. Where vegetation is cleared, the brush debris could have a negative impact on the local visual environment. Permanent impacts are limited to the views of the structures and lines.

To evaluate aesthetic impacts, reconnaissance surveys were conducted to determine the areas where segments of the proposed project would be visible from publicly accessible locations. These locations included areas of potential community value, community resources, public recreation areas, and federal and state highways that cross the study area. Measurements were made to estimate the length of the proposed project that would be present within recreational or major highway foreground visual zones (i.e. one-half mile unobstructed by topography, structures or vegetation). This determination of the visibility of the transmission line from various points was calculated from recent aerial photography and field reconnaissance.

All alternative routes will be visible from public roadways at one or more locations. The following federal and state highways are located within the one-half mile foreground visual zone of the alternative routes: Interstate 20, State Highway 18, State Highway 115, State Highway 329, North State Highway 137, U.S. Highway 385, East U.S. Highway 67, North State Highway 349, East U.S. Highway 190, North U.S. Highway 277, State Highway 163. The length of each route within the foreground visual zone of federal and state highways in the study area is listed in **Table 7-2 (Appendix E)**.

The discussion in **Section 7.7.2** considered potential interference of a transmission line with activities occurring in parks and recreation areas within 1,000 feet of any alternative route for the proposed project. The evaluation of potential aesthetic impacts also includes consideration of the amount of any alternative route for the proposed project within the visual foreground zone of public parks and recreation areas. Given the lack of public parks and recreation areas within 1,000 feet of any alternative route, there will be no significant impacts to the aesthetic views of these areas. As discussed in **Section 7.7.2**, 17 alternative route links are proposed to cross the Butterfield Overland National Historic Trail. A review of aerial photography, in addition to field reconnaissance, confirmed that no signs of permanent trail features are located within the study area. Views from the trail have already been altered by the extensive oil and gas operations in the region, and it appears that the trail receives very little, if any, foot traffic. Therefore, while the introduction of transmission lines spanning overhead may impact the aesthetic views from the trail, these impacts are expected to be minor, and no aesthetic impacts to recreational areas are reflected in **Table 7-2** and **Table 7-3 (Appendix E)**.

7.7.6 Transportation/Aviation

Potential impacts to transportation could include temporary disruption of traffic and conflicts with proposed roadway and/or utility improvements and may include slightly increased traffic during construction of the proposed project. However, such impacts are usually temporary. As discussed in **Section 2.2.1**, Kimley-Horn and Halff attempted to identify any planned improvements proposed by TxDOT or by local agencies. Based on the limited content within the replies received and included in **Appendix A**, it does not appear that the proposed project impacts any planned transportation improvements by any other agencies. The DoD Military Aviation and Installation Assurance Siting Clearinghouse responded via informal review letter on March 5, 2025; this response can be found in **Appendix A**. The proposed project was determined to have minimal impact on military operations.

The typical proposed structure heights are anticipated to be 140-160 feet with a maximum anticipated height of 190 feet, but actual heights will vary depending on terrain and other engineering considerations. According to FAA Regulations, Part 77 (FAA, 2025b), notification of the construction of the proposed project is required if structure heights exceed the height of an imaginary surface extending outward and upward at a slope of: (1) 100 to 1 for a horizontal distance of 20,000 feet from the nearest point of the nearest runway of a public, private, or military airport having at least 1 runway longer than 3,200 feet; (2) 50 to 1 for a horizontal distance of 10,000 feet from the nearest runway of a public, private, or military airport where all runways are 3,200 feet in length or less; or (3) 25 to 1 for a horizontal distance of 5,000 feet for heliports.

Kimley-Horn and Halff's review of airport runway and facilities data, recent aerial photography (ESRI World Imagery Basemap, 2025; NAIP, 2024), and reconnaissance surveys identified:

- Three FAA-registered airports with at least one runway greater than 3,200 feet in length within 20,000 feet of any alternative route;
- One FAA-registered airport with all runways less than 3,200 feet in length within 10,000 feet of any alternative route;
- One private airstrip within 10,000 feet of any alternative route; and
- No heliport within 5,000 feet of any alternative route.

