ENVIRONMENTAL ASSESSMENT AND ALTERNATIVE ROUTE ANALYSIS FOR LCRA TRANSMISSION SERVICES CORPORATION'S PROPOSED COOKS POINT 138-KV TRANSMISSION LINE PROJECT IN BURLESON COUNTY, TEXAS

Prepared for:

LCRA Transmission Services Corporation
3505 Montopolis Drive
Austin, TX 78744

Prepared by:

URS
9400 Amberglen Boulevard
Austin, Texas 78729

May 2018

(This page intentionally left blank)

TABLE OF CONTENTS

1.0 DESCRIPTION OF THE PROPOSED PROJECT 1-1
1.1 SCOPE OF THE PROJECT 1-1
1.2 PURPOSE AND NEED 1-1
1.3 AGENCY ACTIONS 1-4
1.4 DESCRIPTION OF PROPOSED DESIGN AND CONSTRUCTION....1-6
1.4.1 Transmission Line Design Considerations 1-6
1.4.2 Typical Transmission Line Structures and Easements....1-7
1.4.3 Substations....1-7
1.5 PROPOSED PROJECT CONSTRUCTION CONSIDERATIONS 1-7
1.5.1 Right-of-Way Preparation 1-12
1.5.2 Structure Assembly and Erection....1-14
1.5.3 Conductor and Shield Wire Installation 1-14
1.5.4 Cleanup....1-15
1.6 PROPOSED PROJECT MAINTENANCE....1-16
2.0 DESCRIPTION OF THE STUDY AREA 2-1
2.1 STUDY AREA DELINEATION....2-1
2.2 DATA COLLECTION....2-3
2.3 ENVIRONMENTAL SETTING OF THE STUDY AREA....2-6
2.3.1 PHYSIOGRAPHY AND GEOLOGY....2-6
2.3.2 SOILS....2-8
2.3.2.1 Soil Associations....2-8
2.3.2.2 Prime Farmland Soils....2-12
2.3.2.3 Hydric Soils....2-13
2.3.3 MINERAL AND ENERGY RESOURCES....2-13
2.3.4 WATER RESOURCES 2-14
2.3.4.1 Surface Water/Floodplains....2-14
2.3.4.2 Groundwater/Aquifers 2-16
2.3.4.3 Ecologically Significant Stream Segments 2-17
2.3.5 ECOLOGY....2-17
2.3.5.1 Vegetation....2-17
2.3.5.2 Fish and Wildlife....2-27
2.3.6 COMMUNITY VALUES AND COMMUNITY RESOURCES....2-46
2.3.7 LAND USE 2-46
2.3.7.1 Urban/Residential Areas 2-46
2.3.7.2 Existing Linear Facilities and Other Features 2-47
2.3.7.3 Recreational Areas 2-48
2.3.7.4 Agriculture....2-49
2.3.7.5 Aesthetics 2-50
2.3.7.6 Transportation/Aviation 2-51
2.3.7.7 Communication Towers 2-54
2.3.8 SOCIOECONOMICS....2-54
2.3.8.1 Population Trends....2-54
2.3.8.2 Employment....2-55

2.3.8.3 Leading Economic Sectors....2-55
2.3.9 CULTURAL RESOURCES....2-56
2.3.9.1 Cultural Background....2-56
2.3.9.2 Previous Investigations....2-61
2.3.9.3 Records Review....2-65
3.0 SELECTION AND EVALUATION OF ALTERNATIVES....3-1
3.1 SELECTION OF PRELIMINARY ALTERNATIVE ROUTE SEGMENTS....3-1
3.2 SELECTION OF PRELIMINARY SUBSTATION SITES....3-2
3.3 PUBLIC INVOLVEMENT PROGRAM....3-2
3.3.1 Open House Meeting....3-2
3.3.2 Internet Website....3-5
3.4 MODIFICATIONS/DELETIONS/ADDITIONS OF ALTERNATIVE ROUTE SEGMENTS FOLLOWING THE OPEN HOUSE MEETING....3-5
3.4.1 Preliminary Alternative Route Segment Modifications....3-6
3.4.2 Preliminary Alternative Route Segment Deletions....3-13
3.4.3 Alternative Route Segment Additions....3-13
3.5 PRIMARY ALTERNATIVE ROUTES....3-18
4.0 EVALUATION OF THE PRIMARY ALTERNATIVE ROUTES....4-1
4.1 IMPACTS ON PHYSIOGRAPHY/GEOLOGY....4-1
4.2 IMPACT ON SOILS....4-1
4.3 IMPACT ON MINERAL AND ENERGY RESOURCES....4-2
4.4 IMPACT ON WATER RESOURCES....4-3
4.4.1 Surface Water/Floodplains....4-3
4.4.2 Groundwater/Aquifers....4-4
4.5 IMPACT ON ECOSYSTEMS....4-5
4.5.1 Vegetation....4-5
4.5.1.1 Commercially or Recreationally Important Plant Species....4-6
4.5.1.2 Endangered and Threatened Plant Species....4-7
4.5.2 Fish and Wildlife....4-7
4.5.2.1 Terrestrial....4-7
4.5.2.2 Aquatic....4-10
4.5.2.3 Commercially or Recreationally Important Animal Species....4-11
4.5.2.4 Endangered and Threatened Animal Species....4-12
4.5.2.5 Summary of Natural Resource Impacts....4-14
4.6 IMPACTS ON COMMUNITY VALUES AND COMMUNITY RESOURCES....4-15
4.7 LAND USE IMPACTS....4-16
4.7.1 Urban/Residential Areas....4-16
4.7.2 Existing Linear Facilities and other Features....4-17
4.7.3 Recreational Areas....4-19
4.7.4 Agriculture....4-20
4.7.5 Aesthetics....4-20
4.7.6 Transportation/Aviation....4-21
4.7.7 Communication Towers....4-23
4.7.8 Socioeconomics....4-24

4.7.9 Summary of Impacts on Community Values and Community Resources.....4-24
4.8 IMPACTS ON CULTURAL RESOURCES.....4-25
4.8.1 Historical Summary.....4-26
4.8.2 Archaeological Summary.....4-27
4.8.3 Mitigation.....4-31
5.0 LIST OF PREPARERS.....5-1
6.0 REFERENCES.....6-1

APPENDICES

A. Agency and Other Correspondence
B. Public Involvement
C. Primary Alternative Routes (Topographic Base)
D. Habitable Structures and Other Land Use Features in the Vicinity of Primary Alternative Routes
E. Environmental Data for Primary Alternative Route Segment Evaluation
F. Environmental Data for Alternative Route Evaluation
G. LCRA's Corporate Oak Wilt Policy

FIGURES

1-1 Project Area 1-2
1-2 138 kV Delta Tangent Pole 1-8
1-3 138 kV Vertical Tangent/Angle Pole 1-9
1-4 138 kV Deadend Pole 1-10
1-5 Photograph of a Typical Substation 1-11
2-1 Study Area 2-2
2-2 Physiographic Regions of Texas 2-7
2-3 Water Resources Map 2-15
2-4 Study Area with Level III Ecoregions of Texas 2-18
2-5 Species and Ecological Communities of Concern 2-28
2-6 Transportation and Aviation Map 2-52
3-1 Modification of Segments C2, L2, and Q2 and Deletion of Segment J2 3-7
3-2 Modification of Segment Q 3-8
3-3 Modification of Segment V1 3-9
3-4 Modification of Segment Y2 3-10
3-5 Modification of Segment X1 3-11
3-6 Modification of Segment L1 and Addition of Segments A4 and Q3 3-12
3-7 Deletion of Segment D 3-14
3-8a Deletion of Segment I 3-15
3-8b Deletion of Segments B1, C1, N1, and O1 3-16
3-9 Deletion of Segment P1 3-17
3-10 Addition of Segments N3, O3, and P3 3-19
3-11 Addition of Segment R3 3-20

TABLES

2-1 Geologic Units within the Study Area 2-6
2-2 Soil Associations within the Study Area 2-9
2-3 Prime Farmlands and Farmlands of Statewide Importance within the Study Area 2-12
2-4 Hydric Soils within the Study Area 2-13
2-5 Description of Terrestrial Vegetation Types within the Study Area 2-19
2-6 Description of Aquatic Vegetation Types within the Study Area 2-23
2-7 Reptile and Amphibian Species with Potential to Inhabit the Study Area 2-29
2-8 Mammalian Species with Potential to Inhabit the Study Area 2-30
2-9 Avian Species with Potential to Inhabit the Study Area 2-31
2-10 Fish Species with Potential to Inhabit the Study Area 2-37
2-11 Mussel Species with Potential to Inhabit the Study Area 2-39
2-12 Endangered and Threatened Wildlife of Potential Occurrence within Burleson County 2-40

2-13 Recreational Facilities within the Study Area....2-48
2-14 Planned Roadway Projects within the Study Area....2-53
2-15 Aviation Facilities within the Study Area....2-54
2-16 Population Trends....2-55
2-17 Labor Force and Employment....2-55
2-18 Occupations in Burleson County....2-56
2-19 Industries in Burleson County....2-56
2-20 Previously Recorded Archaeological Sites within the Study Area....2-62
2-21 Prehistoric Archaeological Site Types by Percent within the Study Area....2-64
2-22 Historic Archaeological Site Types by Percent within the Study Area....2-64
2-23 Previous Cultural Resources Investigations within the Study Area....2-65
2-24 Previously Documented Historic-Age Resources within the Study Area....2-66
3-1 Preliminary Alternative Segment Concerns/Comments....3-4
3-2 Composition of Primary Alternative Routes....3-21
4-1 Parks and Recreational Areas within 1,000 Feet of Primary Alternative Routes....4-19
4-2 TxDOT Projects Crossed by Primary Alternative Routes....4-22
4-3 Airport and Heliport Facilities and Runway Locations....4-23
4-4 Primary Alternative Routes in Proximity of Communication Towers....4-23
4-5 Known Historic Resource Sites within 1,000 feet of a Primary Alternative Route....4-27
4-6 Previously Recorded Archaeological Sites within 1,000 feet of an Alternative Route....4-28
4-7 Percentages of HPAs, MPAs, and LPAs across Primary Alternative Routes....4-30

Acronyms and Abbreviations

AC	Alternating current
ACSR	Aluminum conductor, steel reinforced
AM	Amplitude Modulation
ASR	Antenna Structure Registration
B.P.	before present
BBEC	Bluebonnet Electric Cooperative
BGEPA	Bald and Golden Eagle Protection Act
BNSF	Burlington Northern Santa Fe Railroad Company
BTU	Bryan Texas Utilities
CCN	Certificate of Convenience and Necessity
CFR	Code of Federal Regulations
CLF	Civilian labor force
CRA	Cultural Resources Assessment
CSJ	Control Section Job
CWA	Clean Water Act
DOD	U.S. Department of Defense
e.g.	for example
EA	Environmental Assessment
EMST	Ecological Mapping System of Texas
ERCOT	Electric Reliability Council of Texas
ESA	Endangered Species Act
ESSS	Ecologically Significant Stream Segments
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FEMA	Federal Emergency Management Agency
FM	Frequency Modulation
FM 116	Farm-to-Market Road
HPAs	High Potential Areas
HTC	Historic Texas Cemetery
ISD	Independent School District
kcmil	Thousand circular mils
kV	kilovolt
LCRA TSC	LCRA Transmission Services Corporation
LPAs	Low Potential Areas
MBTA	Migratory Bird Treaty Act
MISO	Midcontinent Independent System Operator
MPAs	Moderate Potential Areas
msl	Mean sea level
MVA	Megavolt

MW	megawatts
NASS	National Agricultural Statistics Service
NERC	North American Electric Reliability Corporation
NESC	National Electrical Safety Code
NHD	National Hydrography Dataset
NOI	Notice of Intent
NPS	National Park Service
NRA	Natural Resources Assessment
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
OPGW	one fiber optic ground wire
OTHMs	Official Texas Historic Markers
PUCT	Public Utility Commission of Texas
PURA	Public Utility Regulatory Act
ROW	Right-of-Way
RPG	Regional Planning Group
RRC	Railroad Commission of Texas
RTHLs	Recorded Texas Historic Landmarks
RTP	Reginal Transmission Plan
SAWS	San Antonio Water System
SH	State Highway
SWPPP	Storm Water Pollution Prevention Plan
TARL	Texas Archeological Research Laboratory
TASA	Texas Archeological Site Atlas
TCEQ	Texas Commission on Environmental Quality
TDC	Texas Demographic Center
THC	Texas Historical Commission
THSA	Texas Historic Site Atlas
TPWD	Texas Parks and Wildlife Department
TWDB	Texas Water Development Board
TxDOT	Texas Department of Transportation
U.S.	United States
UPRR	Union Pacific Railroad
URS	URS Corporation
USACE	U.S Army Corps of Engineers
USC	U.S. Code
USCB	U.S. Census Bureau
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service

USGS U.S. Geological Survey

1.0 DESCRIPTION OF THE PROPOSED PROJECT

1.1 SCOPE OF THE PROJECT

LCRA Transmission Services Corporation (LCRA TSC) is proposing a new single-circuit 138-kilovolt (kV) transmission line and load-serving substation in Burleson County (the Proposed Project). The Proposed Project will connect from either the existing Bluebonnet Electric Cooperative (BBEC) Lyle Wolz Substation or the existing BBEC Lyons Substation to a new substation in the vicinity of the Cooks Point community. Figure 1-1 shows the location of the Proposed Project.

LCRA TSC requires Public Utility Commission of Texas (PUCT) approval to amend its Certificate of Convenience and Necessity (CCN) for the Proposed Project. Upon PUCT approval, LCRA TSC will construct all transmission line and substation facilities. LCRA TSC and BBEC anticipate that, following completion of the Proposed Project, BBEC will acquire from LCRA TSC an ownership interest in the project, subject to any and all necessary regulatory approvals. Following any necessary regulatory approvals, it is anticipated that LCRA TSC will operate and maintain the transmission line facilities associated with the Proposed Project.

1.2 PURPOSE AND NEED

The Proposed Project is needed to provide 138-kV transmission service to a new load-serving substation (Cooks Point Substation). The Cooks Point Substation is needed to ensure the electric service requirements of existing and future end-use customers in the area are met in a reliable, efficient, and cost-effective manner.

The electric service needs of end-use customers in Burleson County are served today by multiple distribution service providers, including: BBEC, Bryan Texas Utilities (BTU), and the City of Caldwell (which is synchronously connected to the Midcontinent Independent System Operator (MISO) grid). BBEC's end-use customers in the area of the Proposed Project are currently served primarily via transformation and distribution facilities at the existing Lyle Wolz and Lyons substations. Both of these substations are interconnected to the LCRA TSC and BBEC transmission network, which is part of the Electric Reliability Council of Texas (ERCOT) grid. Significant load growth is occurring and expected to continue in the area to the north of

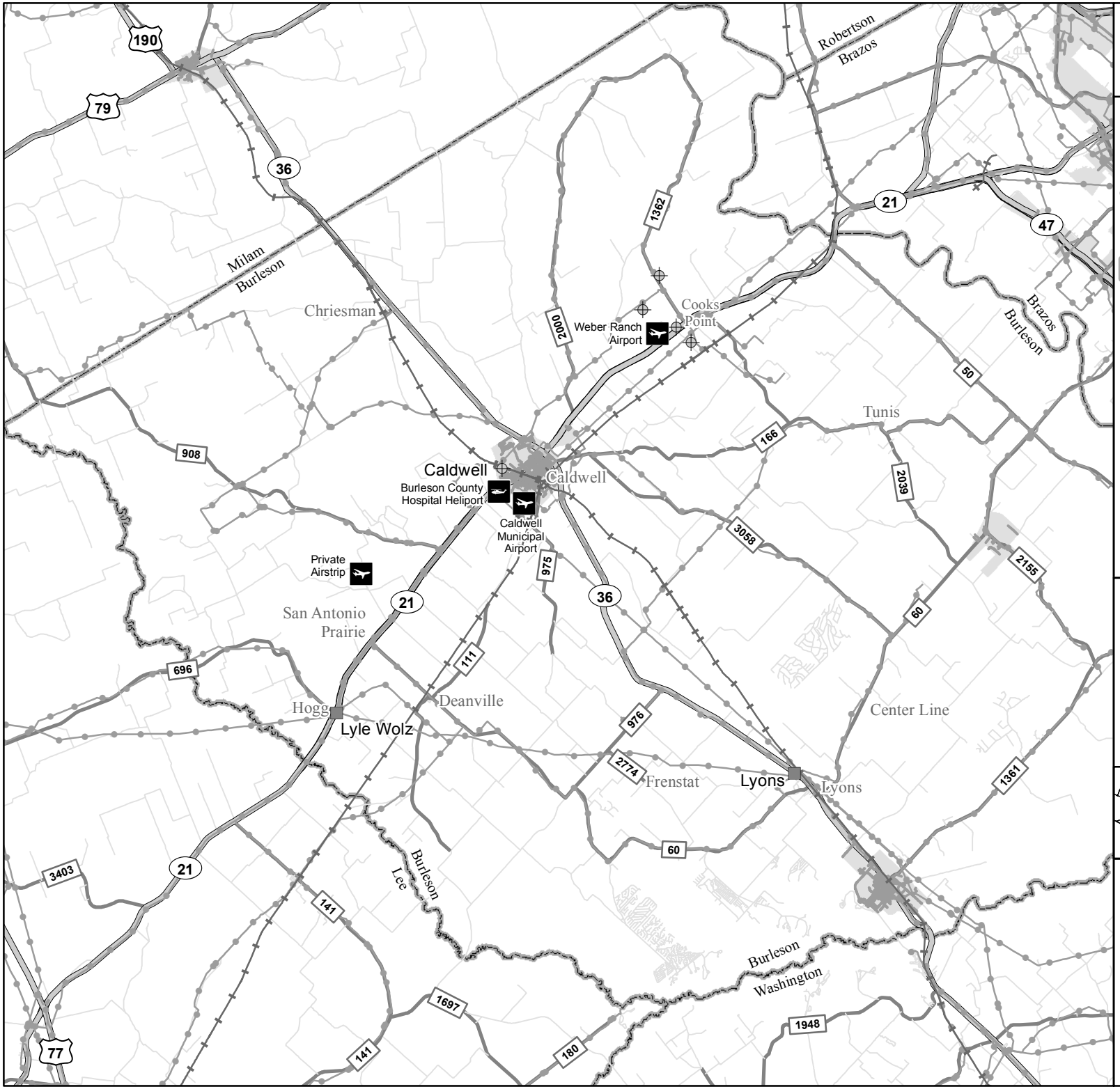


Figure 1-1

Project Area

Cooks Point 138-kV Transmission Line Project
Burleson County, Texas

Alternative Substation

Existing Utilities

Existing Substation

Existing Transmission Line

Administrative Boundaries

Incorporated Area

County Boundary

Transportation

US Highway

State Highway

183 Farm-to-Market Road

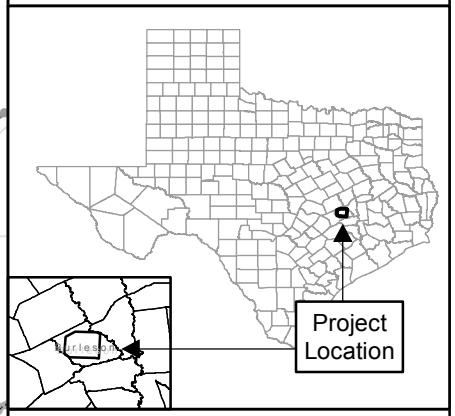
21 Major Road

2155 Local Road

Railroad

Airport

Heliport



0 2 4

SCALE IN MILES

N

LCRA ENERGY • WATER • COMMUNITY SERVICES

URS

Date: 5/25/2018

the existing transmission and substation facilities, particularly at the northern end of Burleson County and BBEC's service territory. This load growth is primarily associated with industrial oil and gas production activity, as well as water well and pumping installations related to the San Antonio Water System (SAWS) Vista Ridge pipeline. Due to the load growth in Burleson County and relative remoteness of existing BBEC load-serving facilities, the electric system's current ability to reliably and adequately serve the growing electric load in the area will be exceeded in the near future. To ensure the reliability of electric service in Burleson County, BBEC, LCRA TSC, and BTU jointly studied and developed the Proposed Project.

BBEC's distribution studies project a load of 37.1 megawatts (MW) at Lyle Wolz and 22.5 MW at Lyons by 2021, absent the Proposed Project. By 2023, BBEC projects a load of 44.4 MW at Lyle Wolz and 23.0 MW at Lyons, absent the Proposed Project. Based on these load forecast values, BBEC's distribution system assessment has determined that expanding the BBEC distribution system, without also adding transmission system capacity, will result in the distribution system being unable to support load growth on the BBEC system in Burleson County by 2021. Without this project, BBEC distribution system criteria violations include:

- an inability to maintain voltages that meet ANSI C84.1 Range A limits under normal operating conditions;
- exceeding optimum conductor loading levels on distribution feeders; and
- the need for an excessive number of voltage regulators.

As a result of these distribution criteria violations and the inability to resolve them solely with distribution system improvements, a new load-serving substation in the Cooks Point area served by a new transmission line from either the Lyle Wolz or Lyons substation is the best option to address these violations and support forecasted load growth in a reliable, efficient, and cost-effective manner.

By 2023, the proposed Cooks Point Substation is forecasted to serve 20.4 MW of load. At this load level, LCRA TSC's Transmission System Planning Criteria require looped transmission service. The looped transmission service will be accomplished through BTU's construction of a new 138-kV transmission line from BTU's Steele Store Substation that will terminate at the new Cooks Point Substation. The looped transmission service will also support transmission system performance in the area of the Proposed Project by providing another source into existing

transmission networks and avoiding load loss during coincident outages. Furthermore, the new Cooks Point Substation and associated transmission line will avoid the need for BBEC to rebuild the 138-kV Gay Hill-Lyons transmission line by 2023, which ERCOT identified as a necessary system upgrade in the 2017 Regional Transmission Plan (RTP) report. In addition, depending on the PUCT-selected route for the transmission line, the Proposed Project may also provide emergency back-up capability to the City of Caldwell during an extreme weather scenario when the City of Caldwell cannot receive electric service from the MISO grid.

The Proposed Project has undergone review by BBEC, BTU, the City of Caldwell, Oncor Electric Delivery Company, LCRA TSC, ERCOT staff, and other ERCOT stakeholders. LCRA TSC submitted the Proposed Project to the ERCOT Regional Planning Group (RPG) on July 8, 2016. During the RPG review process, LCRA TSC received only comments in support of the Proposed Project. ERCOT staff determined that the Proposed Project is a Tier 4 "neutral" project and will not result in any violations of North American Electric Reliability Corporation (NERC) Reliability Standards or ERCOT Protocols.

1.3 AGENCY ACTIONS

This environmental assessment (EA) in support of LCRA TSC's application to the PUCT to amend its CCN is intended to provide information on certain environmental and land use factors contained in Section 37.056(c)(4) of the Public Utility Regulatory Act (PURA) and PUCT Substantive Rule 25.101(b)(3)(B). This EA may also be used in support of any other local, state, or federal permitting requirements, if necessary.

Where an alternative route for the Proposed Project crosses or requires access from a state-maintained road or highway, LCRA TSC will obtain a permit from the Texas Department of Transportation (TxDOT) prior to construction if that route is ultimately approved by the PUCT. Where an alternative route for the Proposed Project is parallel to TxDOT roads, LCRA TSC generally intends to place transmission line structures on adjacent private property and not within the road right of way (ROW).

LCRA TSC will coordinate with Burleson County engineers regarding crossing of county roads as appropriate. For any portion of the Proposed Project located in the City of Caldwell, LCRA TSC will coordinate with the city during the design phase of the project. LCRA TSC does not

generally propose to place any structures of the transmission line within any county or city road ROW.

Where a proposed route for the Proposed Project crosses a railroad, LCRA TSC will obtain a permit from the appropriate railway company prior to construction if that route is ultimately approved by the PUCT. For any routes parallel to an existing railroad, LCRA TSC will coordinate with the owner of the railroad to ensure the Proposed Project does not interfere with railroad operations. LCRA TSC does not propose to place any structures of the transmission line within railroad ROW.

Because more than one acre will be disturbed during construction of the Proposed Project, a Storm Water Pollution Prevention Plan (SWPPP) will be prepared, and because more than five acres will be disturbed, LCRA TSC will submit a Notice of Intent (NOI) to the Texas Commission on Environmental Quality (TCEQ). The controls specified in the SWPPP will be monitored in the field.

Upon approval of LCRA TSC's CCN application and prior to construction, a detailed Natural Resources Assessment (NRA) and Cultural Resources Assessment (CRA) will be performed on the approved route. Depending upon the results of these assessments, permits or regulatory approvals may be required from the U.S. Army Corps of Engineers (USACE) or the U.S. Fish and Wildlife Service (USFWS). If LCRA TSC encounters previously unassessed artifacts, cultural resources, or environmental features during project construction, LCRA TSC will stop construction in the immediate vicinity of the site. LCRA TSC will notify and consult with the appropriate administering authority and LCRA TSC design staff to develop a process for the site before construction continues.

Similarly, as LCRA TSC identifies other obstacles and engineering constraints along the approved route, LCRA TSC will adjust alignments, adjust structure locations/heights, and/or take other actions consistent with a Final Order approving the Proposed Project.

After all other alignments, structure locations, and structure heights are adjusted and set based on the permitting and notices described previously, LCRA TSC will make a final determination of the need for Federal Aviation Administration (FAA) notification, based on structure locations and structure designs. Although it is not presently anticipated, based on potential impacts within the purview of the FAA, LCRA TSC may use alternative structure types and/or

structures of lower-than-typical heights in some areas and add marking and/or lighting to certain structures.

In addition, after all other alignments, structure locations, and structure heights are adjusted and set based on the permitting and notices described previously, LCRA TSC will coordinate with owners and operators of natural gas pipelines in the vicinity of the approved route regarding the pipeline owner's or operator's assessment of the need to install measures to mitigate the effects of alternating-current (AC) interference on existing natural gas pipelines.

Appropriate measures will be taken during engineering design to ensure that special provisions of the PUCT's Final Order regarding environmental and ROW concerns are addressed. If necessary, these measures will be added to construction documents, specifications, or other instructions. Following completion of the design, a preconstruction meeting will be held, which will include a review of these regulatory provisions. A physical inspection of the project will be performed following project completion to ensure all appropriate measures have been taken during construction.

LCRA TSC will report the status of the transmission line project to the PUCT on LCRA TSC's Monthly Construction Progress Report, beginning with the first report following the filing of the CCN application, and in each subsequent monthly progress report until construction is completed and actual project costs have been reported. As required by the PUCT, LCRA TSC will submit location and attribute data for the approved route after it is constructed.

1.4 DESCRIPTION OF PROPOSED DESIGN AND CONSTRUCTION

1.4.1 Transmission Line Design Considerations

The Proposed Project will be operated as a 138-kV transmission line with bundled 795 thousand circular mils (kcmil) aluminum conductor, steel-reinforced (ACSR) "Drake" with two conductors per phase and one fiber optic ground wire (OPGW). The transmission line will be installed on new structures and within new easements.

The Proposed Project will be rated for operation at 1,840 Amperes, yielding a nominal 440-Megavolt-amperes (MVA) capacity. The configurations of the conductor and shield wires will be designed to provide adequate clearance for operation at 138-kV, considering icing and wind conditions. The Proposed Project will be designed and constructed to meet or exceed the specifications set forth in the current edition of the National Electrical Safety Code (NESC) and

will comply with all applicable state and federal statutes and regulations. The results of the Natural/Cultural Resource Assessments will be considered when designing and placing new structures.

1.4.2 Typical Transmission Line Structures and Easements

LCRA TSC proposes to use 138-kV pole structures for typical tangent, angle, and deadend structures. The geometries of the proposed typical tangent, angle, and deadend structures are shown on Figures 1-2 through 1-4. All structure geometries are illustrative. In some areas, such as transmission line crossings, highway crossings, or railroad crossings, shorter than typical, taller than typical, or alternative structure types may be utilized. Actual structure types may differ slightly based on newer or different designs available at the time of construction.

The new 138-kV transmission facilities will typically be constructed on new ROW within easements ranging from approximately 60 to 100 feet in width, and using spans that typically range from approximately 600 to 1,000 feet. In some areas, easement width and span length could be more or less than the typical, depending upon terrain and other engineering constraints. Access easements and/or temporary construction easements may be needed in some areas.

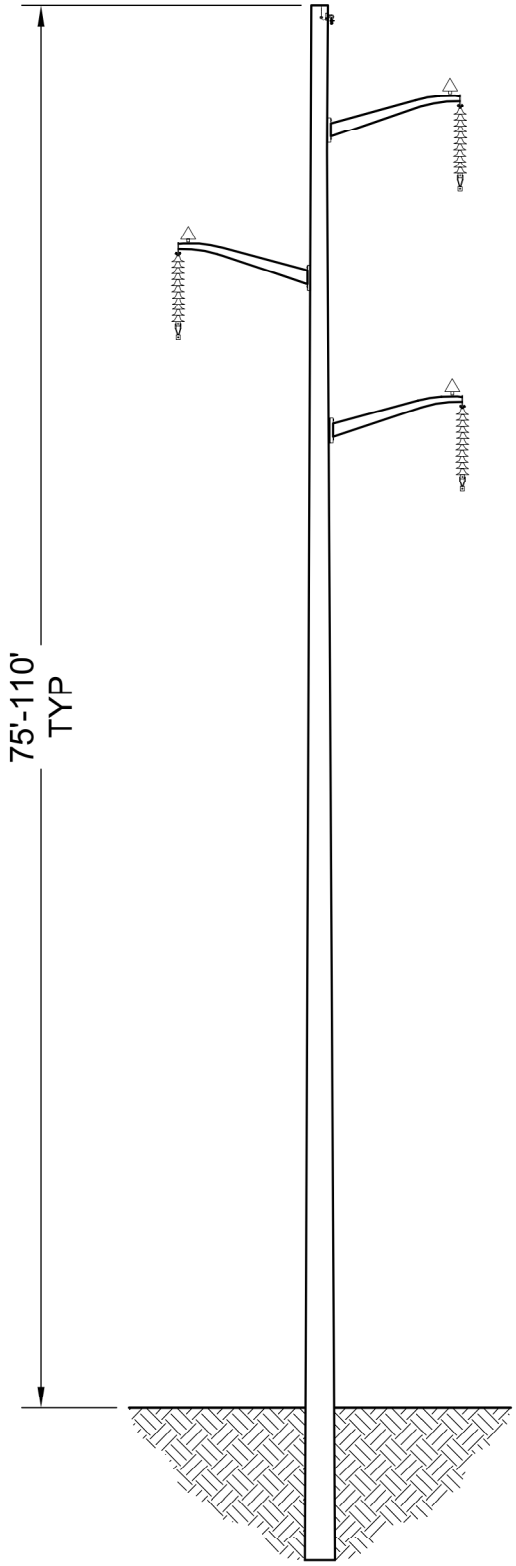
1.4.3 Substations

The Proposed Project will connect one new 138-kV load-serving substation (Cooks Point) to the existing 138-kV electric transmission grid. The connections of the new line to the existing grid will connect at either the existing Lyle Wolz Substation or Lyons Substation. An example of a typical substation as proposed for the project is shown on Figure 1-5.

1.5 PROPOSED PROJECT CONSTRUCTION CONSIDERATIONS

Construction of the proposed transmission line will require removal of vegetation, excavating for installation of foundations, structure assembly and erection, conductor and shield wire installation, and cleanup when construction is complete.

Construction of the Proposed Project includes the installation of one new electric load-serving substation. The substation will require a graded site pad and an access road with construction consisting of vegetation removal, cut and fill of existing soils, and the addition of select fill and compacted crushed limestone. Following site preparation, a perimeter fence, foundations, ground grid, electrical equipment, support structures, and a control building will be installed.



NOTE: SPACING BETWEEN WIRES MAY VARY DEPENDING ON SPAN LENGTH.

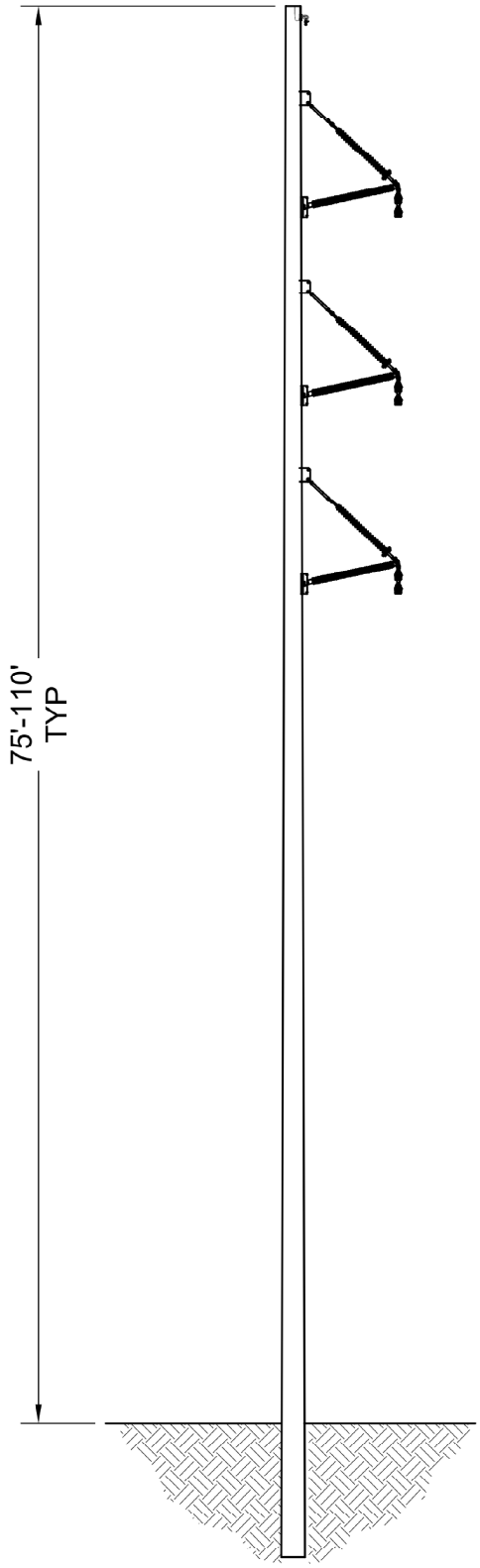
138 kV DELTA TANGENT POLE
(STEEL OR CONCRETE)

Figure 1-2

138-kV Delta Tangent Pole

Cooks Point 138-kV Transmission Line Project
Burleson County, Texas

Map Update: 5/25/2018



NOTE: SPACING BETWEEN WIRES MAY VARY DEPENDING ON SPAN LENGTH.

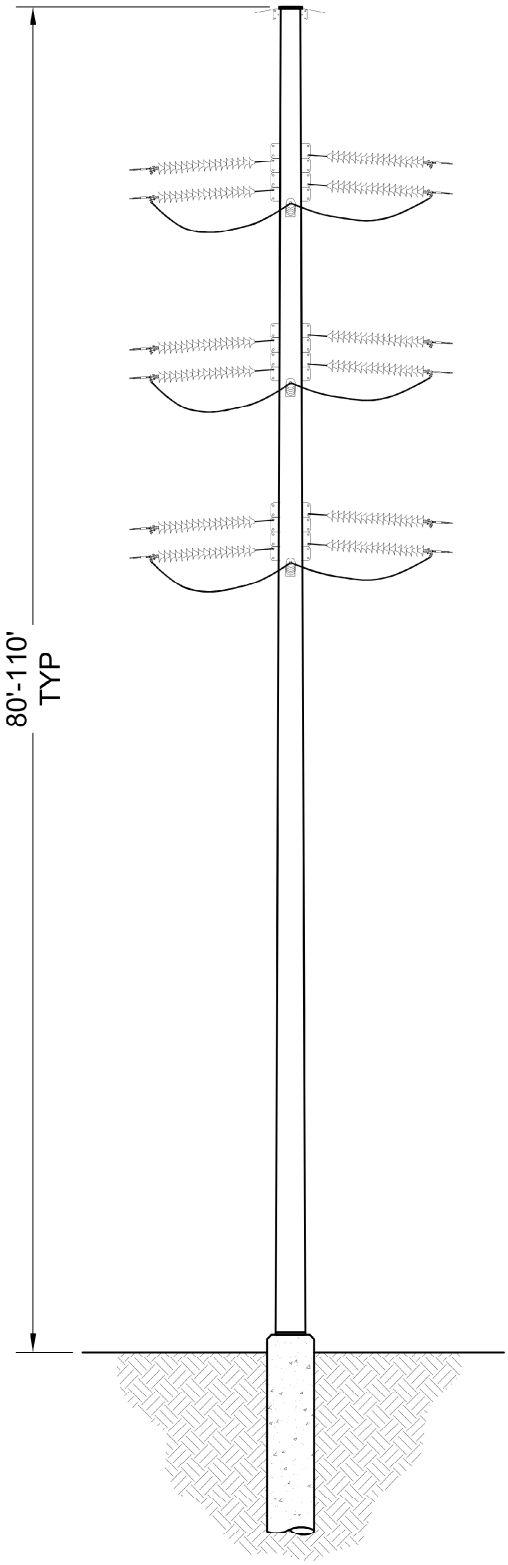
138 kV VERTICAL TANGENT/ANGLE POLE
(STEEL OR CONCRETE)

Figure 1-3

138-kV Vertical Tangent/Angle Pole

Cooks Point 138-kV Transmission Line Project
Burleson County, Texas

Map Update: 5/25/2018



NOTE: SPACING BETWEEN WIRES MAY VARY DEPENDING ON SPAN LENGTH.

138 kV DEADEND POLE

Figure 1-4

138-kV Deadend Pole

Cooks Point 138-kV Transmission Line Project
Burleson County, Texas

Map Update: 5/25/2018

Figure 1-5
Photograph of a Typical Substation

After all substation facilities are installed, a final surface layer of gravel will be added, and cleanup will occur when construction is complete.

After the substation site location is approved as part of the PUCT's approved routing for the Proposed Project, construction documents will be prepared and construction will be conducted with attention to the conservation of natural and cultural resources.

After alignments and structure locations/heights for the transmission line are designed, transmission line and substation construction drawings and specifications will be prepared and construction will be conducted with attention to the conservation of natural and cultural resources. The following criteria will guide LCRA TSC's conservation of natural and cultural resources:

- Efforts will be made to avoid oil spills and other types of pollution, particularly while performing work in the vicinity of streams, ponds, and other water bodies.
- Water used for construction purposes will not typically be taken from streams or other bodies of water. Should water from streams be necessary, its use will be limited to volumes that will not cause harm to the ecology or aesthetics of the area.
- Precautions will be taken to prevent the possibility of accidentally starting range fires, in compliance with local fire laws and applicable regulations.

- Tension stringing of conductors will be employed where possible to reduce the amount of vegetation removal. Helicopters may be considered for use in some areas, potentially including areas where clearing may be difficult or particularly impactful to the environment.
- Precautions will be taken to prevent the spread of oak wilt. ROW preparation will adhere to LCRA's Corporate Oak Wilt Policy (see Appendix G).
- When practical, in areas of known endangered or threatened species habitat and in consultation with the USFWS, construction will be performed during seasons of low occurrence or during the non-breeding season (species dependent).
- The Proposed Project will comply with the TCEQ construction general permit for storm water discharges.
- If any previously unassessed archaeological materials are uncovered during construction, construction will cease in the immediate area of the discovery, and LCRA TSC will take appropriate actions consistent with the PUCT's Final Order and as previously described in Section 1.3.
- ROW preparation will be performed in accordance with the provisions discussed below, in order to diminish soil disturbance during construction.

1.5.1 Right-of-Way Preparation

Trees and brush in the transmission line ROW are removed where necessary to ensure safe operation of and access to the line.

Existing and new transmission line ROW will be used for access during construction operations. Ingress and egress through private property may be required in limited circumstances to reduce construction impacts. In the event ingress and egress through private property is necessary, existing private roads will be used where practical. In some cases, culverts may be used to cross creeks and tributaries. Where culverts are not used, creek crossings may consist of rock or cobble placed on the stream bottom. The following factors, thoughtfully implemented and applicable to the Proposed Project, will minimize the potential adverse effects of the Proposed Project on the natural environment:

- Preparation of the ROW for construction of the transmission line facilities will take into account soil stability, the prevention of silt deposition in water courses, and practical

measures for the protection of natural vegetation and protection of adjacent resources, such as natural habitat for wildlife.

- A flail mower may be used instead of bulldozers with dirt blades, where such use will preserve the cover crop of grass, low-growing brush, and similar vegetation.
- Vegetation will typically be removed in a straight path.
- Removal of vegetation and grading of construction areas, such as storage areas or setup sites, will be performed in a manner that will minimize erosion and conform to the natural topography.
- Vegetation removal will be performed in accordance with construction plans, which will be developed in accordance with natural and cultural resource regulations applicable to the area of construction and in a manner that will diminish scarring of the landscape or silting of streams, while ensuring that the transmission line facilities can be constructed, operated, and maintained safely and in accordance with the construction codes referenced above.
- Vegetation removal will be performed in a manner that diminishes the amount of flora and fauna disturbed during construction of the transmission line, except to the extent necessary to establish appropriate clearance, operation, and maintenance of the transmission line.
- Vegetation removal and construction activities, including temporary or permanent access roads in the Waters of the United States or in the vicinity of streambeds, will be performed in a manner to minimize damage to the natural condition of the area and in accordance with USACE requirements.
- Vegetation removal will not be performed until a SWPPP has been prepared and a NOI has been submitted to the TCEQ for the Proposed Project.
- Erosion control devices will be constructed where necessary to prevent soil erosion in the ROW, in accordance with the SWPPP. Erosion control devices will be maintained and inspections conducted until the site is sufficiently re-vegetated, as required by the SWPPP.
- Roads will be provided with erosion-control measures, which may include side drainage ditches or culverts in accordance with the SWPPP.

- Roads will be stabilized if constructed on steep slopes. Where feasible, service and access roads will be constructed jointly.
- In or near areas where ROWs enter dense vegetation and cross major highways or rivers of high scenic value, a screen of natural vegetation may be left in the ROW while still allowing for access to the ROW.

1.5.2 Structure Assembly and Erection

Survey crews will stake or otherwise mark structure locations. Soil borings and soils testing will provide the parameters for foundation designs for new structures. Construction crews will install structures by excavating circular holes and placing in them a reinforced, concrete foundation or a direct-embed pole. Where direct-embedded poles are used, crews will install them by excavating oversized holes, lifting and setting the structure, and backfilling with native soils, select fill, or concrete, depending on soil conditions at the site. Where structures with foundations are used, after foundations have cured sufficiently, crews will set structures. Following structure erection, crews will install the conductor and shield wire suspension assemblies. Conductor suspension assemblies may include glass, porcelain and/or polymer insulators. Structure grounds will be installed using external grounding systems such as rods or loops. In some areas, avian-perching deterrents will be installed above suspension assemblies.

Although vehicular traffic is a very large part of this operation, construction crews will take care to limit damage to the ROW by minimizing the number of pathways traveled.

1.5.3 Conductor and Shield Wire Installation

Conductor, also referred to as wire, and shield wires (for lightning protection) will be installed via a tensioning system. Tensioning systems typically use ropes threaded through stringing blocks or dollies for each conductor and shield wire. Conductor and shield wires will be pulled by the ropes and held tight by a tensioner to keep the wires from coming in contact with the ground and other objects that could damage the wire. In addition, guard structures (temporary wood-pole structures) will be installed where the transmission line crosses overhead electric power lines, overhead telephone lines, roadways, railroads, or other areas requiring an additional margin of safety during wire installation. After the wire is tensioned to the required sag, the wire will be taken out of the blocks and placed in the suspension and dead-end clamps for permanent attachment.

1.5.4 Cleanup

Cleanup following transmission line and substation construction involves stabilizing disturbed areas, removal of debris, and the restoration of areas damaged by construction of the Proposed Project. The following criteria will guide the cleanup of construction debris and restoration of the area's natural setting. Further requirements may be imposed by land management agencies.

- Construction equipment, supplies, and LCRA TSC or contractor property will be dismantled and removed from the ROW when construction is complete.
- Construction waste, with the possible exception of cleared vegetation, will be removed prior to completion of the Proposed Project.
- If cleared vegetation is mulched, it may be spread out over the ROW, given to the landowner or a nursery as a product for beneficial use, or picked up and taken to a landfill.
- Burning is not typically conducted, but may be used as a means of disposal, if no practical alternative exists. Any material to be burned will be piled in a manner and in locations that will cause the least fire risk. Care will be taken to prevent fire or heat damage to trees, shrubs, and structures adjacent to the ROW and substation. Burning will conform to local fire and air quality regulations.
- Soil that has been excavated during construction and not used will be evenly backfilled onto a cleared area, spread to conform to the terrain and the adjacent land, or removed from the site.
- Replacement of soil adjacent to water crossings for access roads will be at slopes less than the normal angle of repose for the soil type involved.
- If temporary roads are used, they will be removed and the original slopes restored and re-vegetated as required by the SWPPP.
- If natural re-vegetation will not provide ground cover in a reasonable length of time, seeding, sprigging or hydro-seeding of restored areas may be used to encourage growth of grasses and other vegetation that is ecologically desirable.
- Where site factors make it unusually difficult to establish a protective vegetative cover, other restoration procedures may be advisable to prevent erosion, such as the use of gravel, rocks, or concrete.

- LCRA TSC will return each affected landowner's property to its original contours and grades unless otherwise agreed to by the landowner's representatives. However, LCRA TSC will not restore a landowner's property to its original contours and grades if doing so will affect the safety or stability of the project's structures or the safe operation and maintenance of the line.

1.6 PROPOSED PROJECT MAINTENANCE

Following construction, periodic inspection of the transmission line ROW, structures, line, and substation will be performed by the LCRA TSC Operations Department in order to provide for the safe and reliable operation of the transmission line and substation. The major maintenance item will be the necessary removal of trees and other vegetation that have the potential to interfere with the safe and reliable operation of the transmission line and substation. Preservation of the environmental, natural, and cultural resource conservation factors, designed and built into transmission system siting, requires a thoughtful, comprehensive program for maintaining the facilities. The following LCRA TSC maintenance standards (or other best utility practices) will be utilized following construction of this project.

- Native vegetation, particularly that of value to fish and wildlife, that has been preserved during the construction process and that does not impede access nor have the potential to grow close enough to the transmission line to pose a hazard to the safe operation and maintenance of the transmission line, will be allowed to grow in selected parts of the ROW.
- Once a cover of vegetation has been established, it will be properly maintained to ensure public safety and a reliable, functioning transmission system.
- Access roads and service roads, where practical, will be maintained with native grass cover. Substation access roads will be constructed using crushed gravel, asphalt, or concrete as determined by site and regulatory requirements. Gravel roads will employ anti-dusting agents as required. Where grading is necessary, access and service roads will be graded to the proper slope in order to prevent or diminish soil erosion.
- If used, U.S. Environmental Protection Agency (USEPA) approved herbicides will be carefully selected and carefully applied in a manner that will diminish effects on desirable indigenous plant life, and selective application will be used whenever appropriate. To preserve the natural environment, it is essential that herbicides be

applied in a manner fully consistent with the protection of the entire environment, particularly the health of humans and wildlife.