Approximate distances from aviation facilities to alternative route links, organized by facility type and runway length, are provided in **Table 7-6 (Appendix F)**. The locations of aviation facilities are also shown in **Figures 3-1A through 3-1L (Appendix G)**.

It should be noted that historical USGS topographic maps (USGS, 1955-1992) label eight private landing strips located within 10,000 feet of multiple route links. Recent aerial photography (ESRI World Imagery Basemap, 2025; NAIP, 2024) supports that portions of seven of the landing strips have not been maintained, have become overgrown with vegetation or partially developed, and appear to no longer be in use. The remaining private airstrip, listed above, appears to be in service. The locations of all eight unregistered airstrips are labeled on **Figures 3-1A through 3-1L (Appendix G)**; however, because seven no longer remain in their entirety or appear to not be in use, only one is recorded in **Table 7-2 (Appendix E)**, **Table 7-3 (Appendix E)**, and **Table 7-6 (Appendix F)**.

7.7.7 Communication Towers

As stated in **Section 3.7.7** and shown on **Figures 3-1A through 3-1G (Appendix G)**, numerous communication towers, including AM and FM radio transmitters, were identified within the study area. A total of 22 of these communication towers were identified within 2,000 feet of the route link centerlines. Approximate distance and direction from communication towers to alternative route links are provided in **Table 7-7 (Appendix F)**.

No proposed alternative route link is within 10,000 feet of an AM radio transmitter or within 2,000 feet of an FM radio transmitter.

7.8 Cultural Resources Impacts

Construction activities can adversely impact cultural resources. Adverse impacts are found when an undertaking alters, directly or indirectly, the archeological, historical, or cultural characteristics that qualify a property for inclusion in the NRHP. These impacts occur when an undertaking diminishes a property's integrity of location, design, setting, materials, construction, or association that contributes to a resource's significance in accordance with the NRHP criteria.

As discussed in Title 36 CFR Part 800 (U.S., 2004), adverse impacts to NRHP listed or NRHP eligible properties may occur under conditions that include, but are not limited to:

- Destruction or alteration of all or part of a property;
- Isolation from alteration of the property's surrounding environment (setting); or
- Introduction of visual, audible, or atmospheric elements that are out of character with the property or alter its setting.

Direct impacts typically occur during construction. Indirect impacts include those caused by construction that occur later in time or impacts that are further removed but foreseeable. These impacts may include alterations in the pattern of land use, changes in population density, or accelerated growth rates, all of which may impact properties with historical, architectural, archeological, or cultural significance.

The preferred form of mitigation for direct or indirect impacts for cultural resources is avoidance. An alternative form of mitigation of direct impacts can be developed for archeological 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.

The method utilized to assess an area for potential prehistoric cultural resources is to identify high probability areas (HPAs). Locations that are usually identified as HPAs for the occurrence of prehistoric sites include water crossings, stream confluences, drainages, alluvial terraces, wide floodplains, upland knolls, and other areas where lithic resources can be found. When defining HPAs, a distance relationship to a water resource (about 1,000 feet) is set to encompass landforms that may have attracted past human activity and are therefore deemed appropriate for the presence of cultural resource sites.

As a formal cultural resources survey has not been conducted for any of the alternative routes, the possibility of affecting unknown archeological sites exists. The proposed project has potential for encountering sites along the Pecos River, Spring Creek, Toyah Creek, and major draws and drainages within the study area. The THC generally advises that a qualified archeologist survey the PUCT-approved route following criteria for intensive pedestrian survey, including the potential for deep testing. The evaluation of historic-aged structures during the survey should follow THC Guidance for Studying Late 19th-Century and Early 20th-Century Sites, which requires deed research to identify the individual(s) associated with recorded historic-age resource(s). The THC also generally recommends that any work occurring over land owned or managed by a state

agency or political subdivision of the state requires a Texas Antiquities Permit prior to initiation of fieldwork.