- Maintenance inspection intervals will be established by LCRA TSC and routine maintenance will be conducted, when possible, while access roads are firm or dry.
- Aerial and ground maintenance inspection activities of the transmission line facility will include observation of soil erosion problems, fallen timber, and conditions of the vegetation that require attention. As an erosion-control measure, native shrubs, forbs, or grasses may be planted.
- Transmission line ROW can be used for appropriate types of multiple-use concepts, such as trails suitable for hiking, biking, bird watching, farming, ranching and livestock grazing, wildlife production, and recreational or commercial hunting operations, as long as the activity does not impact public safety or inhibit safe operation and maintenance of the electrical system.

(This page intentionally left blank)

2.0 DESCRIPTION OF THE STUDY AREA

2.1 STUDY AREA DELINEATION

The study area for the Proposed Project needed to encompass the two alternative southern endpoints (the existing Bluebonnet Electric Cooperative [BBEC] Lyle Wolz Substation located off State Highway 21 (SH 21) approximately nine miles southwest of Caldwell, Texas, and the existing BBEC Lyons Substation located off SH 36 approximately 12 miles southeast of Caldwell, Texas), as well as the four northern endpoint Cooks Point Substation alternatives located northeast of Caldwell, Texas, as depicted on Figure 2-1. The study area was delineated to be large enough that an adequate number of reasonably differentiated alternative routes could be identified.

To delineate the study area, URS located and depicted the alternative project endpoints on U.S. Geological Survey (USGS) 1:24,000 and 1:100,000 topographic maps and recent aerial photography (October 2017). URS also identified major land use features in the area such as SH 21, SH 36, Farm-to-Market Road 116 (FM 116), FM 696, FM 975, FM 1362, FM 3058, the Burlington Northern Santa Fe (BNSF) Railroad Company railroad, Union Pacific Railroad Company (UPRR) railroad, county roads, existing transmission line infrastructure, and other features. URS then evaluated and reviewed the maps, and ultimately delineated and identified the study area boundary in October 2017 (Figure 2-1). The purpose of delineating a study area for the project was to establish boundaries and limits for the information gathering process (i.e., identifying environmental and land use constraints).

To allow for feasible routing options in the area of the project endpoints, the southernmost limits of the study area were delineated to extend approximately one mile south of BBEC's existing Lyons and Lyle Wolz substations and north of East Yegua Creek (also the Burleson / Lee County Line). The northernmost limits of the study area were delineated to extend approximately one mile north of the alternative Cooks Point substation sites and south of the Brazos River (also the Burleson / Brazos County Line). The eastern extent of the study area was delineated approximately four miles east of the existing BBEC Lyons Substation, and the western extent was delineated approximately 1.5 miles west of the existing BBEC Lyle Wolz Substation. The area within the delineated study area boundary is approximately 314 square miles.

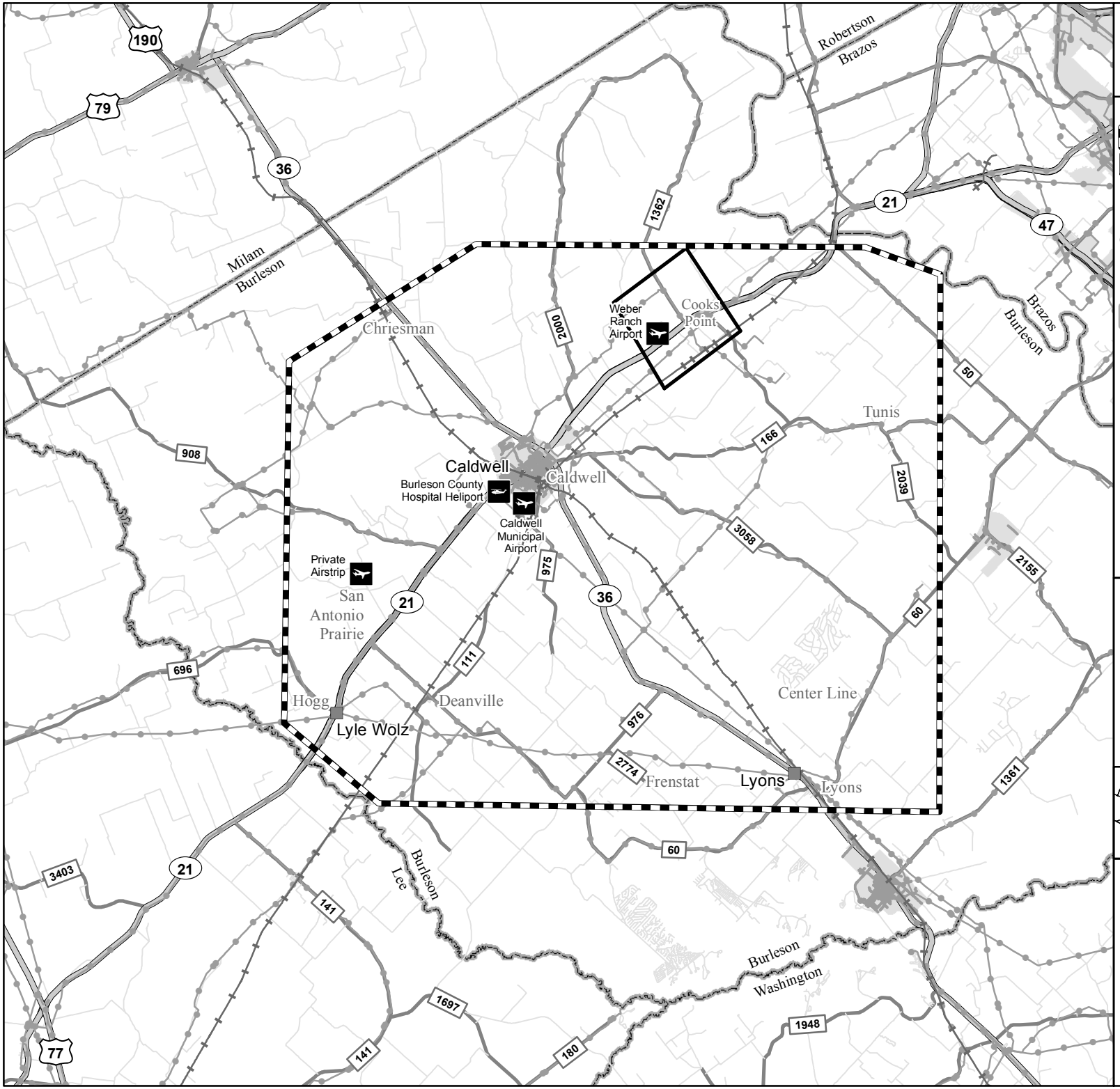


Figure 2-1

Study Area

Cooks Point 138-kV Transmission Line Project
Burleson County, Texas

Station Components

- Study Area
- Substation Siting Area

Existing Utilities

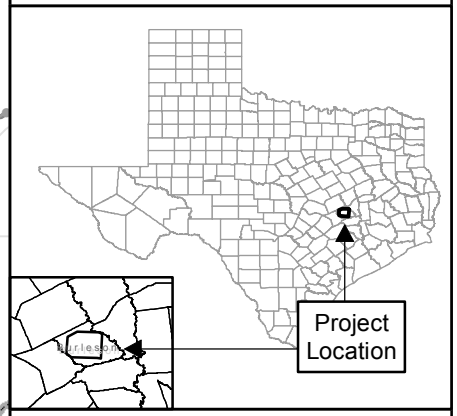
- Existing Substation
- Existing Transmission Line

Administrative Boundaries

- Incorporated Area
- County Boundary

Transportation

- 183 US Highway
- 21 State Highway
- 2155 Farm-to-Market Road
- Major Road
- Local Road
- Railroad
- Airport
- Heliport



0 2 4

SCALE IN MILES

N

LCRA ENERGY • WATER • COMMUNITY SERVICES

URS

Date: 4/13/2018

2.2 DATA COLLECTION

Once the study area was delineated, URS and LCRA TSC initiated a variety of data collection activities. One of the first data collection activities was the development of a list of officials to be mailed a consultation letter regarding the Proposed Project. The purpose of the letter was to inform various local, state, and federal officials and agencies of the Proposed Project and give them the opportunity to provide information they may have regarding the project study area. Copies of correspondence sent to and received from the following local, state, and federal officials and agencies are included in Appendix A.

LOCAL AGENCIES/GOVERNMENTS/ORGANIZATIONS:

Burleson County

- County Judge
- County Commissioner Precinct 1
- County Commissioner Precinct 2
- County Commissioner Precinct 3
- County Commissioner Precinct 4
- Burleson County Chamber of Commerce
- Burleson County Farm Bureau
- Burleson County Historical Commission

City of Caldwell

- Mayor
- Mayor Pro Tem
- City Administrator
- City Councilmembers
- Caldwell Independent School District (ISD)
- City of Caldwell Hispanic Chamber of Commerce
- Caldwell Municipal Airport

Utilities

- City of Caldwell Utilities
- Bluebonnet Electric Cooperative (BBEC)
- Bryan Texas Utilities (BTU)
- Entergy Texas, Inc.

STATE AND REGIONAL AGENCIES/GOVERNMENT:

- Brazos River Authority
- Brazos Valley Council of Governments
- Railroad Commission of Texas (RRC)
- Texas Commission on Environmental Quality (TCEQ)
- Texas Archeological Research Laboratory (TARL)
- Texas Department of Transportation (TxDOT), Aviation Division
- TxDOT, Environmental Affairs Division
- TxDOT, Austin District
- TxDOT, Bryan District
- Texas General Land Office
- Texas Historical Commission (THC)
- Texas Office of Public Utility Counsel
- Texas Parks and Wildlife Department (TPWD)
- Texas Water Development Board (TWDB)
- Texas House of Representatives, Representative Leighton Schubert
- Texas Senate, Senator Lois Kolkhorst

FEDERAL AGENCIES/GOVERNMENT:

- U.S. House of Representatives, Representative Bill Flores
- U.S. Senate, Senator Ted Cruz
- U.S. Senate, Senator John Cornyn
- Federal Aviation Administration (FAA) – Southwest Region
- Federal Emergency Management Agency (FEMA)

- Natural Resources Conservation Service (NRCS)
- U.S. Army Corps of Engineers (USACE) – Fort Worth District
- U.S. Department of Agriculture (USDA)
- U.S. Department of Defense (DOD)
- U.S. Environmental Protection Agency (EPA)
- U.S. Fish and Wildlife Services (USFWS)

In addition to soliciting comments from officials and agencies, URS performed a review of available local, state, and federal files and records, published literature, and a variety of maps, including recent aerial photography (flown October 2017), USGS topographic maps, TxDOT county highway maps, and USFWS National Wetlands Inventory (NWI) maps.

During the course of the above-mentioned data collection activities, URS also conducted field reconnaissance surveys of the study area on November 8-9, 2017, and January 30-31, 2018, to confirm the findings of research and data collection, and identify potential constraints that may not have been previously noted. The field reconnaissance surveys were also used to assist in the route selection process (Section 3.0). These surveys were conducted by visual observations from public ROW located within the study area. Observations of the study area made during these reconnaissance surveys were recorded on aerial photography maps and confirmed or converted in a digital format. LCRA TSC representatives also conducted field reconnaissance surveys of the study area between November 2017 and March 2018.

URS used the data collected during these activities to develop an environmental and land use constraints map to display resource data for the project area. The map depicted a broad overview of the various resource locations indicating routing opportunities and constraints as discussed more fully in Section 3.0. Constraint areas are shown as the base map in Appendices C-D, as referenced in Sections 3.0 and 4.0, respectively.

The following sections summarize the data collection methods and describe the environmental setting for each resource within the study area.

2.3 ENVIRONMENTAL SETTING OF THE STUDY AREA

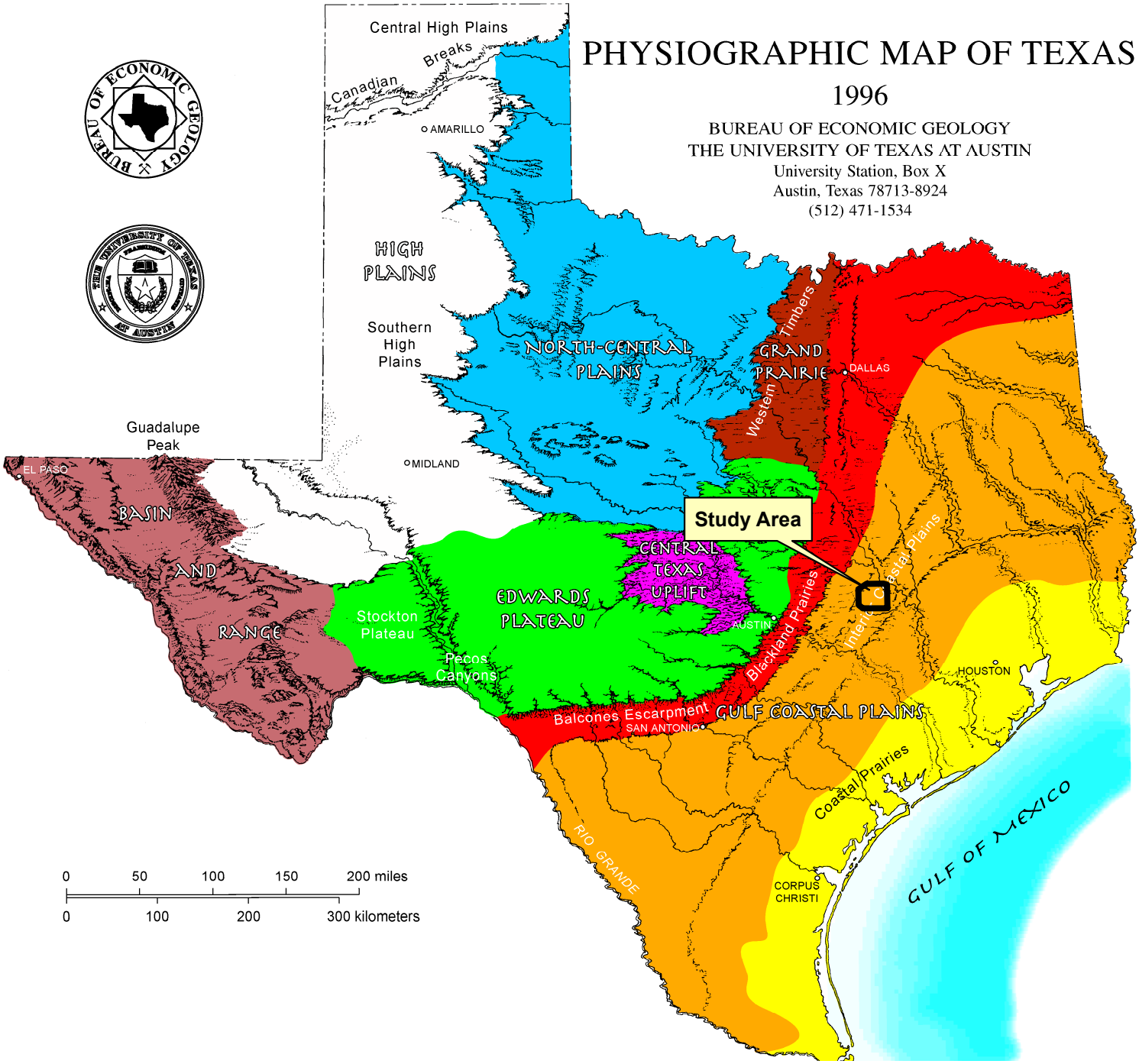
2.3.1 PHYSIOGRAPHY AND GEOLOGY

As shown on Figure 2-2, the study area lies within the Interior Coastal Plains physiographic region of Texas (Bureau of Economic Geology 1996). The geologic beds of the Interior Coastal Plains generally dip to the southeast towards the Gulf of Mexico and are composed of unconsolidated sands and muds. Topography of the Interior Coastal Plains consists of parallel ridges and valleys, and the elevation ranges from 300 to 800 feet above mean sea level (msl). Study area elevations range from 220 to 573 feet above msl and vary from gently undulating hills to nearly level terrain. Clay, sandstone, siltstone, sand, gravel, and silt compose the southeastern portion of the study area, while the remainder of the study area comprises quartz sand, clay, sandstone, gravel, sand, and silt. In general, drainage features in the study area feed into the Brazos River, Davidson Creek, Yegua Creek, East Yegua Creek, and Somerville Lake.

Geologic units identified within the study area are provided in Table 2-1 along with their descriptions and topographic locations.

TABLE 2-1 GEOLOGIC UNITS WITHIN THE STUDY AREA

Geologic Time	Geologic Unit	Description	Location within Study Area
Holocene	Alluvium (Qal)	This geologic unit consists of alluvium and low terrace deposits along streams, sand, silt, clay, and gravel. Locally modified by sheetwash action. Thickness is variable.	This geologic unit consists of multiple deposits throughout the study area, typically located along major drainages; totaling approximately 25,222 acres.
Pleistocene Holocene	Fluviatile terrace deposits (Qt)	This geologic unit consists of sand, silt, clay and gravel. Gravel is commonly rounded to angular limestone and chert pebbles and cobbles. Light-brown, reddish-brown, gray, or yellowish-brown, gravelly quartz and lithic sand and silt to sandy gravel. Low terraces of major rivers are capped by 2-4 meters (m) of clayey sand and silt.	This geologic unit consists of multiple deposits throughout the central, northeastern, and southeastern portions of the study area totaling approximately 4,977 acres.
Eocene-Middle	Yegua Formation (Ey)	This geologic unit consists of clay with minor beds of sandstone, some concretionary limestone beds and lenses of oyster shells. Sandstone is fine grained, calcareous, glauconitic, massive, laminated, and crossbedded. Thickness ~1,000 feet.	This geologic unit consists of two large deposits extending throughout the eastern, southeastern, and southern portions of the study area, along SH 36, east and southeast of Caldwell. These deposits are approximately 39,313 and 28,263 acres in size.



PROVINCE	MAX. ELEV. (ft)	MIN. ELEV. (ft)	TOPOGRAPHY	GEOLOGIC STRUCTURE	BEDROCK TYPES
Gulf Coastal Plains					
Coastal Prairies	300	0	Nearly flat prairie, <1 ft/mi to Gulf	Nearly flat strata	Deltaic sands and muds
Interior Coastal Plains	800	300	Parallel ridges (questas) and valleys	Beds tilted toward Gulf	Unconsolidated sands and muds
Blackland Prairies	1000	450	Low rolling terrain	Beds tilted south and east	Chalks and marls
Grand Prairie	1250	450	Low stairstep hills west; plains east	Strata dip east	Calcareous east; sandy west
Edwards Plateau					
Principal	3000	450	Flat upper surface with box canyons	Beds dip south; normal faulted	Limestones and dolomites
Pecos Canyons	2000	1200	Steep-walled canyons		Limestones and dolomites
Stockton Plateau	4200	1700	Mesa-formed terrain; highs to west	Unfaulted, near-horizontal beds	Carbonates and alluvial sediments
Central Texas Uplift	2000	800	Knobby plain; surrounded by questas	Centripetal dips, strongly faulted	Granites; metamorphics; sediments
North-Central Plains	3000	900	Low north-south ridges (questas)	West dip; minor faults	Limestones; sandstones; shales
High Plains					
Central	4750	2900	Flat prairies slope east and south	Slight dips east and south	Eolian silts and fine sands
Canadian Breaks	3800	2350	Highly dissected; local solution valleys		
Southern	3800	2200	Flat; many playas; local dune fields		
Basin and Range	8750	1700	North-south mountains and basins	Some complex folding and faulting	Igneous; metamorphics; sediments

Figure 2-2

Physiographic Regions of Texas

Cooks Point 138-kVTransmission Line Project

Burleson County, Texas

Miles 0 50 100

Data Source: Bureau of Economic Geology, UT Map Update: 4/13/2018

TABLE 2-1 GEOLOGIC UNITS WITHIN THE STUDY AREA CONTINUED

Geologic Time	Geologic Unit	Description	Location within Study Area
Eocene	Cadell Formation (Eca)	This geologic unit consists of siltstone, clay, and sandstone, silts tuffaceous, clay bentonitic locally fossiliferous. Color is light gray to olive with a thickness of 50-100 feet.	This geologic unit is limited to two deposits in the southeastern portion of the study area near Lyons. These deposits are approximately 144 and 3,825 acres in size.
	Cook Mountain Formation (Ecm)	This geologic unit consists of clay and marly sand, argillaceous and carbonaceous sand, marl and clay, and marly clay. Clay and sandstone about 200-230 feet thick.	This geologic unit consists of two large deposits transecting the center of the study area from northeast to southwest. These deposits are approximately 26,182 and 31,951 acres in size.
	Queen City Sand (Eqc)	This geologic unit consists of fine to medium grained sandstone and siltstone that is well sorted, noncalcareous, friable to indurated, massive, laminated in local beds of glauconite-quartz greensand, crossbedded and light gray siltstone that is friable with thin interbeds of clay. Thickness of 250-500 feet.	This geologic unit is limited to two small deposits in the northwestern corner of the study area just west of SH 36. These deposits are approximately 1,723 and 166 acres in size.
	Sparta Sand (Es)	This geologic unit consists of very fine to fine grained, light gray to very pale orange and grayish brown to brownish gray quartz sand, slightly cohesive from silt and clay matrix, massive, locally crossbedded, well sorted, micaceous, with interbeds of sandy or silty clay that are locally carbonaceous. Some hard, brown ferruginous sandstone near base. Lignite beds locally present near top. Thickness of 150-250 feet.	This geologic unit consists of one small and two large deposits spanning the western portion of the study area. These deposits are approximately 20, 14,112, and 19,692 acres in size.
	Weches Formation (Ew)	This geologic unit consists of greensand, sand, and clay with a thickness of 30+ feet. Grayish green to grayish olive green that weathers to moderately to dark reddish brown. Clay interbeds, thinbedded, locally crossbedded to lenticular.	This geologic unit is limited to two small deposits in the northwestern portion of the study area east and west of SH 36. These deposits are approximately 294 and 4,912 acres in size.
	Wellborn Formation (Ewb)	This geologic unit consists of fine to coarse grained, light gray sandstone that is crossbedded, containing borings of worms and Ophiomorpha burrows and fossil shells. Locally well indurated with a thickness of 150 feet.	This geologic unit is limited to one small deposit in the southwestern portion of the study area along the study area boundary, just southeast of Lyons. This geologic unit is approximately 410 acres in size.

Source: USGS 2015

2.3.2 SOILS

2.3.2.1 Soil Associations

The Burleson County Soil Survey was used to identify and characterize the soil associations within the study area, which are defined as taxonomic soil units occurring together within the

same geographical area (NRCS 2005). Soil associations within the study area are listed in Table 2-2 and described in detail below.

TABLE 2-2 SOIL ASSOCIATIONS WITHIN THE STUDY AREA

State Soil Associations (STATSGO Code)	Approximate Percentage of Study Area
Zulch-Zack-Boonville	26
Wilson-Luling-Crockett-Benchley	22
Tabor-Spiller-Rader-Marquez-Gredge	10
Silstid-Padina-Jedd-Arenosa	10
Silstid-Padina	8
Uhland-Sandow-Kaufman-Kaman-Gowen	8
Weswood-Ships	6
Margie-Lexton	3
Tabor-Robco-Chazos	3
Wilson-Mabank-Burleson-Axtell	2
Singleton-Shiro-Burleswash	2
Yahola-Weswood-Ships-Gaddy	<1

STATSGO Codes: Wilson-Luling-Crockett-Benchley (s7267), Margie-Lexton (s7454), Silstid-Padina-Jedd-Arenosa (s7524), Silstid-Padina (s7525), Tabor-Spiller-Rader-Marquez-Gredge (s7585), Tabor-Robco-Chazos (s7605), Uhland-Sandow-Kaufman-Kaman-Gowen (s7629), Yahola-Weswood-Ships-Gaddy (s7642), Singleton-Shiro-Burlewash (s7647), Weswood-Ships (s7721), Wilson-Mabank-Burleson-Axtell (s7731), Zulch-Zack-Boonville (s7748).
Source: NRCS 2018

The Zulch-Zack-Boonville soil association is the largest soil association, covering approximately 26 percent of the study area. These are loamy, moderately deep, and moderately well-drained soils. Zulch soils are moderately deep to shale and siltstone, and very slowly permeable. Zack soils are moderately deep to mudstone and sandstone, and very slowly permeable. Boonville soils are a minor component in concave areas adjacent to small drainage ways. Soils in the Zulch-Zack-Boonville association are very gently sloping and primarily used for pasture and hayland.

The Wilson-Luling-Crockett-Benchley soil association is the second-most prominent soil association covering approximately 22 percent of the study area. These are very deep, moderately well-drained, and very slowly permeable soils. Wilson soils consist of very deep loam with a slightly acidic surface layer. Luling soils are very deep shale with a neutral surface layer. Crockett soils are deep shale with a moderately acidic surface layer. Benchley soils are very deep shale with a moderately acidic surface layer. Soils in the Wilson-Luling-Crockett-Benchley association are very gently sloping to gently sloping and primarily used for pasture and hayland.

The Tabor-Spiller-Rader-Marquez-Gredge soil association covers approximately ten percent of the study area. These are very deep, moderately well-drained, and very slowly permeable soils. Tabor soils are very deep sandy loam with a strongly acidic surface layer. Spiller soils are very

deep fine sandy loam with a moderately acidic surface layer. Rader soils are very deep, fine sandy loam with a very strongly acidic surface and subsurface layer. Marquez soils are very deep loam with a slightly acidic surface layer. Gredge soils are very deep fine sandy loam with a slightly acidic surface layer. Soils in the Tabor-Spiller-Rader-Marquez-Gredge association are nearly level to very gently sloping and primarily used for pasture and hayland.

The Silstid-Padina-Jedd-Arenosa soil association covers approximately ten percent of the study area. These are moderately deep to very deep, well-drained to somewhat excessively drained, and moderately slowly permeable soils. Silstid soils are very deep loamy fine sand with a moderately acidic surface layer. Padina soils are very deep fine sand with a moderately acidic surface layer. Jedd soils are moderately deep fine sandy loam with a slightly acidic surface layer. Arenosa soils are very deep fine sand with a very strongly acidic surface layer. Soils in the Silstid-Padina-Jedd-Arenosa association are very gently sloping to moderately steep and primarily used for rangeland.

The Silstid-Padina soil association covers approximately eight percent of the study area. These are very deep, well-drained, and moderately permeable soils. Silstid soils are very deep loamy fine sand with a moderately acidic surface layer. Padina soils are very deep fine sand with a moderately acidic surface layer. Soils in the Silstid-Padina association are very gently sloping to moderately steep and primarily used for rangeland.

The Uhland-Sandow-Kaufman-Kaman-Gowen soil association covers approximately eight percent of the study area. These are very deep, moderately well-drained to somewhat poorly drained, and very slowly to moderately slowly permeable soils. Uhland soils are very deep fine sandy loam with a moderately acidic surface layer. Sandow soils are very deep loam with a moderately acidic surface layer. Kaufman soils are very deep clay with a moderately acidic surface layer. Kaman soils are very deep clays that are slightly to strongly acidic. Gowen soils are very deep clay loams that are neutral to moderately alkaline. Soils in the Uhland-Sandow-Kaufman-Kaman-Gowen association are nearly level and primarily used for rangeland.

The Weswood-Ships soil association covers approximately six percent of the study area. These are very deep, moderately well drained to well drained, and very slowly permeable soils. Weswood soils are very deep silty loams that are moderately alkaline. Ships soils are very deep

silty clay loams that are moderately alkaline. Soils in the Weswood-Ships association are nearly level to very gently sloping and primarily used for cropland.

The Margie-Lexton soil association covers approximately three percent of the study area. These are very deep, well drained to moderately well drained, and moderately slowly permeable soils. Margie soils are very deep fine sandy loam with a moderately acidic surface layer. Lexton soils are very deep sandy clay loam with a moderately acidic surface layer. Soils in the Margie-Lexton association are very gently sloping to gently sloping and primarily used for pasture and hay land.

The Tabor-Robco-Chazos soil association covers approximately three percent of the study area. These are very deep, moderately well-drained, and very slowly to slowly permeable soils. Tabor soils are very deep fine sandy loam with a strongly acidic surface layer. Robco soils are very deep loamy fine sand with a strongly acidic surface layer. Chazos soils are very deep, loamy fine sand that is strongly acidic. Soils in the Tabor-Robco-Chazos association are nearly level to moderately sloping and primarily used for pasture and hayland.

The Wilson-Mabank-Burleson-Axtell soil association covers approximately two percent of the study area. These are very deep, moderately well-drained, and very slowly permeable soils. Wilson soils are very deep loam with a slightly acidic surface layer. Mabank soils are very deep fine sandy loam with a moderately acidic surface layer. Burleson soils are very deep clay with a slightly alkaline surface layer. Axtell soils are very deep fine sandy loam with a strongly acidic surface layer. Soils in the Wilson-Mabank-Burleson-Axtell association are nearly level to gently sloping and primarily used for cropland and rangeland.

The Singleton-Shiro-Burlewash soil association covers approximately two percent of the study area. These are moderately deep, well drained to moderately well drained, and very slowly permeable soils. Singleton soils are moderately deep fine sandy loam with a strongly acidic surface layer. Shiro soils are moderately deep loamy fine sand with a strongly acidic surface layer. Burlewash soils are moderately deep fine sandy loam with a strongly acidic surface layer. Soils in the Singleton-Shiro-Burlewash association are very gently sloping to very steep and primarily used for rangeland.

The Yahola-Weswood-Ships-Gaddy soil association covers less than one percent of the study area. These are very deep, moderately well-drained, and very slowly to moderately permeable

soils. Yahola soils are very deep fine sandy loam with a slightly alkaline surface layer. Weswood soils are very deep silty loams that are moderately alkaline. Ships soils are very deep silty clay loams that are moderately alkaline. Gaddy soils are very deep loamy fine sand with a moderately alkaline surface layer. Soils in the Yahola-Weswood-Ships-Gaddy association are nearly level to very gently sloping and primarily used for cropland and rangeland.

2.3.2.2 Prime Farmland Soils

The Secretary of Agriculture, in Title 7 U.S. Code (USC) §4201(c)(l)(A), defines prime farmland as land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor, and without intolerable soil erosion. Prime farmlands have the soil quality, growing season, and moisture supply needed to economically produce sustained high yields of crops when treated and managed, including water management, according to acceptable farming methods. Potential prime farmlands are those soils that meet most of the requirements of prime farmland, but fail because they lack the installation of water management facilities or sufficient natural moisture. The USDA would consider these soils prime farmland if these practices were installed. Farmlands of statewide importance, other than prime or unique farmlands, are those soils determined by the appropriate state agency to be important for the production of food, feed, fiber, forage, or oilseed crops.

According to the NRCS, 32 of the soils in the study area are identified as prime farmlands or farmlands of statewide importance, as presented in Table 2-3.

TABLE 2-3 PRIME FARMLANDS AND FARMLANDS OF STATEWIDE IMPORTANCE WITHIN THE STUDY AREA

Soil Units - Prime Farmland	Soil Units - Farmlands of Statewide Importance
Belk clay, 0 to 1 percent slopes, rarely flooded	Axtell fine sandy loam, 1 to 4 percent slopes
Benchley loam, 1 to 3 percent slopes	Boonville fine sandy loam, 1 to 3 percent slopes
Benchley loam, 3 to 5 percent slopes	Crockett loam, 1 to 3 percent slopes
Burleson clay, 0 to 1 percent slopes	Davilla-Wilson complex, 0 to 2 percent slopes
Burleson clay, 1 to 3 percent slopes	Gredge fine sandy loam, 1 to 3 percent slopes
Burleson clay, 3 to 5 percent slopes	Kurten fine sandy loam, 2 to 5 percent slopes
Chazos loamy fine sand, 1 to 3 percent slopes	Mabank fine sandy loam, 0 to 1 percent slopes
Coarswood silt loam, 0 to 1 percent slopes, rarely flooded	Rader fine sandy loam, 1 to 3 percent slopes
Gasil fine sandy loam, 1 to 5 percent slopes	Tabor fine sandy loam, 0 to 2 percent slopes
Highbank silt loam, 0 to 1 percent slopes, rarely flooded	Wilson loam, 0 to 1 percent slopes
Lexton sandy clay loam, 1 to 3 percent slopes	
Luling clay, 1 to 3 percent slopes	
Luling clay, 3 to 5 percent slopes	
Ships clay, 0 to 1 percent slopes, rarely flooded	
Ships clay, 1 to 3 percent slopes, rarely flooded	

Soil Units - Prime Farmland	Soil Units - Farmlands of Statewide Importance
Shiro loamy fine sand, 1 to 5 percent slopes	
Silawa loamy fine sand, 2 to 5 percent slopes	
Spiller fine sandy loam, 1 to 3 percent slopes	
Weswood silt loam, 0 to 1 percent slopes, rarely flooded	
Weswood silty clay loam, 0 to 1 percent slopes, rarely flooded	
Weswood silty clay loam, 1 to 3 percent slopes, rarely flooded	
Yahola fine sandy loam, 0 to 2 percent slopes, rarely flooded	

Source: NRCS 2018

2.3.2.3 Hydric Soils

According to the NRCS, hydric soils are those which are formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part. These soils under natural conditions are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation (NRCS 2018). Table 2-4 lists the soils in the study area identified as hydric according to the NRCS.

TABLE 2-4 HYDRIC SOILS WITHIN THE STUDY AREA

Hydric Soil Units	
Belk clay, 0 to 1 percent slopes, rarely flooded	Sandow loam, frequently flooded
Boonville fine sandy loam, 1 to 3 percent slopes	Ships clay, 0 to 1 percent slopes, rarely flooded
Cadelake fine sandy loam, 0 to 2 percent slopes	Sumpf clay, frequently flooded
Coarswood silt loam, 0 to 1 percent slopes, rarely flooded	Uhland fine sandy loam, frequently flooded
Highbank silt loam, 0 to 1 percent slopes, rarely flooded	Weswood silt loam, 0 to 1 percent slopes, rarely flooded
Kaufman clay, frequently flooded	Weswood silty clay loam, 0 to 1 percent slopes, rarely flooded
Mabank fine sandy loam, 0 to 1 percent slopes	Wilson loam, 0 to 1 percent slopes
Rader fine sandy loam, 1 to 3 percent slopes	Yahola fine sandy loam, 0 to 2 percent slopes, rarely flooded
Roetex clay, occasionally flooded	Zilaboy clay, frequently flooded

Source: NRCS 2018

2.3.3 MINERAL AND ENERGY RESOURCES

Based on site reconnaissance and data received from the RRC and LCRA TSC, 1,061 active oil wells, gas wells and other associated wells used in oil/gas exploration and 407 pipelines (of six inches and greater in diameter carrying petrochemicals) are located within the study area (RRC 2017, LCRA TSC 2018). Three active gravel quarries were identified within the study area through review of USGS 7.5-minute topographic maps, aerial photography, and site reconnaissance. Two quarries are located southwest of Caldwell and the third quarry is located northeast of Caldwell.

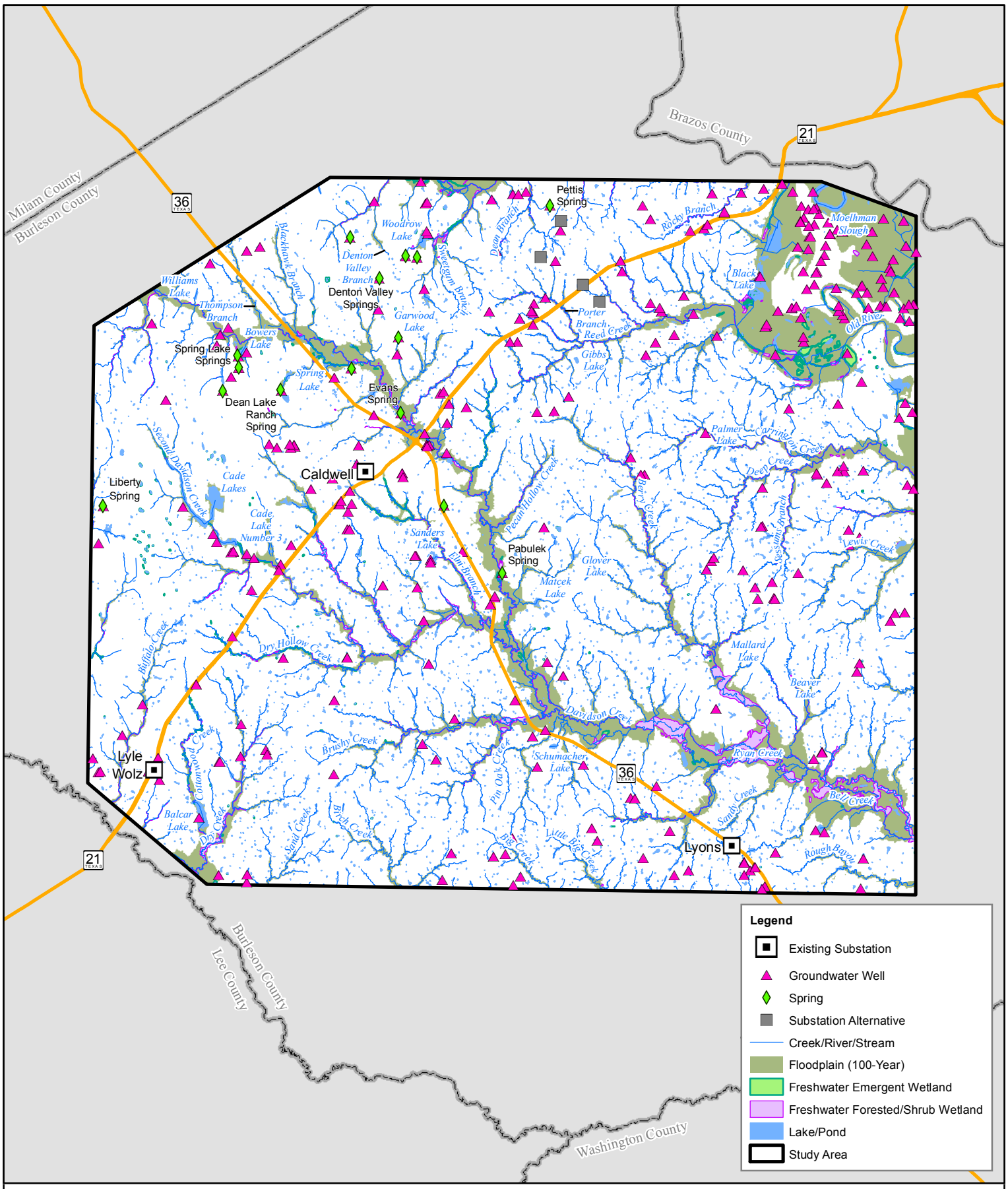
2.3.4 WATER RESOURCES

2.3.4.1 Surface Water/Floodplains

The study area is within the Brazos River Basin, which is the second largest river basin by area within Texas encompassing 42,865 square miles (TWDB 2018a). According to the USGS National Hydrography Dataset (NHD), Old River as well as 37 named creeks (Bell, Berry, Bethel, Big, Birch, Blackhawk Branch, Brushy, Buffalo, Carrington, Cedar, Copper, Cottonwood, Davidson, Dead, Dean Branch, Deep, Denton Valley Branch, Dry, Dry Hollow, Elm Branch, Hickory, Hooker, Lewis, Little Big, Pecan Hollow, Pin Oak, Porter Branch, Reed, Rocky Branch, Rough Bayou, Ryan, Sand, Sandy, Second Davidson, Sessums Branch, Sweetgum Branch, and Thompson Branch), and their associated tributaries occur within the study area. The USGS NHD also identified 18 named waterbodies within the study area including; Balcar Lake, Beaver Lake, Black Lake, Bowers Lake, Cade Lake Number 3, Cade Lakes, Garwood Lake, Gibbs Lake, Glover Lake, Mallard Lake, Matcek Lake, Moelhman Slough, Palmer Lake, Sanders Lake, Schumacher Lake, Spring Lake, Williams Lake, and Woodrow Lake. In addition, multiple unnamed perennial and intermittent drainage features and numerous small impoundments and stock ponds are mapped within the study area (Figure 2-3). According to TWDB's State Water Plan, there are no proposed new reservoir projects in the study area (TWDB 2007).

In accordance with Section 303(d) and 304(a) of the Clean Water Act (CWA), the TCEQ identifies surface waters for which effluent limitations are not stringent enough to implement water quality standards and for which the associated pollutants are suitable for measurement by maximum daily load. Review of the TCEQ 303(d) list indicates that Davidson Creek Segment 1211A is located within the study area. Segment 1211A is listed on the 303(d) list due to bacteria and depressed dissolved oxygen (TCEQ 2012).

According to the USFWS NWI, multiple wetlands occur within the study area (Figure 2-3). These wetlands include freshwater emergent (approximately 545 acres), freshwater forested (approximately 3,102 acres), and freshwater scrub/shrub (approximately 51 acres). Freshwater emergent wetlands are dominated by erect, rooted, herbaceous vegetation that is typically present for most of the growing season in most years (Cowardin et al. 1979). Freshwater forested wetlands typically consist of stands of woody vegetation at least 19.6 feet in height and possess an overstory of trees, an understory of young trees or shrubs, and an herbaceous layer. Freshwater scrub/shrub wetlands are dominated by shrubs or trees less than 19.6 feet tall.



Data Source: Federal Emergency Management Agency (FEMA), Lower Colorado River Authority (LCRA), National Wetland Inventory (NWI), Texas Department of Transportation (TxDOT), Texas Water Development Board (TWDB), US Geological Survey National Hydrography Dataset (NHD)
Map Update: 5/10/2018

Figure 2-3

Water Resources Map

Cooks Point 138-kV Transmission Line Project
Burleson County, Texas

0 1.5 3 Miles

LCRA ENERGY • WATER • COMMUNITY SERVICES

URS

These wetland types may represent a successional stage leading to forested wetlands or be relatively stable wetland communities (Cowardin et al. 1979). All of these wetland types primarily occur adjacent to riverine systems within the study area.

FEMA's 100-year floodplain designation represents a flood event that has a one percent chance of being equaled or exceeded for any given year (FEMA 2017). FEMA digital floodplain data for the study area indicates limits of 100-year floodplains are generally located along the named creeks and many of their tributaries (Figure 2-3).

2.3.4.2 Groundwater/Aquifers

The principal water-bearing unit in the study area is the Carrizo-Wilcox Aquifer (TWDB 2006), which is a major aquifer extending from the Texas/Louisiana border to Mexico. This aquifer is primarily composed of sand locally interbedded with gravel, silt, clay, and lignite, and reaches a thickness of 3,000 feet. The primary uses of this aquifer include irrigation and municipal water supply (TWDB 2018b).

In addition, four minor aquifers occur within the study area: the Queen City, Sparta, Brazos River Alluvium, and Yegua Jackson Aquifers (TWDB 2017). The Queen City and Sparta Aquifers occur within the majority of the study area. The Queen City Aquifer is composed of sand, loosely cemented sandstone, and interbedded layers of the Queen City Formation. The primary groundwater uses of this minor aquifer include livestock and domestic purposes (TWDB 2018c). The Sparta Aquifer is composed of silt and clay and massive sand beds.

Freshwater saturated thickness averages 120 feet and groundwater is primarily used for domestic and livestock purposes (TWDB 2018d). The Brazos River Alluvium Aquifer occurs in a small portion of the northeastern corner of the study area along the Brazos River. Groundwater within this minor aquifer is contained in alluvial floodplain, consisting of sand, gravel, silt, and clay, and terrace deposits (TWDB 2018e). The Yegua Jackson Aquifer occurs in the southwestern portion of the study area and is composed of water-bearing parts of the Yegua Formation and the Jackson Groups consisting of interbedded sand, silt, and clay layers. Groundwater from this minor aquifer is primarily used for domestic and livestock purposes (TWDB 2018f).

The TWDB dataset recorded 301 groundwater wells within the study area (Figure 2-3). Primary uses of these groundwater wells include domestic, irrigation, stock, and public supply.

In addition, USGS data indicates 15 springs are located within the study area including seven named springs: Dean Lake Ranch, Pabulek, Liberty, Evans, Spring Lake, Denton Valley, and Pettis Springs (Figure 2-3). The majority of the springs are located in the northwestern portion of the study area.

2.3.4.3 Ecologically Significant Stream Segments

Under 31 TAC §357.8, TPWD has identified Ecologically Significant Stream Segments (ESSS) based on biological function, hydrologic function, riparian conservation areas, high water quality / exceptional aquatic life / high aesthetic value, and threatened or endangered species / unique communities. No ESSS were identified within the study area (TPWD 2017).

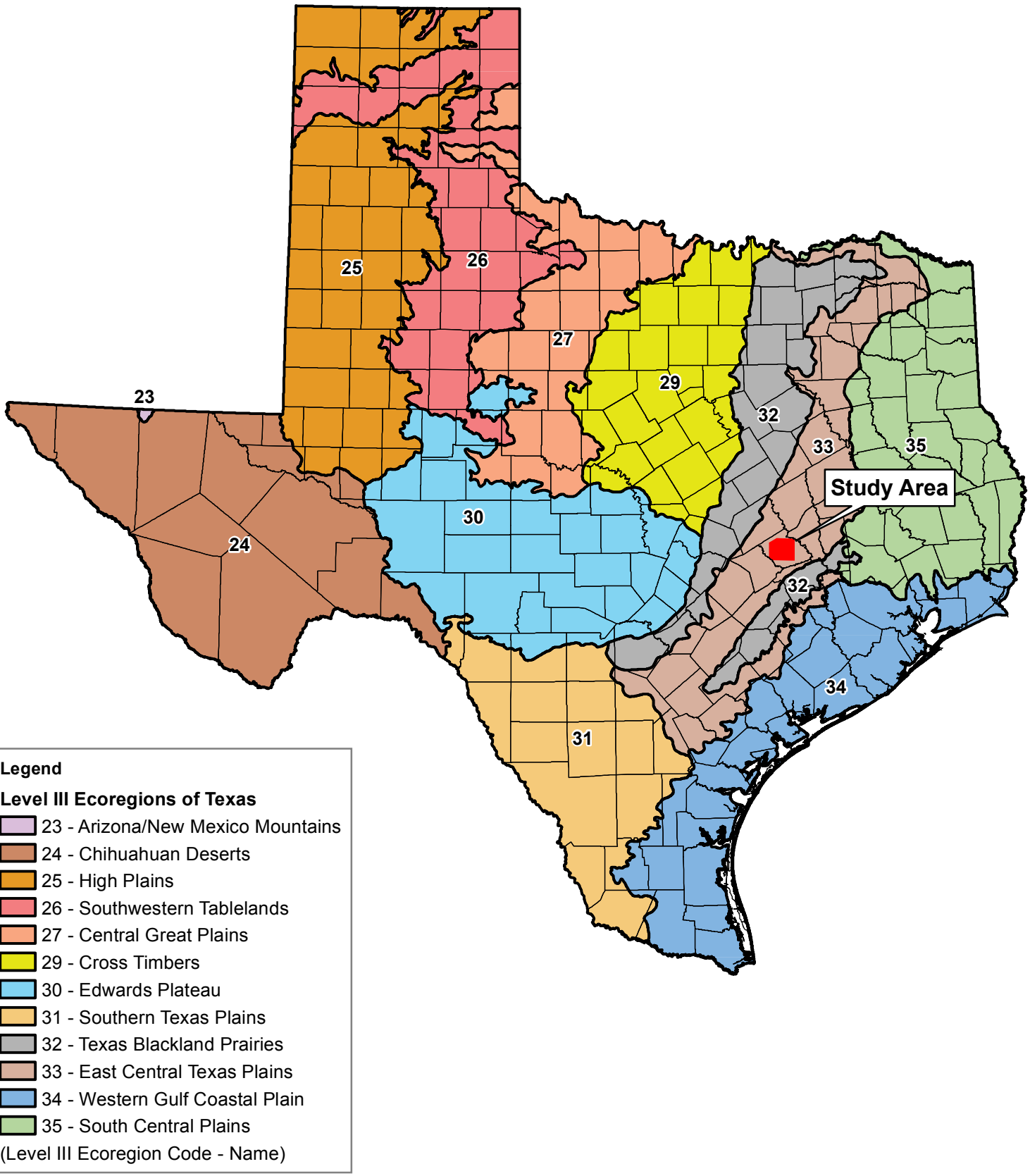
2.3.5 ECOLOGY

2.3.5.1 Vegetation

The study area falls within the East Central Texas Plains Level III Ecoregion of Texas (Griffith et al. 2007) (Figure 2-4), which is further divided into three Level IV Ecoregions: the Southern Post Oak Savanna (located in both the northwestern and southeastern portions of the study area), San Antonio Prairie (located in the central portion of study area), and Floodplains and Low Terraces Ecoregions (located in northeastern portion of the study area) (Griffith et al. 2007).

The landscape of the Southern Post Oak Savanna Level IV Ecoregion consists of a mix of post oak woodlands with a thick yaupon (*Ilex vomitoria*) and eastern red cedar (*Juniperus virginiana*) understory, pastureland, rangeland, and invasive mesquite to the south (Griffith et al. 2007). The soils are predominantly composed of sand and sandy loam with some clay to clay loams on lower areas with a dense clay pan under all soil types. Elevations within this ecoregion range from 95-800 feet above msl. The vegetation consists of oak savannas or oak-hickory forest with post oak (*Quercus stellata*), blackjack oak (*Quercus marilandica*), black hickory (*Carya texana*), and grasses including little bluestem (*Schizachyrium scoparium*), purpletop (*Tridens flavus*), curly threeawn (*Aristida desmantha*), and yellow indiangrass (*Sorghastrum nutans*). Understory vegetation includes yaupon, eastern redcedar, winged elm (*Ulmus alata*), American beautyberry (*Callicarpa americana*), and farkleberry (*Vaccinium arboreum*) (Griffith et al. 2007).

The landscape of the San Antonio Prairie Level IV Ecoregion consists of mosaic of woodlands, pastures, rangeland, and croplands. This ecoregion occurs of the Eocene Cook Mountain Formation and soils are generally dark, loamy to clayey, blackland soils. Elevations within this



Data Source: EPA, 2011
Map Update: 4/13/2018

Figure 2-4
Study Area with Level III Ecoregions of Texas
Cooks Point 138-kV Transmission Line Project
Burleson County, Texas

0 50 100 Miles

ecoregion range from 250-570 feet above msl. Vegetation consists of croplands and tallgrass prairies of little bluestem, yellow indiangrass, switchgrass (*Panicum virgatum*), purpletop, sunflowers (*Helianthus annuus*), and other forbs and grasses (Griffith, et al. 2007).

The Floodplains and Low Terraces Level IV Ecoregion contains floodplain and low terrace deposits associated with the Suphur, Trinity, Brazos, and Colorado Rivers. Land cover in this ecoregion includes deciduous forest and woodlands; croplands of cotton, sorghum, corn; and pasture. Elevations within this ecoregion range from 160-420 feet above msl. Vegetation consists of bottomland hardwood forests of water oak (*Quercus nigra*), willow oak (*Quercus phellos*), post oak, green ash (*Fraxinus pennsylvanica*), pecan (*Carya illinoinensis*), cedar elm (*Ulmus crassifolia*), and American elm (*Ulmus americana*) with more sugar hackberry (*Celtis laevigata*) and eastern cottonwood (*Populus deltoides*) to the south and west (Griffith, et al. 2007).

According to TPWD's Ecological Mapping Systems of Texas (EMST), the study area contains 35 different vegetation types (TPWD 2014). Each of these vegetation types is classified as either terrestrial or aquatic, as further discussed below.

Terrestrial

Based on TPWD's EMST, 18 terrestrial vegetation types occur in the study area. The names and descriptions of these vegetation types are provided in Table 2-5.

TABLE 2-5 DESCRIPTION OF TERRESTRIAL VEGETATION TYPES WITHIN THE STUDY AREA

Vegetation Type	Description	Approximate Percentage of Study Area
Post Oak Savanna: Savanna Grassland	This vegetation type represents a mosaic of woody and herbaceous cover types. These grasslands are often dominated by mid- and tallgrass species, often present in the understory of woody vegetation within the system. This vegetation is typically dominated by little bluestem, yellow Indiangrass, and switchgrass. Other important grass species include big bluestem (*Andropogon gerardii*), silver bluestem (*Bothriochloa laguroides* ssp. *torreyana*), brownseed paspalum (*Paspalum plicatulum*), Texas wintergrass (*Nassella leucotricha*), and sand dropseed (*Sporobolus cryptandrus*). Non-native grass species such as King Ranch bluestem (*Bothriochloa ischaemum* var. *songarica*), bahiagrass (*Paspalum notatum*), kleingrass (*Panicum coloratum*), Kleberg bluestem (*Dichanthium annulatum*), and bermudagrass (*Cynodon dactylon*) may dominate some sites.	50%

Vegetation Type	Description	Approximate Percentage of Study Area
Post Oak Savanna: Post Oak Motte and Woodland	This vegetation type is typically dominated by post oak, blackjack oak, and/or plateau live oak (*Quercus fusiformis*) (particularly in the south). Black hickory may be present in the overstory, particularly on deep sands. Other tree species that may be present, and are often stunted, include sugar hackberry, honey mesquite (*Prosopis glandulosa*), water oak, eastern persimmon (*Diospyros virginiana*), eastern redcedar, winged elm (*Ulmus alata*), and cedar elm. The shrub layer may include species such as American beautyberry, possumhaw (*Ilex decidua*), yaupon, gum bumelia (*Sideroxylon lanuginosum*), saw greenbrier (*Smilax bona-nox*), coral-berry (*Symphoricarpos orbiculatus*), farkleberry, and Hercules' club (*Zanthoxylum clava-herculis*). Herbaceous components are often represented by grass species of the surrounding prairies, including little bluestem, yellow Indiangrass, big bluestem, and brownseed paspalum. Other grass species may include silver bluestem, Canada wildrye (*Elymus canadensis*), switchgrass, Florida paspalum (*Paspalum floridanum*), thin paspalum (*Paspalum setaceum*), tall dropseed (*Sporobolus compositus*), and purpletop.	20%
Row Crops	This vegetation type includes all cropland where fields are fallow for some portion of the year. Some fields may rotate into and out of cultivation frequently, and year-round cover crops are generally mapped as grassland.	5%
Blackland Prairie: Disturbance or Tame Grassland	This vegetation type may include non-native grasses such as bermudagrass, kleingrass, King Ranch bluestem, and Johnsongrass (*Sorghum halepense*). Weedy forbs such as western ragweed (*Ambrosia psilostachya*) and common broomweed (*Amphiachyris dracunculoides*) are often present. Honey mesquite or huisache (*Acacia farnesiana*) are often present and may be fairly dense. Important native grasses may include little bluestem, silver bluestem, yellow Indiangrass, Texas wintergrass, hairy grama (*Bouteloua hirsuta*), and threeawn species (*Aristida spp.*)	4%
Post Oak Savanna: Post Oak – Yaupon Motte and Woodland	This vegetation type typically occurs on sandy Post Oak Savanna sites and may have an exceedingly dense shrub layer dominated by yaupon. The overstory is dominated by post oak. Eastern redcedar or plateau live oak may also be present. The dense shrub layer is generally dominated by yaupon, almost to the exclusion of other shrub species, and the closed shrub canopy limits the development of a significant herbaceous layer. Near the Bastrop Lost Pines region, loblolly pine (*Pinus taeda*) may be an important overstory tree.	4%
Urban Low Intensity	This vegetation type is typically developed with areas of impervious cover. This includes areas within cities and towns that are non-industrious	<1%

Vegetation Type	Description	Approximate Percentage of Study Area
Post Oak Savanna: Sandyland Woodland and Shrubland	This vegetation type is an herbaceous-dominated sand "prairie," with open, oak-dominated woodlands. Species such as bluejack oak (*Quercus incana*), sand post oak (*Quercus margarettae*), post oak, and black hickory (often stunted) occur in the overstory, and invasion by yaupon is frequent in the absence of fire. Other woody plants that may be encountered include eastern redcedar, fragrant sumac (*Rhus aromatica*), farkleberry, rusty blackhaw (*Viburnum rufidulum*), flameleaf sumac (*Rhus copallinum*), and flowering dogwood (*Cornus florida*). The herbaceous layer may be sparse, often with exposed sand, including but not limited to foliose lichens (*Cladonia spp.*), curly threeawn, bluntsepal brazoria (*Brazoria truncata*), Texas bull-nettle (*Cnidoscolus texanus*), rosette grass (*Dichanthelium spp.*), little bluestem, and slender Indiangrass (*Sorghastrum elliottii*). Texas endemics, such as Centerville brazos-mint (*Brazoria truncata* var. *pulcherrima*), Texas sandmint (*Rhododon ciliatus*), and Carrizo Sands woollywhite (*Hymenopappus carrizoanus*), may be found in this vegetation type.	<1%
Post Oak Savanna: Live Oak Motte and Woodland	This vegetation type is typically dominated by plateau live oak or coastal live oak (*Quercus virginiana*). Post oak may be present in these woodlands, but typically only as a minor component of the canopy. Yaupon, American beautyberry, saw greenbrier, gum bumelia, poison ivy (*Toxicodendron radicans*), mustang grape (*Vitis mustangensis*), Texas persimmon (*Diospyros texana*), and Hercules' club may be present in the shrub layer. To the south, blackbrush (*Acacia rigidula*), Texas hogplum (*Colubrina texensis*), Texas kidneywood (*Eysenhardtia texana*), desert olive (*Forestiera angustifolia*), and colima (*Zanthoxylum fagara*) may form a conspicuous shrub layer. Little bluestem, silver bluestem, and Texas wintergrass are among the many species of grass that may be present in the herbaceous layer, though many sites may have King Ranch bluestem, bahiagrass, and/or bermudagrass as herbaceous dominants.	<1%
Post Oak Savanna: Sandyland Grassland	This vegetation type is as described for Post Oak Savanna: Sandyland Woodland and Shrubland, but lacking a significant woody component.	<1%
Native Invasive: Deciduous Woodland	This broadly-defined vegetation type includes species such as sugar hackberry, water oak, cedar elm, sweetgum, winged elm, yaupon, huisache, ashes (*Fraxinus spp.*), and honey mesquite. To the south and west, species such as granjeno (*Celtis pallida*), colima, and Texas persimmon are more common. Post oak, coastal live oak, and plateau live oak may be important species and eastern redcedar and loblolly pine may be present.	<1%
Urban High Intensity	This vegetation type consists of built-up areas and wide transportation corridors that are dominated by impervious cover.	<1%

Vegetation Type	Description	Approximate Percentage of Study Area
Barren	This vegetation type is mapped in areas where little or no vegetative cover is present. This type includes areas that are cleared for development as well as rural roads and buildings and associated clearing in primarily rural areas. In addition, stream beds with exposed gravel or bedrock, rock outcrops, quarries, and mines may be mapped as this type.	<1%
Native Invasive: Juniper Woodland	This vegetation type is dominated by eastern redcedar in the northeast and east. Plateau live oak is a common component and other species that may be present include sugar hackberry and cedar elm. In areas dominated by eastern redcedar, post oak and yaupon are common.	<1%
Native Invasive: Mesquite Shrubland	This broadly-defined vegetation type is dominated by honey mesquite, but species such as huisache, sugar hackberry, Ashe juniper (*Juniperus ashei*), cedar elm, lotebush (*Ziziphus obtusifolia*), agarito (*Mahonia trifoliolata*), winged elm, sumacs (*Rhus spp.*), brasil (*Condalia hookeri*), Texas persimmon, granjeno, and Lindheimer pricklypear (*Opuntia engelmannii* var. *lindheimeri*) may also be important. Trees such as plateau live oak, coastal live oak, or post oak may form a sparse canopy.	<1%
Native Invasive: Deciduous Shrubland	This vegetation type includes a variety of shrubs and generally small or sparse deciduous trees that may be important on non-prairie soils. Species may include sugar hackberry, water oak, honey mesquite, Chinese tallow (*Triadica sebifera*), yaupon, baccharis (*Baccharis spp.*), southern dewberry (*Rubus trivialis*), sweetgum (*Liquidambar styraciflua*), southern red oak (*Quercus falcata*), winged elm, or cedar elm. Small pine trees may be present in young, managed plantations.	<1%
Post Oak Savanna: Oak – Hardwood Slope Forest	This deciduous forest vegetation type is found on slopes greater than twenty percent along the Red River and its tributaries, as well as on slopes from Milam to Gonzales counties and elsewhere. Slopes may be dominated by post oak, cedar elm, American elm, blackjack oak, and sugar hackberry. This vegetation type is poorly understood, and may be compositionally quite similar to surrounding woodlands. The greater topographic relief associated with this system results in more mesic conditions, leading to the development of denser overstory canopy.	<1%
Grass Farm	This vegetation type mostly includes areas that are dominated by bermudagrass and consist of golf course fairways and greens that are fertilized and irrigated. This type also includes areas of moist soil and fast-growing, highly productive grassland.	<1%
Native Invasive: Juniper Shrubland	This vegetation type is dominated by various species of juniper. Eastern redcedar is the primary dominant of these shrublands or low woodlands in the Blackland Prairie, Post Oak Savanna, and far northern Crosstimber ecoregions. Other dominants that may be present include Ashe juniper and yaupon. Deciduous species that may be present include cedar elm, winged elm, sugar hackberry, and honey mesquite.	<1%

Source: Elliott et al 2014

Aquatic

Based on TPWD's EMST, 17 aquatic vegetation types occur within the study area. These vegetation types are associated with study area aquatic systems such as lakes, creeks, small drainages, or wetlands. Descriptions of these vegetation types are provided in Table 2-6.

TABLE 2-6 DESCRIPTION OF AQUATIC VEGETATION TYPES WITHIN THE STUDY AREA

Vegetation Type	Description	Approximate Percentage of Study Area
Central Texas: Floodplain Hardwood Forest	This vegetation type is typically dominated by deciduous and hardwood trees including pecan, white ash (*Fraxinus americana*), water oak, cedar elm, sugar hackberry, American elm, plateau or coastal live oak, American sycamore (*Platanus occidentalis*), eastern cottonwood, black willow (*Salix nigra*), boxelder (*Acer negundo*), common honeylocust (*Gleditsia triacanthos*), bur oak (*Quercus macrocarpa*), red mulberry (*Morus rubra*), green ash, western soapberry (*Sapindus saponaria* var. *drummondii*), sweetgum, willow oak, river birch (*Betula nigra*), and overcup oak (*Quercus lyrata*). Shrub species may include American beautyberry, common buttonbush (*Cephalanthus occidentalis*), possumhaw, yaupon, gum bumelia, eastern persimmon, farkleberry, eastern redcedar, roughleaf dogwood (*Cornus drummondii*), and rusty blackhaw. Herbaceous cover includes Virginia wildrye (*Elymus virginicus*), frostweed (*Verbesina virginica*), creek oats (*Chasmanthium latifolium*), narrowleaf woodoats (*Chasmanthium sessiliflorum*), Cherokee sedge (*Carex cherokeensis*), eastern gamagrass (*Tripsacum dactyloides*), giant ragweed (*Ambrosia trifida*), and switchgrass. Wetter sites may contain species such as marshmillet (*Zizaniopsis miliacea*), beaksedges (*Rhynchospora spp.*), spikerushes (*Eleocharis spp.*), American waterlily (*Nymphaea odorata*), and Virginia peltandra (*Peltandra virginica*).	6%
Central Texas: Floodplain Herbaceous Vegetation	This vegetation type is mapped in areas within the floodplain that lack significant overstory or shrub canopy, but retain cover in the herbaceous layer. Non-native grass species such as bermudagrass, King Ranch bluestem, and Johnsongrass may frequently dominate this vegetation type. Eastern gamagrass – Switchgrass dominated prairies on lowlands may also be mapped as this vegetation type.	6%
Central Texas: Riparian Hardwood Forest	This vegetation type is mapped in areas of lowland forest dominated by a deciduous overstory canopy including; but not limited to, sugar hackberry, cedar elm, American sycamore, eastern cottonwood, western soapberry, black willow, white ash, green ash, common honeylocust, honey mesquite, and pecan.	1%

Vegetation Type	Description	Approximate Percentage of Study Area
Central Texas: Riparian Herbaceous Vegetation	This herbaceous vegetation type occurs along riparian corridors, lacking overstory or shrub canopy but retaining herbaceous cover. Some sites may be dominated by species such as little bluestem or yellow Indiangrass, that are more commonly encountered in surrounding uplands. Other sites may be dominated by non-native grasses like giant reed (*Arundo donax*), King Ranch bluestem, or bermudagrass.	<1%
Open Water	This vegetation type consists of large lakes, rivers, and marine water. Ephemeral ponds may be mapped as open water. Some areas may support vegetation including black willow, eastern cottonwood, Chinese tallow, cattails (*Typha spp.*), and spikerushes.	<1%
Marsh	This vegetation type is small, and consists of wet or alternatively wet and dry soils with herbaceous vegetation that may include cattails, spikerushes, bulrushes (*Schoenoplectus* spp.), smartweeds (*Polygonum* spp.) and grasses such as Johnsongrass or bermudagrass. Shrubs that may be present include black willow and common buttonbush.	<1%
Central Texas: Floodplain Deciduous Shrubland	This vegetation type represents shrublands of the floodplains of the region that are dominated by deciduous shrubs such as possumhaw, honey mesquite, black willow, roughleaf dogwood, and/or common buttonbush. This type may also include areas with sparse woodlands composed of typical deciduous overstory species as described for Central Texas: Floodplain Hardwood Forest, or sites in early succession dominated by species such as honey mesquite, huisache, sugar hackberry, or Chinese tallow.	<1%
Central Texas: Floodplain Hardwood – Evergreen Forest	This vegetation type is as described for the Central Texas: Floodplain Hardwood Forest type, but with a mix of evergreen and deciduous species in the canopy, with plateau live oak representing the most common evergreen component.	<1%
Central Texas: Riparian Hardwood - Evergreen Forest	This vegetation type is as described for the Central Texas: Riparian Hardwood Forest type, but with a mix of evergreen species, including eastern redcedar, pines (*Pinus spp.*), plateau live oak and/or coastal live oak and deciduous species in the canopy.	<1%
Central Texas: Floodplain Evergreen Shrubland	This vegetation type represents shrublands within floodplains that are dominated by Juniper (*Juniperus spp.*) occurring as shrubs, or other evergreen shrubs, such as yaupon or the non-native Macartney rose (*Rosa bracteata*). This type may also represent young loblolly pine stands.	<1%
Central Texas: Floodplain Evergreen Forest	This vegetation type is as described for the Central Texas: Floodplain Hardwood Forest type, but the canopy is dominated by eastern redcedar. In some cases, this type may have loblolly pine as the dominant canopy.	<1%

Vegetation Type	Description	Approximate Percentage of Study Area
Central Texas: Riparian Live Oak Forest	This vegetation type is as described for the Central Texas: Riparian Hardwood Forest type, but with plateau live oak or coastal live oak dominating the canopy. Deciduous species can be common in the canopy, but oaks clearly dominate. Eastern redcedar may also be present.	<1%
Central Texas: Riparian Deciduous Shrubland	This vegetation type is represented by shrublands in riparian sites that may be dominated by deciduous shrubs such as possumhaw, honey mesquite, black willow, roughleaf dogwood, swamp privet (*Forestiera acuminata*), and/or common buttonbush. This type may also represent relatively sparse woodlands dominated by overstory species typical of the Central Texas: Riparian Hardwood Forest type.	<1%
Central Texas: Floodplain Live Oak Forest	This vegetation type is as described for the Central Texas: Floodplain Hardwood Forest type, but dominated by plateau live oak or coastal live oak. Deciduous species can be common in the canopy, but oaks clearly dominate. Eastern redcedar may also be present.	<1%
Central Texas: Riparian Evergreen Forest	This vegetation type is as described for the Central Texas: Riparian Hardwood Forest type, but with eastern redcedar dominating the canopy. On the eastern edge of the range of this type, some occurrences may be dominated by loblolly pine, or less commonly, shortleaf pine (*Pinus echinata*).	<1%
Swamp	This vegetation type typically includes forested, wet or alternately wet and dry soils at the upper ends of reservoirs, stock tanks, or ponds. A variety of species, including baldcypress (*Taxodium distichum*), American elm, cedar elm, black willow, bur oak, water oak, sweetgum, or common buttonbush may be present.	<1%
Central Texas: Floodplain Baldcypress Swamp	This vegetation type is typically encountered in the eastern part of the upper Trinity River basin. These sites are dominated by baldcypress. Some mapped occurrences may be dominated by water elm (*Planera aquatica*).	<1%

Source: Elliott et al 2014

Commercially or Recreationally Important Plant Species

Commercially important species are defined as those that (a) are commercially or recreationally valuable; (b) are endangered or threatened; (c) affect the well-being of some important species within criterion (a) or (b); and (d) are critical to the structure and function of the ecological system or are biological indicators. Commercially important species within the study area include forage, corn for grain, cotton, upland cotton, and sorghum (USDA 2017).

Endangered and Threatened Plant Species

As defined by the USFWS under the Endangered Species Act (ESA), an endangered species is one that is in danger of extinction throughout all or a significant portion of its range, while a threatened species is one likely to become endangered within the foreseeable future throughout

all or a significant portion of its range. Proposed species are those that have been formally submitted for official listing as endangered or threatened, but have yet to be designated as such. In addition, the USFWS has identified candidate species, which are listed as those species for which the USFWS has on file sufficient information on biological vulnerability and threat(s) to support their being listed as either endangered or threatened, and are likely to be listed in the foreseeable future.

The ESA also provides for the conservation of "critical habitat," the areas of land, water, and air space that an endangered species needs for survival. These areas include sites with food and water, breeding areas, cover or shelter sites, and sufficient habitat to provide for normal population growth and behavior. One of the primary threats to endangered and threatened species is the destruction or modification of essential habitat areas by uncontrolled land and water development. No designated critical habitat for any endangered/threatened plant species occurs within the study area (USFWS 2018).

One plant species, the Navasota ladies'-tresses (*Spiranthes parksii*), is listed as endangered by USFWS and TPWD for Burleson County (TPWD 2016, USFWS 2017). It should be noted that inclusion on the list does not imply that a species is known to occur in the study area, but only acknowledges the potential for occurrence. Only those species listed as threatened or endangered by USFWS are afforded federal protection under the ESA.

The Navasota ladies'-tresses is a federally endangered orchid endemic to Texas. This species occurs in sandy soils along the banks of ephemeral upland tributaries of the Navasota and Brazos rivers. This orchid produces rosettes or leaves above ground from February to May, but persists as underground tubers from May to September. Flowering begins as early as September (Wonkka et al. 2012). The number of flowering individuals is positively correlated to the amount of rainfall occurring in the month of August (Parker 2001). Flowering persists through December with seed dispersal occurring from December to January (Wonkka et al. 2012). This species is known to occur on gently rolling slopes of elevations between 60–110 m (Wonkka et al. 2012). The maximum depth of a root tuber was detected at nine cm below the surface (Hammons et al. 2010). Known populations have been associated with the Manning and Wellborn geologic formations and Arol, Burlewash, Shirol, and Singleton soil series (USFWS 2009). The Wellborn geologic formation and the Burlewash, Shirol, and Singleton soil series are located within the study area. These soils are strongly acidic and composed of approximately 50

– 90 percent sand and 0 – 20 percent clay (USDA 2017). A Habitat Suitability Analysis (HSA) was conducted to determine potential existence of suitable habitat for the Navasota ladies'-tresses within the study area. The HSA incorporated and analyzed the physical attributes of soil (percent clay and percent sand), soil pH, elevation, geologic formations, and EMST vegetation to delineate potential suitable habitat of the species (USDA 2017, USGS 2001, U.S. Department of the Interior [DOI] and USGS 2017, USGS 2007, USGS 2017, TPWD 2014). The results from the HSA were classified from 0–100 percent habitat suitability, where zero percent is least suitable habitat and 100 percent is highly suitable habitat. Areas with 90-100 percent suitability are considered optimal habitat because this range represents areas with all parameters present. Areas of suitable habitat were identified, with approximately 488 acres of optimal habitat occuring within the southeastern corner of the study area (Figure 2-5). Additionally, the TXNDD reported four EOs of the Navasota ladies'-tresses within 10 miles of the study area (TPWD 2017).

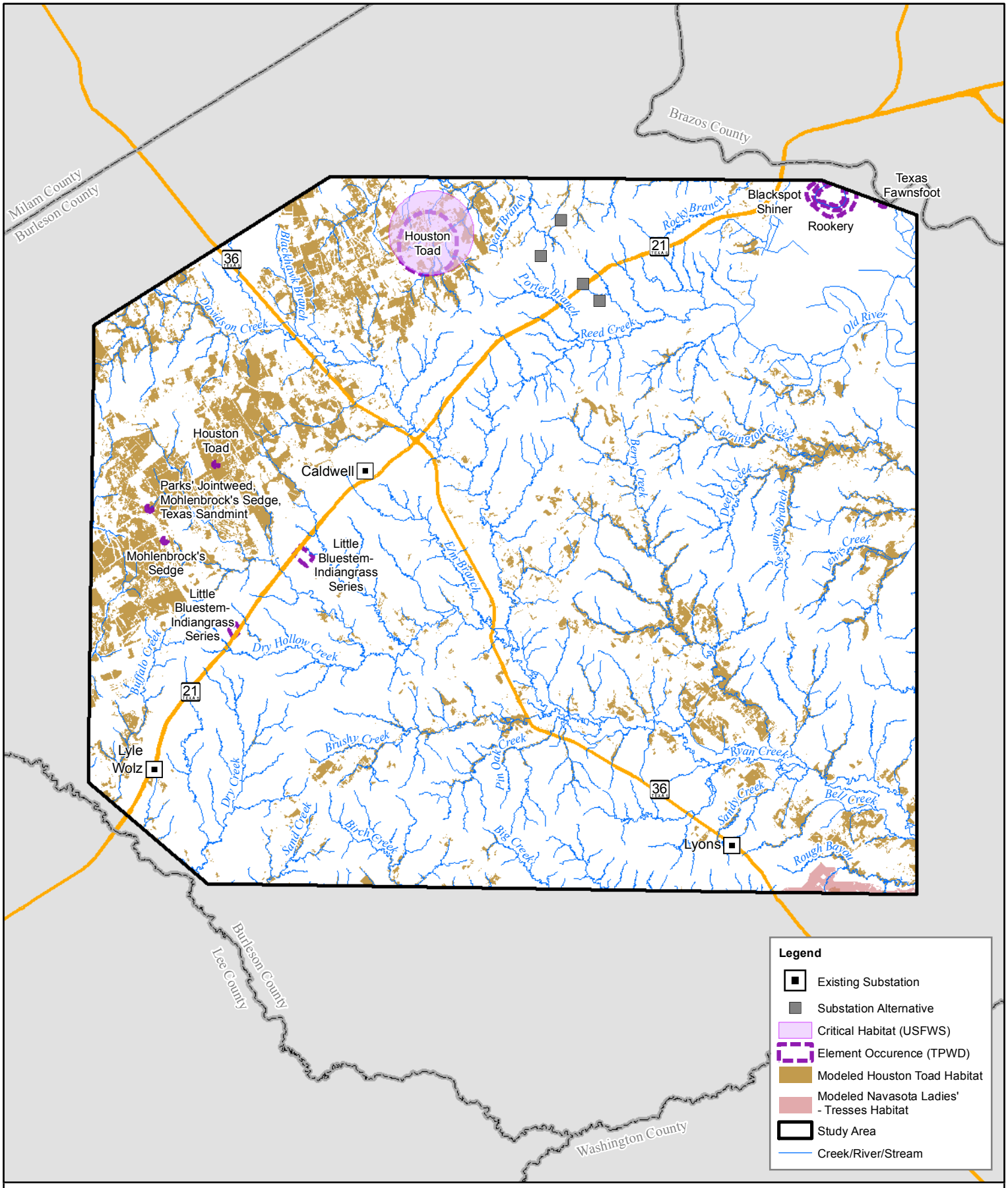
Sensitive Communities

While not regulated, TXNDD data also list rare and sensitive communities such as native terrestrial vegetation communities. TPWD generally recommends consideration for these communities and avoidance of the listed vegetation communities when routing linear utility corridors. Within the study area, the TXNDD reported two sensitive vegetation communities (bluestem-indiangrass series) (Figure 2-5).

2.3.5.2 Fish and Wildlife

Terrestrial Species

The study area lies along the southern portion of the Texan biotic province as described by Blair (1950). As previously discussed, the study area also lies within the East Central Texas Plains Level III Ecoregion (Griffith et al. 2007), which corresponds to the central portion of Blair's Texan biotic province. This ecoregion includes a diversity of habitats for wildlife species (Griffith et al. 2007). Vertebrate species with the potential to inhabit the study area, based on ranges which intersect the study area, are included in Tables 2-7 through 2-9.



Data Source: Lower Colorado River Authority (LCRA), Modeled Habitat (Houston Toad and Navasota Ladies'-Tresses, AECOM, October 2017), Platt's Energy, Texas Parks and Wildlife Department (TPWD), US Fish and Wildlife Service (USFWS)
Map Update: 5/25/2018

Figure 2-5

Species and Ecological Communities of Concern

Cooks Point 138-kV Transmission Line Project
Burleson County, Texas

0 1.5 3 Miles

TABLE 2-7 REPTILE AND AMPHIBIAN SPECIES WITH POTENTIAL TO INHABIT THE STUDY AREA

Common Name	Scientific Name
Blanchard's Cricket Frog	*Acris blanchardi*
Houston Toad	*Anaxyrus houstonensis*
Red-spotted Toad	*Anaxyrus punctatus*
Texas Toad	*Anaxyrus speciosus*
Woodhouse's Toad	*Anaxyrus woodhousii*
Eastern Narrow-mouthed Toad	*Gastrophryne carolinensis*
Western Narrow-mouthed Toad	*Gastrophryne olivacea*
Cope's Gray Treefrog	*Hyla chrysoscelis*
Green Treefrog	*Hyla cinerea*
Gray Treefrog	*Hyla versicolor*
Gulf Coast Toad	*Incilius nebulifer*
Crawfish Frog	*Lithobates areolatus*
American Bullfrog	*Lithobates catesbeianus*
Green Frog	*Lithobates clamitans clamitans*
Pickerel Frog	*Lithobates palustris*
Southern Leopard Frog	*Lithobates sphenocephalus*
Spotted Chorus Frog	*Pseudacris clarkii*
Spring Peeper	*Pseudacris crucifer*
Upland Chorus Frog	*Pseudacris feriarum*
Strecker's Chorus Frog	*Pseudacris streckeri*
Hurter's Spadefoot	*Scaphiopus hurterii*
Small-mouthed Salamander	*Ambystoma texanum*
Central Newt	*Notophthalmus viridescens louisianensis*
Western Lesser Siren	*Siren intermedia nettingi*
Green Anole	*Anolis carolinensis*
Texas Spotted Whiptail	*Aspidoscelis gularis gularis*
Eastern Six-lined Racerunner	*Aspidoscelis sexlineata sexlineata*
Mediterranean Gecko*	*Hemidactylus turcicus*
Slender Glass Lizard	*Ophisaurus attenuatus*
Texas Horned Lizard	*Phrynosoma cornutum*
Common Five-lined Skink	*Plestiodon fasciatus*
Broad-headed Skink	*Plestiodon laticeps*
Prairie Skink	*Plestiodon septentrionalis*
Prairie Lizard	*Sceloporus consobrinus*
Texas Spiny Lizard	*Sceloporus olivaceus*
Little Brown Skink	*Scincella lateralis*
Eastern Copperhead	*Agkistrodon contortrix*
Northern Cottonmouth	*Agkistrodon piscivorus*
Texas Glossy Snake	*Arizona elegans arenicola*
North American Racer	*Coluber constrictor*
Western Coachwhip	*Coluber flagellum testaceus*
Western Diamond-backed Rattlesnake	*Crotalus atrox*
Timber Rattlesnake	*Crotalus horridus*
Red-bellied Mudsnake	*Farancia abacura*
Eastern Hog-nosed Snake	*Heterodon platirhinos*
Prairie Kingsnake	*Lampropeltis calligaster*
Common Kingsnake	*Lampropeltis getula*
Eastern Milksnake	*Lampropeltis triangulum*
Texas Coralsnake	*Micrurus tener*
Plain-bellied Watersnake	*Nerodia erythrogaster*
Southern Watersnake	*Nerodia fasciata*
Diamond-backed Watersnake	*Nerodia rhombifer*
Rough Green Snake	*Opheodrys aestivus*
Great Plains Ratsnake	*Pantherophis emoryi*

Common Name	Scientific Name
Western Ratsnake	*Pantherophis obsoleta*
Graham's Crayfish Snake	*Regina grahamii*
Texas Threadsnake	*Rena dulcis*
Long-nosed Snake	*Rhinocheilus lecontei*
Eastern Patch-nosed Snake	*Salvadora grahamiae*
Texas Brownsnake	*Storeria dekayi texana*
Flat-headed Snake	*Tantilla gracilis*
Checkered Gartersnake	*Thamnophis marcianus*
Western Ribbonsnake	*Thamnophis proximus*
Lined Snake	*Tropidoclonion lineatum*
Western Smooth Earthsnake	*Virginia valeriae elegans*
American Alligator	*Alligator mississippiensis*
Spiny Softshell	*Apalone spinifera*
Snapping Turtle	*Chelydra serpentina*
Chicken Turtle	*Deirochelys reticularia*
False Map Turtle	*Graptemys pseudogeographica*
Yellow Mud Turtle	*Kinosternon flavescens*
Eastern Mud Turtle	*Kinosternon subrubrum*
Alligator Snapping Turtle	*Macrochelys temminckii*
Texas Cooter	*Pseudemys texana*
Eastern Musk Turtle	*Sternotherus odoratus*
Eastern Box Turtle	*Terrapene carolina*
Ornate Box Turtle	*Terrapene ornata*
Pond Slider	*Trachemys scripta*

**Invasive/non-native species*
Source: Dixon 2013, Crother 2017

TABLE 2-8 MAMMALIAN SPECIES WITH POTENTIAL TO INHABIT THE STUDY AREA

Common Name	Scientific Name
Virginia Opossum	*Didelphis virginiana*
Nine-Banded Armadillo	*Dasypus novemcinctus*
Southern Short-Tailed Shrew	*Blarina carolinensis*
Least Shrew	*Cryptotis parva*
Eastern Mole	*Scalopus aquaticus*
Big Free-Tailed Bat	*Nyctinomops macrotis*
Cave Myotis	*Myotis velifer*
Seminole Bat	*Lasiurus seminolus*
Eastern Red Bat	*Lasiurus borealis*
Hoary Bat	*Aeorestes cinereus*
Silver-Haired Bat	*Lasionycteris noctivagans*
Evening Bat	*Nycticeius humeralis*
Big Brown Bat	*Eptesicus fuscus*
Northern Yellow Bat	*Dasypterus intermedius*
Brazilian Free-Tailed Bat	*Tadarida brasiliensis*
American Perimyotis	*Perimyotis subflavus*
Red Wolf	*Canis rufus*
Coyote	*Canis latrans*
Red Fox*	*Vulpes vulpes*
Common Gray Fox	*Urocyon cinereoargenteus*
Northern River Otter	*Lontra canadensis*
Ringtail	*Bassariscus astutus*
Northern Raccoon	*Procyon lotor*
Long-Tailed Weasel	*Mustela frenata*
American Mink	*Vison vison*
American Badger	*Taxidea taxus*
Eastern Spotted Skunk	*Spilogale putorius*

Common Name	Scientific Name
Striped Skunk	*Mephitis mephitis*
Mountain Lion	*Puma concolor*
Bobcat	*Lynx rufus*
Feral Pig*	*Sus scrofa*
White-Tailed Deer	*Odocoileus virginianus*
Thirteen-Lined Ground Squirrel	*Ictidomys tridecemlineatus*
Eastern Fox Squirrel	*Sciurus niger*
Eastern Gray Squirrel	*Sciurus carolinensis*
Southern Flying Squirrel	*Glaucomys volans*
Attwater's Pocket Gopher	*Geomys attwateri*
Baird's Pocket Gopher	*Geomys breviceps*
Woodland Vole	*Microtus pinetorum*
Northern Pygmy Mouse	*Baiomys taylori*
Hispid Pocket Mouse	*Chaetodipus hispidus*
Fulvous Harvest Mouse	*Reithrodontomys fulvescens*
Plains Harvest Mouse	*Reithrodontomys montanus*
Cotton Deermouse	*Peromyscus gossypinus*
White-Footed Mouse	*Peromyscus leucopus*
Deer Mouse	*Peromyscus maniculatus*
Eastern Woodrat	*Neotoma floridana*
Hispid Cotton Rat	*Sigmodon hispidus*
Norway Rat*	*Rattus norvegicus*
Roof Rat*	*Rattus rattus*
House Mouse*	*Mus musculus*
Texas Marsh Rice Rat	*Oryzomys texensis*
Common Muskrat	*Ondatra zibethicus*
American Beaver	*Castor canadensis*
Nutria*	*Myocastor coypus*
Eastern Cottontail	*Sylvilagus floridanus*
Swamp Rabbit	*Sylvilagus aquaticus*
Black-Tailed Jackrabbit	*Lepus californicus*

**Invasive/non-native species*
Source: Schmidly and Bradley 2016

TABLE 2-9 AVIAN SPECIES WITH POTENTIAL TO INHABIT THE STUDY AREA

Common Name	Scientific Name	Burleson County
Black-bellied Whistling-Duck	*Dendrocygna autumnalis*	YR
Greater White-fronted Goose	*Anser albifrons*	W
Snow Goose	*Anser caerulescens*	W
Ross's Goose	*Anser rossii*	M
Cackling Goose	*Branta hutchinsii*	W
Canada Goose	*Branta canadensis*	M
Wood Duck	*Aix sponsa*	YR
Blue-winged Teal	*Spatula discors*	M
Cinnamon Teal	*Spatula cyanoptera*	M
Northern Shoveler	*Spatula clypeata*	W
Gadwall	*Mareca strepera*	W
American Wigeon	*Mareca americana*	W
Mallard	*Anas platyrhynchos*	W
Northern Pintail	*Anas acuta*	W
Green-winged Teal	*Anas crecca*	W
Canvasback	*Aythya valisineria*	W
Redhead	*Aythya americana*	W
Ring-necked Duck	*Aythya collaris*	W
Greater Scaup	*Aythya marila*	W
Lesser Scaup	*Aythya affinis*	W

Common Name	Scientific Name	Burleson County
Bufflehead	*Bucephala albeola*	W
Common Goldeneye	*Bucephala clangula*	W
Hooded Merganser	*Lophodytes cucullatus*	W
Red-breasted Merganser	*Mergus serrator*	W
Ruddy Duck	*Oxyura jamaicensis*	W
Northern Bobwhite	*Colinus virginianus*	YR
Wild Turkey	*Meleagris gallopavo*	YR
Common Loon	*Gavia immer*	W
Pied-Billed Grebe	*Podilymbus podiceps*	YR
Horned Grebe	*Podiceps auritus*	W
Eared Grebe	*Podiceps nigricollis*	W
Rock Pigeon*	*Columba livia*	YR
Eurasian Collared-Dove*	*Streptopelia decaocto*	YR
Inca Dove	*Columbina inca*	YR
White-winged Dove	*Zenaida asiatica*	YR
Mourning Dove +	*Zenaida macroura*	YR
Yellow-billed Cuckoo	*Coccyzus americanus*	S
Black-billed Cuckoo	*Coccyzus erythropthalmus*	M
Greater Roadrunner	*Geococcyx californianus*	YR
Common Nighthawk	*Chordeiles minor*	S
Chuck-will's-widow	*Antrostomus carolinensis*	S
Eastern Whip-poor-will	*Antrostomus vociferous*	M
Chimney Swift	*Chaetura pelagica*	S
Ruby-throated Hummingbird	*Archilochus colubris*	S
Black-chinned Hummingbird	*Archilochus alexandri*	M
Yellow Rail	*Coturnicops noveboracensis*	M
Black Rail	*Laterallus jamaicensis*	M
King Rail	*Rallus elegans*	M
Virginia Rail	*Rallus limicola*	W
Sora	*Porzana carolina*	W
Purple Gallinule	*Porphyrio martinicus*	S
Common Gallinule	*Gallinula galeata*	S
American Coot	*Fulica americana*	YR
Sandhill Crane	*Antigone canadensis*	W
Black-necked Stilt	*Himantopus mexicanus*	S
American Avocet	*Recurvirostra americana*	M
Black-bellied Plover	*Pluvialis squatarola*	M
American Golden-Plover	*Pluvialis dominica*	M
Snowy Plover	*Charadrius nivosus*	M
Semipalmated Plover	*Charadrius semipalmatus*	M
Piping Plover	*Charadrius melodus*	M
Killdeer +	*Charadrius vociferus*	YR
Mountain Plover	*Charadrius montanus*	W
Upland Sandpiper	*Bartramia longicauda*	M
Whimbrel	*Numenius phaeopus*	M
Long-billed Curlew	*Numenius americana*	S/M
Hudsonian Godwit	*Limosa haemastica*	M
Marbled Godwit	*Limosa fedoa*	M
Ruddy Turnstone	*Arenaria interpres*	M
Red Knot	*Calidris canutus*	M
Stilt Sandpiper	*Calidris himantopus*	M
Sanderling	*Calidris alba*	M
Dunlin	*Calidris alpina*	M
Baird's Sandpiper	*Calidris bairdii*	M
Least Sandpiper	*Calidris minutilla*	W

Common Name	Scientific Name	Burleson County
White-rumped Sandpiper	*Calidris fuscicollis*	M
Buff-breasted Sandpiper	*Calidris subruficollis*	M
Pectoral Sandpiper	*Calidris melanotos*	M
Semipalmated Sandpiper	*Calidris pusilla*	M
Western Sandpiper	*Calidris mauri*	M
Short-billed Dowitcher	*Limmodromus griseus*	M
Long-billed Dowitcher	*Limnodromus scolopaceus*	M
American Woodcock	*Scolopax minor*	W
Wilson's Snipe	*Gallinago delicata*	W
Spotted Sandpiper	*Actitis macluarius*	W
Solitary Sandpiper	*Tringa solitaria*	M
Lesser Yellowlegs	*Tringa flavipes*	M
Willet	*Tringa semipalmata*	M
Greater Yellowlegs	*Tringa melanoleuca*	W
Wilson's Phalarope	*Phalaropus tricolor*	M
Sabine's Gull	*Xema sabini*	M
Bonaparte's Gull	*Chroicocephalus philadelphia*	W
Franklin's Gull	*Leucophaeus pipixcan*	M
Ring-billed Gull	*Larus delawarensis*	W
Herring Gull	*Larus argentatus*	W
Least Tern	*Sternula antillarum*	M
Caspian Tern	*Hydroprogne caspia*	M
Black Tern	*Chlidonias niger*	M
Common Tern	*Sterna hirundo*	M
Forster's Tern	*Sterna forsteri*	W
Wood Stork	*Mycteria americana*	M
Neotropic Cormorant	*Phalacrocorax brasilianus*	YR
Double-crested Cormorant	*Phalacrocorax auritus*	W
Anhinga	*Anhinga anhinga*	S
American White Pelican	*Pelecanus erythrorhynchos*	W
American Bittern	*Botaurus lentiginosus*	M
Least Bittern	*Ixobrychus exilis*	S
Great Blue Heron +	*Ardea herodias*	YR
Great Egret +	*Ardea alba*	YR
Snowy Egret	*Egretta thula*	S
Little Blue Heron	*Egretta caerulea*	S
Cattle Egret	*Bubulcus ibis*	S
Green Heron	*Butorides virescens*	S
Black-crowned Night-Heron	*Nycticorax nycticorax*	YR
Yellow-crowned Night-Heron	*Nyctanassa violacea*	S
White Ibis	*Eudocimus albus*	S
White-faced Ibis	*Plegadis chihi*	M
Black Vulture +	*Coragyps atratus*	YR
Turkey Vulture +	*Cathartes aura*	YR
Osprey	*Pandion haliaetus*	S
Swallow-tailed Kite	*Elanoides forficatus*	M
White-tailed Kite	*Elanus leucurus*	YR
Mississippi Kite	*Ictinia mississippiensis*	S
Bald Eagle	*Haliaeetus leucocephalus*	YR
Northern Harrier	*Circus cyaneus*	W
Sharp-shinned Hawk	*Accipiter striatus*	W
Cooper's Hawk +	*Accipiter cooperii*	YR
Red-shouldered Hawk +	*Buteo lineatus*	YR
Broad-winged Hawk	*Buteo platypterus*	S
Swainson's Hawk	*Buteo swainsoni*	S

Common Name	Scientific Name	Burleson County
Red-tailed Hawk +	*Buteo jamaicensis*	YR
Barn Owl	*Tyto alba*	YR
Eastern Screech-Owl	*Megascops asio*	YR
Great Horned Owl	*Bubo virginianus*	YR
Burrowing Owl	*Athene cunicularia*	W
Barred Owl +	*Strix varia*	YR
Short-eared Owl	*Asio flammeus*	W
Belted Kingfisher	*Ceryle alcyon*	S
Red-headed Woodpecker	*Melanerpes erythrocephalus*	YR
Red-bellied Woodpecker	*Melanerpes carolinus*	YR
Yellow-bellied Sapsucker	*Sphyrapicus varius*	W
Ladder-backed Woodpecker	*Picoides scalaris*	YR
Downy Woodpecker	*Picoides pubescens*	YR
Hairy Woodpecker	*Picoides villosus*	YR
Northern Flicker	*Colaptes auratus*	W
Pileated Woodpecker	*Dryocopus pileatus*	YR
Crested Caracara	*Caracara cheriway*	YR
American Kestrel +	*Falco sparverius*	W
Merlin	*Falco columbarius*	W
Peregrine Falcon	*Falco peregrinus*	M
Prairie Falcon	*Falco mexicanus*	W
Olive-Sided Flycatcher	*Contopus cooperi*	M
Eastern Wood-Pewee	*Contopus virens*	S
Yellow-bellied Flycatcher	*Empidonax flaviventris*	M
Acadian Flycatcher	*Empidonax virescens*	S
Alder Flycatcher	*Empidonax alnorum*	M
Willow Flycatcher	*Empidonax traillii*	M
Least Flycatcher	*Empidonax minimus*	M
Eastern Phoebe +	*Saynoris phoebe*	YR
Great Crested Flycatcher	*Myiarchus crinitus*	S
Western Kingbird	*Tyrannus verticalis*	S
Eastern Kingbird	*Tyrannus tyrannus*	S
Scissor-tailed Flycatcher	*Tyrannus forficatus*	S
Loggerhead Shrike +	*Lanius ludovicianus*	YR
White-eyed Vireo	*Vireo griseus*	YR
Bell's Vireo	*Vireo bellii*	M
Yellow-throated Vireo	*Vireo flavifrons*	S
Blue-headed Vireo	*Vireo solitarius*	W
Warbling Vireo	*Vireo gilvus*	M
Philadelphia Vireo	*Vireo philadelphicus*	M
Red-eyed Vireo	*Vireo olivaceus*	S
Blue Jay	*Cyanocitta cristata*	YR
American Crow	*Corvus brachyrhynchos*	YR
Horned Lark	*Eremophila alpestris*	W
Purple Martin	*Progne subis*	S
Tree Swallow	*Tachycineta bicolor*	S
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	S
Bank Swallow	*Riparia riparia*	M
Cliff Swallow	*Petrochelidon pyrrhonta*	S
Cave Swallow	*Petrochelidon fulva*	S
Barn Swallow	*Hirundo rustica*	S
Carolina Chickadee	*Poecile carolinensis*	YR
Tufted Titmouse	*Baeolophus bicolor*	YR
Red-breasted Nuthatch	*Sitta canadensis*	W
White-breasted Nuthatch	*Sitta carolinensis*	W