7.8.1 Historical Summary

As discussed in **Section 3.8.2**, numerous cemeteries have been documented within the study area, at least nine of which are designated as HTCs. Links B32, E1, M4, and Q22 are located within 1,000 feet of these HTC cemeteries, as shown in **Table 7-8 (Appendix F)** and reflected in **Table 7-3 (Appendix E)**. Rest Haven Cemetery, which is located within 1,000 feet of Link Q22, is designated as an HTC, and Rankin Cemetery, which is located within 1,000 feet of Link M4, is designated as an OTHM. Barstow Cemetery and Pyote Cemetery, which are neither HTCs or OTHMs, are located within 1,000 feet of Link B32 and E1, respectively. As discussed in **Section 3.8.1**, there are numerous properties and districts in the study area that have been recorded in the NRHP; however, none of these sites or districts are located within 1,000 feet of the alternative route links.

As noted in **Section 7.7.2**, 17 links are proposed to cross the Butterfield Overland National Historic Trail. Although some links cross the trail at only one location along its alignment, several links cross the trail multiple times, including Links C1, F3, J6, K7, and M4. Although there remains little evidence of the trail on aerial photography, the approximate location is provided by the NPS (2025a) and the trail is generally recognized by the THC as a potential resource. Therefore, the trail is included in recorded cultural resources data in **Table 7-2** and **Table 7-3** in **Appendix E**. Field reconnaissance of the study area provided a better understanding of surviving property types in the region, and potentially historically significant resources were observed. Most of the study area retains a rural, agricultural character intermixed with industry. Typical historic resources in the study area vicinity may include intact farms or the remnants of farms, with structures consisting primarily of farmhouses, associated barns and outbuildings, fencing and other components including water storage tanks, troughs, animal pens, and windmills. These observations are based on views of areas in the region from public roadways and from aerial reconnaissance. Additional potentially historic features may be found in areas that were not visually accessible from public roadways.

7.8.2 Archeological Summary

As discussed in **Section 3.8.1**, numerous archeological sites are located within the study area, 179 of which are currently recorded within 1,000 feet of the proposed route centerline. **Table 7-8 (Appendix F)** details the archeological sites and the distance from the proposed route link centerline.

Significant prehistoric sites recorded near the study area are generally associated with dunes, rock outcrops containing lithic materials useful for making stone tools, or significant water sources. Although permanent water sources are infrequent throughout the study area, the overall lack of significant development allows the possibility of intact archeological material. Consequently, HPAs were identified within the study area. HPAs typically consist of areas that contain deep soils

and lie within 300 meters (nearly 1,000 feet) of natural water sources. However, in the study area's more arid environment, these areas include:

- Uplands overlooking bodies of water, typically a major stream or river;
- Terraces and bluffs adjacent to stream channels;
- Outcrops containing lithic materials useful for making stone tools; and
- Structures (including windmills) identified on historic maps.

Alternative route links within the study area may cross numerous individual HPAs. **Table 7-3 (Appendix E)** quantifies by length of route across areas of high archeological and historical value.

Following PUCT approval of a route for the proposed project, a cultural resources survey will be conducted in accordance with the pre-approved research design developed by Oncor and LCRA TSC and THC for new transmission line studies. Any cultural resources discovered during this initial survey will be mitigated, if required, through consultation with the THC. In the event Oncor and LCRA TSC or their contractors encounter any archeological materials or other cultural resources during construction of the proposed project, Oncor and LCRA TSC will cease work in the immediate vicinity of the resource and report the discovery to the THC. It is anticipated that the project will have no substantial impacts to cultural resources, including NRHPs, OTHMs, SALs, or HPAs.

8.0 LIST OF PREPARERS

This report was prepared for Oncor and LCRA TSC by Kimley-Horn and Halff. Oncor and LCRA TSC provided information in **Section 1.0**. **Table 8-1** provides a list of the project team with primary responsibilities for the preparation of this document.

Table 8-1: List of Preparers

Name	Title	Responsibility
Julie Jones, P.E.	Kimley-Horn, Senior Project Manager	Senior Project Manager
Russell Marusak	Halff, Environmental Scientist	Senior Project Manager, QA/QC
Joshua Cutler	Halff, Archeologist	Cultural Resources
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Emily Rabel	Halff, Environmental Scientist	GIS Data Research and Mapping
Julia Holloway	Halff, Environmental Scientist	GIS Data Research
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