Common Name	Scientific Name	Burleson County
Brown Creeper	*Certhia americana*	W
House Wren	*Troglodytes aedon*	W
Winter Wren	*Troglodytes hiemalis*	W
Sedge Wren	*Cistothorus platensis*	W
Marsh Wren	*Cistothorus palustris*	W
Carolina Wren	*Thryothorus ludovicianus*	YR
Bewick's Wren	*Thryomanes bewickii*	YR
Blue-gray Gnatcatcher	*Polioptila caerulea*	S
Golden-crowned Kinglet	*Regulus satrapa*	W
Ruby-crowned Kinglet +	*Regulus calendula*	W
Eastern Bluebird +	*Sialia sialis*	S
Veery	*Catharus fuscescens*	M
Gray-cheeked Thrush	*Catharus minimus*	M
Swainson's Thrush	*Catharus ustulatus*	M
Hermit Thrush	*Catharus guttatus*	W
Wood Thrush	*Hylocichla mustelina*	M
American Robin	*Turdus migratorius*	YR
Gray Catbird	*Dumetella carolinensis*	M
Brown Thrasher	*Toxostoma rufum*	W
Northern Mockingbird +	*Mimus polyglottos*	YR
European Starling*	*Sturnus vulgaris*	YR
Cedar Waxwing	*Bombycilla cedrorum*	W
House Sparrow*	*Passer domesticus*	YR
American Pipit	*Anthus rubescens*	W
Sprague's Pipit	*Anthus spragueii*	M
House Finch +	*Haemorhous mexicanus*	YR
Purple Finch	*Haemorhous purpureus*	W
Pine Siskin	*Spinus pinus*	W
American Goldfinch	*Spinus tristis*	W
Lapland Longspur	*Calcarius lapponicus*	W
Chestnut-collared Longspur	*Calcarius ornatus*	W
McCown's Longspur	*Rhynchophanes mccownii*	W
Spotted Towhee	*Pipilo maculatus*	W
Eastern Towhee	*Pipilo erythrophthalmus*	W
Chipping Sparrow	*Spizella passerina*	W
Clay-colored Sparrow	*Spizella pallida*	M
Field Sparrow	*Spizella pusilla*	W
Vesper Sparrow	*Pooecetes gramineus*	W
Lark Sparrow	*Chondestes grammacus*	S
Savannah Sparrow	*Passerculus sandwichensis*	W
Grasshopper Sparrow	*Ammodramus savannarum*	YR
LeConte's Sparrow	*Ammodramus leconteii*	W
Nelson's Sparrow	*Ammodramus nelsoni*	M
Fox Sparrow	*Passerella iliaca*	W
Song Sparrow	*Melospiza melodia*	W
Lincoln's Sparrow	*Melospiza lincolnii*	W
Swamp Sparrow	*Melospiza georgiana*	W
White-throated Sparrow	*Zonotrichia albicollis*	W
Harris's Sparrow	*Zonotrichia querula*	W
White-crowned Sparrow	*Zonotrichia leucophrys*	W
Dark-eyed Junco	*Junco hyemalis*	W
Yellow-breasted Chat	*Icteria virens*	S
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	M
Bobolink	*Dolichonyx oryzivorus*	M
Eastern Meadowlark +	*Sturnella magna*	YR

Common Name	Scientific Name	Burleson County
Western Meadowlark	*Sturnella neglecta*	W
Orchard Oriole	*Icterus spurius*	S
Bullock's Oriole	*Icterus bullockii*	M
Baltimore Oriole	*Icterus galbula*	M
Red-winged Blackbird	*Agelaius phoeniceus*	YR
Bronzed Cowbird	*Molothrus aeneus*	S
Brown-headed Cowbird	*Molothrus ater*	YR
Rusty Blackbird	*Euphagus carolinus*	W
Brewer's Blackbird	*Euphagus cyanocephalus*	W
Common Grackle	*Quiscalus quiscula*	YR
Great-tailed Grackle	*Quiscalus mexicanus*	YR
Ovenbird	*Seiurus aurocapilla*	M
Worm-eating Warbler	*Helmitheros vermivorum*	M
Louisiana Waterthrush	*Parkesia motacilla*	S
Northern Waterthrush	*Parkesia noveboracensis*	M
Golden-winged Warbler	*Vermivora chrysoptera*	M
Blue-winged Warbler	*Vermivora cyanoptera*	M
Black-and-white Warbler	*Mniotilta varia*	YR
Prothonotary Warbler	*Protonotaria citrea*	S
Swainson's Warbler	*Limnothlypis swainsonii*	S
Tennessee Warbler	*Oreothlypis peregrina*	M
Orange-crowned Warbler	*Oreothlypis celata*	W
Nashville Warbler	*Oreothlypis ruficapilla*	M
Mourning Warbler	*Geothlypis philadelphia*	M
Kentucky Warbler	*Geothlypis formosa*	S
Common Yellowthroat	*Geothlypis trichas*	W
Hooded Warbler	*Setophaga citrina*	M
American Redstart	*Setophaga ruticilla*	M
Cerulean Warbler	*Setophaga cerulea*	M
Northern Parula	*Setophaga americana*	S
Magnolia Warbler	*Setophaga magnolia*	M
Bay-breasted Warbler	*Setophaga castanea*	M
Blackburnian Warbler	*Setophaga fusca*	M
Yellow Warbler	*Setophaga petechia*	M
Chestnut-sided Warbler	*Setophaga pensylvanica*	M
Blackpoll Warbler	*Setophaga striata*	M
Palm Warbler	*Setophaga palmarum*	M
Pine Warbler	*Setophaga pinus*	YR
Yellow-rumped Warbler	*Setophaga coronata*	W
Yellow-throated Warbler	*Setophaga dominica*	S
Prairie Warbler	*Setophaga discolor*	M
Black-throated Green Warbler	*Setophaga virens*	M
Canada Warbler	*Cardellina canadensis*	M
Wilson's Warbler	*Cardellina pusilla*	M
Summer Tanager	*Piranga rubra*	S
Scarlet Tanager	*Piranga olivacea*	M
Northern Cardinal +	*Cardinalis cardinalis*	YR
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	M
Blue Grosbeak	*Passerina caerula*	S
Indigo Bunting	*Passerina cyanea*	S
Painted Bunting	*Passerina ciris*	S
Dickcissel	*Spiza americana*	S

S – Summer resident; W – Winter resident; YR – Year-round resident; M – Migrant
** Invasive/non-native species*
+ Observed during field reconnaissance

Source: Lockwood and Freeman 2014; Chesser et al 2018

Aquatic Species

As previously stated, the study area lies within the Brazos River Basin. Aquatic habitats within the study area are influenced by the Brazos and Old rivers, as well as numerous named creeks and their tributaries. In addition to these major water features, the study area contains palustrine emergent wetlands, palustrine forested/shrub wetlands, lakes, and ponds. These water features provide diverse aquatic habitats throughout the study area.

According to Thomas et al. (2007), at least 83 species of freshwater fish are known to occur in this region of Texas. Species with potential to inhabit waters in and around the study area are included in Table 2-10.

TABLE 2-10 FISH SPECIES WITH POTENTIAL TO INHABIT THE STUDY AREA

Common Name	Scientific Name
Spotted Gar	*Lepisosteus oculatus*
Longnose Gar	*Lepisosteus osseus*
Bowfin	*Amia calva*
American Eel	*Anguilla rostrata*
Gizzard Shad	*Dorosoma cepedianum*
Threadfin Shad	*Dorosoma petenense*
Goldfish*	*Carassius auratus*
Grass Carp*	*Ctenopharyngodon idella*
Red Shiner	*Cyprinella lutrensis*
Blacktail Shiner	*Cyprinella venusta*
Common Carp*	*Cyprinus carpio*
Guadalupe Roundnose Minnow	*Dionda nigrotaeniata*
Mississippi Silvery Minnow	*Hybognathus nuchalis*
Plains Minnow	*Hybognathus placitus*
Pallid Shiner	*Hybopsis amnis*
Ribbon Sshiner	*Lythrurus fumeus*
Redfin Shiner	*Lythrurus umbratilis*
Shoal Chub	*Macrhybopsis hyostoma*
Golden Shiner	*Notemigonus crysoleucas*
Texas Shiner	*Notropis amabilis*
Blackspot Shiner	*Notropis atrocaudalis*
Smalleye Shiner	*Notropis buccula*
Ghost Shiner	*Notropis buchanani*
Sharpnose Shiner	*Notropis oxyrhynchus*
Chub Shiner	*Notropis potteri*
Silverband Shiner	*Notropis shumardi*
Weed Shiner	*Notropis texanus*
Mimic Shiner	*Notropis volucellus*
Pugnose Minnow	*Opsopoeodus emiliae*
Suckermouth Minnow	*Phenacobius mirabilis*
Fathead Minnow	*Pimephales promelas*
Bullhead Minnow	*Pimephales vigilax*
River Carpsucker	*Carpiodes carpio*
Blue Sucker	*Cycleptus elongatus*
Creek Chubsucker	*Erimyzon oblongus*

Common Name	Scientific Name
Lake Chubsucker	*Erimyzon sucetta*
Smallmouth Buffalo	*Ictiobus bubalus*
Spotted Sucker	*Minytrema melanops*
Gray Redhorse	*Moxostoma congestum*
Mexican Tetra	*Astyanax mexicanus*
Black Bullhead	*Ameiurus melas*
Yellow Bullhead	*Ameiurus natalis*
Blue Catfish	*Ictalurus furcatus*
Channel Catfish	*Ictalurus punctatus*
Tadpole Madtom	*Noturus gyrinus*
Freckled Madtom	*Noturus nocturnus*
Flathead Catfish	*Pylodictis olivaris*
Redfin Pickerel	*Esox americanus*
Rainbow Trout*	*Oncorhynchus mykiss*
Pirate Perch	*Aphredoderus sayanus*
Mountain Mullet	*Agonostomus monticola*
Striped Mullet	*Mugil cephalus*
Brook Silverside	*Labidesthes sicculus*
Western Mosquitofish	*Gambusia affinis*
Starhead Topminnow	*Fundulus dispar*
Gulf Killifish	*Fundulus grandis*
Blackstripe Topminnow	*Fundulus notatus*
Plains Killifish	*Fundulus zebrinus*
Sheepshead Minnow	*Cyprinodon variegatus*
White Bass	*Morone chrysops*
Striped Bass	*Morone saxatilis*
Redbreast Sunfish	*Lepomis auritus*
Green Sunfish	*Lepomis cyanellus*
Warmouth	*Lepomis gulosus*
Orangespotted Sunfish	*Lepomis humilis*
Bluegill	*Lepomis macrochirus*
Redspotted Sunfish	*Lepomis miniatus*
Longear Sunfish	*Lepomis megalotis*
Redear Sunfish	*Lepomis microlophus*
Spotted Bass	*Micropterus punctulatus*
Largemouth Bass	*Micropterus salmoides*
Guadalupe Bass	*Micropterus treculii*
White Crappie	*Pomoxis annularis*
Black Crappie	*Pomoxis niromaculatus*
Bluntnose Darter	*Etheostoma chlorosomum*
Slough Darter	*Etheostoma gracile*
Goldstripe Darter	*Etheostoma parvipinne*
Texas Logperch	*Percina carbonaria*
Bigscale Logperch	*Percina macrolepida*
Dusky Darter	*Percina sciera*
Freshwater Drum	*Aplodinotus grunniens*
Banded Pygmy Sunfish	*Elassoma zonatum*
Blue Tilapia*	*Oreochromis aurea*

** – non-native/introduced*
Source: Thomas et al. 2007

According to Howells et al. (1996), at least 23 mussel species are known to occur in this region of Texas. Mussel species with the potential to inhabit waters in and around the study area are included in Table 2-11.

TABLE 2-11 MUSSEL SPECIES WITH POTENTIAL TO INHABIT THE STUDY AREA

Common Name	Scientific Name
Threeridge	*Amblema plicata*
Giant Floater	*Anodonta grandis*
Paper Pondshell	*Anodonta imbecillis*
Rock-Pocketbook	*Arcidens confragosus*
Tampico Pearlymussel	*Cyrtonaias tampicoensis*
Louisiana Fatmucket	*Lampsilis hydiana*
Yellow Sandshell	*Lampsilis teres*
Fragile Papershell	*Leptodea fragilis*
Pond Mussel	*Ligumia subrostrata*
Washboard	*Megalonaias nervosa*
Pink Papershell	*Potamilus ohiensis*
Bleufer	*Potamilus purpuratus*
Southern Mapleleaf	*Quadrula apiculata*
Golden Orb	*Quadrula aurea*
Smooth Pimpleback*	*Quadrula houstonensis*
False Spike	*Quincuncina mitchelli*
Squawfoot	*Strophitus undulatus*
Lilliput	*Toxolasma parvus*
Texas Lilliput	*Toxolasma texasensis*
Pistolgrip	*Tritogonia verrucosa*
Texas Fawnsfoot*	*Truncilla macrodon*
Tapered Pondhorn	*Uniomerus declivis*
Pondhorn	*Uniomerus tetralasmus*

** Candidate for federal listing*
Source: Howells et al. 1996

Commercially or Recreationally Important Animal Species

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

Wildlife resources within the study area provide human benefits as a result of both nonconsumptive and consumptive uses. Nonconsumptive uses include activities such as observing and photographing wildlife, bird-watching, etc. These uses deserve consideration in the evaluation of the wildlife resources of the study area. No national or state parks are located within the study area. Several parks managed by municipalities or private organizations, which offer potential wildlife viewing opportunities, are present within the study area. All native wildlife species within the study area provide the potential for nonconsumptive use.

Some wildlife species within the study area are common for consumptive uses. The White-tailed Deer is the most important big game mammal in Texas, and occurs throughout the study

area. TPWD divides the counties of Texas into ecological areas for White-tailed Deer management, with Burleson County occuring within the Post Oak Savannah Wildlife District (TPWD n.d.). This species favors edge or transitional habitats and requires woodlands containing shrub layers that provide browse and cover.

Other important game species (also common for consumptive use) in the study area include American Alligator, doves, Northern Bobwhite, rabbits and hares, squirrels, and American Woodcock. Additionally, hunting of duck, teal, geese, rail, gallinule, and snipe species is likely to occur at waterbodies within the study area (TPWD 2018b).

Recreational fishing opportunities within the study area may be afforded within study area lakes (Section 2.3.7.3), as well as minor water bodies for species including, but not limited to, sunfish, catfish, and bass. There are no commercial fisheries in the study area.

Endangered and Threatened Animal Species

Table 2-12 lists those fish and wildlife species considered by USFWS or TPWD to be endangered or threatened within Burleson County. It should be noted that inclusion on the list does not imply that a species is known to occur in the study area, but only acknowledges the potential for occurrence. Only those species listed as threatened or endangered by USFWS have federal protection under the ESA.

TABLE 2-12 ENDANGERED AND THREATENED WILDLIFE OF POTENTIAL OCCURRENCE WITHIN BURLESON COUNTY

Common Name	Scientific Name	USFWS	TPWD	Potential for Occurrence in the Study Area
AMPHIBIANS				
Houston Toad	*Anaxyrus houstonensis*	E	E	Yes
BIRDS				
Bald Eagle	*Haliaeetus leucocephalus*	DL	T	Yes
Interior Least Tern	*Sternula antillarum athalassos*	E	E	Yes*
Peregrine Falcon	*Falco peregrinus*	DL	T	Yes*
Red Knot	*Calidris canutus rufa*	T	-	Yes*
Whooping Crane	*Grus americana*	E	E	Yes*
Wood Stork	*Mycteria americana*	N/A	T	Yes
MAMMALS				
Louisiana Black Bear	*Ursus americanus luteolus*	DL	T	No
Red Wolf	*Canis rufus*	E	E	No
FISHES				
Blue Sucker	*Cycleptus elongatus*	N/A	T	Yes
Sharpnose Shiner	*Notropis oxyrhynchus*	E	-	Yes
Smalleye Shiner	*Notropis buccula*	E	-	Yes
MOLLUSKS				
Smooth Pimpleback	*Quadrula houstonensis*	C	T	Yes

Common Name	Scientific Name	USFWS	TPWD	Potential for Occurrence in the Study Area
Texas Fawnsfoot	*Truncilla macrodon*	C	T	Yes
REPTILES				
Alligator Snapping Turtle	*Macrochelys temminckii*	N/A	T	Yes
Texas Horned Lizard	*Phrynosoma cornutum*	N/A	T	Yes
Timber Rattlesnake	*Crotalus horridus*	N/A	T	Yes

E – Endangered, in danger of extinction; T – Threatened, severely depleted or impacted by man;
*DL – Federally delisted; C – Candidate for federal listing; "-" indicates a species listed as "Rare" by TPWD, this listing carries no regulatory meaning; N/A – indicates a species that is not recognized as a candidate, threatened or endangered species. *Assumed to be a transient/migrant species within the study area.*
Source: TPWD 2016, USFWS 2017

As noted in Table 2-12, several of the listed species have the potential to occur within the study area. Descriptions of these species and likelihood of occurrence are provided below.

Federally Listed Species

Of the seven federally endangered or threatened species listed for Burleson County, six have potential to occur in the study area: the Houston Toad, Interior Least Tern, Red Knot, Whooping Crane, Sharpnose Shiner, and Small-eyed Shiner. The federally endangered Red Wolf does not have potential to occur within the study area because it is considered extirpated from the state.

The Houston Toad is an amphibian endemic to Texas and found in deep, sandy soils with a tree overstory (USFWS 2011). Breeding habitat has been characterized as areas with sandy soils, canopy cover, and water sources. Dispersal habitat, between breeding sites, could include areas that are not considered optimal breeding habitat such as pasturelands, flowing creeks, and open prairies. An HSA was conducted for this species to determine areas of potentially suitable habitat within the study area. For the HSA, the physical attributes of soil (percent sand), canopy cover, and distance to water source were used to delineate suitable habitat. The results from the HSA were classified from 0–100 percent suitability, where 0 percent is the least suitable and 100 percent is highly suitable habitat. Areas with 90-100 percent suitability are considered optimal breeding habitat, because this range represents areas with all parameters present. Several areas of suitable habitat were identified within the study area with approximately 21,978 acres of optimal habitat occuring within the study area (Figure 2-5). The TXNDD has two EO records of the Houston Toad within the study area. In addition, the USFWS has designated critical habitat mapped for this species within the study area (Figure 2-5).

According to TPWD, the Interior Least Tern nests along sand and gravel bars within braided streams and rivers, and can be found along large rivers and streams during the summer nesting on sand and gravel bars (USFWS 2013). There are no TXNDD EO records within 10 miles of the study area (TPWD 2017); however, there are eBird records of Interior Least Terns in Burleson County located approximately two miles south of the study area at Somerville Lake (eBird 2017). Interior Least Terns could potentially use the study area during migration. Additionally, the Moelhman Slough associated with the Brazos River is located in the northeastern corner of the study area and could provide potential stopover sites.

According to TPWD, the rufa subspecies of Red Knot prefers the shorelines of coasts and bays, and also uses mudflats during rare inland encounters. Their habitat primarily consists of seacoasts on tidal flats and beaches, herbaceous wetlands, and tidal flat/shores (TPWD 2016). While there are wetlands within the study area, the study area is not located close enough to the coast to provide the necessary habitat and inland migratory records are very rare (Lockwood and Freemann 2014); therefore, no potential nesting habitat exists within the study area. However, the Red Knot may occur in the study area during migration.

The Whooping Crane winters on the central Texas Gulf Coast, where it inhabits the oak savannas, salt marshes, and bays of the Aransas National Wildlife Refuge and surrounding areas. Whooping Cranes are not restricted to the Aransas National Wildlife Refuge. They use a variety of habitats during migration including croplands, palustrine wetlands of varying sizes, and other riverine habitats (USFWS 2012), which occur in the study area (Section 2.3.4). No TXNDD EO records or eBird sightings have been reported for Burleson County (TPWD 2016, eBird 2017). However, Burleson County is within their migration corridor (USFWS 2012); therefore the Whooping Crane may occur in the study area during migration.

The Sharpnose Shiner is endemic to Brazos River drainages and tributaries. They prefer large turbid rivers, with the bottom consisting of a combination of sand, gravel, and clay-mud (TPWD 2016). No TXNDD EO records were identified within 10 miles of the study area; however, the Brazos River is located immediately to the northeast of the study area and several stream features have been identified as tributaries to the Brazos River within the study area.

The Smalleye Shiner is endemic to the upper Brazos River system and its tributaries (Clear Fork and Bosque). They prefer medium to large prairie streams with sandy substrate and turbid to

clear warm water (TPWD 2016). Several stream features have been identified as tributaries to the Brazos River within the study area and one TXNDD EO record was identified within 10 miles of the study area.

Federally Listed Candidate Species

Species with the potential to occur within the study area that are considered candidate species by the USFWS (and currently listed as threatened by TPWD) include the Smooth Pimpleback and Texas Fawnsfoot.

The Smooth Pimpleback is a mollusk that can be found in small to moderately sized streams and rivers, as well as moderately sized reservoirs. They prefer a mixed mud, sand, and fine gravel substrate and tolerate very slow to moderate flow rates. They do not tolerate substantial water level fluctuations, scoured bedrock substrates, or shifting sand bottoms. They occur in the lower Trinity, Brazos, and Colorado River basins (TPWD 2016). The study area is within the Brazos River basin and the TXNDD reported one EO within the study area, and four EOs within ten miles of the study area (TPWD 2017) (Figure 2-5).

Texas Fawnsfoot is a mollusk that occurs in large streams and is intolerant to impoundments. Their preferred substrate possibly includes sand, gravel, and perhaps sandy-mud bottoms in moderate flows within the Brazos and Colorado River basins (TPWD 2016). The TXNDD reported one EO within the study area (Figure 2-5) and three EOs within ten miles of the study area (TPWD 2017).

Federally Delisted and State-Listed Species

Species with the potential to occur within the study area that have recently been delisted by USFWS, but are currently listed as threatened by TPWD, include the Peregrine Falcon (both the American and Artic Peregrine Falcon subspecies) and Bald Eagle. The federally delisted Louisiana Black Bear does not have potential to occur within the study area because of the lack of suitable habitat such as larger tracts of inaccessible forested areas void of roads.

The Peregrine Falcon, including the American and Arctic subspecies, occurs in a variety of habitats throughout North America. Migrants can be found in almost any open or edge habitat type in Texas and wintering individuals occur in the southern half of the state (White et al. 2002). The TXNDD does not report any EO records for this species within 10 miles of the study area; however, several recent eBird sightings have been reported near the Brazos River and

Lake Somerville within Burleson County (eBird 2017). There is the possibility for Peregrine Falcons to stop over during migration or use the study area for foraging.

Bald Eagles are typically found near rivers and large lakes and nest in large riparian trees or on cliffs near water. The TXNDD did not report any EOs within 10 miles of the study area; however, eBird reported several observations within Burleson County (TPWD 2016, eBird 2017). Additionally, appropriate habitat for the species occurs within the study area near the Brazos River and other large waterbodies such as Cade Lakes, Black Lake, Garwood Lake, and Woodrow Lake.

While not listed by USFWS, the remaining species from Table 2-12 are state-listed as threatened by TPWD. These species include the Wood Stork, Blue Sucker, Alligator Snapping Turtle, Texas Horned Lizard, and Timber Rattlesnake.

The Wood Stork inhabits fresh water cypress swamps, marshes, ponds, and lagoons. They nest in tall stands of cypress, and occasionally in mangroves or dead trees in flooded impoundments (National Audubon Society 2016). The TXNDD did not report any EOs for the species within 10 miles of the study area (TPWD 2017). However, eBird (2017) reported several records in Burleson County and one record within the study area at Black Lake and marshes and ponds occur within the study area; therefore, there is potential for this species to occur within the study area.

The Blue Sucker is a freshwater fish found in exposed bedrock, with hard clay, sand, and gravel bottoms in major Texas rivers, and prefer channels and flowing pools with a moderate flow (TPWD 2016). No TXNDD EOs were reported for this species within 10 miles of the study area (TPWD 2017). However, the Brazos River is considered a major Texas river and has the potential to include habitat for this species.

The Alligator Snapping Turtle occurs in deep, perennial waterbodies including rivers, canals, lakes, swamps, bayous, ponds, and oxbows with mud bottoms and abundant aquatic vegetation (TPWD 2016). The TXNDD did not report any EOs within ten miles of the study area. However, deep water habitats are present within the study area including the Moelhman Slough.

The Texas Horned Lizard prefers open, flat terrain with scattered vegetation. Over the past 20 years, it has almost vanished from the eastern half of the state, but still maintains relatively stable numbers in west Texas (Price 1990). They occur in arid and semi-arid regions in open

areas with sparse vegetation. Texas Horned Lizards dig for hibernation, nesting, and insulation purposes and commonly are found in loose sand or loamy soils. These soil types, such as those found in the Silstid-Padina-Jedd-Arenosa soil association, occur throughout the study area. Additionally, while the TXNDD did not report any EOs within 10 miles of the study area, individuals have been documented within Burleson County in recent years (Dixon 2013).

The Timber Rattlesnake can be found in swamps, floodplains, upland pine and deciduous woodlands, riparian zones, and abandoned farmland. The species prefers dense ground cover over limestone bluffs, sandy soil, or black clay (TPWD 2016). The TXNDD did not report any EOs for the species within 10 miles of the study area; however, suitable habitat such as floodplains, upland pine and deciduous woodland, and riparian zones occurs within the study area.

Critical Habitat

The ESA also provides for the conservation of "critical habitat," the areas of land, water, and air space that an endangered species needs for survival. These areas include sites with food and water, breeding areas, cover or shelter sites, and sufficient habitat to provide for normal population growth and behavior. One of the primary threats to endangered and threatened species is the destruction or modification of essential habitat areas by uncontrolled land and water development. Designated critical habitat for the federally endangered Houston Toad exists within the study area and includes areas surrounding Lake Woodrow (USFWS 2018) (Figure 2-5).

Sensitive Communities

While not regulated, TXNDD data also list rare and sensitive communities such as animal assemblages. TPWD generally recommends consideration for these communities and avoidance of the listed animal communities when routing linear utility corridors. However, these data do not preclude the potential for each species to exist within the study area. Only a species-specific survey could delineate potential suitable habitat and determine the presence or absence of a special status species. Within the study area, the TXNDD reported one rookery or colonial wading bird colony (Figure 2-5).

2.3.6 COMMUNITY VALUES AND COMMUNITY RESOURCES

The term "community values" is included as a factor for the consideration of transmission line certification under PURA §37.056(c)(4)(A)-(D). In prior CCN proceedings, the PUC and Commission Staff have interpreted community values to mean a shared appreciation of an area or other natural or human resource by a national, regional, or local community. The PUCT's CCN application requires information regarding the following items, which may be relevant in assessing community values:

- comments received from community leaders and members of the public during a public meeting or public open house;
- approvals or permits required from other governmental agencies;
- a brief description of the area traversed;
- habitable structures within 300 feet of the centerline of the proposed project;
- Amplitude Modulation (AM), Frequency Modulation (FM), microwave, and other electronic installations in the area;
- FAA-registered airstrips, private airstrips, and heliports located in the area; and
- irrigated pasture or croplands utilizing center-pivot or other traveling irrigation systems.

In addition, URS evaluated the Proposed Project for community resources that may be of importance to a particular community as a whole. URS has defined the term "community resources" as shared appreciation of an area or other natural or human resource recognized by a national, regional, or local community. Examples of a community resource would be a park or recreational area, historical and archaeological sites, or a scenic vista. As previously discussed, URS and LCRA TSC mailed consultation letters to various local elected and appointed officials and hosted an open house meeting to identify and collect information regarding community values and community resources.

2.3.7 LAND USE

2.3.7.1 Urban/Residential Areas

The study area is situated across approximately 314 square miles in portions of northwestern and central Burleson County, Texas. The majority of the study area is located in rural undeveloped lands. The communities, towns, and cities present within the study area include

Caldwell, Lyons, Deanville, Cooks Point, Chriesman, Tunis, San Antonio Prairie, Center Line, Hogg, Frenstat, and Birch. As previously discussed, URS and LCRA TSC solicited information regarding environmental and/or land use constraints within the study area from the City of Caldwell; Burleson County; Caldwell ISD; and various state and federal regulatory agencies (Appendix A). No current or proposed urban or residential projects were identified during the information solicitation process.

Habitable Structures

In PUCT Substantive Rule 25.101(a)(3), habitable structures are defined as "structures normally inhabited by humans or intended to be inhabited by humans on a daily or regular basis." "Habitable structures include, but are not limited to, single-family and multi-family dwellings and related structures, mobile homes, apartment buildings, commercial structures, industrial structures, business structures, churches, hospitals, nursing homes, and schools." Locations of habitable structures were identified during site reconnaissance and aerial photography evaluation. Concentrations of habitable structures within the study area are largely limited to the limits of the above-listed communities, towns, and cities, with the exception of rural, large tract properties scattered throughout the study area.

Schools

The study area is located within the Caldwell ISD. Five existing Caldwell ISD schools are located within the study area (Caldwell ISD 2018).

2.3.7.2 Existing Linear Facilities and Other Features

In accordance with PUCT Substantive Rule 25.101(b)(3)(B), paralleling or utilizing existing compatible ROWs and other features should be considered as opportunities when selecting transmission line route alternatives. Such compatible ROWs include electrical transmission lines, telephone utilities, railroads, and roadways. Other features include apparent property boundaries or other natural or cultural features. Data sources used to identify existing electrical transmission lines include utility company and regional system maps, Platts data (2012), aerial photography, USGS topographic maps, and field reconnaissance. Three existing transmission lines were identified within the study area. These include a BBEC 138-kV transmission line in the southern portion of the study area that roughly parallels the southern study area boundary, and two Entergy Texas, Inc. 69-kV transmission lines, one that extends from the southeastern

portion of the study area northwest to the City of Caldwell and one that extends northeast from the City of Caldwell through the Cooks Point community.

2.3.7.3 Recreational Areas

The PUCT CCN Application requires reporting of parks and recreational areas owned by a governmental body or an organized group, club, or church. URS conducted a review of federal, state, and local websites and maps, as well as reconnaissance surveys, to identify parks and recreational facilities in the study area.

No National Park Service (NPS) parks, wild and scenic rivers, national monuments, national recreation areas, national preserves, national battlefields, or additional other national historic sites are located within the study area (NPS 2018a). A review of the NPS website did identify segments of the El Camino Real de los Tejas National Historic Trail within the study area, closely following SH 21 and extending north from the Lake Somerville area. (NPS 2018a). The trail is not a continuous hiking trail, but an historical corridor that passes through communities and areas of variable land ownership. Designated by the NPS in 2004, the El Camino Real de los Tejas National Historic Trail is a combination of historic routes totaling approximately 2,580 miles, from the Río Grande near Eagle Pass and Laredo, Texas, to Natchitoches, Louisiana (NPS 2018b). For additional information on the trail, see Section 2.9.

There are no TPWD-managed parks located within the study area (Appendix A) (TPWD 2018b). No conservation easements, wildlife management areas, wildlife management associations, or hike and bike trails have been identified in the study area (USGS 2016, National Conservation Easement Database 2018).

Eleven local parks were identified within the study as listed and detailed in Table 2-13. Locations of the identified parks and recreation areas can be found in Appendices C-D.

TABLE 2-13 RECREATIONAL FACILITIES WITHIN THE STUDY AREA

Location	Facility	Description
Caldwell	Davidson Creek Park	The park is located off of SH 36 at 600 Davidson Creek Park. It includes fishing ponds, horseshoe pits, washer pits, soccer fields, baseball fields, batting cages, covered basketball court, picnic areas, playground areas, and a nine-hole disc golf course.
Caldwell	Copperas Hollow Country Club	This is a city, nine-hole golf course and country club located on Country Club Road approximately 0.80 miles northwest of SH 21 in Caldwell.
Caldwell	Molly Street Park	This is a neighborhood park located on Molly Drive near Stone Street Retirement Ltd. Apartments. The park includes a playground area and a picnic table.

Location	Facility	Description
Caldwell	Womack Ditch Park	This is a neighborhood park located off of North Shaw Street near East Old San Antonio Road. The park includes a fenced-in playground area.
Caldwell	Freeman Park	This is a neighborhood park located at the intersection of Freeman Street and Elm Street. This park has a playground area, baseball field, basketball court, and picnic areas.
Caldwell	Santa Fe Park	This is a neighborhood park located in between City Street and North Stone Street. This park includes a playground area, baseball fields, tennis courts, and picnic areas.
Caldwell	Caldwell Elementary School	This is a public elementary school located on CR 300. It includes a playground area.
Caldwell	Caldwell High School	This is a public high school located on CR 300. It includes a football field, track, and baseball field.
Burleson County	TxDOT Rest Area 1	This is a TxDOT rest area located on SH 36, approximately four miles northwest of Lyons. This area contains parking spaces and picnic tables.
Burleson County	TxDOT Rest Area 2	This is a TxDOT rest area located on SH 21 approximately two miles southwest of Cooks Point. This area contains parking spaces, picnic tables, and a historical marker for Elizabeth Chapel Methodist Church (7571) and Fort Tenoxtitlan (8634). For additional information please refer to Section 2.9.
Deanville	Deanville Memorial Park	This is a city park located approximately one mile northeast of Deanville, off FM 111. This park includes a baseball diamond.

Source: Burleson County 2018, THC 2017

Additional recreational activities such as hunting and fishing may occur on private properties throughout the study area. Although not designated as a federal, state, or local recreational area, the Brazos River, located just outside the study area, and its tributaries have been documented as locations for recreational activities such as paddling and fishing (The Brazos River Authority 2018).

2.3.7.4 Agriculture

Burleson County is located in District 8-North (South Central) of the National Agricultural Statistics Service (NASS). According to the NASS, the primary crops in the study area are forage (land used for all hay and haylage [similar to hay, but baled with moisture content relatively high]), corn for grain, cotton, upland cotton, and sorghum for grain (NASS 2012). The NASS 2012 Census of Agriculture also indicates that the primary livestock categories within Burleson County include chickens, layers (chickens for egg production), cattle, and roosters. Agriculture is an important part of the economy throughout the region and primarily represented by cropland, pastureland, and ranchland.

Two center-pivot irrigation systems, a form of overhead sprinkler irrigation for agricultural lands, were observed in the study area during site reconnaissance and from aerial photography evaluation in the northwestern and southeastern portions of the study area.

2.3.7.5 Aesthetics

Aesthetics is included as a factor for consideration in the evaluation of transmission facilities in PURA §37.056(c)(4)(A)-(D). For the purpose of this study, the term aesthetics is utilized by URS to address the subjective perception of natural beauty in a landscape. This evaluation attempts to define and measure the study area's scenic qualities.

Consideration of the visual environment includes a determination of aesthetic values (where the major potential effect of a project on the resource is considered visual) and recreational values (where the location of a transmission line could potentially affect the scenic enjoyment of the area).

URS considered the following aesthetic values in this study that combine to give an area its aesthetic identity:

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

The study area is primarily rural with concentrations of residential and commercial development within the City of Caldwell and along SH 21 and SH 36. The predominant land use within the study area is undeveloped or agricultural land. Much of the study area has been impacted by land improvements associated with agriculture, residential and commercial structures, electric utility corridors, substations, railroads, roadways, petrochemical production, and pipelines. The overall landscape of the study area consists of a mix of post oak woods, improved pasture, rangeland, and some cropland intermingled with major streams and bottomland forests.

No known designated views or national scenic roadways are within the study area. The study area is located within the Brazos Trail Region, and sites of interest include the Burleson County Museum, Burleson County Czech Heritage Museum, and Caldwell Visitors Center Museum (THC 2018), all of which are located within the City of Caldwell.

As previously discussed, a review of the NPS website did not indicate any Wild and Scenic Rivers, National Parks, National Monuments, National Historic Sites, National Historical Landmarks, or National Battlefields within the study area. The website did indicate the existence of the El Camino Real de los Tejas National Historic Trail in the study area with trail segments closely following SH 21 and extending north from the Lake Somerville area. Although there are no physical hiking facilities or other infrastructure associated with the trail, the viewshed from the El Camino Real de los Tejas National Historic trail may be considered historically important, depending on the location/orientation of landscape features and/or historic structures.

Based on these criteria, the study area exhibits a generally moderate degree of aesthetic quality. The study area maintains the feel of a rural community with agriculture uses and range land, undulating hills and drainage features throughout. Although some portions of the study area might be visually appealing, the overall aesthetic quality of the study area is not distinguishable from that of other adjacent areas in the region.

2.3.7.6 Transportation/Aviation

Transportation

Federal, state, and local roadways were identified using TxDOT county transportation maps and field reconnaissance surveys. The existing transportation system in the study area includes two state highways (SH 21 and SH 36), 14 FM roads (FM 111, FM 1362, FM 1363, FM 166, FM 2000, FM 2039, FM 2774, FM 3058, FM 50, FM 60, FM 696, FM 908, FM 975, and FM 976), several county roads, and local roadways.

URS reviewed TxDOT's "Project Tracker," which contains detailed information by county for every road/highway project scheduled for construction. According to the TxDOT Project Tracker, there are 23 planned roadway projects within the study area (TxDOT 2018) (Table 2-14; Figure 2-6).

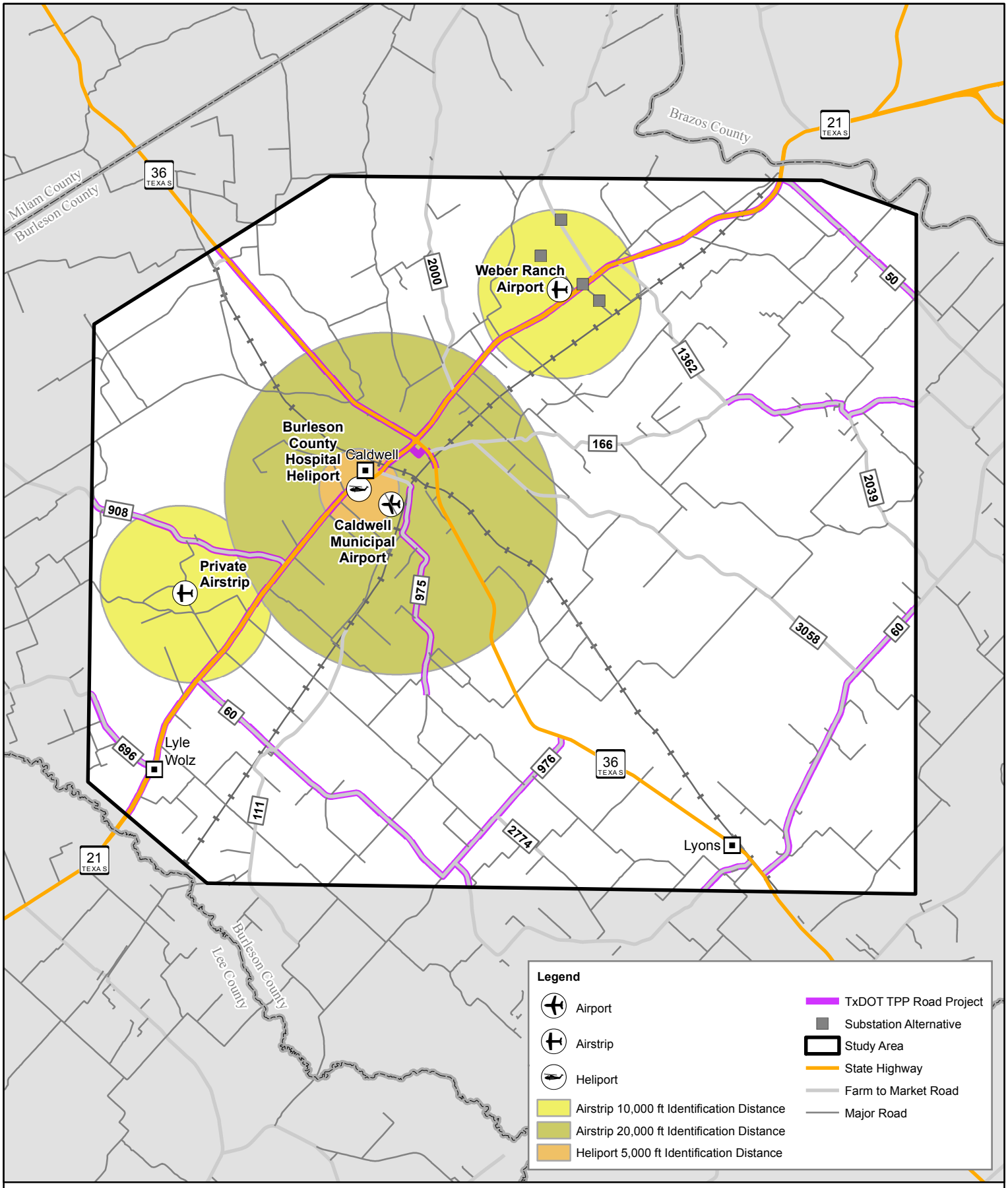


Figure 2-6

Transportation and Aviation Map

Cooks Point 138-kV Transmission Line Project
Burleson County, Texas

Data Source: Federal Aviation Admininstration (FAA), Lower Colorado River Authority (LCRA), Platt's Energy, Texas Department of Transportation (TxDOT)
Map Update: 5/25/2018

0 1.5 3 Miles

TABLE 2-14 PLANNED ROADWAY PROJECTS WITHIN THE STUDY AREA

Project Owner	County	Roadway	Planned Improvements	Project Limits	CSJ No.*
TxDOT	Burleson	SL 83	Construction of sidewalks and curb ramps	From SH 21 to SH 36	011606008
TxDOT	Burleson	SH 21	Construction of sidewalks and landscape development	From North Broadway Street to SL 83	011603060
TxDOT	Burleson	FM 60	Construction of a new facility	From 1.2 miles west of FM 2039 to 0.62 mile east of Old River	064803050
TxDOT	Burleson	FM 60	Construction to widen an existing facility	From 2.0 miles east of SH 36 near CR 426 to 0.8 mile west of FM 2039	064803051
TxDOT	Burleson	FM 60	Construction to widen an existing facility	From SH 36 to 2.0 miles East of SH 36 near CR 426	064803049
TxDOT	Burleson	FM 60	Resurface and repaint pavement markings	From SH 21 west to FM 111	071301032
TxDOT	Burleson	FM 60	Resurface	From FM 111 to SH 36	071301031
TxDOT	Burleson	FM 976	Resurface	From FM 60 to SH 36	113001018
TxDOT	Burleson	SH 36	Milled edgeline rumble strips and centerline rumble strips	From Burleson / Milam County Line to SH 21	018602029
TxDOT	Burleson	FM 908	Install pavement stripes/markers	From Burleson / Milam County Line to SH 21	085803016
TxDOT	Burleson	SH 36	Hydraulic feasibility study	At UPRR underpass in Caldwell	018603062
TxDOT	Burleson	FM 60	Install pavement stripes/markers	From FM 976 to SH 36	071301036
TxDOT	Burleson	FM 50	Install pavement stripes/markers	From 0.008 Mile northwest of SH 21 to FM 60	064803067
TxDOT	Burleson	FM 166	Resurface	From FM 1362 to FM 50	095501026
TxDOT	Burleson	FM 60	Resurface	From SH 21 to FM 111	071301038
TxDOT	Burleson	FM 60	Install pavement stripes/markers	From 0.009 Mile northwest of SH 21 to FM 976	071301037
TxDOT	Burleson	SH 21	Resurface	From Lee County Line to 0.7 mile south of FM 975	011602044
TxDOT	Burleson	FM 975	Resurface and repaint pavement markings	From UPRR overpass to end of state maintenance	112901028
TxDOT	Burleson	FM 696	Resurface	From Burleson / Lee County Line to SH 21	150702015
TxDOT	Burleson	FM 60	Reconstruct and replace existing railroad underpass	At UPRR 0.2 mile northwest of FM 111 in Deanville	071301039
TxDOT	Burleson	FM 908	Resurface	From Burleson / Milam County Line to SH 21	085803017
TxDOT	Burleson	FM 60	Resurface	From SH 36 to FM 2155	064803069
TxDOT	Burleson	SH 21	Resurface	From FM 975 to Burleson / Brazos County Line	011603061

**CSJ – Control Section Job*
Source: TxDOT 2018

Railroads located within the study area include the BNSF main line, side tracks, and business leads; and the UPRR mainline, side tracks, and spur line.

Aviation

URS conducted a review of the following resources to identify airstrips in the vicinity of the study area: airport runway and facilities data from AirNav.com, recent aerial photography (October 2017), and field reconnaissance surveys. This review resulted in the identification of one municipal airport, one private airport, one private airstrip, and one heliport as detailed in Table 2-15 below and depicted on Figure 2-6 and Appendices C-D.

TABLE 2-15 AVIATION FACILITIES WITHIN THE STUDY AREA

Facility Name	Description	Runway Length (ft)
Caldwell Municipal Airport	City-owned airport with runway	3,252
Weber Ranch Airport	Private use airport with two runways	2,800; 853
Private Airstrip	Private airstrip with one runway	2,575
Burleson County Hospital Heliport	Hospital heliport	-

Source: AirNav 2018

2.3.7.7 Communication Towers

Federal Communications Commission (FCC) database research and field observation resulted in the identification of 36 communication towers within the study area, including 30 Antenna Structure Registration (ASR) towers (FCC 2013). Six additional towers were noted during field reconnaissance. Signage on two of the towers indicated that they were owned by San Antonio MTA, L.P., while the ownership of the remaining four communication towers is unknown, as there were no discernable indicators noted during the reconnaissance. Locations of the communication towers within the study area can be found in Appendices C-D.

2.3.8 SOCIOECONOMICS

This section presents a summary of economic and demographic characteristics for Burleson County and describes the socioeconomic environment of the study area. Literature sources reviewed include publications of the U.S. Census Bureau (USCB) and the Texas Demographic Center (TDC).

2.3.8.1 Population Trends

Burleson County experienced a population increase between 2000 and 2010 of four percent. By comparison, population at the state level increased by nearly 21 percent during the same decade (USCB 2018). According to TDC growth projections, Burleson County is projected to experience a one percent population increase from 2020 to 2030 and then a one percent population decrease

from 2030 to 2040. The population of Texas is expected to experience population increases of six percent from 2020 to 2030 and five percent from 2030 to 2040 (TDC 2018). Table 2-16 presents the past population trends and projections for Burleson County and for the State of Texas.

TABLE 2-16 POPULATION TRENDS

State/County	Past		Projected		
	2000	2010	2020	2030	2040
Texas	20,851,820	25,145,561	27,238,610	28,994,210	30,305,304
Burleson County	16,470	17,187	17,437	17,623	17,375

Source: USCB 2018; TDC 2018

2.3.8.2 Employment

The civilian labor force (CLF) in Burleson County increased from 2000 to 2016 by 8.6 percent (658 people). By comparison, the CLF at the state level grew by 34 percent (3,388,964 people) over the same period (USCB 2000 and 2016). Between 2000 and 2016, Burleson County experienced an increase in its unemployment rate from 4.7 percent in 2000 to 6.5 percent in 2016. By comparison, the State of Texas also experienced a small increase in the unemployment rate over the same time period, from 6.4 percent in 2000 to 6.8 percent in 2016 (USCB 2000 and 2016). Table 2-17 presents the CLF, employment, and unemployment data for Burleson County and the State of Texas for the years 2000 and 2016.

TABLE 2-17 LABOR FORCE AND EMPLOYMENT

State/County	2000	2016
Texas		
Civilian Labor Force	9,830,559	13,219,523
Employment	9,234,372	12,371,392
Unemployment	596,187	848,131
Unemployment Rate	6.4%	6.8%
Burleson County		
Civilian Labor Force	7,360	7,988
Employment	7,024	7,499
Unemployment	336	489
Unemployment Rate	4.7%	6.5%

Source: USCB Census 2000 and 2012-2016 ACS 5-Year Estimates

2.3.8.3 Leading Economic Sectors

The major occupations in Burleson County in 2016 are listed under the category of management, business, science, and arts occupations, followed by the categories of service occupations; sales and office occupations; natural resources, construction, and maintenance occupations; and production, transportation, and material moving occupations (USCB 2016). Table 2-18 presents the number of persons employed in each occupation category during 2016 in Burleson County.

TABLE 2-18 OCCUPATIONS IN BURLESON COUNTY

Occupation	Burleson County
Management, business, science, and arts occupations	2,020
Service occupations	1,299
Sales and office occupations	1,573
Natural resources, construction, and maintenance occupations	1,224
Production, transportation, and material moving occupations	1,383

Source: USCB 2012-2016 ACS 5-Year Estimates

From 2000 to 2016, the industry group employing the most people in Burleson County was educational services health care and social assistance. The industry group that experienced the most growth from 2000 to 2016 was manufacturing, which experienced a 38 percent increase (274 people) (USCB 2016). Table 2-19 presents the number of persons employed in each of the industries in Burleson County for the years 2000 and 2016.

TABLE 2-19 INDUSTRIES IN BURLESON COUNTY

Industry Group	Burleson County	
	2000	2016
Manufacturing	726	1,000
Construction	626	590
Educational services Health care and social assistance	1,798	1,940
Agriculture, forestry, fishing and hunting, and mining	679	721
Retail trade	832	718

Source: USCB Census 2000 and 2012-2016 ACS 5-Year Estimates

2.3.9 CULTURAL RESOURCES

2.3.9.1 Cultural Background

The study area primarily falls within the east-central portion of the Post Oak Savannah ecological region, which consists of a vegetative mosaic of post oak forest, grasslands, and parklands situated between the Blackland Prairies to the west and the Pineywoods to the east. The prehistory and history of this area is divided into the Paleoindian, Archaic, Late Prehistoric, and Historic periods. Each is defined on the basis of unique material culture assemblages observed in the archaeological record.

Paleoindian Period

The Paleoindian period, which began as early as 11,200 years before present (B.P.), is characterized by highly mobile hunter-gatherers who seasonally migrated. Large game hunting comprised an important aspect of prehistoric subsistence, though deer and smaller animals were likely consumed also. Paleoindian sites in the Post Oak Savannah are exceedingly rare. When found, they tend to be situated on older geologic surfaces, or on lower slope settings adjacent to small streams (Rogers 1995). These sites tend to be mixed with Archaic and Late Prehistoric materials. Site discovery in deep alluvial settings is generally limited to chance

encounters in stream cutbanks, and few deeply buried sites have been documented. Archaeological evidence for the Paleoindian period in this region mostly consists of isolated projectile points, including the Dalton, San Patrice, Angostura, Clovis, and Folsom types (Thoms et al. 2004). Due to the high mobility of Paleoindian groups, many of the projectile points found were made from non-local stone materials, suggesting the occurrence of long-distance trade.

Archaic Period

The Archaic period occurred from approximately 8000 to 1300 B.P. and is traditionally subdivided into Early, Middle, and Late periods. A Transitional Archaic or Early Ceramic sub-period is sometimes included in local cultural chronologies after the Late Archaic period (Thoms et al. 2004). During the Archaic period, Native Americans practiced a generalized hunting strategy that included small game animals. Gathering of wild plant foods and fishing also took place. Stone tools were usually made from local lithic tool-stone materials. Stone-lined hearths, baking pits, and ground-stone tools were commonly used, and sites from this period often contain greater artifact densities (Story 1990). Overall, however, Early and Middle Archaic sites are rare, while Late Archaic sites are better represented (Story 1990).

The Early Archaic period is not well understood in this region because of the low number of sites that have been identified and fully investigated (Fields et al. 1996). Likely, generalized hunting was practiced, which relied on the use of dart points such as Gower, Martindale, and Uvalde types. Other tools documented in Early Archaic sites include pitted stones, hammerstones, and manos, which suggests that local resources were intensively utilized. Some fire-cracked rock and hearth features are present, but occur in low density. Early Archaic sites tend to be found on the lower slope portions of interfluves along small streams (Thoms et al. 2004). Subsistence was generalized, and deer and rabbit were likely important game resources, along with floral resources such as acorns, pecans, and hickory nuts.

Middle Archaic sites are poorly represented in the Post Oak Savannah (Fields et al. 1996; Thoms et al. 2004). The occurrence of numerous burned rock features and grinding stones at some sites suggests populations were fairly sedentary. Middle Archaic sites tend to be concentrated along the lower slope portions of small stream interfluves, and are oftentimes mixed with Early Archaic deposits. The presence of corner-notched projectile points suggests some bison exploitation was practiced, while grinding stone tools and burned rock features suggests an

increased reliance on nuts and wild plant foods. Large burned rock middens, which were common in Central Texas during this time, are mostly absent from the region, though a few have been documented in the far western edge of the Post Oak Savannah.

Late Archaic sites are characterized by abundant hearth features, nutting stones, rock-lined features, and burned rock concentrations, and tend to be situated on landforms adjacent to tributary stream floodplains, and on sandy knolls and on high terraces (Story 1990). Diagnostic artifacts include contracting stem dart points such as Gary, Kent, and Wells types. A wider subsistence base was likely exploited during this period as site excavations have yielded evidence of turtle, beaver, bison, rabbit, and deer (Story 1990; Thoms et al. 2004). The recovery of floral remains from these sites suggests that the native populations also consumed acorns, pecans, hickory nuts, and prairie turnips, which points to an increasingly sedentary lifestyle as populations grew and congregated (Perttula et al. 1993). Increased use of local lithic material and the use of cemeteries suggest the formation of group territories. The recovery of long-distance trade items also indicates that trading networks were developing.

Beginning around 2200 B.P., evidence suggests that there was a Woodland-like or Early Ceramic transitional period in this region (Fields et al. 1996; Story 1990; Thoms et al. 2004). This transitional period is represented by increased sedentism and utilization of uplands, resulting in greater artifact densities at sites (Perttula et al. 1993; Thoms et al. 2004). The emergence of ceramic technology, such as the use of sandy-paste Goose Creek pottery, is also evident and suggests an increased reliance on plant foods. The utilization of Scallorn and Bonham arrow points, thin bifaces, and end-scrapers underscore the overall importance of hunting in subsistence (Story 1990; Thoms et al. 2004).

Late Prehistoric Period

Within the study area, the Late Prehistoric period closely follows the cultural chronology for Central Texas, and ranges from approximately 1300 to 300 B.P. Use of the bow and arrow began during this period, along with an increased use of ceramics. Corn horticulture was practiced, and house structures likely consisted of circular pole-and-thatch constructions. Arrow points representative of this period include Scallorn, Catahoula, Steiner, Alba, and Bonham types. Ceramic technology included the use of grog, bone, and shell temper and clay pastes (Fields et al. 1996). Decorative wares also became more common than in the preceding transitional phase, and there was likely a systematic revisiting of long-term campsites (Thoms et al. 2004).

During the latter portion of the Late Prehistoric period, a Plains Village-like assemblage emerged, particularly in the northern and western reaches of the Post Oak Savannah that are adjacent to the Blackland Prairies. The artifact assemblage includes contracting-stem arrow points such as Washita, Fresno, Perdiz, and Harrell arrow points. Scrapers, beveled-edged knives, and flake drills were also used. Ceramics are mostly shell-tempered Nocona Plain types. Such an assemblage was probably geared toward bison exploitation. Research indicates bison were in substantially higher numbers during this time (Creel 1991; Dillehay 1974; Huebner 1991; Prewitt 1981). In the eastern part of the Post Oak Savannah, increased use of stylistic and utilitarian ceramics developed because of the close association with the Caddo culture. Ranked societies, civic and ceremonial centers (e.g., mounds), extensive trade networks, and elaborate mortuary practices have been identified archaeologically in the Caddo region and its peripheries (Perttula et al. 1993).

Historic Period

Early European exploration during the 17th and 18th centuries was essentially limited to passing through the territory. LaSalle reached the middle Trinity River basin in 1687, followed by several Spanish expeditions. Domingo Terán de los Ríos likely passed through the region on his way to Northeast Texas in 1690. In 1713, French explorer and trader Louis Juchereau de St. Denis likely traveled through the area now encompassed by Burleson County (Jackson 2017). He followed a series of trails between the Trinity River and San Antonio, which collectively became known as the *Caminos Reales* (Jackson 2017). Historic native groups described during early European forays into the Post Oak Savannah include the Tonkawa, Wichita, Kichai, Yojuane, Caddo, Delaware, and Kickapoo.

The earliest European settlements in the Post Oak Savannah region occurred much later following the Mexican national colonization laws of 1824 and the empresario grants issued by the Mexican state law of Coahuila and Texas in 1825. Under the empresario system, large tracts of undeveloped land were given to empresarios (land agents) who were responsible for the settlement of a specified number of families within an agreed-upon schedule. The U.S. Anglo-American settlement of the region began with the establishment of a colony by Sterling C. Robertson, who issued land patents north of the Old San Antonio Road. Further growth within the future Burleson County area occurred after the Republic of Texas was established. Many early settlers came from the southern states of Tennessee, Kentucky and Alabama. In an effort

to maintain control of the area, the Mexican government enacted the Mexican Law of April 6, 1830, which prohibited the further immigration of citizens from the U.S. (Barker 2014). The law had little effect, as new settlers continued to immigrate into Mexican territory. By 1836, Texas gained its independence from Mexico, and the newly formed Republic of Texas opened the region for settlement.

In 1840, George B. Erath platted the town site of Caldwell where the Old San Antonio Road crossed Davidson Creek. In 1846, the first legislature of the State of Texas established Burleson County, named for General Edward Burleson, and designated Caldwell as the county seat (Jackson 2017). Prior to the Civil War, large plantations were established in the eastern part of Burleson County where fertile soils border the Brazos River. This area accounted for most of the agricultural production in the county, which consisted primarily of crops such as cotton and corn. The raising of livestock, such as cattle, hogs and sheep, was located primarily in the central and western parts of the County. After the Civil War, economic recovery in Burleson County was slow and farm values fell. By the end of the 19th century, the farming and livestock industries recovered somewhat, but the cultivation of cotton increased slowly after the war and eventually developed into the county's economic mainstay. In 1870, 6,423 bales of cotton were produced; by 1900, the number of bales produced had grown to 25,243 (Jackson 2017).

During the 1860s and 1870s, an increase in the Burleson County population resulted from the arrival of Civil War refugees from southern states including Alabama, Mississippi and Tennessee. During the 1880s, numerous immigrants, particularly from Germany and Austria, settled in the county. A large group of Czechs established the towns of Frenstat, New Tabor, and Sebesta. During the 1890s, Italians, mostly from Sicily, settled in eastern Burleson County. Many of the new arrivals became tenant cotton farmers. During the Reconstruction period, many African Americans took up tenant farming, and comprised 37 percent of the population in 1870, and 46 percent in 1910. By 1920, Burleson County's African American population dropped to 24 percent, and continued to drop throughout the Great Depression of the 1930s. Mexican migrant workers subsequently moved to Burleson County to fill the shortage of agricultural labor (Jackson 2017). In 1930, 91,021 acres were devoted to the cultivation of cotton, but by 1940, the number of acres in cultivation dropped by almost half due to diminishing soil fertility, as well as the depression-era low prices and New Deal acreage-reduction programs.

The decline in cotton production continued over the next half century, and by 1987, only 8,431 acres were cultivated for cotton in the county (Jackson 2017).

By the end of World War II, most of the land used for cotton cultivation was converted to livestock production, which developed into Burleson County's most important industry. By 1982, 75 percent of the county's agricultural revenue was derived from livestock. However, only 14 percent of the county's labor force remained employed in agriculture at that time, while 17 percent were employed in trade, 17 percent in manufacturing, and 20 percent in the service industry. Almost one-third of the work force was employed in surrounding counties in such communities as Rockdale, Bryan, and College Station. In 2002, the county had 1,550 farms and ranches covering 388,982 acres, 51 percent of which were devoted to pasture and 34 percent to crops (Jackson 2017).

In 2014, the census counted 17,253 people living in Burleson County. Caldwell with a population of 4,210 is the largest city. Other communities include Somerville (1,313), Snook (505), and Lyons (360). In the early 21st century, oil and gas production, tourism, and agribusiness were important elements of the area's economy and many residents worked at Texas A&M University in neighboring Brazos County (Jackson 2017).

2.3.9.2 Previous Investigations

Cultural resources include archaeological and historical resources (such as prehistoric or historic sites, districts, buildings, structures, cemeteries, or objects). Historic properties are those properties that are listed in, or are eligible for listing in, the National Register of Historic Places (NRHP). Information on known cultural resources and cultural history was compiled relative to the study area.

Data from the Texas Archaeological Sites Atlas (TASA), maintained by the THC and TARL, was reviewed to identify previously recorded archaeological sites and previous investigations within the study area. A total of 34 cultural resources sites have been recorded and assigned archaeological site numbers within the study area (Table 2-20). Of these, 27 sites contain only historic materials, six sites contain only prehistoric cultural materials, and one site contains both prehistoric and historic cultural materials. For sites containing a prehistoric component, most (approximately 57 percent) are classified as campsites, followed by undetermined prehistoric sites (approximately 29 percent), and lithic scatter sites (approximately 14 percent) (Table 2-21).

Within historic component sites, most (approximately 43 percent) are made up of cemeteries (n=12) that have been assigned trinomials, followed by farmstead-related sites (approximately 18 percent), school sites (approximately 11 percent), and homestead sites (approximately seven percent). The remaining approximately 21 percent of historic sites are represented by single occurrences of a jail, fort, theater, stage stop, railroad depot, and World War II training site (Table 2-22). There are 36 additional cemeteries present within the study area; however, these have not previously been assigned trinomials. These are discussed below in the historic records review in Section 2.3.9.3.

Of the 34 recorded archaeological sites in the study area, only the Kraitchar House (41BU92) is listed in the NRHP. Two sites have been determined not eligible for listing in the NRHP. Twenty-three sites currently have no designations. Eight of the 12 cemeteries in the study area with previously assigned site trinomials have Historic Texas Cemetery (HTC) designations. No sites within the study area are currently designated as State Antiquities Landmarks.

TABLE 2-20 PREVIOUSLY RECORDED ARCHAEOLOGICAL SITES WITHIN THE STUDY AREA

Site	Period	Recorded Type	Description	Designation
41BU15	Prehistoric	Undetermined	Isolated biface	Undetermined
41BU17	Prehistoric	Open campsite	Late Prehistoric points, scrapers, bifaces, flakes	Undetermined
41BU22	Prehistoric	Lithic scatter	Lithic debitage	Undetermined
41BU49	Prehistoric	Open campsite	Lithic debitage	Undetermined
41BU54	Prehistoric	Campsite	Ceramics and grinding stone	Determined Ineligible – 1/30/06
41BU55	Prehistoric	Campsite	Arrow points	Undetermined
41BU76	Historic	Farmstead	Structures	Determined Ineligible – 3/10/05
41BU77	Historic	Fort Oldham	1830-1840s fortified log house with surrounding buildings; mail stop	Undetermined
41BU78	Historic	Oldham Cemetery	African American Cemetery, from 1830s-present; approximately 80 gravesites	Undetermined
41BU81	Historic	Farmstead	20th century log smokehouse, 2 houses, and outbuildings	Undetermined
41BU82	Historic	Unknown Grave (BU-C100)	Single child burial (early 1900s)	Undetermined; HTC (2008)
41BU84	Historic and Prehistoric	Farmstead; unknown prehistoric	Buffalo Springs Kiln and artifacts; 1800s brick kiln and home site; prehistoric arrow points, grinding stones, and knives	Undetermined

Site	Period	Recorded Type	Description	Designation
41BU85	Historic	Cistern; stage stop	Skrivanek Cistern; Underground cistern made of handmade red-clay bricks, from 1840-1860s; located along former stagecoach stop along Old San Antonio Road	Undetermined
41BU86	Historic	Salem Baptist (Post Oak) Cemetery (BU-C031)	1880-1930; associated with Salem Baptist Church; 33 known burials	Undetermined; HTC (2009)
41BU89	Historic	Kramer Cemetery (BU-C039)	Historic Cemetery from 1903-present; approximately 40 graves, including obelisks and military stones. Possible unmarked graves	Undetermined; HTC (2004)
41BU90	Historic	School site	Site of Liberty (Germania [1876]) School and underground cistern	Undetermined
41BU91	Historic	Old City (Old City Cemetery at Caldwell, Caldwell City Cemetery) Cemetery (BU-C034)	Old City Cemetery in Caldwell; 1843-1950s; 200 known graves, and numerous unmarked graves	Undetermined
41BU92	Historic	Homestead - Kraitchar House (1891)	Carriage house, shed, cistern	NRHP (2002)
41BU93	Historic	School site	Chriesman Colored School and water well	Undetermined
41BU94	Historic	World War II military pilot training site	Smith Field, a WWII airfield used during the 1940s; runways still visible	Undetermined
41BU95	Historic	Bird-Harmony Cemetery (BU-C058)	Established in 1880s, with graves from 1884-1991; approximately 60 marked burials; 10 to 12 grave depressions suggest unmarked burials	Undetermined; HTC (2010)
41BU96	Historic	Jezek Cemetery (BU-C061)	1870s Czech Cemetery containing numerous unmarked graves; 1881-1912	Undetermined; HTC (2011)
41BU97	Historic	Farmstead	Gabriel Jackson homestead; remains of Gabriel Jackson's house, cistern, or well	Undetermined
41BU98	Historic	Railroad depot	Site consists of remains of historic Houston and Texas Central Railroad depot; contains scatter of brick, concrete footings, and foundation	Undetermined
41BU99	Historic	Poor Farm and Cemetery (BU-C073)	Established in 1885; Unmarked graves in pasture; estimated 30 burials, though headstones have been removed	Undetermined

Site	Period	Recorded Type	Description	Designation
41BU100	Historic	Beaird (Birdsong) Cemetery (BU-C017)	Late 1800s cemetery containing approximately 27 marked graves and numerous unmarked depressions; 1895-present	Undetermined
41BU101	Historic	School site	Historic Caldwell High school gymnasium (1941); building intact and currently part of middle school	Undetermined
41BU103	Historic	Farmstead	Kubecka dairy barn, built 1941-1942; demolished in 1990s	Undetermined
41BU104	Historic	Rowland (Seven Star) Cemetery (BU-C077)	Over 400 graves beginning in 1890s	Undetermined; HTC (2004)
41BU105	Historic	Movie theater	Matsonian Theater built in 1930 (Caldwell Movie Theater); demolished	Undetermined
41BU108	Historic	Providence Cemetery (BU-C002)	Established in 1830s; 1841 earliest known grave; contains over 600 marked burials, and numerous unmarked depressions;	Undetermined; HTC (2000)
41BU109	Historic	Christian (Frenstat, Mynar, Sobotik) Cemetery (BU-C018)	Historic cemetery dating to 1880s; approximately 19 marked graves, and various unmarked graves	Undetermined; HTC (2006)
41BU111	Historic	Jail - Caldwell Calaboose	Historic jail, located in downtown Caldwell; 1901-present; still standing and in excellent condition	Undetermined
41BU120	Historic	Homestead	Historic homestead with two sheds, a dog house or coop structure, and material evidence of other structures. Many of the structures have burned or are falling down	Undetermined

Source: TASA 2017

TABLE 2-21 PREHISTORIC ARCHAEOLOGICAL SITE TYPES BY PERCENT WITHIN THE STUDY AREA

Site Type	Approximate Percent
Campsite	57.0
Undetermined Prehistoric	29.0
Lithic Scatter	14.0

Source: TASA 2017

TABLE 2-22 HISTORIC ARCHAEOLOGICAL SITE TYPES BY PERCENT WITHIN THE STUDY AREA

Site Type	Approximate Percent
Cemetery	43.0
Farmstead-related	18.0
School sites	11.0
Homestead/house site	7.0
Jail	3.5
Fort	3.5
Theater	3.5
Stage Stop	3.5
Railroad Depot	3.5
WW II Training Site	3.5

Source: TASA 2017

A total of 14 previous archaeological investigations have been conducted within the limits of the study area (Table 2-23), including six areal surveys from 1983 to 2006, five linear surveys from 1980 to 1993, one NRHP eligibility testing project in 1987, and one data recovery project in 1985. In addition, there is a TxDOT survey in which site 41BU76 was recorded, but the survey does not show up on the TASA. Linear surveys are mainly the result of investigations related to infrastructure projects such as highways, pipelines, utilities, and transmission lines. Areal surveys, testing, and excavations in the study area are primarily related to archaeological investigations for Soil Conservation Service (SCS) projects, housing sites, and some highway-related projects. The majority of the study area has not been previously surveyed for cultural resources.

TABLE 2-23 PREVIOUS CULTURAL RESOURCES INVESTIGATIONS WITHIN THE STUDY AREA

Type of Investigation	Year	Agency	Antiquities Permit No.
Linear Survey	1980	USACE-Ft Worth District	-
Areal Survey	1983	SCS	-
Areal Survey	1983	SCS	-
Data Recovery (41BU17)	1985	Texas A&M University (Bowman 1985)	-
Areal Survey	1986	Rural Electrification Administration (REA)	-
Linear Survey	1986	REA	-
Areal Survey	1987	Federal Housing Authority FHWA	-
Linear Survey	1987	FHWA	-
Site Testing (41BU49)	1987	FHWA	-
Linear Survey	1990	State Department of Highways and Public Transportation (SDHPT)	-
Linear Survey	1993	Federal Highway Administration (FHWA)	-
Areal Survey	2001	TxDOT	-
Survey	2005	TxDOT (no data)	3245
Areal Survey	2006	TxDOT (Ellis et al.2009)	4044

Source: TASA 2017

2.3.9.3 Records Review

A records review of data from the THC's Texas Historic Sites Atlas (THSA), the NRHP, TxDOT's Historic District and Properties GIS layer, and TxDOT's Historic Bridges of Texas GIS layer was conducted to identify previously recorded and/or designated historic resources within the study area. Historic resources refer to any buildings, structures, objects, and potential historic districts that are, or will be, 45 years of age or older at the time of the anticipated project letting date for construction. Historic resources considered for this review included historic properties, which are properties that are listed in, or eligible for listing in, the NRHP; National Historic Landmarks; Recorded Texas Historic Landmarks (RTHLs); HTCs; and Official Texas

Historic Markers (OTHMs). The THC and TARL were also consulted for published and unpublished data regarding historic cemetery locations and historic properties. The TxDOT bridge database includes information on previously recorded historic properties and bridges that are listed in the NRHP or have been previously determined eligible for listing in the NRHP through coordination with the THC.

No previously recorded historic bridges are present within the study area. However, previously recorded historic resources identified within the study area include two NRHP-listed properties, five resources with RTHL designations, 49 OTHMs, and 48 cemeteries, 19 of which are designated as HTCs (Table 2-24).

TABLE 2-24 PREVIOUSLY DOCUMENTED HISTORIC-AGE RESOURCES WITHIN THE STUDY AREA

Address / Location	Historic Resource	Cemetery Number / Trinomial	Designation / Date of listing
200 East Buck Street, Caldwell	Kraitchar House	41BU92	NRHP (2002) RTHL (1983) OTHM (1983)
405 West Fox Street, Caldwell	Reeves-Womack House	N/A	NRHP (1993) RTHL (1983) OTHM (1983)
4212 East State Highway (SH) 21, Caldwell	Duewall House	N/A	RTHL (2001) OTHM (2001)
9203 County Road (CR) 286, Caldwell	San Salvador Mission Church	N/A	RTHL (1974) OTHM (1974)
13608 Pecan, Lyons	Lyons Methodist Church	N/A	RTHL (1968) OTHM (1968)
From Caldwell, take SH 21 west for about 8 miles; marker on north side of road	Subject Marker: An Arm of the Chisholm Cattle Trail	N/A	OTHM (1981)
On Farm-to-Market (FM) 50, 1.3 miles south of intersection with SH 21	Subject Marker: Brazos River Levee	N/A	OTHM (1978)
From Snook, take FM 2039 northwest, then west on CR 254	Subject Marker: Brazos Bottom Baptist Church Cemetery	N/A	OTHM (2002)
Burleson County Courthouse Grounds, 100 West Buck Street, Caldwell	Subject Marker: Burleson County in World War II	N/A	OTHM (2008)
West end of 12th Street, Caldwell	Subject Marker: Caldwell Masonic Cemetery	N/A	OTHM (2001)
129 West Buck Street, Caldwell	Subject Marker: Caldwell National Bank	N/A	OTHM (1981)
206 South Hill Street, Caldwell	Subject Marker: Caldwell Volunteer Fire Department	N/A	OTHM (1986)
SH 21 and Gray Street in front of Caldwell Public Library	Subject Marker: City of Caldwell	N/A	OTHM (1967)
Unknown	Subject Marker: City of Caldwell	N/A	OTHM (1967)
Courthouse Square, Echols and Buck Streets, Caldwell	Subject Marker: City of Caldwell	N/A	OTHM (1982)
Northeast corner of intersection of SH 21 and FM 1362	Subject Marker: Cooks Point	N/A	OTHM (1969)
From Caldwell, take SH 21 east about 5 miles to church on south side of road	Subject Marker: Cooks Point United Methodist Church	N/A	OTHM (1984)

Address / Location	Historic Resource	Cemetery Number / Trinomial	Designation / Date of listing
Corner of Thomas and Mustang Streets, Caldwell, Texas	Subject Marker: First Baptist Church	N/A	OTHM (1969)
600 Block of Buck Street at the corner of Moore Street, Caldwell, Texas	Subject Marker: First Presbyterian Church of Caldwell	N/A	OTHM (1984)
306 West Fox Street, Caldwell, Texas	Subject Marker: First United Methodist Church of Caldwell	N/A	OTHM (1970)
FM 1362 near CR 226	Subject Marker: Fort Oldham	N/A	OTHM (1973)
From Caldwell, take SH 21 east about 5 miles to roadside park on south side of road	Subject Marker: Fort Tenoxtitian	N/A	OTHM (1970)
Intersection of FM 2774 and CR 406, off of SH 36	Subject Marker: Frenstat Cemetery	N/A	OTHM (2004)
From Snook, travel two miles west on FM 60 to CR 271, then north about 0.5 miles	Subject Marker: Giesenschlag Cemetery	N/A	OTHM (1983)
From Caldwell, take SH 36 northwest about 6.2 miles to CR 328, then east about 0.5 miles	Subject Marker: Horatio Chriesman	N/A	OTHM (1969)
From Lone Oak, take FM 60 4 miles west, near FM 3058	Subject Marker: Lone Oak Baptist Church	N/A	OTHM (2004)
From Lyons, take SH 36 to FM 60, south on Private Road 4047, in front of community center	Subject Marker: Lyons	N/A	OTHM (1968)
From Caldwell, take SH 21 east about 2.5 miles to CR 208, south 0.9 miles to bridge over railroad tracks, west on trail; marker is on south side of tracks	Subject Marker: Josef Masik Grave Marker	N/A	OTHM (1968)
Burleson County Courthouse Grounds	Subject Marker: John Mitchell	N/A	OTHM (2002)
From Caldwell, take FM 166 about 2.1 miles East to CR 225, then north about 0.8 miles	Subject Marker: New Tabor Brethren Church	N/A	OTHM (1993)
Buffalo and Thomas Streets, Caldwell	Subject Marker: Old City Cemetery	N/A	OTHM (1971)
From Caldwell, take SH 36 south for 7 miles, then west on FM 976 to FM 2774, and south 0.8 miles	Subject Marker: Our Lady of the Holy Rosary Catholic Church	N/A	OTHM (2004)
Seven miles southeast of Caldwell on FM 166, then south 0.5 miles on CR 243	Subject Marker: Providence Baptist Church	N/A	OTHM (1968)
Seven miles southeast of Caldwell on FM 166, south 0.5 mile on CR 243	Subject Marker: Providence Cemetery	N/A	OTHM (1992)
Intersection of FM 111 and FM 60, Deanville, Texas	Subject Marker: St. John's Lutheran Church	N/A	OTHM (1994)
500 West Old San Antonio Road, Caldwell	Subject Marker: St. Mary's Our Lady of Lourdes Catholic Church	N/A	OTHM (2004)
From Caldwell, take SH 21 about 9.4 miles west to marker in roadside park on south side of road	Subject Marker: Site of Camino Real	N/A	OTHM (1968)
On FM 1363 about 0.3 miles west of intersection with SH 36, about 6.2 miles north of Caldwell	Subject Marker: Town of Chriesman	N/A	OTHM (1968)
From Caldwell, take SH 21 east about 1.5 miles to FM 2000, then north about 3.5 miles. Marker on east side of road	Subject Marker: Waugh Campground	N/A	OTHM (1972)
702 West Buck Street, Caldwell	Subject Marker: Woodson Lumber Company	N/A	OTHM (2013)
Northeast corner of SH 21 and FM 1362 Intersection in Cooks Point	Subject Marker: Homesite of Judge Andrew S. Broaddus	N/A	OTHM (1971)
Southeast corner of Intersection of SH 21 and FM 36, in Caldwell	Subject Marker: Burleson County	N/A	OTHM (1970)

Address / Location	Historic Resource	Cemetery Number / Trinomial	Designation / Date of listing
Courthouse Square at Echols and Buck Street, Caldwell	Subject Marker: Burleson County	N/A	OTHM (1970)
Courthouse Lawn at Fox and Main Streets, Caldwell	Subject Marker: Burleson County, C.S.A.	N/A	OTHM (1973)
In Old City Cemetery at Buffalo and Thomas Streets, Caldwell	Subject Marker: Lewis L. Chiles	N/A	OTHM (1936)
Intersection of FM 111 and FM 60, Deanville	Subject Marker: Deanville	N/A	OTHM (1972)
Courthouse Lawn at Main and Fox Streets, Caldwell	Subject Marker: Burleson County in the Texas War for Independence	N/A	OTHM (1973)
From Caldwell, take SH 21 east for 5 miles to Roadside Park, located on south side of road	Subject Marker: Elizabeth Chapel Methodist Church	N/A	OTHM (1970)
Masonic Cemetery, 11th and Hall Street	Subject Marker: Lee W. Henslee	N/A	OTHM (1968)
On J.C. Benton Farm, about 2 miles northeast of Harmony Church	Bird-Harmony Cemetery	BU-C058 41BU95	HTC (2010)
About 10 miles east of Caldwell	Brazos Bottom Baptist Church Cemetery	BU-C003	HTC (2000)
West end of 12th Street, Caldwell	Caldwell Masonic Cemetery	BU-C004	HTC (2000)
On FM 2774, about 0.25 mile south of FM 976, Caldwell	Christian (Frenstat, Mynar, Sobotik) Cemetery	BU-C018 41BU109	HTC (2006)
About 5 miles east of Caldwell on CR 212, 0.5 miles north of SH 21	Elizabeth Chapel Cemetery	BU-C040	HTC (2011)
On FM 2774, about 0.5 mile south of FM 976, Caldwell	Frenstat (Our Lady of the Holy Rosary Catholic Church) Cemetery	BU-C019	HTC (2004)
From Snook, take FM 60 about 2 miles west to CR 271, then north about 0.5 miles	Giesenschlag Cemetery	BU-C060	HTC (2006)
CR 489, about 0.75 miles west of SH 36, south on CR 409	High Prairie (Union, High Prairie Union) Cemetery	BU-C020	HTC (2005)
South of Highway 21, about 3 miles east of Caldwell, Texas	Jezek Cemetery	BU-C061 41BU96	HTC (2011)
About 5 miles east of Caldwell on SH 21	Kramer Cemetery	BU-C039 41BU89	HTC (2004)
FM 166, 3.5 miles northeast of Caldwell	New Tabor Cemetery	BU-C001	HTC (1998)
CR 127, about 8 miles south of Caldwell, Texas	Prairie Dale (Phelps) Cemetery	BU-C074	HTC (2004)
Seven miles southeast of Caldwell on FM 166, then south 0.5 miles on CR 243	Providence Cemetery	BU-C002 41BU108	HTC (2000)
Highway 36, north of Caldwell	Rowland (Seven Star) Cemetery	BU-C077 41BU104	HTC (2004)
CR 217, about 1.5 miles north of Cooks Point, Texas	Salem Baptist (Post Oak) Cemetery	BU-C031 41BU86	HTC (2009)
About 8 miles southwest of Caldwell on SH 21	SPJST (San Antonio Prairie) Cemetery	BU-C006	HTC (2002)
SH 21, north of Caldwell	St. Mary's Catholic (Caldwell Catholic) Cemetery	BU-C036	HTC (2005)
CR 229 south of SH 21 east	Zion Hill (Jackson) Cemetery	BU-C117	HTC (2016)
CR 126, about 3 miles southeast of Deanville	Beaird (Birdsong) Cemetery	BU-C017 41BU100	No designation
Northwest of SH 21 and FM 696 on CR 347	Belltown (Sulphur Springs) Cemetery	BU-C007	No designation
CR 221, 1.1 miles from SH 21	Brewers Hill (New Jerusalem) Cemetery	BU-C059	No designation
CR 217, about 2.5 miles north of Cooks Point	Carr (Broaddus) Cemetery	BU-C030	No designation
CR 130 at Southern Pacific Railroad, about 2 miles west of Deanville	Chriesman Chapel Cemetery	BU-C098	No designation

Address / Location	Historic Resource	Cemetery Number / Trinomial	Designation / Date of listing
CR 328, about 0.5 miles east of Chriesman	Chriesman Cemetery	BU-C046	No designation
Located 0.06 of a mile southeast of the junction of SH 21 and FM 1362, on west side in Cooks Point	Cooks Point Brethren Cemetery	BU-C052	No designation
Intersection of SH 21 and FM 1362 in Cooks Point	Cooks Point Methodist (German) Cemetery	BU-C038	No designation
FM 60 in Deansville	Deanville (St. John's Lutheran) Lutheran Cemetery	BU-C050	No designation
CR 221, about 3 miles east of Cooks Point	Draper (Mosley, Bundick) Cemetery	BU-C029	No designation
SH 21, about 3 miles east of Caldwell, off CR 206	Elizabeth Lutheran Cemetery	BU-C037	No designation
Individual grave located near SH 21 and FM 908, on private property	Faulkner Grave	BU-C121	No designation
South of CR 310, near Chriesman, 0.73 miles south of CR 310 crossing of Davidson Creek	Graves Farm (Morse Grave) Cemetery	BU-C091	No designation
On Alfred Boeker's Farm, off CR 201	Krohne Cemetery	BU-C027	No designation
Lawrence Farm, approximately 3.5 miles east of Lyons on FM 60	Lawrence Cemetery	BU-C025	No designation
FM 908, about 5 miles north of SH 21	Liberty (Cox, Hookerville) Cemetery	BU-C045	No designation
North of Lyons community off FM 60	Lyons Lutheran Cemetery	BU-C014	No designation
Near SH 36 at FM 60	Lyons School Lot Cemetery	BU-C107	No designation
FM 60, about 1 mile west of Lyon	Lyons United Church of Christ (United Church of Christ at Lyons) Cemetery	BU-C022	No designation
About 4 miles west of Snook on FM 60	Mound Prairie (St. Stephen Evangelical & Reformed, Fick) Cemetery	BU-C026	No designation
Highway 36, south/southeast of Caldwell, along railroad tracks	Oak Grove Cemetery	BU-C032	No designation
Northwest on FM 2039, west on CR 254 in Snook	Old Bethlehem Cemetery	BU-C028	No designation
Buffalo Street at Thomas Street, Caldwell	Old City (Old City Cemetery at Caldwell, Caldwell City Cemetery) Cemetery	BU-C034 41BU91	No designation
Located 1.3 miles northwest of the junction of FM 1362 and FM 166 on the east side of CR 226	Oldham Cemetery	41BU78	No designation
3 miles north of Lyons off CR 428	Pillow Cemetery	BU-C021	No designation
Northeast of Lyons off FM 60 and CR 230	Saint James Cemetery	BU-C024	No designation
Behind Shiloh Baptist Church, off FM 908	Shiloh Cemetery	BU-C044	No designation
About 5 miles east of Caldwell on CR 210	Slovak (Bednar, Drgac) Cemetery	BU-C041	No designation
2076 CR 127	Unknown Grave	BU-C100 41BU82	HTC (2008)
Approximately 2 miles north of Caldwell on the south side of CR 202	Poor Farm and Cemetery	BU-C073 41BU99	No designation

Source: THSA 2017

As previously discussed, the El Camino Real de los Tejas National Historic Trail traverses the study area. This trail system represents a combination of native and historic corridors, including the Old San Antonio Road, and totals approximately 2,580 miles extending from the Rio Grande

near Laredo, Texas, to Natchitoches, Louisiana (NPS 2011). Segments of this trail closely follow SH 21 through Burleson County. A connecting trail segment also crosses the study area and extends north from the Lake Somerville area in southern Burleson County. These routes originated as Native American trails and trade routes that were subsequently used during the Spanish Colonial period to link northern Mexico and Texas to areas of East Texas and Western Louisiana. It continued to be an important transportation corridor throughout the subsequent historic and modern periods (NPS 2017). National Historic Trail designation does not qualify all portions of the trail eligible for the NRHP; however, archaeological and historical sites along the route might be considered eligible based on the significance of their association with the trail (NPS 2011).

The NRHP-listed properties within the study area include the Reeves-Womack House, located at 405 West Fox Street, Caldwell, Burleson County, Texas, and the Kraitchar House, located at 200 East Buck Street, Caldwell, Burleson County (THSA 2017). Listing on the NRHP provides national recognition of a property's historical or architectural significance and denotes the resource is worthy of preservation. Buildings, sites, objects, structures, and districts are eligible for this designation if they are at least 50 years old and meet established criteria. The Reeves-Womack House was built in 1895 and was listed in the NRHP in 1993 under Criterion C as an example of the Queen Anne style of architecture and intricate Eastlake detailing. The Kraitchar House was built in 1891 and was listed in the NRHP in 2002 under Criterion C as an example of 19th century residential architecture.

Five historic resources in the study area have been determined to be historically and architecturally significant by the THC and have received RTHL designation. The THC awards RTHL designation to buildings and structures that are at least 50 years old and that are deemed worthy of preservation for its historical and architectural significance. The RTHL designation is the highest honor the state can bestow on a historic resource. The NRHP-listed Reeves-Womack House and the Thomas Kraitchar House, both located in Caldwell, received RTHL designation in 1983. The Duewall House, located at 4212 East SH 21 in Caldwell, is a vernacular farm house constructed in 1928 and was designated as a RTHL in 2001. The San Salvador Mission Catholic Church in Caldwell, constructed in 1908, was designated an RTHL in 1974, while the Lyons Methodist Church located in Lyons, was constructed in 1887 and designated an RTHL in 1968.

Of the 48 total cemeteries recorded in the study area, 19 have been designated as HTCs. In 1998, the THC developed the HTC program as a first step toward the preservation of historic cemeteries. The HTC designation is an official recognition of family and community graveyards, but does not impose land use restrictions on land adjacent to the cemetery. For a cemetery to be eligible for designation as an HTC, it must be at least 50 years old and be deemed worthy of recognition for its historic association, such as being a landmark that identifies a family or community presence. Of the 48 cemeteries within the study area, 12 have been previously assigned state trinomials and are considered archaeological sites (Table 2-24).

A total of 49 OTHMs are located within the study area. Four OTHMs are associated with the Caldwell Masonic, Frenstat, Giesenschlag, and Providence cemeteries, which are also designated as HTCs. The remaining 45 OTHMs are subject makers covering a variety of topics important to a community or region, are solely educational, and provide no restrictions on the use of the property or site on which they are located. However, it is THC's policy to preserve the original location of markers whenever possible. Furthermore, the THC must be notified if a marker is ever to be relocated.

(This page intentionally left blank)

3.0 SELECTION AND EVALUATION OF ALTERNATIVES

As described in Section 1.0, the Proposed Project consists of a new single-circuit 138-kV transmission line and load-serving substation in Burleson County to connect from either the existing BBEC Lyle Wolz Substation or the existing BBEC Lyons Substation to a new substation in the vicinity of the Cooks Point community. URS and LCRA TSC developed and evaluated alternative transmission line routes and substation locations that are feasible for the Proposed Project from an economic, engineering, system planning, and environmental perspective. The following sections describe this process of initial selection of preliminary alternative route segments and substation sites, public involvement, alternative route segment refinement, and the identification of the primary alternative routes and substation sites to be carried forward in an application to the PUCT for review and approval.

3.1 SELECTION OF PRELIMINARY ALTERNATIVE ROUTE SEGMENTS

URS documented existing environmental and land use constraints within the study area (Section 2.0) for the purpose of identifying preliminary alternative route segments connecting the existing BBEC Lyle Wolz Substation or the existing BBEC Lyons Substation to four alternative new substation sites in the vicinity of the Cooks Point community. Generally, URS utilized the following in identifying preliminary alternative route segments:

- input received from the various meetings and correspondence with local officials and others (Appendices A-B);
- review of aerial photography;
- results of the visual reconnaissance of the study area;
- findings of the various data collection activities;
- review of the environmental and land use constraints map (Appendices C-D);
- apparent property boundaries;
- existing compatible corridors;
- location of existing developments;
- information received from LCRA TSC; and
- other relevant factors.

Preliminary alternative route segments were identified in accordance with PURA §37.056(c)(4)(A)-(D), PUCT Substantive Rule 25.101 including the PUCT's policy of prudent

avoidance, and the PUCT's CCN Application. It was URS' intent to identify a number of geographically diverse preliminary alternative route segments that were environmentally acceptable, considering such factors as community values, park and recreational areas, historical and aesthetic values, environmental integrity, length of route parallel to or utilizing existing compatible corridors (including apparent property boundaries), and prudent avoidance. Eighty-six preliminary alternative route segments were identified.

3.2 SELECTION OF PRELIMINARY SUBSTATION SITES

LCRA TSC and URS identified four alternative preliminary substation sites for the proposed Cooks Point Substation, each of which could support the need for the project (see Cooks Point Substation Alternatives 1 through 4 as depicted on the various maps contained in this EA). Some of the factors considered in identifying these locations included proximity to the electric load growth area that would be served from the new substation, location on a single property owner with approximately eight to nine acres, proximity to existing distribution facilities, proximity to suitable access roads, and potentially impacted environmental features and land uses.

The preliminary alternative route segments and alternative substation sites identified by URS and LCRA TSC were then presented at a public Open House meeting as discussed in Section 3.3.

3.3 PUBLIC INVOLVEMENT PROGRAM

The purpose of the Open House meeting was to solicit input from landowners, public officials, and other interested parties about the Proposed Project, the preliminary alternative route segments, and the alternative substation sites, and to:

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

3.3.1 Open House Meeting

The Open House meeting was held on January 30, 2018, from 5:30 to 8:00 pm at the Caldwell Civic Center, 103 Highway 21 West, Caldwell, Texas 77836. LCRA TSC mailed written notices

of the meeting to all owners of property within approximately 350 feet of each preliminary alternative route segment centerline and the owners of the property on which each alternative substation site was identified (Appendix B). Additional letters were sent to elected officials, public officials, and representatives of school districts and utilities, as listed in Appendix B. This resulted in the mailing of approximately 1,250 meeting notices. In addition, a public notice was published on January 18 and 25, 2018, in the *Burleson County Tribune*, a newspaper with circulation within Burleson County. The public notice announced the location, time, and purpose of the meeting. A copy of the published newspaper notice is located in Appendix B.

At the meeting, personnel from LCRA TSC and URS staffed information stations, with each station devoted to a particular aspect of the project. These stations included maps, illustrations, photographs, and/or text explaining each topic. LCRA TSC and URS provided two GIS computer stations to show the extent of the project, the preliminary alternative route segments, property ownership parcel boundaries, and recent aerial photography (October 2017) of the project area. GIS staff were also available to answer detailed questions such as the distance from the preliminary alternative route segment centerline to habitable structures or other features of interest. Attendees were encouraged to visit each Open House station so that the entire process could be explained in the logical sequence of project development. The information station format typically is advantageous because it allows attendees to process information in a more relaxed manner, to focus on their particular area of interest, and to ask specific questions. Furthermore, the one-to-one discussions with LCRA TSC and URS personnel typically encourage more interaction from those attendees who might be hesitant to participate in a more formal, speaker-audience format.

Upon entering the meeting, visitors were asked to sign in and were handed an information packet including a questionnaire. The questionnaire was used to solicit input on the Proposed Project and included an evaluation of the information presented at the meeting. The information packet included answers to frequently asked questions and a map indicating the location of the preliminary alternative route segments and alternative substation sites. Copies of the questionnaire and information packet are located in Appendix B.

After the Open House meeting, URS reviewed and evaluated each questionnaire that was submitted at the meeting or sent in after the meeting. Of the 161 people who signed in at the Open House meeting, a total of 45 submitted questionnaires at the meeting. Thirty-three

additional questionnaires were received from individuals after the meeting, some of whom did not attend the Open House meeting. A total of 78 questionnaires were received by URS and LCRA TSC.

A review of the questionnaires indicated that the majority of the respondents agreed that that they were given an opportunity to ask questions and receive answers (97 percent) and that LCRA TSC staff were knowledgeable about the meeting topic (94 percent). The majority of the respondents also agreed that LCRA TSC staff listened to their issues and concerns (90 percent) and that the meeting was a good use of their time (87 percent).

Thirty (42 percent) of the respondents indicated that the features on the Land Use and Environmental Constraints Map were accurately plotted. Forty-three respondents (72 percent) indicated that they were not aware of any missing features on the Land Use and Environmental Constraints Map.

Respondents were asked if they had a concern with a particular preliminary alternative route segment as they were presented at the Open House meeting. They were also asked to describe their concerns. Segment Y2 received the most negative comments (six), followed by Segment H1, which received five negative comments, and Segments G2, J1, K1, MI and U, which each received four negative comments. Table 3-1 summarizes the segments that received the most responses to this question, both negative and positive.

TABLE 3-1 PRELIMINARY ALTERNATIVE SEGMENT CONCERNS/COMMENTS

Segment	T	U	F1	L	N	F1	Y2
Negative Comments	2	4	2	1	1	1	6
Positive Comments	7	4	6	7	6	5	0

Source: Appendix B

The questionnaire also solicited comments concerning typical transmission line routing issues, such as land use, paralleling existing corridors, and community values/resources. The questionnaire asked the respondents to rank a list of factors in the order of importance from one (most important) to 11 (least important). These factors were: maintain reliable electric service; use or parallel existing electric transmission line ROW where possible; parallel other existing compatible ROW (e.g., roads, highways) where possible; parallel property lines where possible; maximize distance from residences, schools, churches, nursing homes, commercial buildings, historic sites or areas, and parks and recreational areas; and minimize visibility of the lines and environmental impacts. The concerns identified as most important on the questionnaires

regarding routing the proposed transmission line project included maximizing distances from residences; maintaining reliable electric service; paralleling other existing compatible ROW (e.g., roads, highways) where possible; and paralleling other existing electric transmission line ROW where possible.

3.3.2 Internet Website

To better communicate with the public and provide up-to-date, project-specific information, LCRA TSC created and maintains a section on LCRA's main website regarding the Proposed Project (https://www.lcra.org/cookspoint). Project information available on the website includes:

- Project background;
- Open House meeting invitations/ads;
- Project questionnaire
- Frequently asked questions
- Exhibits from the Open House meeting;
- Aerial and topographic maps of the study area that include the preliminary alternative route segments, alternative substation sites, and land use constraints;
- Property ownership maps; and
- Interactive mapping tool that allows individuals to zoom in on the preliminary alternative route segments, alternative substation sites, and property boundary information.

3.4 MODIFICATIONS/DELETIONS/ADDITIONS OF ALTERNATIVE ROUTE SEGMENTS FOLLOWING THE OPEN HOUSE MEETING

After considering the input, comments, and information received at the Open House meeting, LCRA TSC and URS conducted further reconnaissance surveys between January and March 2018. The purpose of these reconnaissance surveys was to evaluate and identify in the field the input, comments, and information received at the Open House meeting as well as supplement prior work. These reconnaissance surveys were also used to determine whether the information from the Open House meeting or other sources would lead to modifications to the existing preliminary alternative route segments and/or the identification of new segments that were not presented at the Open House. Following the Open House meeting, URS also received updated parcel boundary, pipeline, and utility data from LCRA TSC that allowed for the further

refinement of the preliminary alternative route segments in order to better reflect LCRA TSC and URS' intent to parallel compatible ROW and apparent property boundaries.

LCRA TSC and URS considered the data and information gathered from these reconnaissance surveys, the Open House meeting, and other sources of public input as part of the overall evaluation of the preliminary alternative route segments and the development of primary alternative routes and substation sites. As a result of this evaluation and the input received, eight preliminary alternative route segments were modified, eight preliminary alternative route segments were deleted, and six alternative route segments were added, as described in detail below. As a result of these segment modifications, deletions, or additions, some other preliminary alternative route segments were relabeled, as described further below.

3.4.1 Preliminary Alternative Route Segment Modifications

Segments C2, L2, and Q2 were shifted to the north side of an existing transmission line due to the presence of an existing pipeline and habitable structures located on the south side of the transmission line (Figure 3-1).

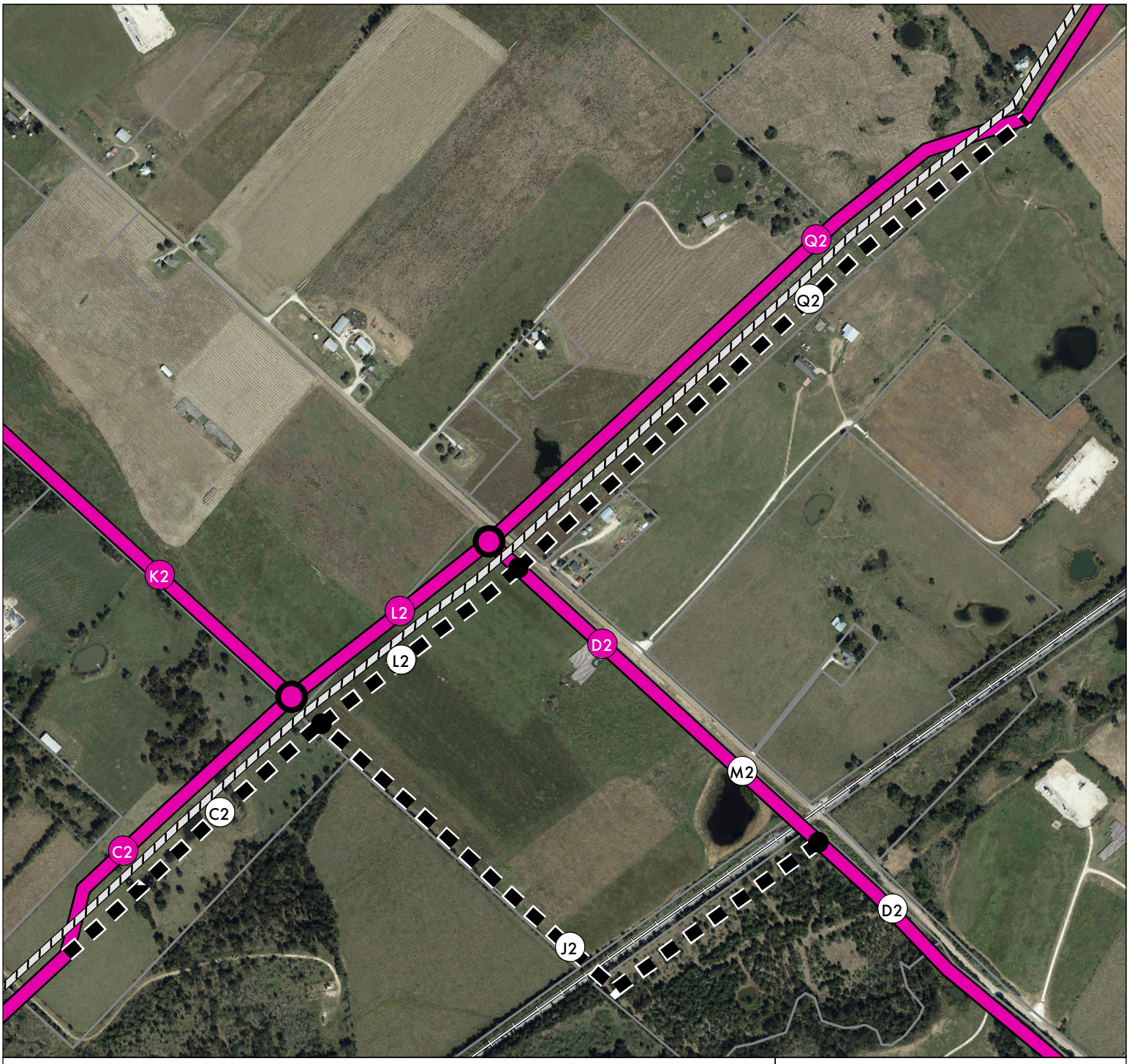
Segment Q was modified to continue parallel to a railroad, where it had previously been delineated to deviate from the railroad corridor to avoid a shed (non-habitable structure). LCRA TSC determined that the shed would not interfere with the construction, operation, and maintenance of the transmission line (Figure 3-2).

Segment V1 was shifted to the southeastern side of the property boundary at the request of the landowner (Figure 3-3).

Segment Y2 was modified to parallel apparent property boundaries and, at the request of landowners, to follow a distribution line (Figure 3-4).

Segment X1 (relabeled as Segment V3 following the Open House meeting; see Section 3.4.2) was modified in part to shift from the south side to the north side of CR 235 in order to avoid multiple existing pipelines located on the south side of CR 235 (Figure 3-5).

A portion of Segment L1 (relabeled as Segments Z3 and L3 following the Open House meeting; see Section 3.4.3) was modified in order to avoid crossing an existing transmission line in the vicinity of the Burleson Memorial Hospital and SH 21 and to parallel the existing transmission line north of SH 21 (Figure 3-6).



New Primary Alternative Segment

Primary Alternative Segment

Removed Portion of Preliminary Alternative Segment Shown at Open House Meeting

New Primary Alternative Segment Node

Primary Alternative Segment Node

Preliminary Alternative Segment Node Shown at Open House Meeting

A New Primary Alternative Segment Label

A Primary Alternative Segment Label

A Preliminary Alternative Segment Label Shown at Open House Meeting

Proposed Substation Alternative

Parcel Boundary

Existing Transmission Line

Railroad

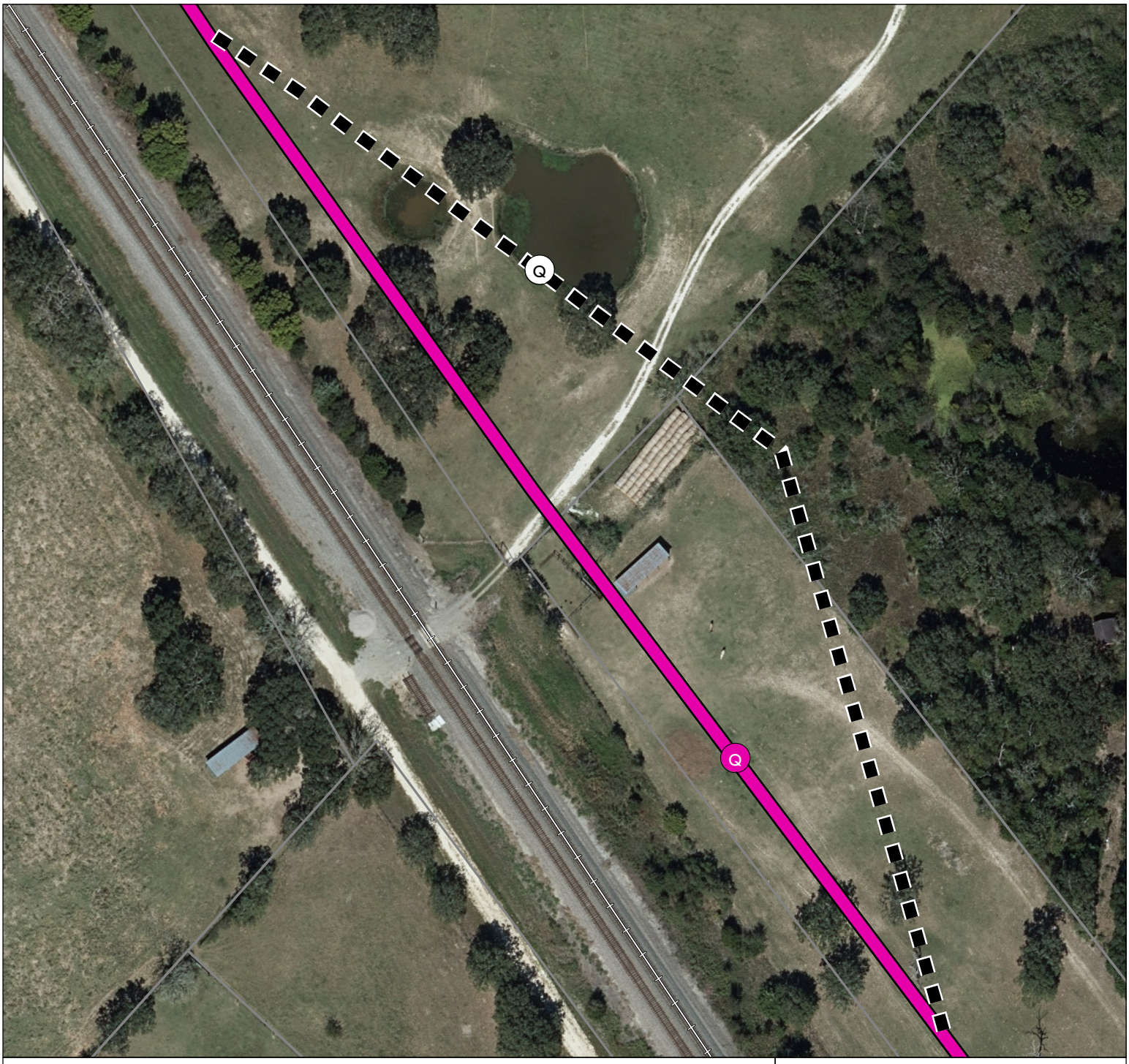
Cooks Point
138-kV Transmission Line Project

Figure 3-1
Modification of Segments C2, L2, and Q2 and Deletion of Segment J2

LCRA ENERGY • WATER • COMMUNITY SERVICES

URS

0 670 1,340
Feet



New Primary Alternative Segment

Primary Alternative Segment

Removed Portion of Preliminary Alternative Segment Shown at Open House Meeting

New Primary Alternative Segment Node

Primary Alternative Segment Node

Preliminary Alternative Segment Node Shown at Open House Meeting

A New Primary Alternative Segment Label

A Primary Alternative Segment Label

A Preliminary Alternative Segment Label Shown at Open House Meeting

Proposed Substation Alternative

Parcel Boundary

Existing Transmission Line

Railroad

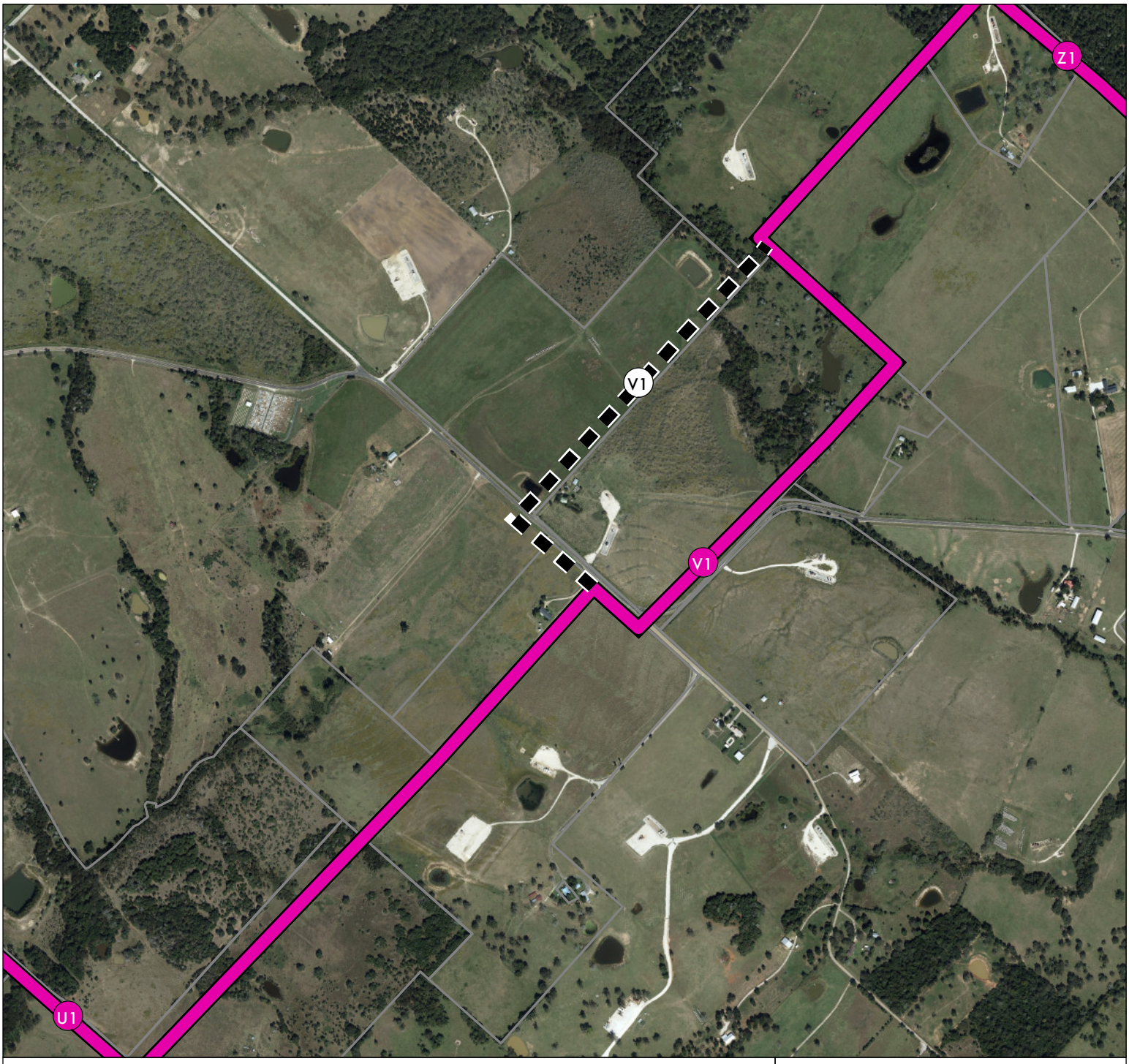
Cooks Point
138-kV Transmission Line Project

Figure 3-2
Modification of Segment Q

LCRA ENERGY • WATER • COMMUNITY SERVICES

URS

0 120 240
Feet



New Primary Alternative Segment

Primary Alternative Segment

Removed Portion of Preliminary Alternative Segment Shown at Open House Meeting

New Primary Alternative Segment Node

Primary Alternative Segment Node

Preliminary Alternative Segment Node Shown at Open House Meeting

A New Primary Alternative Segment Label

A Primary Alternative Segment Label

A Preliminary Alternative Segment Label Shown at Open House Meeting

Proposed Substation Alternative

Parcel Boundary

Existing Transmission Line

Railroad

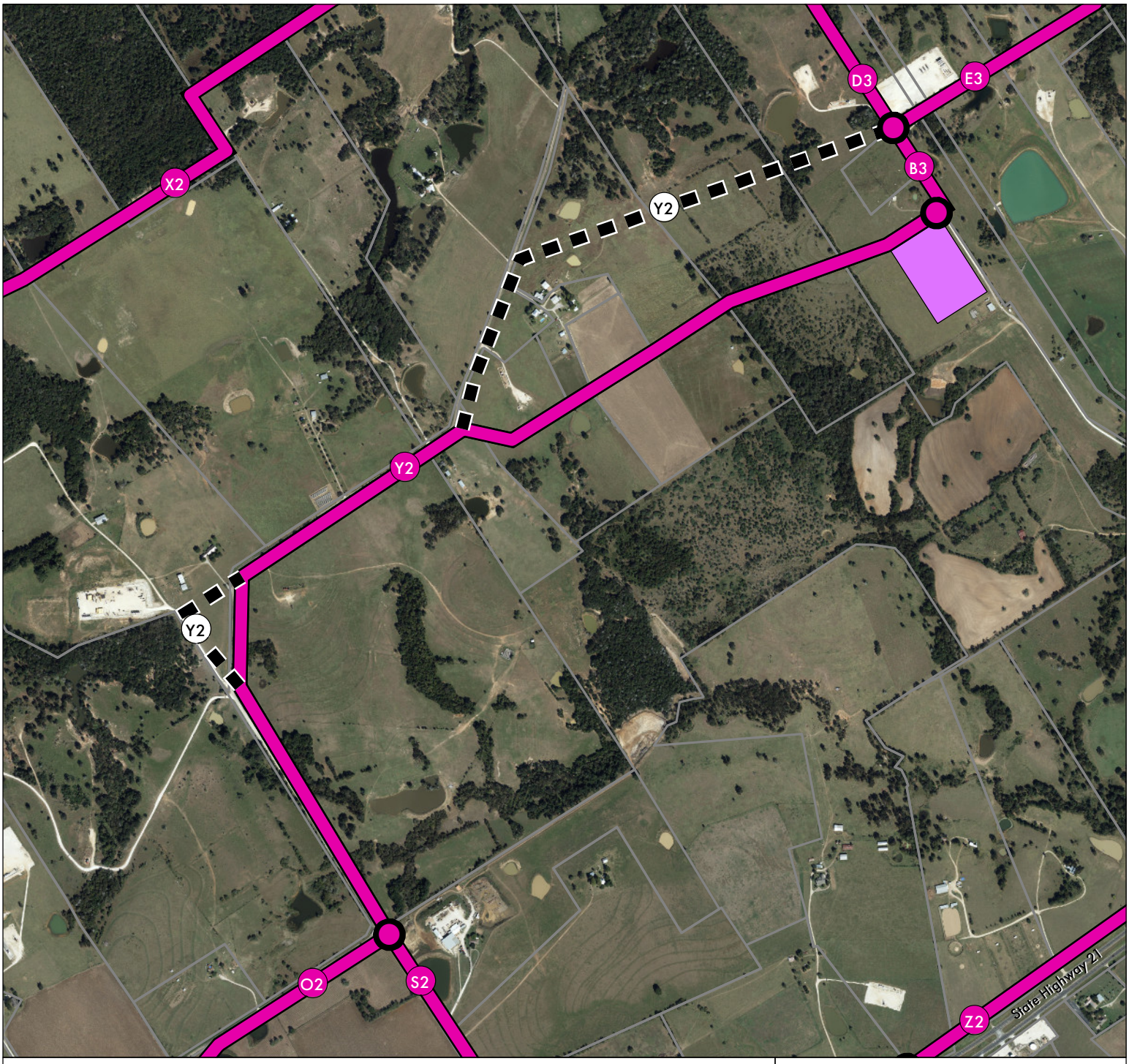
Cooks Point
138-kV Transmission Line Project

Figure 3-3
Modification of Segment V1

LCRA ENERGY • WATER • COMMUNITY SERVICES

URS

0 1,000 2,000
Feet



New Primary Alternative Segment

Primary Alternative Segment

Removed Portion of Preliminary Alternative Segment Shown at Open House Meeting

New Primary Alternative Segment Node

Primary Alternative Segment Node

Preliminary Alternative Segment Node Shown at Open House Meeting

A New Primary Alternative Segment Label

A Primary Alternative Segment Label

A Preliminary Alternative Segment Label Shown at Open House Meeting

Proposed Substation Alternative

Parcel Boundary

Existing Transmission Line

Railroad

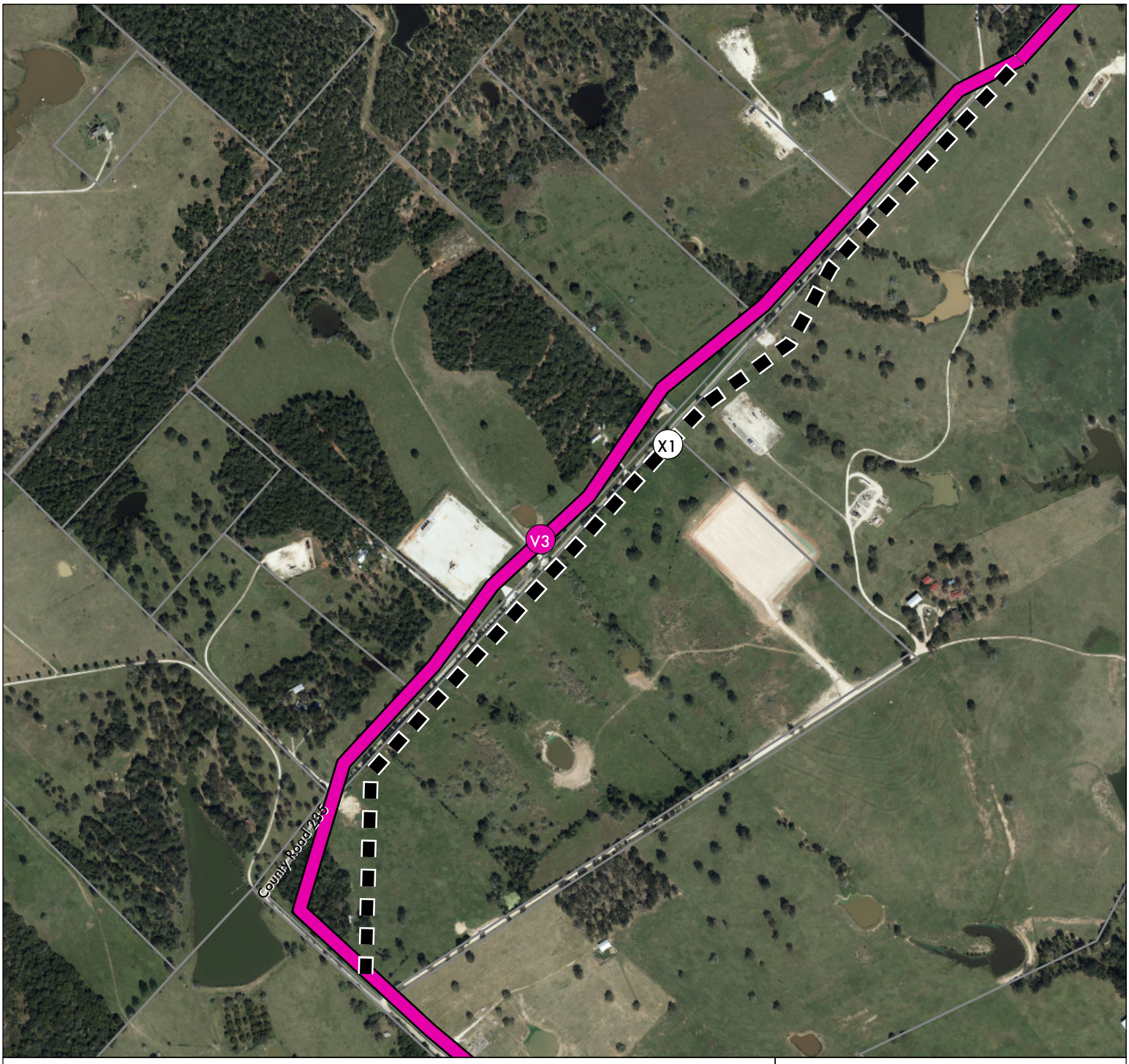
Cooks Point
138-kV Transmission Line Project

Figure 3-4
Modification of Segment Y2

LCRA ENERGY • WATER • COMMUNITY SERVICES

URS

0 1,250 2,500
Feet



New Primary Alternative Segment

Primary Alternative Segment

Removed Portion of Preliminary Alternative Segment Shown at Open House Meeting

New Primary Alternative Segment Node

Primary Alternative Segment Node

Preliminary Alternative Segment Node Shown at Open House Meeting

A New Primary Alternative Segment Label

A Primary Alternative Segment Label

A Preliminary Alternative Segment Label Shown at Open House Meeting

Proposed Substation Alternative

Parcel Boundary

Existing Transmission Line

Railroad

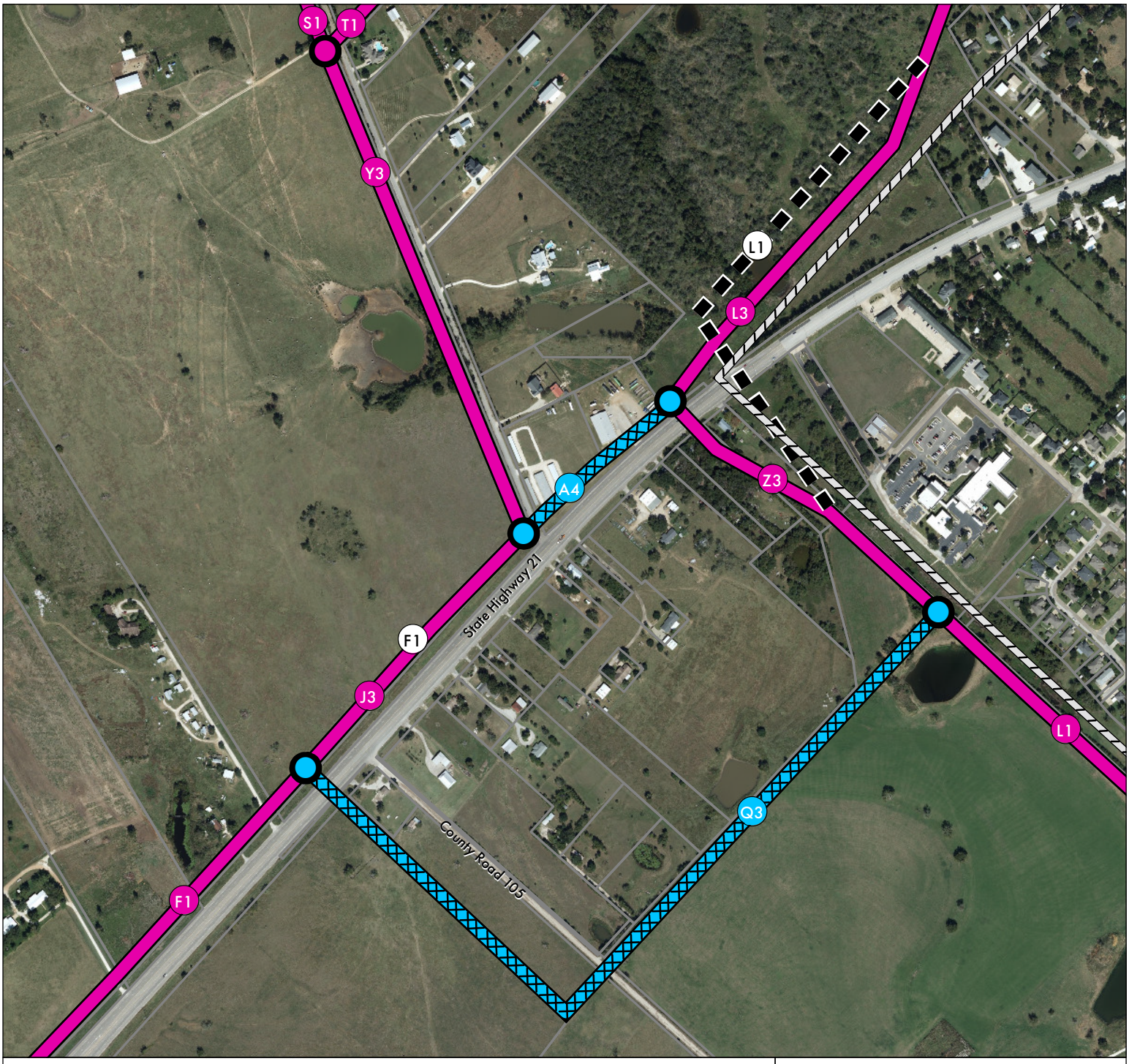
Cooks Point
138-kV Transmission Line Project

Figure 3-5
Modification of Segment X1

LCRA ENERGY • WATER • COMMUNITY SERVICES

URS

0 750 1,500
Feet



New Primary Alternative Segment

Primary Alternative Segment

Removed Portion of Preliminary Alternative Segment Shown at Open House Meeting

New Primary Alternative Segment Node

Primary Alternative Segment Node

Preliminary Alternative Segment Node Shown at Open House Meeting

A New Primary Alternative Segment Label

A Primary Alternative Segment Label

A Preliminary Alternative Segment Label Shown at Open House Meeting

Proposed Substation Alternative

Parcel Boundary

Existing Transmission Line

Railroad

Cooks Point
138-kV Transmission Line Project

Figure 3-6
Modification of Segment L1 and Addition of Segments A4 and Q3

LCRA ENERGY • WATER • COMMUNITY SERVICES

URS

0 600 1,200
Feet

3.4.2 Preliminary Alternative Route Segment Deletions

Segment D was originally proposed parallel to the existing Lyle Wolz to Lyons transmission line, as well as apparent property boundaries, CR 117, and FM 975. After the Open House meeting, a significant portion of Segment D was deleted from further consideration due to length and estimated cost. A small portion of Segment D was utilized to create a new Segment R3 (see Section 3.4.3). As a result of deleting the majority of Segment D, Segments C and J were combined to become Segment S3 (Figure 3-7).

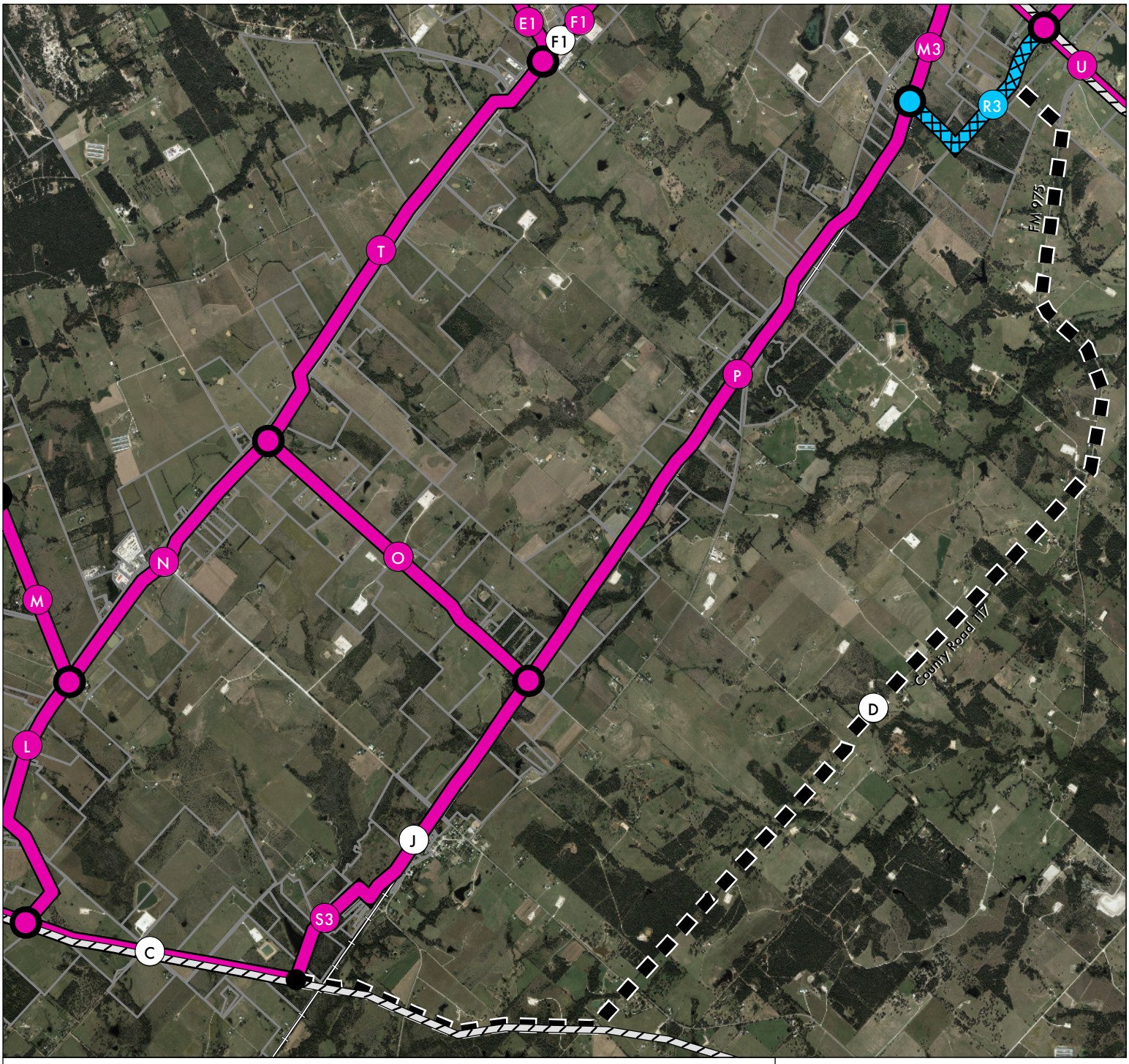
Segment I was originally proposed along apparent property boundaries, FM 3058, and CR 288. After the Open House meeting, this segment was deleted from further consideration due to length, estimated cost, and the number of habitable structures within 300 feet of the centerline of the proposed segment. As a result of deleting Segment I, Segments G and H were combined to become Segment U3 (see Figure 3-8a). As a result of deleting Segment I, Segments B1, C1, N1 and O1 were also deleted (see Figure 3-8b). As a result of deleting Segment B1, Segments D1, R, and R1 were combined to become Segment T3. As a result of deleting Segment O1, Segments H2 and X1 were combined to become Segment V3 (see Figure 3-8b).

Segment J2 was originally proposed to the southeast of an existing transmission line and parallel to apparent property boundaries. After the Open House meeting, this segment was deleted from further consideration because it was not a component of a forward-progressing route. As a result of deleting Segment J2, Segment M2 was subsumed as a part of Segment D2 (Figure 3-1).

Segment P1 was originally proposed along apparent property boundaries and CR 316. After the Open House meeting, this segment was deleted from further consideration due to length and estimated cost. As a result of deleting Segment P1, Segment S and Segment Q1 were relabeled as Segment X3 (Figure 3-9).

3.4.3 Alternative Route Segment Additions

Segments N3, O3, and P3 were added in the vicinity of CR 316 and SH 36 in order to provide geographic diversity. As a result of the addition of Segment P3, a node was added to Segment B2, the western portion of which was relabeled as Segment I3. As a result of the addition of Segment O3, a node was added to Segment Q1 on the west side of the railroad. Due to the addition of the node, the northern portion of Segment Q1 was relabeled as Segment W3 and the



New Primary Alternative Segment

Primary Alternative Segment

Removed Portion of Preliminary Alternative Segment Shown at Open House Meeting

New Primary Alternative Segment Node

Primary Alternative Segment Node

Preliminary Alternative Segment Node Shown at Open House Meeting

A New Primary Alternative Segment Label

A Primary Alternative Segment Label

A Preliminary Alternative Segment Label Shown at Open House Meeting

Proposed Substation Alternative

Parcel Boundary

Existing Transmission Line

Railroad

Cooks Point
138-kV Transmission Line Project

Figure 3-7
Deletion of Segment D

LCRA ENERGY • WATER • COMMUNITY SERVICES

URS

0 4,300 8,600
Feet

New Primary Alternative Segment

Primary Alternative Segment

Removed Portion of Preliminary Alternative Segment Shown at Open House Meeting

New Primary Alternative Segment Node

Primary Alternative Segment Node

Preliminary Alternative Segment Node Shown at Open House Meeting

A New Primary Alternative Segment Label

A Primary Alternative Segment Label

A Preliminary Alternative Segment Label Shown at Open House Meeting

Proposed Substation Alternative

Parcel Boundary

Existing Transmission Line

Railroad

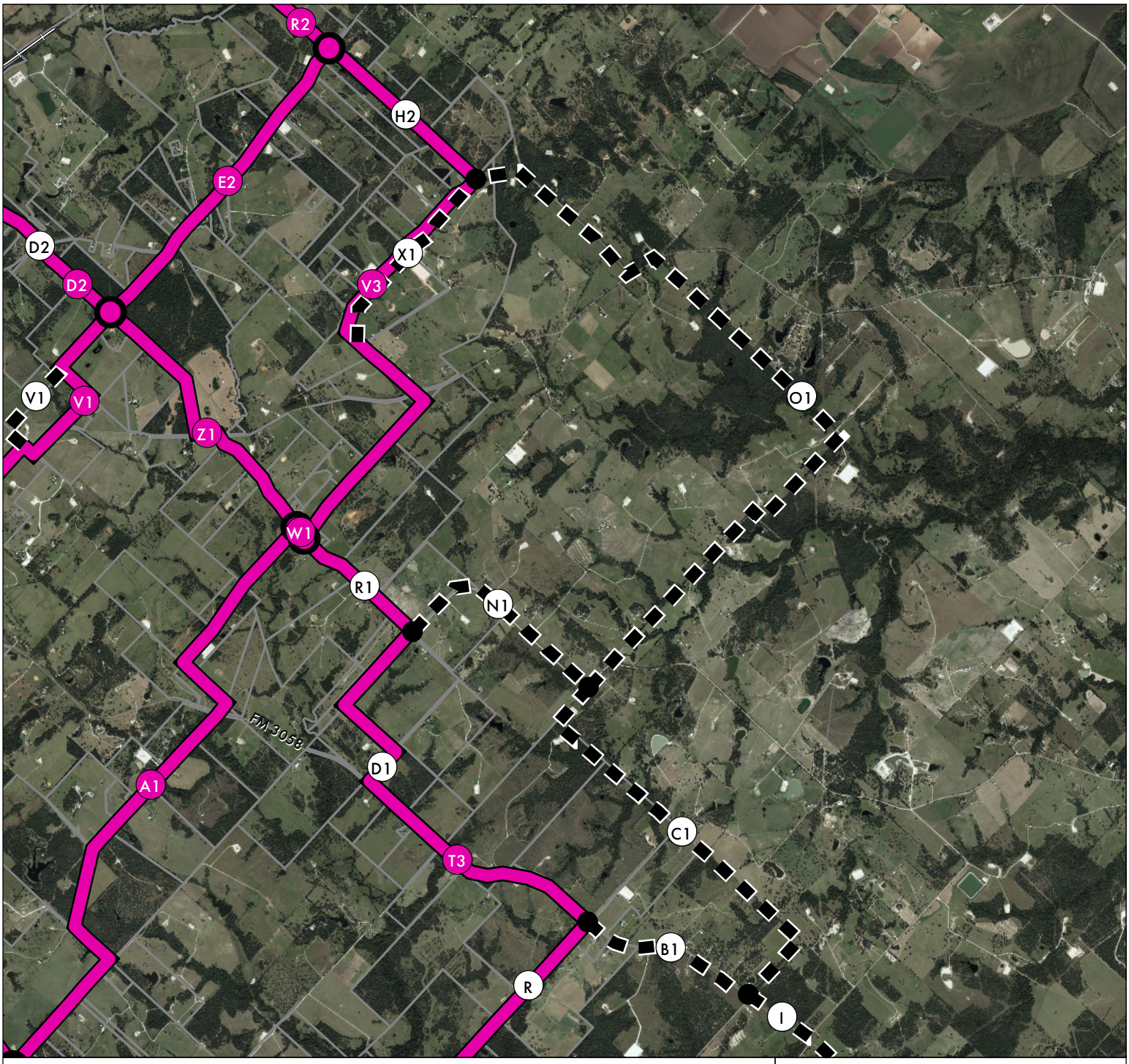
Cooks Point
138-kV Transmission Line Project

Figure 3-8a
Deletion of Segment I

LCRA ENERGY • WATER • COMMUNITY SERVICES

URS

0 4,000 8,000
Feet



New Primary Alternative Segment

Primary Alternative Segment

Removed Portion of Preliminary Alternative Segment Shown at Open House Meeting

New Primary Alternative Segment Node

Primary Alternative Segment Node

Preliminary Alternative Segment Node Shown at Open House Meeting

New Primary Alternative Segment Label

Primary Alternative Segment Label

Preliminary Alternative Segment Label Shown at Open House Meeting

Proposed Substation Alternative

Parcel Boundary

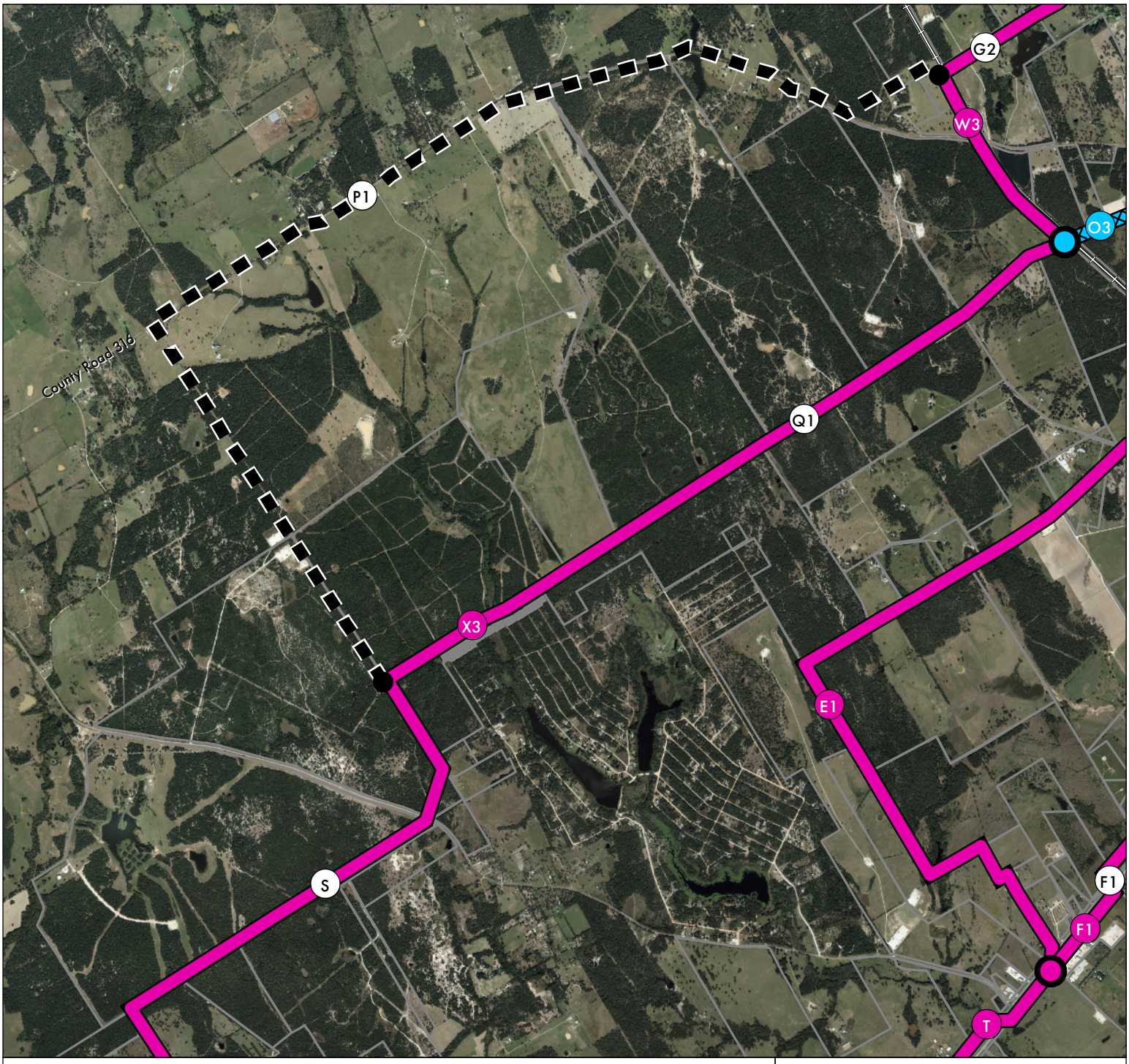
Existing Transmission Line

Railroad

Cooks Point
138-kV Transmission Line Project

Figure 3-8b
Deletion of Segments B1, C1, N1, and O1

0 4,500 9,000
Feet



New Primary Alternative Segment

Primary Alternative Segment

Removed Portion of Preliminary Alternative Segment Shown at Open House Meeting

New Primary Alternative Segment Node

Primary Alternative Segment Node

Preliminary Alternative Segment Node Shown at Open House Meeting

A New Primary Alternative Segment Label

A Primary Alternative Segment Label

A Preliminary Alternative Segment Label Shown at Open House Meeting

Proposed Substation Alternative

Parcel Boundary

Existing Transmission Line

Railroad

Cooks Point
138-kV Transmission Line Project

Figure 3-9
Deletion of Segment P1

LCRA ENERGY • WATER • COMMUNITY SERVICES

URS

0 3,500 7,000
Feet

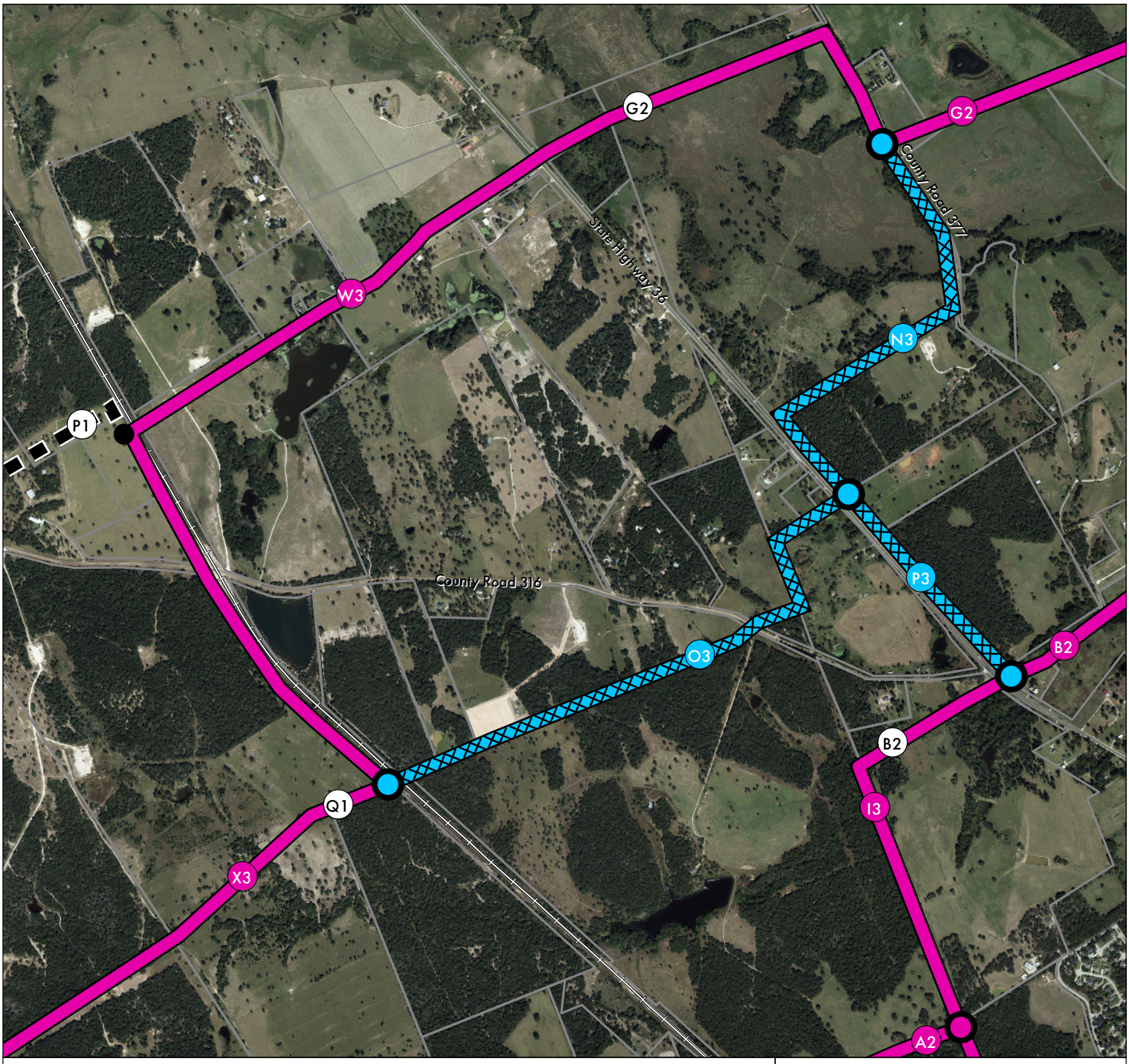
southern portion of Segment Q1 was relabeled as Segment X3. As a result of the addition of Segment N3, a node was added to Segment G2 on the west side of CR 377. Due to the addition of the node, the western portion of Segment G2 was relabeled as Segment W3 (Figure 3-10).

Segment A4 was added along the northern side of SH 21 in order to provide geographic diversity and to provide for continued paralleling of the highway. In addition, Segment Q3 was added parallel to CR 105 and apparent property boundaries in order to provide geographic diversity in the vicinity of SH 21. As a result of the addition of Segments A4 and Q3, nodes were added to Segment F1 and Segment L1. Due to the addition of these nodes, portions of Segment F1 were relabeled as Segment J3 and Segment Y3, and portions of Segment L1 were relabeled as Segment Z3 and Segment L3 (Figure 3-6).

Segment R3 was added along apparent property boundaries and CR 109 to provide geographic diversity. As a result of the addition of Segment R3, a node was added to Segment P west of the railroad. Due to the addition of the node, the northern portion of Segment P was relabeled as Segment M3 (Figure 3-11).

3.5 PRIMARY ALTERNATIVE ROUTES

The modifications, deletions, and additions of segments described in Section 3.4 resulted in a total of 84 primary alternative route segments. URS and LCRA TSC identified a total of 26 geographically diverse primary alternative routes for inclusion in the Application. Many more alternative routes could be formed by connecting the primary alternative route segments in various combinations. Any such reasonably forward-progressing route that satisfies the need for the project would be a feasible alternative. Appendix C depicts the location of each primary alternative route segment, and Table 3-2 details the composition of the 26 primary alternative routes by segment. These primary alternative routes are further evaluated as discussed in Section 4.0.



New Primary Alternative Segment

Primary Alternative Segment

Removed Portion of Preliminary Alternative Segment Shown at Open House Meeting

New Primary Alternative Segment Node

Primary Alternative Segment Node

Preliminary Alternative Segment Node Shown at Open House Meeting

A New Primary Alternative Segment Label

A Primary Alternative Segment Label

A Preliminary Alternative Segment Label Shown at Open House Meeting

Proposed Substation Alternative

Parcel Boundary

Existing Transmission Line

Railroad

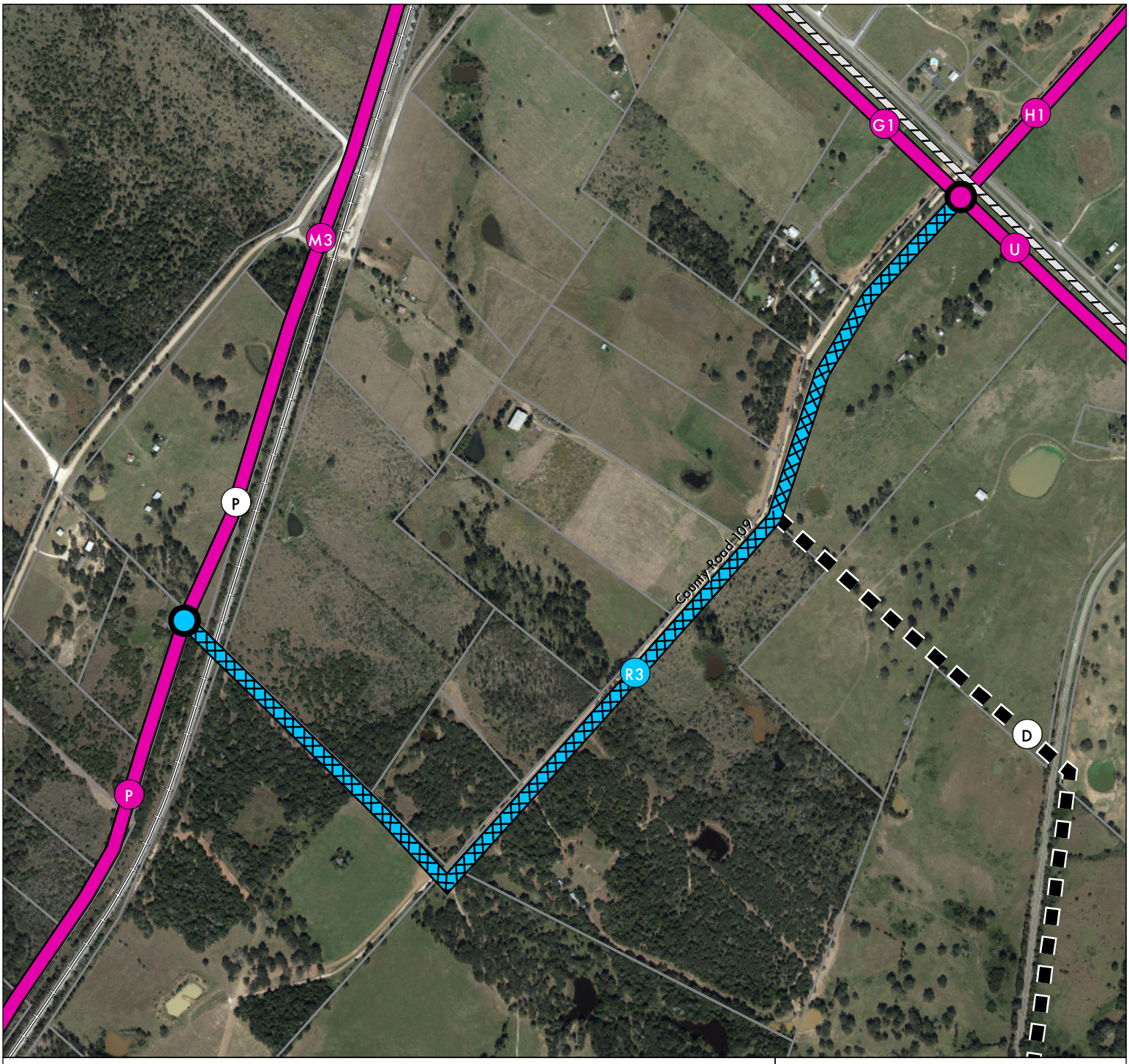
Cooks Point
138-kV Transmission Line Project

Figure 3-10
Addition of Segments N3, O3, and P3

LCRA ENERGY • WATER • COMMUNITY SERVICES

URS

0 1,600 3,200
Feet



New Primary Alternative Segment

Primary Alternative Segment

Removed Portion of Preliminary Alternative Segment Shown at Open House Meeting

New Primary Alternative Segment Node

Primary Alternative Segment Node

Preliminary Alternative Segment Node Shown at Open House Meeting

A New Primary Alternative Segment Label

A Primary Alternative Segment Label

A Preliminary Alternative Segment Label Shown at Open House Meeting

Proposed Substation Alternative

Parcel Boundary

Existing Transmission Line

Railroad

Cooks Point
138-kV Transmission Line Project

Figure 3-11
Addition of Segment R3

LCRA ENERGY • WATER • COMMUNITY SERVICES

URS

0 750 1,500
Feet

TABLE 3-2 COMPOSITION OF PRIMARY ALTERNATIVE ROUTES

Primary Alternative Routes	Primary Alternative Route Segments	Existing Substation Alternative (Start Point)	Cooks Point Substation Alternative (End Point)	Approximate Length (Miles)
1	A-B-L-N-T-F1-J3-Y3-T1-Y1-I3-B2-F2-P2-T2-Z2	Lyle Wolz	1	18.8
2	A-B-L-N-T-F1-J3-Y3-T1-Y1-I3-B2-I2-O2-S2-T2-Z2	Lyle Wolz	1	18.5
3	A-B-S3-P-M3-L1-Z3-L3-Y1-I3-B2-I2-O2-S2-T2-Z2	Lyle Wolz	1	20.5
4	A-B-L-M-X3-O3-P3-B2-I2-O2-Y2	Lyle Wolz	2	20.5
5	A-B-L-N-O-P-M3-L1-Z3-L3-Y1-I3-B2-I2-O2-Y2	Lyle Wolz	2	21.5
6	A-B-L-N-T-F1-J3-Y3-S1-A2-I3-P3-N3-G2-X2-D3-B3	Lyle Wolz	2	20.1
7	A-B-L-N-T-F1-J3-Y3-T1-Y1-I3-B2-I2-O2-Y2	Lyle Wolz	2	17.8
8	A-B-L-N-T-E1-A2-I3-B2-I2-O2-Y2-B3-E3-G3-H3	Lyle Wolz	3	20.7
9	A-B-L-N-T-F1-J3-Y3-T1-Y1-I3-B2-I2-N2-X2-F3-G3-H3	Lyle Wolz	3	20.0
10	A-K-X3-W3-G2-X2-F3-G3-H3	Lyle Wolz	3	23.4
11	A-B-L-N-T-F1-Q3-L1-G1-H1-M1-C2-L2-Q2-V2-W2	Lyle Wolz	4	19.6
12	A-B-S3-P-R3-H1-M1-C2-L2-Q2-V2-W2	Lyle Wolz	4	18.3
13	E-F-V-W-K1-M1-C2-L2-Q2-V2-A3	Lyons	1	18.8
14	E-U3-Q-Y-Z-J1-U1-C2-K2-P2-T2-Z2	Lyons	1	18.9
15	E-U3-Q-Y-Z-I1-K1-M1-C2-L2-Q2-V2-A3	Lyons	1	18.1
16	E-F-V-X-Y-Z-I1-K1-M1-C2-L2-Q2-U2-Z2	Lyons	1	19.6
17	E-F-U-G1-L1-Z3-L3-Y1-I3-B2-I2-O2-Y2	Lyons	2	21.8
18	E-U3-Q-Y-Z-J1-V1-D2-Q2-U2-Z2-C3-H3	Lyons	3	20.6
19	E-U3-T3-V3-R2	Lyons	4	18.5
20	E-U3-Q-Y-A1-Z1-E2-R2	Lyons	4	17.1
21	E-F-U-H1-M1-C2-L2-Q2-V2-W2	Lyons	4	19.3
22	E-U3-Q-Y-A1-Z1-D2-Q2-V2-W2	Lyons	4	17.6
23	E-U3-Q-Y-Z-I1-K1-M1-C2-L2-Q2-V2-W2	Lyons	4	17.8
24	E-F-V-X-Y-Z-J1-U1-C2-L2-Q2-V2-W2	Lyons	4	19.3
25	A-B-L-N-T-F1-J3-A4-L3-Y1-I3-B2-F2-P2-T2-Z2	Lyle Wolz	1	18.8
26	A-B-L-N-T-F1-Q3-Z3-L3-Y1-I3-B2-F2-P2-T2-Z2	Lyle Wolz	1	19.4

(This page intentionally left blank)

4.0 EVALUATION OF THE PRIMARY ALTERNATIVE ROUTES

The evaluation and comparison of potential impacts for each primary alternative route were based upon the consideration of the requirements of PURA §37.056(c)(4)(A)-(D), PUCT Substantive Rule 25.101, including the PUCT's policy of prudent avoidance, public comments from and following the Open House meeting (Appendix B), field reconnaissance, and the information and responses received from agencies and others (Appendix A). Measurements for the majority of the environmental criteria were obtained from aerial photography flown in October 2017 and available digital resource layers using GIS. URS staff with expertise in different environmental disciplines (geology/soils, hydrology, terrestrial ecology, wetland ecology, land use/aesthetics, socioeconomics, cultural resources [archeological and historical]) and GIS evaluated the primary alternative routes, considering existing environmental conditions, land use data (augmented by aerial photo interpretation and field reconnaissance), and the PUCT's routing criteria. A summary of potential impacts to environmental, community, and land use resources is provided in the following sections and quantified by primary alternative route segment in Appendix E and primary alternative route in Appendix F.

4.1 IMPACTS ON PHYSIOGRAPHY/GEOLOGY

Construction of the proposed transmission line would have no significant effect on the physiographic or geologic features/resources of the area. The erection of the structures would require the removal and/or minor disturbance of small amounts of near-surface materials; however, no measurable impact on the geologic resources or features along any of the primary alternative routes and no geologic hazards would be anticipated.

4.2 IMPACT ON SOILS

Activities associated with the construction, operation, and maintenance of electrical transmission lines typically do not adversely impact soils when appropriate mitigative measures are implemented during construction. Potential impacts to soils include erosion, compaction, and conversion of prime farmland soils.

The highest risk for soil erosion and compaction is primarily associated with the construction phase of a project. Prior to construction, LCRA TSC would develop a SWPPP to minimize potential impacts associated with soil erosion and sedimentation. Implementation of this plan would incorporate Best Management Practices (BMPs), including erosion control devices to

minimize soil erosion on the ROW during significant rainfall events. The SWPPP would also establish the criteria for re-vegetation to ensure adequate soil stabilization during the construction and post construction phases. The native herbaceous layer of vegetation would be maintained, to the extent practical, during construction and most bared areas with a low erosion potential would be allowed to re-vegetate with native herbaceous species. Areas with a higher erosion potential, including steep slopes and areas with shallow topsoil, may require seeding and/or matting to stabilize disturbed areas and minimize soil erosion potential during the post construction phase. The ROW would be inspected during and after construction to ensure that potential high erosion areas are identified and appropriate BMPs are implemented and maintained. The study area supports limited areas of cropland and pastureland, and some of these soils are designated by the USDA as "Prime Farmlands." As discussed in Section 2.3.2, the NRCS does not typically consider the construction of a transmission line to be a significant conversion of these soils. Agricultural activities are typically still practiced around the base of the structures after construction is completed. The NRCS responded to the solicitation for information in a letter dated May 5, 2017 (Appendix A) that stated, "The Proposed Project may involve soils designated as Prime Farmland; however, we consider the installation of transmission lines as a minimal activity." Therefore, no further consideration from protection is required and the project is exempt from provisions of Farmland Protection Policy Act. In addition, the NRCS stated that soil erosion is the primary resource concern and recommends the use of BMPs such as limiting the amount of time soils are left unprotected and reducing construction traffic to avoid soil compaction.

No significant conversions of prime farmland or state important soils are anticipated related to project activities for any of the primary alternative routes.

4.3 IMPACT ON MINERAL AND ENERGY RESOURCES

As previously stated in Section 2.3.3, multiple oil and gas wells, other facilities associated with oil and gas exploration, and petrochemical pipelines are located throughout the study area. All of the primary alternative routes cross a petrochemical pipeline that is six inches or greater in diameter. The number of petrochemical pipelines crossed ranges from one pipeline for Route 6 to 24 pipelines for Route 19. Upon approval of a route for the Proposed Project and as required by the PUCT, LCRA TSC will coordinate with pipeline owners or operators in the vicinity of the approved route regarding the need to install measures to mitigate the effects of alternating

current (AC) interference on existing pipelines, including modeling and analyzing potential hazards because of AC interference. The number of petrochemical pipelines crossed, the number of oil/gas wells within 150 feet, and lengths of pipelines parallel to each primary alternative segment and each primary alternative route are presented in Appendices E-F.

4.4 IMPACT ON WATER RESOURCES

4.4.1 Surface Water/Floodplains

Throughout the process of selecting and evaluating primary alternative routes for the Proposed Project, consideration was applied toward minimizing potential impacts to surface waters and associated NWI-mapped wetlands. TPWD recommended minimizing crossing or paralleling aquatic resources (river, creeks, wetlands) (Appendix A). Where crossings could not be avoided, impacts were minimized by maintaining a perpendicular angle at each crossing where practical. Additional TPWD recommendations for construction and clearing within riparian areas are provided in Appendix A.

Surface waters typically include ephemeral, intermittent, or perennial streams and lakes or ponds as discussed in Section 2.3.4. If surface waters are crossed, the proposed transmission line would span all surface waters, with the structure foundations located outside of ordinary high water mark boundaries. No construction activities would be allowed that would significantly impede the flow of water within the watersheds. Vegetation removal at surface water crossings would be performed in a manner to diminish damage to the natural condition of the area and in accordance with USACE requirements. Erosion control devices would be implemented in accordance with the SWPPP to reduce the potential for sedimentation outside of the ROW (as discussed in Section 4.2). The proper inspection and maintenance of these erosion control devices would minimize the potential for erosion of exposed soils on the ROW and deposition of sediments into surface waters.

According to data evaluated from the NHD, all of the primary alternative routes cross streams or creeks. The number of stream crossings range from 18 stream crossings for Route 20 to 45 stream crossings for Route 17. No rivers are crossed by any of the primary alternative routes. All of the primary alternative routes have some length of ROW across open water (lakes, ponds), ranging from approximately 0.01 mile for Route 19 to approximately 0.35 mile for Route 2. All of the primary alternative routes parallel (within 100 feet) streams for some distance,

ranging from approximately 0.2 mile for Route 20 to approximately 1.5 miles for Routes 3 and 5. The number of stream crossings and the length of paralleling streams (within 100 feet) for each primary alternative route segment and primary alternative route are presented in Appendices E-F.

As discussed in Section 2.3.4, NWI wetland types identified within the study area include palustrine forested, palustrine shrub/scrub, and palustrine emergent wetlands that are associated with the streams, creeks, rivers and depressional areas. The extent to which the primary alternative routes cross mapped NWI wetlands ranges from zero (0.0) miles for Routes 10 and 24 to approximately 0.04 mile for Routes 15 and 23. Predominately, the wetlands within the study area are relatively small and would be spanned, thereby avoiding direct impacts to these potentially jurisdictional water features. The lengths of each primary alternative route segment and primary alternative route crossing NWI wetland types is presented in Appendices E-F.

As stated in Section 2.3.4, floodplain data indicates that 100-year floodplains are located along the majority of creeks and streams found within the study area (FEMA 2016). The extent to which the primary alternative routes cross mapped 100-year floodplains ranges from approximately 1.1 miles for Route 20 to approximately 5.1 miles for Route 17. Structures may be located within these floodplains; however, engineering considerations and proper structure placement should alleviate the potential for adverse impacts of floodwater flow by minimizing impedance. Construction of the Proposed Project should not have any significant impacts on the overall function of the floodplain, nor adversely affect adjacent or downstream properties. If structures are to be located within the floodplain, LCRA TSC would coordinate with the appropriate Burleson County floodplain administrators. The length of each primary alternative route segment and primary alternative route crossing 100-year floodplains is presented in Appendices E-F.

4.4.2 Groundwater/Aquifers

The construction, operation, and maintenance of the Proposed Project are not anticipated to adversely affect groundwater resources in the study area. No measurable decrease of aquifer recharge capacity should occur, and groundwater contamination is not anticipated with the implementation of a SWPPP.

During construction activities, another potential impact for both surface water and groundwater resources is related to potential fuel and/or other chemical spills. As a component of the SWPPP, standard operating procedures and response specifications relating to petroleum product storage, refueling, and maintenance activities of equipment are provided to avoid and minimize potential contamination to these resources.

As discussed in Section 2.3.4, 15 springs are located within the study area including seven named springs: Dean Lake Ranch, Pabulek, Liberty, Evans, Spring Lake, Denton Valley, and Pettis Springs. Routes 6, 10, and 13 are located within 0.1 mile of one unnamed spring, Pabulek Spring, and Deal Lake Ranch Spring. However, these springs can be spanned by the Proposed Project. Therefore, no impacts to springs would be anticipated.

4.5 IMPACT ON ECOSYSTEMS

4.5.1 Vegetation

Impacts to vegetation would be limited to that necessary for the construction, operation, and maintenance of the Proposed Project. Prior to construction, removal of woody vegetation within new ROW would be required within upland forested, bottomland/riparian, and forested/scrub-shrub wetland areas to facilitate access for structure construction, line stringing, and maintenance activities. Mowing and/or shredding of herbaceous vegetation may be required within pasture/rangeland. Future ROW maintenance activities may include periodic mowing and/or herbicide applications to maintain the herbaceous vegetation layer within the ROW. Vegetation removal would be performed in accordance with natural and cultural resource regulations, and in a manner that would diminish marring and scarring of the landscape while ensuring that the transmission line could be constructed, operated, and maintained safely and in accordance with state and federal regulations governing utility construction.

The most common land use types within the study area are upland forests, croplands, and pasture/rangeland. While TPWD recommends implementing practices to prevent establishment of invasive plant species and sustain native species (Appendix A), the native vegetation within these areas has likely been previously modified (see Section 1.0 for LCRA TSC's vegetation management activities). Regardless, clearing the new ROW of woody vegetation and/or clearing herbaceous vegetation may result in impacts to native vegetation

and generate an additional degree of habitat fragmentation. According to the EMST (Section 2.3.5), the length of ROW across forested/woody vegetation ranges from approximately 1.12 miles for Route 11 to 9.24 miles for Route 10. The length of ROW across bottomland/riparian woodlands ranges from approximately 0.11 mile for Route 20 to 0.99 mile for Route 18. The length of each primary alternative route segment and primary alternative route across EMST forested and riparian vegetation are provided in Appendices E-F. The degree of new habitat fragmentation is typically reduced when a route parallels an existing linear feature such as a transmission line, railroad, or roadway. During the route development process, consideration was given to avoid extensive woodland and riparian areas and maximize the length of the routes paralleling existing linear corridors. The majority of the primary alternative route segments and all of the primary alternative routes parallel existing linear corridors for some portion of their lengths (including apparent property boundaries) that may minimize potential impacts to the vegetation and habitat fragmentation (Appendices E-F).

A summary of the TPWD recommendations (Appendix A) includes using existing facilities whenever possible and where new construction is the only feasible option, routing new transmission and distribution lines along existing roads, transmission lines, or other utility ROW and easements to reduce habitat fragmentation. These recommendations were considered and implemented where practical during the routing process.

4.5.1.1 Commercially or Recreationally Important Plant Species

Commercially important plant species, such as row crops and hay production fields, exist within the study area. Minimal vegetation clearing would be required in agricultural cropland areas. Primary alternative route lengths within cropland areas range from approximately 0.95 mile for Routes 6, 10, 14, and 19, to approximately 3.47 miles for Route 11. Primary alternative route lengths proposed within pasture/rangeland areas vary from approximately 8.33 miles for Route 4 to approximately 12.6 miles for Route 17. Primary alternative route segment and primary alternative route lengths across cropland and pasture/rangeland areas are provided in Appendices E-F. Temporary impacts to row crop species would be the greatest during the growing season and these could be minimized with seasonal timing of construction activities. Permanent impacts (loss of production areas) would be limited to the footprint of the transmission structures since these areas are inaccessible with large farming or cultivating

equipment. None of the primary alternative routes cross land with known mobile irrigation systems.

4.5.1.2 Endangered and Threatened Plant Species

One plant species, the Navasota ladies'-tresses, is listed by the USFWS as federally endangered within the study area. As stated in Section 2.3.5, based on the presence of modeled suitable habitat, there is potential for this species to occur in the study area. However, further review determined that the modeled suitable habitat for the species was identified south of all primary alternative routes; therefore, the Proposed Project is unlikely to adversely affect this species.

4.5.2 Fish and Wildlife

4.5.2.1 Terrestrial

Short-term effects to wildlife, in the form of physical disturbance, could occur during construction and maintenance activities. Increased noise and activity levels during construction may affect wildlife along the edges of proposed transmission line impact areas, which could temporarily displace animals from these sites. The increased noise and activity levels during construction could also potentially disturb breeding or other activities of species inhabiting areas adjacent to the ROW. These impacts would be short-term and normal wildlife movements would be expected to resume after construction is completed. The effect of increased noise, dust, and emissions from combustion engines on wildlife is expected to be minimal. Although the normal behavior of many wildlife species would be temporarily altered during construction of the proposed transmission line, permanent effects due to noise, dust, and emissions are not expected.

Long-term effects to wildlife, from habitat modification and/or fragmentation, and the addition of permanent man-made structures, would occur from the Proposed Project. In general, vegetation clearing and associated disturbances would be the primary impact of construction activities on wildlife. Any required clearing and other construction-related activities would directly and/or indirectly affect most animals that reside in, or pass through, the transmission line ROW. Some small, low-mobility species have the potential to be impacted by heavy construction and maintenance machinery. These include several species of amphibians, reptiles, mammals, and, if ROW clearing and construction occurs during the breeding season, the young of many species, including nestling and fledgling birds. Fossorial animals (i.e. those that live underground) such as mice, moles, and gophers, may be similarly impacted as a result of soil

compaction caused by heavy machinery. Larger or more mobile species such as birds, deer, rabbits, and foxes may avoid clearing and construction activities and be displaced to adjacent areas outside of the ROW. Wildlife in the immediate area may experience a loss of browse during construction; however, the prevalence of similar habitats in adjacent areas and regrowth of vegetation in the ROW following construction would minimize the effects of this loss.

After construction is completed and grasses and forbs are allowed to recover, many forms of wildlife are anticipated to re-occupy the Proposed Project ROW. Clearing of ROW for construction and maintenance activities would result in increased edge habitat in dense shrubland areas and result in decreased edge habitats where the existing landscape is patchy. Edge habitats or ecotones are often preferred by generalist species such as cottontail rabbits and Northern Bobwhite. More specialized species can be positively or negatively impacted by clearing activities, such as grassland passerines that may benefit from the increase in open expanses.

Species requiring forest interior or shrubland habitat are typically more sensitive to fragmentation than edge-adapted species and are particularly affected by predation, brood parasitism, elevated rates of interspecific competition, and reductions in pairing and nesting success (Faaborg, et al. 1995). Several protected migratory songbirds require unfragmented stands of shrublands for residence to avoid nest parasitism and predation; therefore, these songbirds could become more vulnerable following construction of the transmission line.

Transmission line structures could benefit some bird species, particularly raptors and corvids, by providing resting and hunting perches, particularly in open, treeless habitats (APLIC 2006). Raptors, most commonly the red-tailed hawk, often utilize the support structures as nesting sites. Vultures and ravens are known to use these structures as nighttime roosts. The wires and supports are often used as hunting or resting perches by species such as the American Kestrel, Loggerhead Shrike, and Mourning Dove. The danger of electrocution to birds would be minimal as the distance between conductors or conductor and ground wire on 138-kV transmission lines is greater than the wingspan of the birds in the area, including the 5.9 to 7.5-feet wingspan of the Bald Eagle, which has the potential to occur in the study area (Section 2.3.5).

Bald and Golden Eagle Protection Act

Under the provisions of the Bald and Golden Eagle Protection Act (BGEPA), the taking or possession of and commerce in Bald and Golden eagles, parts, feathers, nests, or eggs, with limited exceptions is prohibited. Bald Eagles are known to occur in Burleson County (Section 2.3.5). The study area is outside of the known current breeding range of the Golden Eagle (Lockwood and Freeman 2014). Although the frequency of bird collision with power lines is rare (APLIC 2006), there is a potential for increased risk where the proposed transmission line would cross large streams or waterbodies. Potential detrimental impacts would be mitigated in accordance with the BGEPA and APLIC guidelines (APLIC 2006), as applicable. The term "disturb" under the BGEPA was defined via a final rule published in the Federal Register on June 5, 2007 as "means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity by substantially interfering with normal breeding, feeding or sheltering behavior, or 3) nest abandonment by substantially interfering with normal breeding, feeding or sheltering behavior" (USFWS 2007). Currently, the USFWS has a permitting process for activities which may disturb Bald or Golden eagles or take an eagle nest where their location poses a risk to human or eagle safety. Prior to construction, an NRA will be conducted (see Section 1.0) to ensure no Bald Eagles, or their nests, are present during construction.

Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) states that it is unlawful to kill, capture, collect, possess, buy, sell, trade, or transport any migratory bird, nest, young, feather, or egg in part or in whole, without a federal permit issued in accordance within the MBTA's policies and regulations. If ROW clearing occurs during the nesting season, potential impacts could occur within the ROW area related to potential takes of migratory bird eggs and/or nestlings. Increases in noise and activity levels during construction could also potentially disturb breeding or other activities of species nesting in areas immediately adjacent to the ROW. TPWD recommends using practices to avoid harassment and harm to migratory birds, for vegetation removal, and that ground-disturbing activities be done outside the nesting season (Appendix A).

The greatest potential impact to wildlife from the Proposed Project would result from both direct and indirect impacts of clearing forest and woodland habitats, as well as habitats within

100 feet of rivers, creeks, and streams, and wetlands. Reducing the amount of vegetation clearing by utilizing or paralleling existing utility and road ROWs would reduce overall direct impacts to wildlife and habitat fragmentation. TPWD recommended "routing new transmission lines along existing roads, pipelines, transmission lines, or other utility ROWs and easements to reduce habitat fragmentation" (Appendix A). All of the primary alternative routes cross some forest and shrubland, and therefore may potentially impact wildlife. These impacts are anticipated to be minimal, as the primary alternative routes parallel existing ROW or other existing features, such as apparent property lines, to the greatest extent reasonable, as recommended by TPWD.

4.5.2.2 Aquatic

Potential impacts to aquatic systems by a project of this nature typically involve effects of increased erosion, siltation, and sedimentation. Aquatic ecosystems directly affected by the primary alternative routes for the Proposed Project include wetlands, streams, and tributaries of the Brazos River. Land clearing and/or construction may result in increased suspended solids entering aquatic systems traversed by, or in proximity to, the transmission line. Increases in suspended solids have the potential to negatively affect aquatic organisms and their associated habitats that require relatively clear water for feeding and reproduction.

Construction activities could result in impacts to water quality from erosion (increased sedimentation), increased suspended solids loading, or accidental petroleum spills. Erosion results in siltation, which negatively affects many aquatic organisms, notably game fish that require relatively clear water for feeding and reproduction. Alteration of water quality as a result of particulate loading caused by direct mechanical damage from workers, equipment, and siltation from erosion in newly disturbed areas could also have effects on downstream areas. Wherever riparian vegetation would be removed and at temporary crossings for access roads, increased levels of siltation or sedimentation may also potentially impact downstream areas, primarily affecting filter feeding benthic and other aquatic invertebrates. Particularly sensitive areas include the gravel, riffle, and sand bottom habitats within various stream/creek drainages. Blanketing these sensitive areas by fine sediments could eliminate habitats important for fish spawning, resident benthic invertebrates, nymphal dragonflies, mayflies and caddisflies, and freshwater mussels. However, no significant adverse impacts are anticipated to any aquatic habitats crossed or adjacent to the ROW for any of the primary alternative routes.

Potential impacts would be largely, if not completely, obviated by appropriate construction techniques and applicable BMPs. Implementation of BMPs within the project's SWPPP would minimize potential impacts from soil erosion and siltation near aquatic and wetland habitats. The construction of access roads and the installation of culverts would be minimized, and necessary access roads would be constructed in a manner to prevent damage or erosion to the ROW and/or adjacent property or environmentally sensitive areas such as wetlands. The installation of culverts, including the number and size of culverts would be pre-approved by LCRA TSC or an authorized representative. Culverts would be sized such that they do not create a restriction to the flow of water. Following construction, culverts would be removed in a manner that minimizes soil disturbance and erosion. LCRA TSC and its contractors would exercise care to avoid affecting aquatic life when using chemical herbicides to control vegetation within the ROW. Herbicide use would comply with rules and guidelines established in the Federal Insecticide, Fungicide, and Rodenticide Act, and with Texas Department of Agriculture regulations.

All of the primary alternative routes for the proposed transmission line have the potential to cross the aquatic habitats previously mentioned. Wherever possible, the proposed transmission line route would cross linear water features in a perpendicular fashion, such that the water body would be spanned. In addition, the majority of any potential wetlands and other aquatic features crossed by the transmission line would be spanned. None of the primary alternative routes for the proposed transmission line would span significant amounts of open water. Therefore, no significant direct impacts to the area's aquatic resources are anticipated.

4.5.2.3 Commercially or Recreationally Important Animal Species

Construction of the proposed transmission line would not be expected to have adverse impacts on commercially or recreationally important animal species occurring within the study area, particularly where habitat clearing would be minimized by routing along existing roadway, railroad, or transmission line ROWs. Game species are highly mobile and would leave the immediate vicinity during initial construction phases. These species may experience a loss of browse or forage vegetation during and after construction; however, the prevalence of similar habitats in adjacent areas would minimize the effect of the loss. Additionally, much of the ROW would be available for forage after completion of construction and vegetation clearing could be beneficial to game species that prefer edge habitat such as the white-tailed deer.

4.5.2.4 Endangered and Threatened Animal Species

As discussed in Section 2.3.5, six federally listed endangered or threatened animal species have the potential to occur in the study area. These species include the Houston Toad, Interior Least Tern, Red Knot, Whooping Crane, Smalleye Shiner, and Sharpnose Shiner. Also, federally listed candidate species such as the Smooth Pimpleback and Texas Fawnsfoot, and the federally delisted Bald Eagle and Peregrine Falcon (including the American and Arctic Peregrine Falcon subspecies) have the potential to occur in the study area. Furthermore, five state-listed species have the potential to occur within the study area including the Wood Stork, Blue Sucker, Alligator Snapping Turtle, Texas Horned Lizard, and Timber Rattlesnake.

The HSA for the Houston Toad identified multiple areas of optimal habitat within the ROW of the primary alternative routes. Of the primary alternative routes within the study area, Routes 11 and 12 cross the least optimal Houston Toad habitat, with approximately 0.21 mile and 0.32 mile, respectively. Whereas Routes 6 and 10 cross the most optimal Houston Toad habitat, with approximately 3.18 miles and 5.30 miles, respectively. The length of Houston Toad habitat crossed by each primary alternative route segment and primary alternative route are presented in Appendices E-F. The use of perpendicular water crossings, reducing impacts to riparian vegetation from construction equipment, and spanning the length of streams, tributaries, and wetlands would minimize potential impacts to potential Houston Toad breeding habitat; however, clearing of canopy cover could reduce the amount of suitable habitat present for the species. Therefore, if the primary alternative route approved by the PUCT impacts vegetation within optimal Houston Toad habitat, LCRA TSC would coordinate with the USFWS regarding potential impacts. TPWD recommends avoiding disturbances to woodland savannahs located within areas of deep, sandy soils and that if disturbances are anticipated, they recommend a qualified biologist conduct preconstruction surveys following USFWS survey protocols (Appendix A). TPWD further recommends that LCRA TSC coordinate with USFWS directly, to determine avoidance, minimization, and mitigation strategies following the ESA.

The Interior Least Tern is a state- and federally listed endangered species that could potentially occur in the study area during migration, as these species are known to follow major river basins during migration (Section 2.3.5). Additionally, the Brazos River is in proximity to the project area, which could result in potential stopover sites. Of the primary alternative routes, Routes 6, 8, 9, 10, and 18 are closest (approximately 2.5 miles) to the Brazos River and have the

highest potential for the occurrence of stopover sites. The use of perpendicular water crossings, selective tree removal along river banks, and spanning Brazos River tributaries and associated wetlands would minimize potential impacts to stopover habitat. Therefore, it is unlikely that the Proposed Project would adversely affect the species.

The federally listed threatened Red Knot has the potential to occur in the study area during a rare inland migration stop. Red Knots could be found at lakes and ponds with shallow grade sandy and/or muddy shorelines, or mudflats within the study area (Section 2.3.5). Minimizing disturbance to water bodies, especially with mudflats, within the study area by spanning or avoiding them would minimize potential impacts to stopover habitat. However, given the scarcity of inland sightings, the potential for Red Knots to stop over within the study area is very low. Therefore, the Proposed Project is unlikely to adversely affect this species.

The Whooping Crane is a state- and federally listed endangered species and has the potential to occur in the study area during migration. Whooping Crane migration habitat includes croplands, palustrine wetlands of varying sizes, and other riverine habitats that may be found along the Brazos River and other water features within the study area (Section 2.3.5). Though Whooping Crane sightings are rare, spanning and avoiding water features and wetlands, especially those near croplands, would minimize potential impacts to this species and their migration habitats. While the Proposed Project is unlikely to adversely affect the species, if a Whooping Crane is observed in proximity to the PUCT-approved route, coordination with USFWS would occur to ensure impacts to the individual would be avoided.

The Smalleye Shiner and Sharpnose Shiner, both federally listed endangered species, could occur within the study area, as potential habitat exists within the tributaries of the Brazos River (Section 2.3.5). Additionally, given the mobility of these species and their potential to occur outside of their designated critical habitat, potential habitat for these species is considered to include all of the Brazos River and its tributaries. All of the primary alternative routes would cross tributaries of the Brazos River. Additionally, all primary alternative routes cross streams that could be habitat for these species. The use of perpendicular water crossings, not locating transmission line structures within streams, and proper stormwater pollution prevention measures as outlined in the SWPPP, would aid in protecting these waters from pollutants or sediments carried into the river by runoff during construction and minimize potential impacts to this species. Therefore, it is unlikely that the project would adversely affect these species.

The Smooth Pimpleback and Texas Fawnsfoot, both federal candidate species, can be found in small to moderately sized streams and rivers, as well as moderately sized reservoirs, all of which occur in the study area (Section 2.3.5). The use of perpendicular water crossings, not locating transmission line structures within streams, and spanning the length of streams and tributaries would minimize potential impacts to the Smooth Pimpleback and Texas Fawnsfoot individuals and their preferred habitat. Therefore, it is unlikely that the Proposed Project would adversely affect these species.

As discussed in Section 2.3.5, the federally de-listed and state-listed Bald Eagle and Peregrine Falcon (including its subspecies) and state-listed Wood Stork, Blue Sucker, Alligator Snapping Turtle, Texas Horned Lizard, and Timber Rattlesnake have the potential to occur within the study area. The construction of a transmission line does not include activities associated with collecting, hooking, hunting, netting, shooting, or snaring by any means or device, and does not include an attempt to conduct such activities. Therefore, "take" of state-listed species as defined in Section 1.01(5) of the Texas Parks and Wildlife Code is not anticipated by this project. Construction activities along the ROW may temporarily displace wildlife species. If state-listed species are observed during construction, they would be relocated out of the construction area by a permitted individual or allowed to leave the area on their own. Overall, impacts of the proposed transmission line project are expected to be minimal and temporary; displaced organisms would be expected to return after construction or permanently relocate. In addition, spanning surface waters and wetlands, and implementing the SWPPP to the extent practicable, will avoid and minimize significant adverse impacts to state-listed aquatic species, such as the Blue Sucker.

For TPWD recommendations regarding state-listed species within the study area, please refer to the TPWD letter in Appendix A. As stated in TPWD's response letter, a lack of site-specific records should not be interpreted as presence/absence data, but instead that limited information is available to TPWD at the time of their review (Appendix A).

4.5.2.5 Summary of Natural Resource Impacts

Biological criteria primarily considered for the Proposed Project included the length of ROW through upland woodlands, riparian/bottomland woodlands, potential wetlands, known and potential habitat of federally listed endangered or threatened species, USFWS designated critical habitat, and area of ROW across Navasota Ladies'-tresses and Houston Toad habitat.

Consideration was also given to length of ROW parallel to streams or rivers and number of stream crossings. The overall length of each route and length of each route paralleling other compatible ROW (e.g. roadways, railroads, and electric transmission lines) as a means to minimize fragmentation and clearing, were also considered. No significant impacts to natural resources are anticipated for any of the primary alternative routes.

- Route 11 has the shortest length of ROW through upland woodland/brushland, at approximately 1.1 miles;
- Route 20 has the shortest length of ROW through bottomland/riparian woodlands, at approximately 0.1 mile;
- Routes 10 and 24 have the shortest length of ROW through NWI-mapped wetlands, at approximately zero (0.0) miles;
- No primary alternative routes cross Navasota Ladies-'tresses modeled habitat;
- No primary alternative routes cross USFWS critical habitat for the Houston Toad. Routes 6, 9, and 10 occur approximately 0.10 mile from the critical habitat;
- Route 11 crosses the least amount of modeled optimal habitat for the Houston Toad, at approximately 0.2 mile;
- Routes 12, 13, 19, and 20 cross the least length of ROW across open water, at approximately zero (0.0) miles;
- Route 20 has the least number of stream crossings with 18 crossings and Route 17 has the highest number of stream crossings with 45 crossings;
- No primary alternative routes cross a river;
- Routes 20 and 22 have the least length of ROW parallel to streams or rivers (within 100 feet), at approximately 0.2 mile; and

4.6 IMPACTS ON COMMUNITY VALUES AND COMMUNITY RESOURCES

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

(primarily aesthetic) of the proposed transmission line, structures, or ROW. Impacts on community resources, whether direct or indirect, can be more accurately gauged if they affect recreational areas, natural resources, and the visual environment of an area (aesthetics). Impacts in these areas are discussed in detail in the sections below.

4.7 LAND USE IMPACTS

The magnitude of potential land use impacts resulting from the construction of a transmission line is determined by the amount of land burdened 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, equipment and materials through the area. Construction noise and dust, as well as temporary disruptions of traffic flow, may also temporarily affect residents and businesses in the area immediately adjacent to the ROW. Coordination between LCRA TSC, its contractors, and landowners regarding ROW access and construction scheduling should minimize these disruptions. The primary criteria considered to compare potential land use impacts for this project include proximity to habitable structures, length utilizing or parallel to existing ROW, length parallel to apparent property lines, and overall route length. An analysis of the existing land use within and adjacent to the proposed ROW is required to evaluate the potential impacts.

4.7.1 Urban/Residential Areas

Generally, one of the most important measures of potential land use impacts is the number of habitable structures located in the vicinity of each primary alternative route. URS determined the number and distance of habitable structures located within 300 feet of the centerline of each primary alternative route through the interpretation of aerial photography and verification during reconnaissance surveys, where possible.

URS, where feasible, attempted to avoid habitable structures in the identification of the primary alternative routes. All of the primary alternative routes are located with 300 feet of habitable structures. Routes 15 and 23 have the least number of habitable structures within 300 feet (19), while Route 5 has the greatest number of habitat structures within 300 feet (63). Habitable structures within 300 feet of the primary alternative routes are documented and labeled in Appendix F.

4.7.2 Existing Linear Facilities and other Features

The least impact to land use generally results from locating new lines within or parallel to an existing transmission line ROW. PUCT Substantive Rule 25.101(b)(3)(B) requires, among other things, the consideration of whether new transmission line routes parallel existing compatible ROWs, apparent property boundaries, or other natural or cultural features in the selection and evaluation of alternate routes.

Paralleling Existing Transmission Lines

There are three existing transmission lines, two Entergy 69-kV transmission lines and one BBEC 138-kV transmission line, located in the study area. All of the primary alternative routes parallel existing transmission line ROWs for a portion of their length, ranging from approximately 0.1 mile for Routes 10, 19, and 20 to approximately 14 miles for Route 21. The lengths paralleling existing transmission line ROW for each primary alternative route segment and primary alternative route are provided in Appendices E-F. There are no vacant or open positions on any existing transmission lines located within the study area. None of the primary alternative routes utilize existing transmission line ROW.

Paralleling Other Existing Compatible ROW

Paralleling other existing compatible ROW is also considered to be a favorable routing criterion. URS identified railroad and roadway ROWs as potential paralleling opportunities in accordance with the provisions of PUCT Substantive Rule 25.101(b)(3)(B). However, URS deviated from paralleling some compatible ROWs to avoid other known constraints (e.g., existing habitable structures, oil/gas wells, etc.). All of the primary alternative routes parallel other existing ROW to the extent feasible.

Roadway ROWs

Multiple roadway ROWs, as previously mentioned in Section 2.3.7, are located throughout the study area. URS evaluated paralleling SH 21, SH 36, FM 166, FM 696, FM 1362, FM 2000, and FM 3058 and numerous other local roads. The primary alternative route lengths parallel to roadway ROWs ranges from approximately 0.3 mile for Routes 21 and 23 to approximately 13 miles for Route 1. The lengths paralleling existing roadway ROW for each primary alternative route segment and primary alternative route are provided in Appendices E-F.

Railroad ROWs

There are two existing railroads located in the study area, the BNSF railway and UPRR railway. The total primary alternative route lengths parallel to railroad ROWs range from zero (0.0) miles for Routes 1, 2, 4, 6, 7, 8, 9, 17, 25, and 26 to approximately 10.7 miles for Routes 15 and 23. The lengths paralleling existing railroad ROW for each primary alternative route segment and primary alternative route are provided in Appendices E-F.

Paralleling Apparent Property Boundaries

In addition to existing transmission line, roadway, and railroad ROW, paralleling apparent property boundaries is a favorable routing criteria per PUCT Substantive Rule 25.101(b)(3)(B). Paralleling property lines or fence lines may minimize the potential for disruption to agricultural activities and create less of a constraint for future development of a tract of land. LCRA TSC provided URS with updated parcel line data that was obtained from Universal Field Services, Inc., in March 2018. There can be differences between property lines and parcel lines depending on how the information is organized at the county appraisal district. LCRA TSC grouped the updated parcel data where possible in an effort to identify potential aggregate ownership. All primary alternative routes parallel apparent property boundaries where practical considering other environmental and land use constraints. The total primary alternative route lengths parallel to apparent property boundaries ranges from approximately 1.7 miles for Routes 15 and 23 to approximately 16.7 miles for Route 10. Where there are contiguous parcels in apparent common ownership, only paralleling of the outside boundary of the parcels was tabulated. The lengths paralleling apparent property boundaries for each primary alternative route segment and primary alternative route are provided in Appendices E-F.

Paralleling Compatible ROW and Apparent Property Boundaries

The total length of primary alternative routes parallel and adjacent to existing transmission line, roadway, and railroad ROW and apparent property boundaries ranges from approximately 80 percent (or 16.5 miles) for Route 8 to approximately 97 percent (or 18.3 and 18.7 miles, respectively) for Routes 14 and 24. The length of each primary alternative route segment and primary alternative route parallel to existing corridors, including apparent property boundaries, are provided in Appendices E-F.

Overall Length of Routes

The overall length of a route can be an indicator of the relative level of potential land use and environmental impacts. Potential impacts to land use are typically minimized with routes that have shorter lengths, as less land surface area is required for the ROW. The total lengths of the primary alternative routes vary from approximately 17.1 miles for Route 20 to approximately 23.4 miles for Route 10. The differences in route lengths reflect the direct or indirect pathway of each route between the project endpoints. The length of the routes may also reflect the effort to parallel existing transmission lines, other existing linear features like highways, apparent property boundaries, and the geographic diversity of the primary alternative routes. The overall lengths of each primary alternative route segment and primary alternative route are provided in Appendices E-F.

4.7.3 Recreational Areas

All park or recreational area locations are shown in Appendices C-D. Potential impacts to recreational areas include the disruption or preemption of recreation activities. None of the alternative routes directly cross any park or recreational areas as defined by the PUCT Standard Application for a CCN. There are two park or recreational areas (Copperas Hollow Country Club and TxDOT Rest Area 2) located within 1,000 feet of the centerline of several primary alternative routes. The distance of each park or recreation area from the nearest route segment was measured using GIS and aerial photography interpretation (see Appendix D). Of the recreational areas discussed in Section 2.3.7.3, Routes 1, 2, 3, 14, 16, 18, 25, and 26 are within 1,000 feet of the TxDOT Rest Area 2, and Routes 1, 2, 3, 5, 7, 9, 17, 25, and 26 are within 1,000 feet of Copperas Hollow Country Club (Table 4-1). The number of parks and recreational areas within 1,000 feet for each primary alternative route are also provided in Appendix E.

TABLE 4-1 PARKS AND RECREATIONAL AREAS WITHIN 1,000 FEET OF PRIMARY ALTERNATIVE ROUTES

Map ID (Appendix D)	Parks and Recreational Areas (with Ownership)	Nearest Route Segment	Primary Alternative Routes	Distance from Nearest Route Segment (feet)
229	Copperas Hollow Country Club (City of Caldwell)	Y1	1, 2, 3, 5, 7, 9, 17, 25, 26	66
230	TxDOT Rest Area 2	Z2	1, 2, 3, 14, 16, 18, 25, 26	246

During construction, minor and temporary disruption to recreational users of the rest area and Copperas Hollow Country Club may occur; however, long-term impacts are not anticipated. Upon project completion, recreational activities within these areas would be anticipated to

resume. No significant impacts to the use of the parks and recreation facilities located within the study area are anticipated from any of the primary alternative routes.

Visual impacts to these recreational facilities could occur if certain links are selected as part of the PUCT-approved route. These impacts are discussed in Section 4.7.5.

In addition, no adverse impacts are anticipated as a result of any of the primary alternative routes to the fishing or hunting areas discussed in Section 2.3.7.3.

4.7.4 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 on cultivated cropland. Few impacts to cropland are anticipated as a result of this project. Since LCRA TSC would not fence the ROW for this project or otherwise separate the ROW from adjacent lands, there would be no long-term or significant displacement of farming or grazing activities. Most existing agricultural land uses may be resumed following construction. For additional information on impacts to cropland and pastureland, see Section 4.5.1.

4.7.5 Aesthetics

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

Construction of the proposed 138-kV transmission line could have both temporary and permanent aesthetic effects. Temporary impacts would include views of the actual assembly and erection of the structures. Where wooded areas are cleared, the brush and wood debris could have an additional negative temporary impact on the local visual environment. Permanent impacts from the project would involve the views of the structures and lines. New visual impacts would be minimized by constructing the new transmission line parallel to existing transmission lines.

Potential visibility impacts were evaluated by tabulating the linear feet of each route that would potentially create a new or additional impact to potential sensitive viewers. The lengths of each

route within the foreground visual zone of U.S. and state highways, FM roads, and parks or recreational areas were tabulated. The foreground visual zone is defined as that part of the transmission line which is visible (i.e., not obstructed by terrain, structures, or vegetation) within one-half mile.

Route 26 has the longest length within the foreground visual zone of U.S. and state highways, approximately 16.8 miles, while Route 20 has the shortest length, approximately 4.3 miles.

Route 3 has the longest length, approximately 3.5 miles, within the foreground visual zone of parks or recreational areas, while Routes 4, 10, 19, and 20 have the shortest length, zero (0.0) miles. The lengths of each primary alternative route segment and primary alternative route within the foreground visual zone of U.S. and state highways and parks or recreational areas are presented in Appendices E-F.

4.7.6 Transportation/Aviation

Transportation

Potential impacts to transportation could include temporary disruption of traffic and conflicts with proposed roadway and/or utility improvements, and may also include slightly increased traffic during construction of the Proposed Project. However, such impacts are usually temporary and short-term.

All of the primary alternative routes cross a U.S. or state highway ranging from one crossing for Routes 12, 19, 20, 22, 23, and 24 to eight crossings for Route 26. The number of FM and other road crossings ranges from seven crossings for Routes 15 and 23, to 19 crossings for Route 3. The number of U.S., SH, FM, and other road crossings for each of the primary alternative routes are presented in Appendix E.

As discussed in Section 2.8.5, 23 planned TxDOT projects are recorded in the study area. Ten of the planned TxDOT projects would be crossed by primary alternative routes (Table 4-2). As the proposed transmission line would span these roads, no impacts to TxDOT's planned activities are anticipated.

TABLE 4-2 TXDOT PROJECTS CROSSED BY PRIMARY ALTERNATIVE ROUTES

TxDOT CSJ No.	Primary Alternative Routes
011602044	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 17, 25, 26
011603061	1, 13, 14, 15, 16, 18, 25, 26
018602029	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 17, 25, 25

TxDOT CSJ No.	Primary Alternative Routes
071301032	1, 2, 3, 5, 6, 7, 8, 9, 11, 12, 25, 26
071301037	1, 2, 3, 5, 6, 7, 8, 9, 11, 12, 25, 26
071301038	1, 2, 3, 5, 6, 7, 8, 9, 11, 12, 25, 26
071301039	3, 12
085803016	4, 10
085803017	4, 10
112901028	11, 12, 17, 21

Aviation

According to FAA Regulations, Part 77 – Objects Affecting Navigable Airspace (1975), notification of the construction of the proposed transmission line is required if structure heights exceed the height of an imaginary surface extending outward and upward at a slope of 100:1 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 one runway longer than 3,200 feet; 50:1 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 25:1 for a horizontal distance of 5,000 feet for heliports.

As discussed in Section 2.3.7.6, URS identified the Caldwell Municipal Airport in the study area with a runway length of greater than 3,200 feet in length within 20,000 feet of all of the primary alternative routes. In addition, a private airstrip and the private Weber Ranch Airport were identified within 10,000 feet of several primary alternative routes. There are no FAA-registered public/military airstrips with runways shorter than 3,200 feet within 10,000 feet of the primary alternative routes. One FAA-registered heliport, Burleson County Hospital Heliport, was identified within 5,000 feet of several primary alternative routes.

The distance of each airport airstrip/heliport from the nearest primary alternative route segment was measured using GIS and aerial photograph interpretation (Table 4-3). All known airport runway/heliport locations are shown in Appendices C-D.

TABLE 4-3 AIRPORT AND HELIPORT FACILITIES AND RUNWAY LOCATIONS

Map ID (Appendix D)	Airstrip or Heliport	Nearest Route Segment	Primary Alternative Routes	Distance form Nearest Route Segment (feet)	Estimated Runway Length (feet)
225	Caldwell Municipal Airport	L1	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 21, 23, 24, 25, 26	1,324	3,252
226	Weber Ranch Airport (Private)	Z2	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26	212	2,800; 853
227	Private Airstrip	X3	1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 25, 26	6,541	2,575
228	Burleson County Hospital Heliport	Z3	1, 2, 3, 5, 6, 7, 9, 11, 17, 25, 26	644	N/A

Source: FAA 2015; AirNav 2018

No adverse impacts to any existing airport or airstrip runways or heliports are anticipated from construction of the proposed transmission line along any of the primary alternative routes. Coordination with FAA would be conducted as necessary if the approved route should be determined to potentially affect navigable airspace during final design (FAA 2015).

4.7.7 Communication Towers

No known AM radio transmitters were identified within the study area or within 10,000 feet of the primary alternative routes. The number of microwave towers and other electronic communication towers located within 2,000 feet of any of the primary alternative routes ranges from zero (0) for Routes 14 and 16, to nine for Route 11 (Appendix F). The distance of each communication tower from the nearest segment was measured using GIS and aerial photograph interpretation (Table 4-4). None of the routes are anticipated to have significant impact on communication towers in the study area. All communication tower locations are depicted in Appendices C-D.

TABLE 4-4 PRIMARY ALTERNATIVE ROUTES IN PROXIMITY OF COMMUNICATION TOWERS

Map ID No. (Appendix D)	Tower Type	Nearest Primary Alternative Route Segment	Primary Alternative Routes	Distance from Nearest Primary Route Segment (feet)
Within 2,000 feet of FM towers and other electronic installations				
213	Microwave Tower	A	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 25, 26	201
214	Antenna Structure	E1	1, 2, 6, 7, 8, 9, 11, 25, 26	361
215	Antenna Structure	F1	1, 2, 6, 7, 9, 11, 25, 26	1,536

Map ID No. (Appendix D)	Tower Type	Nearest Primary Alternative Route Segment	Primary Alternative Routes	Distance from Nearest Primary Route Segment (feet)
216	Microwave Tower/Cellular Tower	F1	1, 2, 6, 7, 9, 11, 25, 26	1,066
217	Antenna Structure	H1	11, 12, 21	357
218	Microwave Tower	F1	1, 2, 6, 7, 9, 11, 25, 26	1,917
219	Antenna Structure	F2	1, 25, 26	703
220	Antenna Structure	H1	11, 12, 21	357
221	Antenna Structure	L1	3, 5, 11, 17	1,745
222	FM/Microwave Tower	Y2	4, 5, 6, 7, 8, 17	331
223	Field Collected Communication Tower	A3	11, 12, 13, 15, 18, 19, 20, 21, 22, 23, 24	494
224	Antenna Structure	Z1	22, 20	138

Source: FCC 2017

4.7.8 Socioeconomics

LCRA TSC uses its own employees or contractors during the clearing and construction phase of transmission line projects. However, a portion of the project costs will find their way into the local economy through purchases such as fuel, food, lodging, and possibly building materials. ROW easement payments will be made to individuals whose private property is crossed by the transmission line based on the appraised land value. LCRA TSC is also required to pay state and local sales tax on purchases and is subject to paying local property tax on land or improvements. None of the land associated with ROW for the transmission line and none of the land purchased by LCRA TSC for the new substations will be taken off the tax rolls. The cost of permitting, designing, and constructing the transmission line will be paid for through revenue generated by LCRA TSC's provision of electric transmission service within ERCOT. Rates for LCRA TSC's electric transmission service are regulated by the PUCT.

Economic growth and development rely heavily on adequate public utilities, including a reliable electrical power supply. Without this basic infrastructure, a community's potential for economic growth is constrained. The Proposed Project will improve the long-term reliability of electric service throughout the study area and the surrounding areas.

4.7.9 Summary of Impacts on Community Values and Community Resources

As mentioned in Section 3.0 of the EA, respondents to the formal LCRA TSC project questionnaires identified maximizing distances from residences as a primary routing concern.

Land use criteria that were primarily considered for the Proposed Project were the number of habitable structures located within 300 feet of each primary alternative route centerline, the overall length of the primary alternative route, and the length that parallels existing compatible ROWs (electric transmission lines, railroads, roadways, etc.).

- Routes 15 and 23 have the fewest number of habitable structures located within 300 feet of their respective centerlines (19); Route 13 has the second fewest number of habitable structures (20), and Routes 10 and 16 have 21 habitable structures located within 300 feet of their respective centerlines.
- Route 20 has the shortest overall length at approximately 17.1 miles, Route 22 is slightly longer at approximately 17.6 miles, and Routes 7 and 23 are approximately 17.8 miles in length.
- Routes 14 and 24 have the highest percentage route length (approximately 97 percent) parallel and adjacent to existing transmission line ROW, other existing compatible ROW (e.g. railroads and roadways), and apparent property boundaries. Routes 15 and 23 parallel existing compatible ROW and apparent property boundaries for approximately 95 percent of their length, and Routes 13 and 16 parallel existing compatible ROW and apparent property boundaries for approximately 94 percent of their length.

4.8 IMPACTS ON CULTURAL RESOURCES

Construction activities have the potential to adversely impact cultural resources. Adverse impacts are found when an undertaking alters, directly or indirectly, the archaeological, 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, workmanship, feeling, or association that contributes to a resource's significance.

As discussed in 36 Code of Federal Regulations (CFR) 800, adverse impacts to NRHP–listed or 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 or 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 impacts caused by construction that occur later in time or 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 have an impact on properties with historical, architectural, archaeological, or cultural significance.

Adverse impacts may be minimized, avoided, or mitigated through data recovery. Additionally, relocation may be possible for some historic structures. Indirect impacts on historical properties and landscapes can sometimes be lessened through careful design considerations and landscaping.

A review of the TASA and THSA identified 34 archaeological sites within the study area, two NRHP-listed properties, five resources with RTHL designations, 49 OTHMs, and 48 cemeteries, 19 of which are designated as HTCs. In addition, the El Camino Real de Los Tejas National Historic Trail traverses the study area. Based on the background review, it was found that no previously recorded cultural resources sites are crossed by a primary alternative route. Further examination was conducted to identify those cultural resources sites that are within 1,000 feet of a primary alternative route, and are discussed below.

4.8.1 Historical Summary

A total of 14 historic resources are located within 1,000 feet of a primary alternative route, including six OTHMs and eight cemeteries (Table 4-5). Two of these cemeteries (Kramer Cemetery and SPJST Cemetery) have been designated as HTCs. Because a cultural resources survey has not yet been conducted for each primary alternative route, it is unknown whether construction of the transmission line would impact any unidentified historic resources. Historic resources that may be encountered in the study area, but are not yet recorded, include nineteenth and twentieth century farmsteads and ranches, cemeteries, sawmills and other logging sites, mining sites, brick kilns, grist mills, ferries and river crossings, railroad sites, roads and trains, and town sites. Such resources tend to be located in a broad range of topographic settings, but are primarily situated in uplands and near historic transportation routes and/or water resources (Fields et al. 1996).

TABLE 4-5 KNOWN HISTORIC RESOURCE SITES WITHIN 1,000 FEET OF A PRIMARY ALTERNATIVE ROUTE

Historic Resource	Nearest Primary Route Segment	Primary Alternative Routes	Distance from Nearest Primary Route Segment (feet)	Direction to Nearest Primary Route Segment
An Arm of the Chisolm Cattle Trail Historic Marker	L	1, 2, 4, 5, 6, 7, 8, 9, 11, 25, 26	258	SE
St. John's Lutheran Church Historic Marker	S3	3, 12	982	NW
Fort Tenoxtitlan Historic Marker	Z2	1, 2, 3, 14, 16, 18, 25, 26	374	NW
Cooks Point United Methodist Church Historic Marker	Z2	1, 2, 3, 14, 16, 18, 25, 26	444	NW
Elizabeth Chapel Methodist Church Historic Marker	Z2	1, 2, 3, 14, 16, 18, 25, 26	374	NW
Duewall House Historic Marker	T2	1, 2, 3, 14, 25, 26	235	NW
Elizabeth Lutheran Cemetery (BU-C037)	F2	1, 25, 26	189	SE
Cooks Point Methodist Cemetery (BU-C038)	Z2	1, 2, 3, 14, 16, 18, 25, 26	545	NW
Kramer Cemetery (BU-C039; 41BU89); Designated as HTC (2004)	Z2	1, 2, 3, 14, 16, 18, 25, 26	304	NW
Lyons Lutheran Cemetery (BU-C014)	E	13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24	992	NW
Oak Grove Cemetery (BU-C032)	M1	11, 12, 13, 15, 16, 21, 23	498	SW
Pillow Cemetery (BU-C021)	U3	14, 15, 18, 19, 20, 22, 23	892	SW
Slovak Cemetery (BU-C041)	D2	18, 22	118	SW
SPJST Cemetery (BU-C006); Designated as HTC (2002)	N	1, 2, 5, 6, 7, 8, 9, 11, 25, 26	293	SE

Source: TASA, THSA 2018

4.8.2 Archaeological Summary

A total of five archaeological sites are located within 1,000 feet of a primary alternative route (Table 4-6). None of the sites have been determined eligible for listing in the NRHP or for designation as a SAL. However, site 41BU89 (Kramer Cemetery) is designated as a HTC. This site is located 256 feet from the nearest route and would therefore not be impacted by construction. Because a cultural resources survey has not yet been conducted, it is unknown whether construction of the transmission line would impact any unidentified archaeological

resources. Therefore, an archaeological survey would need to be conducted following approval of a route.

TABLE 4-6 PREVIOUSLY RECORDED ARCHAEOLOGICAL SITES WITHIN 1,000 FEET OF AN ALTERNATIVE ROUTE

Site No.	Site Description	Nearest Primary Route Segment	Primary Alternative Route	Distance from Nearest Primary Route Segment (feet)	Direction to Nearest Primary Route Segment
41BU49	Prehistoric open campsite	K	10	418	SE
41BU84	Historic farmstead; unknown prehistoric	K	10	714	SW
41BU89	Historic Kramer Cemetery (BU-C039)	Z2	1, 2, 3, 14, 16, 18, 25, 26	256	NW
41BU90	Historic (1876) Liberty (Germania) School and underground cistern	Z2	1, 2, 3, 14, 16, 18, 25, 26	533	NW
41BU103	Historic farmstead	F	13, 16, 17, 21, 24	578	SW

Source: TASA 2018

The presence of numerous recorded archeological sites in the study area indicates there is a high likelihood for unrecorded sites to be present. Prehistoric archaeological sites recorded in the region of the study area generally consist of residential bases and campsites with abundant artifacts but few features (Fields et al. 1996). Sites typically exhibit low visibility on the surface due to vegetation and sediment deposition. Prehistoric sites tend to be located along stream margins, upland projections over floodplains, floodplain rises, levees, stream confluences, and near springs. Sites are less frequently found in uplands away from water sources and/or on steep slopes (Fields et al. 1996).

In order to provide an assessment of archaeological site sensitivity for the project, a predictive model was developed on the basis of landform, soil type, distance from water sources, extant site distributions, and proximity to the El Camino Real de Los Tejas National Historic Trail. From these data, the study area was divided into areas of high, moderate, and low potential for prehistoric archaeological sites. This assessment was intended to facilitate the initial planning/routing study and does not necessarily attempt to identify all archaeologically sensitive landforms. For that task, a more detailed analysis will be performed for the identified route prior to field survey.

High Potential Areas (HPAs) possess the greatest potential for containing cultural resource sites. Site integrity is also presumed to be highest in the HPAs. HPAs for prehistoric

archaeological sites typically include areas with deep alluvial soils near natural water sources. Floodplain deposits offer excellent preservation potential for archaeological sites since they may be deeply buried and stratified. Though such sites have the greatest research potential, they exhibit the lowest visibility and are usually only located through deep mechanical excavation or by observing eroding stream bank deposits. Previous research has also shown that prehistoric sites with reasonable integrity frequently occur on ridges and projections overlooking creek bottomlands, as well as occupying terrace treads and scarps, interfluve summits, shoulders, and backslopes within sandy deposits along wide, low-relief stream valleys. Such sites are particularly prevalent within lower footslopes and toeslopes overlooking valley floors (Thoms et al. 2004). Areas adjacent to the El Camino Real de Los Tejas National Historic trail may also be considered HPAs due to the potential for sites along this route to be eligible for the NRHP under Criterion A (association with events that contribute to our understanding of broad patterns of history). For example, prehistoric and historic archaeological sites, including habitation, commercial, religious sites, and cemeteries, as well as standing structures, cultural landscapes, and traditional cultural properties, are often found along established trail routes (Burden and Gonzales 2013; NPS 2011).

For HPAs, it was found that Route 26 crosses approximately 15 miles of HPAs, followed by Route 25 (approximately 14.5 miles), and Route 1 (approximately 14.1 miles). The lengths of HPAs crossed by each primary alternative route segment and primary alternative route are presented in Appendices E-F.

HPAs for historic sites tend to be situated on interfluve summits and upper slopes where Anglo and African American occupations are commonly found (Thoms et al. 2004). Often, such sites are located near historic transportation routes that were typically selected on the basis of defensibility, level terrain for farming and ranching, and placement of homesteads and outbuildings (Thoms et al. 2004). Such sites generally consist of aboveground structures, structural elements, or may only be represented by buried (archaeological) historic artifacts. Historic site types may include town sites, farmsteads, historic-period bridges, ranches, cemeteries, stone walls, mills, lime kilns, and industrial sites. Historic sites generally exhibit greater surface visibility because either they are not buried as deeply as prehistoric sites, or they are not buried at all. Identification of HPAs for historic sites outside the El Camino Real de Los

Tejas National Historic trail HPA will be based on archival and historic research specific to the selected route prior to the commencement of fieldwork.

Moderate Potential Areas (MPAs) generally include upland summit and shoulder and sideslope settings that may contain archaeological remains, but their presence and/or integrity potential is considered to be less likely, either because of increased distance to water, proximity to less reliable water sources, strong slopes, and shallow, eroded, or poorly drained soils. Though site visibility in MPAs tends to be higher than in HPAs due to decreased vegetation and shallower soils, MPAs are less likely to exhibit the geologic conditions necessary for the burial and preservation of cultural materials. In MPAs, archaeological integrity potential tends to be lower because of mixing of cultural components and near-surface ground disturbances.

For MPAs, it was found that Route 12 crosses approximately 14.1 miles of MPAs, followed by Route 24 (approximately 13.9 miles), and Route 10 (approximately 13.5 miles). The lengths of MPAs crossed by each primary alternative route segment and primary alternative route are presented in Appendices E-F.

Low Potential Areas (LPAs) are those areas in which archaeological sites are unlikely to be present, or areas that are otherwise disturbed. LPAs include steeply sloping topography, those areas situated at a significant distance to water, deflated or eroded surfaces, or severely impacted areas. It is presumed any prehistoric archaeological sites in these settings would not retain integrity.

For LPAs, it was found that Route 10 crosses approximately 8.1 miles of LPAs, followed by Route 4 (approximately 7.2 miles), and Route 16 (approximately 4.3 miles). The lengths of LPAs crossed by each primary alternative route segment and primary alternative route are presented in Appendices E-F.

In summary, percentages of HPAs, MPAs, and LPAs across the primary alternative routes are provided below in Table 4-7.

TABLE 4-7 PERCENTAGES OF HPAS, MPAS, AND LPAS ACROSS PRIMARY ALTERNATIVE ROUTES

Primary Alternative Route	HPA (%)	MPA (%)	LPA (%)
1	75.0	22.1	3.0
2	62.6	29.7	7.8
3	22.6	65.4	11.9
4	12.6	52.2	35.2
5	26.4	59.4	14.2

Primary Alternative Route	HPA (%)	MPA (%)	LPA (%)
6	46.8	41.2	12.0
7	52.1	37.6	10.4
8	35.3	47.8	16.8
9	46.8	46.8	6.3
10	7.3	57.9	34.8
11	47.1	41.8	11.2
12	6.6	77.5	15.9
13	19.5	59.3	21.3
14	23.8	62.4	13.8
15	14.5	64.3	21.2
16	23.0	55.3	21.7
17	20.5	61.3	18.2
18	18.5	65.7	15.8
19	11.7	65.5	22.8
20	10.2	71.9	18.0
21	17.2	62.6	20.2
22	8.7	75.5	15.8
23	12.5	65.9	21.5
24	10.7	72.3	17.1
25	77.0	20.8	2.2
26	77.7	20.2	2.2

4.8.3 Mitigation

If historic properties are identified within the Area of Potential Effects (APE), then the criteria of adverse effect is applied in accordance with 36 CFR §800.5. An adverse effect is found "when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the NRHP in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association." If it is determined that potential adverse effects exist to historic properties that would result from the construction of the project, then a reasonable and good faith effort would be undertaken in order to resolve the adverse effects through the implementation of alternatives that would avoid, minimize, or mitigate the effects.

This would be accomplished through the development of treatment plans, which would vary depending on the type of resource being impacted, the nature of the impact, setting, and visual and atmospheric elements. Where historic resources may be adversely impacted, the treatment plan should provide detailed descriptions of treatment measures to avoid, minimize and/or mitigate those impacts while taking into account the cumulative and foreseeable impacts the project could have on historic properties. Where archeological historic properties may be adversely impacted, the treatment plan should provide detailed descriptions of protection

measures and may include, but are not limited to, establishing archaeologically sensitive areas; pre-construction archaeological excavation; preservation in-place; and avoidance, minimization, and/or monitoring during construction where appropriate. For linear transmission lines, avoidance during the detailed design phase is generally preferable, which occurs after a route has been approved. If avoidance is not possible, mitigation measures such as data recovery excavations may be used for archaeological sites in order to resolve adverse effects.

Where cemeteries may be impacted, all cemeteries must be treated in accordance with state law. If a cemetery is publicly owned by a state agency or political subdivision of the state (counties, cities, utility districts, etc.), the burials are protected as archaeological sites under the Antiquities Code of Texas (Title 9, Chapter 191 of the Texas Natural Resources Code), and it is preferred to preserve in place any cemetery that may be directly affected. A reasonable, good faith effort will be made to define the historic boundaries of the cemetery and to identify the extent of the historic cemetery boundary within the APE through deed research, tax records, cemetery records and oral histories. When a cemetery cannot be preserved in place, the data collection associated with the exhumation of graves that falls under the Texas Historical Commission's jurisdiction will be based on policy found in T.A.C. Chapter 22 and the Council of Texas Archeologists' Guidelines for Identification of Historic Cemeteries and Unmarked Historic Graves. All cemetery/burial relocations, publically or privately owned, will follow the general provisions and procedures of the Texas Health and Safety Code Chapter 711, General Provisions Relating to Cemeteries, requiring additional investigations.

Because a cultural resources survey has not been conducted for any of the primary alternative routes, the possibility of impacting unknown archaeological sites and historic resources exists. Therefore, following approval of a route for the proposed transmission line, a cultural resources survey would be conducted. Antiquities Code coordination and permitting with the THC will be required in order for a cultural resources survey to be conducted.

5.0 LIST OF PREPARERS

This EA and Alternative Route Analysis were prepared for LCRA TSC by URS. LCRA TSC provided information in Sections 1.0 and 3.0. A list of the URS employees with primary responsibilities for the preparation of this document is presented below.

Responsibility	Name	Title
Principal-In-Charge Project Manager Deputy Project Manager	Diane Cowin Melinda Jensen Kristi Teykl	Program Manager Senior Project Manager Senior Project Manager
Soils, Physiography and Geology, Water Resources	Jennifer Oakley	Environmental Scientist
Terrestrial and Wetland Ecology	Amanda Hargrave	Ecologist
Community Values and Community Resources, Land Use, Aesthetics, Public Involvement	Jennifer Oakley Josh Orr Nancy Gates Regina Geren	Environmental Scientist Environmental Scientist Public Involvement Specialist Executive Assistant
Cultural Resources	Steve Ahr Tanya McDougall	Principal Investigator Architectural Historian
Maps/Figures/Graphics	Julia Presas John Wade	GIS Manager GIS Specialist
Quality Control	Diane Cowin Patrick Young	Senior Program Manager Senior GIS Manager

(This page intentionally left blank)

6.0 REFERENCES

AirNav. 2018. "83TX Texas A&M Flight Test Station Airport." Effective January 4, 2018. Accessed January 8, 2018. http://www.airnav.com/airport/83TX

Allen, J. David. 1995. "Trophic Relationships." In Stream Ecology, 131-161. Springer, Dordrecht.

Avian Power Line Interaction Committee (APLIC)

APLIC. 2012. Reducing Avian Collisions with Power Lines: The Stateof the Art in 2012. Washington, D.C.: Edison Electric Institute and APLIC.

APLIC. 2016. Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006. Washington, D.C. and Sacramento, California: Edison Electric Institute, APLIC, and the California Energy Commission.

Avery, Michael L. Impacts of Transmission Lines on Birds in Flight: Proceedings from a Workshop. Oak Ridge Associated Universities, Oak Ridge Tennessee: Dept. of the Interior, Fish and Wildlife Service, 1978, FWS/OBS-78/48.

Barker, Eugene. C. 2014. "Mexican Colonization Laws." The Handbook of Texas Online. https://www.thshaonline.org/handbook/online/articles/ugm01 (accessed October 9, 2014).

Blair, W. Frank. 1950. "The Biotic Provinces of Texas." Texas Journal of Science: 93-117.

Bowman, Bradley F. 1985. "Winnie's Mound (41BU17): A Study in the Prehistory of Burleson County, Texas." Bulletin of The Texas Archaeological Society 56 .

Burden, Andrea S., and Steven Gonzales. 2013. "El Camino Real de los Tejas National Historic Trail: Documenting Sites and Segments in Eagle Ford Shale Country." Brownbag presentation to Council of Texas Archeologists. http://counciloftexasarcheologists.org/?page_id=27Accessed (accessed January 2018).

Burleson County. 2018. "Welcome to Burleson County." Accessed January 9, 2018. http://co.burleson.tx.us/visiting/

Bureau of Economic Geology. 1996. Physiographic Map of Texas. Austin: The University of Texas at Austin.

Chesser, R. T., K. J. Burns, C. Cicero, J. L. Dunn, A. W. Kratter, I. J. Lovette, P. C. Rasmussen, J. V. Remsen, Jr., D. F. Stotz, B. M. Winger, and K. Winker. 2018. Check-list of North American Birds (online). American Ornithological Society. http://checklist.aou.org/taxa

Conant, Roger, and Joseph T. Collins. 1998. Reptiles and Amphibians of Eastern and Central North America. Third Edition. Expanded. Boston: Houghton Mifflin Company.

Cowardin, Lewis M, Virginia Carter, Francis C Golet, and Edward T LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. Washington, D.C.: U.S. Fish and Wildlife Services.

Creel, Darrell. 1991. "Bison Hides in Late Prehistoric Exchange in the Southern Plains." American Antiquity 56: 40-49.

Crother, Brian I. 2017. Scientific and Standard English Names of Amphibians and Reptiles of North America North of Mexico, and With Comments Regarding our Confidence in our Understanding. Shoreview, MN: Society for the Study of Amphibians and Reptiles.

Dillehay, Tom.D. 1974. "Late Quaternary Bison Population Changes on the Southern Plains." Plains Anthropologist 65: 180-196.

Dixon, James R. 2013. Amphibians and Reptiles of Texas. College Station, Texas: Texas A&M Press.

eBird. 2018. eBird: An online database of bird distribution and abundance [web application]. http://www.ebird.org (accessed December 13, 2017, April 16, 2018).

Elliott, Lee F., et al. 2014. Ecological Mapping Systems of Texas Data.

Ellis, Linda W., Krista McDonald, and Michael Nash. 2009. "Summary Report of Surveys and Impact Evaluations Conducted in TxDOT's Austin, Bryan, and Yoakum Districts During 2006-2008 Under PBS&J Contract No. 577XXSA005, In Fulfillment of Contract No. 576XXSA002 Issued to GTI Environmental, Inc." TxDOT Archeological Studies Program Report No. 119.

Faaborg, John, Margaret Brittingham, Therese Donovan, and John Blake. 1995. Ecology and Management of Neotropical Migraotry Birds: A Synthesis and Review of Critical Issues. Habitat Fragmentation in the Temperate Zone. Edited by Thomas E Martin and Deborah M Finch. Oxford University Press, New York.

FCC. 2018. Tools and Data. Accessed January 8, 2018. http://www.fcc.gov/data.

FEMA.
FEMA. 2011. Digital Floodplain Insurance Rate Maps.

Fields, Ross C., Margaret Howard, Meg Cruse, and Duane Peter. 1996. "The Archeology of the Post Oak Savannah of East Central Texas." Bulletin of the Texas Archeological Society 66: 301-330.

Griffith, Glenn E., Sandy A. Bryce, James M. Omernik, and Anne C. Rogers. 2007. Ecoregions of Texas. Texas Commission on Environmental Quality, Austin, Texas: Texas Commission on Environmental Quality.

Hammons, J. R., F. E. Smeins, and W. E. Rogers. 2010. "Transplant methods for Spiranthes parksii." Native Plants Journal 16, no. 1: 38-46.

Herkert, James R., Peter D. Vickery, and Donald E. Kroodsma. 2002. "Henslow's Sparrow (Ammodramus henslowii)." The Birds of North America. Ithaca, New York: Cornell Lab of Ornithology.

Howells, Robert G., Raymond W. Neck, and Harold D. Murray. 1996. Freshwater Mussels of Texas. Austin, Texas: University of Texas Press.

Huebner, Jeffery A. 1991. "Late Prehistoric Bison Populations in Central and Southern Texas." Plains Anthropologist 36: 343-358.

Jackson, Charles Christopher. "Burleson County." The Handbook of Texas Online. 2017. http://www.tshaonline.org/handbook/online/articles/hcb18 (accessed December 27, 2017).

Kerlinger, Paul. How Birds Migrate. 1995. Mechanicsburg: Stackpole Books.

Lockwood, Mark W., and Brush Freemann. 2014. The Texas Ornithological Society Handbook of Texas Birds. College Station, Texas: Texas A&M University Press.

Martin, Alexander C, Herbert S Zim, and Arnold L Nelson. 1951. American Wildife & Plants: A Guide to Wilife Food Habits. New York: Dover Press.

National Audubon Society. 2016. Guide to North American Birds. http://www.audubon.org/bird-guide (accessed February 2, 2016).

National Agricultural Statistics Service (NASS). 2012. "2012 Census of Agriculture County Profiles." Accessed December 27, 2017 . http://www.agcensus.usda.gov/Publications/2012/Online_Highlights/County_Profiles/Texas.

National Conservation Easement Database. 2018. "National Conservation Easement Database." Accessed January 8, 2018. http://conservationeasement.us/browse/map.

National Park Service (NPS).

NPS. 2011. "El Camino Real de los Tejas National Historic Trail: Comprehensive Management Plan/Environmental Assessment." United States Department of the Interior.

NPS. 2017. "El Camino Real de los Tejas: History & Culture." http://www.nps.gov/elte/historyculture/index.htm (accessed December 2017).

NPS. 2018a. "Texas." Accessed January 8, 2018. http://www.nps.gov/state/tx/index.htm?program=parks.

NPS. 2018b. "El Camino Real de los Tejas National Historic Trail Louisiana and Texas." Accessed January 9, 2018. https://www.nps.gov/nr/travel/american_latino_heritage/el_camino_real_de_los_tejas_national_historic_trail.html.

Natural Resources Conservation Service (NRCS)

NRCS. 2005. Soil Survey of Burleson County, Texas. USDA NRCS

NRCS. 2018. Soil Survey Staff, United States Department of Agriculture. Web Soil Survey. Accessed January 15, 2018. https://websoilsurvey.sc.egov.usda.gov/.

Parker, K. M. 2001. "A compendium on Spiranthes parksii Correll (Navasota ladies' tresses)." Unpublished report prepared for Texas Municipal Power Agency, Tejas Ecological Services, Bryan, Texas.

Perttula, Timothy K., Ross C. Fields, James E. Corbin, and Nancy A. Kenmotsu. 1993 "The Emergence of Sedentism in Northeast Texas, ca. 500 B.C. to A.D. 1000." In Archeology in the Eastern Planning Region, Texas: A Planning Document, ed. N. A. Kenmotsu and T. K. Perttula, 97-120. Austin: Cultural Resources Management Report No. 3, Department of Antiquities Protection, Texas Historical Commission.

Prewitt, Elton R. "Cultural Chronology in Central Texas. 1981." Bulletin of the Texas Archeological Society 52: 62-89.

Price, A. H. 1990. "Phrynosoma cornutum (Harlan), Texas Horned Lizard." Catalouge of American Amphibians and Reptiles: 1-7.

Rogers, Robert. 1995. "Archaeological Excavations at Prehistoric Sites 41GM 166, 41GM281, and 41GM282 at the Gibbons Creek Lignite Mine, Grimes County, Texas." Espey, Huston & Associates, Austin.

Schmidly, David J., and Robert D. Bradley. 2016. The Mammals of Texas. Austin, Texas: University of Texas Press.

Sibley, David Allen. 2003. The Sibley Field Guide to Birds of Eastern North America. New York, New York: Alfred A. Knopf, Inc.

Story, Dee A. 1990. "Cultural History of the Native Americans." In The Archeology and Bioarcheology of the Gulf Coastal Plain, ed. D.A. Story, et al., 163-366. Fayetteville: Arkansas Archeological Survey Research Series No. 38.

Texas Historical Commission (THC)

THC. 2017. http://nueces.thc.state.tx.us/ (accessed November 2014).

THC. 2018. http://texasbrazostrail.com/map. (accessed april 2018).

Texas Demographic Center. 2018. "TxPop. Estimates & Projections" http://osd.texas.gov/Data/TPEPP/Projections/(accessed April 2018).

Texas Department of Transportation (TxDOT). 2018. "Current TxDOT Projects." Accessed January 5, 2018. http://www.txdot.gov/apps-cq/project_tracker.

Texas Parks and Wildlife Department (TPWD)

TWDB. 2007. Water for Texas 2007. Texas Water Development Board.

TPWD. 2014. Ecological Mapping Systems of Texas. http://www.tpwd.state.tx.us/gis/data/ (accessed April 24, 2017).

TPWD. 2015. White-tailed Deer. n.d. http://www.tpwd.state.tx.us/landwater/land/habitats/trans_pecos/big_game/wtd (accessed December 31, 2015).

TPWD. 2016. Annotated County Lists of Rare Species. http://tpwd.texas.gov/gis/rtest/ (accessed November 11, 2017).

TPWD. 2017. "Texas Natural Diversity Database."

TPWD.2018b. "TEAM: Texas Ecosystems Analytical Mapper." Accessed January 8, 2018. http://tpwd.texas.gov/gis/team/.

TPWD. 2018b. https://tpwd.texas.gov/regulations/outdoor-annual/regs/counties/burleson (accessed January 17, 2018).

Texas Water Development Board (TWDB).

TWDB. 2006. "Major Aquifers GIS data." Accessed January 16, 2018. http://www.twdb.texas.gov/mapping/gisdata.asp

TWDB. 2017. "Minor Aquifers GIS data." Accessed January 16, 2018. http://www.twdb.texas.gov/mapping/gisdata.asp

TWDB. 2018a. "River Basins." Texas Water Development Board.Accessed January 16, 2018. http://www.twdb.texas.gov/surfacewater/img/riverbasins.jpg.

TWDB. 2018b. "Carrizo-Wilcox Aquifer." Accessed Januar 16, 2017. http://www.twdb.texas.gov/groundwater/aquifer/majors/carrizo-wilcox.asp.

TWDB. 2018c. "Queen City Aquifer." Accessed January 16, 2018. http://www.twdb.texas.gov/groundwater/aquifer/minors/queen-city.asp.

TWDB. 2018d. "Sparta Aquifer." Accessed January 22, 2018. http://www.twdb.texas.gov/groundwater/aquifer/minors/sparta.asp.

TWDB. 2018e. "Brazos River Alluvium Aquifer." Accessed January 16, 2018. http://www.twdb.texas.gov/groundwater/aquifer/minors/brazos-river-alluvium.asp.

TWDB. 2018f. "Yegua Jackson Aquifer." Accessed January 22, 2018. http://www.twdb.texas.gov/groundwater/aquifer/minors/queen-city.asp.

TWDB. 2018g. "Well Locations from TWDB Groundwater Database GIS data." Accessed January 19, 2018. http://www.twdb.texas.gov/mapping/gisdata.asp

The Burleson River Authority. 2018. "Recreation on the Brazos." Accessed January 9, 2018. https://www.brazos.org/About-Us/News/News-Room/Resource-Library/Recreation-On-The-Brazos-River.

THSA. Texas Historical Commission. 2017. http://atlas.thc.state.tx.us/ (accessed November 2017).

Thomas, Chad, Timothy H. Bonner, and Bobby G. Whiteside. 2007. Freshwater Fishes of Texas. College Station, Texas: Texas A&M University Press.

Thoms, Alston V., J. Bryan Mason, Stephanie K. Judjahn, and Scott A. Minchak. 2004. "Native American Land Use in the Yegua Creek Basin and Vicinity: Ethnohistoric and Archeological Records." In Yegua Creek Archaeological Project: Survey Results from Lake Somerville State Parks and Trailway, East-Central Texas, ed. A.V. Thoms, 35-48. Reports of Investigations No. 5, Center for Ecological Archaeology, Texas A&M University.

U.S. Census Bureau (USCB)

USCB 2000 and 2012-2016. Census 2000 Summary File 3, U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates, Selected Economic Characteristics

USCB. 2018. Census 2000 Summary File 1, Matrices P1, U.S. Census Bureau, Census 2010 Summary File 1, Matrices P1, and Texas Demographic Center, 2014, Sex and Race/Ethnicity Total Population by Migration Scenario for 2010-2050 in 1 year increments, Population Projections for the State of Texas and Counties.

USDA. 2017. Web Soil Survey. http://websoilsurvey.sc.egov.usda.gov (accessed June 12, 2017).

U.S. Department of the Interior and U.S. Geological Survey
URL: http://nationalmap.gov/elevation.html

Page Contact Information: The National Map
Page Last Modified: Monday, 22-May-2017 15:28:18 EDT

U.S. Fish and Wildlife Services (USFWS)

USFWS.2009. Navasota ladies' -tresses (Spiranthes parksii) 5-year review: summary and Evaluation. Austin, Texas: U.S. Fish and Wildlife Service.

USFWS.2011. Houston toad (Bufo houstonensis) 5-year Review: Summary and Evaluation. Department of the Interior: Austin:.

USFWS. 2012. Whooping Crane (Grus americana) 5-Year Review: Summary and Evaluation. Austwell, Texas: U.S. Fish and Wildlife Service.

USFWS.2013. Interior Least Tern (Sternula antillarum) 5-Year Review: Summary and Evaluation. Albuquerque.

USFWS.2017. Information for Planning and Conservation. http://ecos.fws.gov/ipac/gettingStarted/index (accessed December 13, 2017).

USFWS. 2018. Critical Habitat Portal. http://criticalhabitat.fws.gov/crithab/ (accessed January 3, 2018).

U.S. Geological Survey (USGS).

USGS. 2001. National Elevation Dataset (NED). https://lta.cr.usgs.gov/NED.

USGS. 2007. Texas Water Development Board. Geologic Database of Texas. 2007. https://tnris.org/data-catalog/entry/geologic-database-of-texas/.

USGS. 2015. "Geologic units by Geographic Area." Accessed January 8, 2018. http://mrdata.usgs.gov/geology/state/geog-units.html

USGS. 2016. National Gap Analysis Program (GAP) | Protected Areas Data Portal. May 2016. Accessed January 8, 2018. https://gapanalysis.usgs.gov:443/index.php.

White, Clayton M., Nancy J. Clum, Tom J Cade, and W. Grainger Hunt. 2002. "Peregrine Falcon (Falco peregrines)." The Birds of North America. Ithaca, New York: Cornell Lab of Ornithology.

Wonkka, C. L., W. E. Rogers, F. E. Smeins, J. R. Hammons, S. J. Haller, and M. C. Ariza. 2012. "Biology, ecology, and conservation of Navasota ladies' tresses (Spiranthes parksii Correll), an endangered terrestrial orchid of Texas." Native Plants Journal 13, no. 3: 236-243.

GIS Data Sources

Data Layer: Airports

Data File Name (Feature Class/Shapefile/Raster): LCRA_CPT_TRAN_Airports_AECOM
Data File Type: Vector
Data Source: TNRIS with TXDOT
Data Current As Of: 2014
Acquired/Downloaded: September 2017
Download Link: https://tnris.org/data-catalog/

Data Layer: Administrative Boundaries

Data File Name (Feature Class/Shapefile/Raster):
LCRA_CPT_BND_CityPoly_TNRISTXDOT
Data File Type: Vector
Data Source: TXDOT via TNRIS
Data Current As Of: 2015
Acquired/Downloaded: September 2017
Download Link: https://tnris.org/data-catalog

Data Layer: Existing Substations

Data File Name (Feature Class/Shapefile/Raster): LCRA_CPT_UTIL_Substations
Data File Type: Vector
Data Source: Platts/URS
Data Current As Of: September 2017
Acquired/Downloaded: September 2017
Download Link: L:\AGE\Projects\ENV\LCRA\60551452_LCRA_Task #1 Cooks Point\900-CAD GIS\920-GIS\LCRA_CooksPoint.gdb(Local Server)

Data Layer : Existing Transmission Lines

Data File Name (Feature Class/Shapefile/Raster):
LCRA_CPT_UTIL_TransmissionLine_URS
Data File Type: Vector
Data Source: URS with Platts Energy (Proprietary Dataset), digitized LCRA 2017 aerial imagery
Data Current As Of: September 2017
Acquired/Downloaded: September 2017
Download Link: L:\AGE\Projects\ENV\LCRA\60551452_LCRA_Task #1 Cooks Point\900-CAD GIS\920-GIS\LCRA_CooksPoint.gdb(Local Server)

Data Layer : Streams/Rivers

Data File Name (Feature Class/Shapefile/Raster): LCRA_CPT_WAT_Flowline_NHD
Data File Type: Vector
Data Source: US Geological Survey, National Hydrography Dataset, NHDFlowline

Data Current As Of: September 2017
Acquired/Downloaded: September 2017
Download Link:
ftp://nhdftp.usgs.gov/DataSets/Staged/States/FileGDB/HighResolution/

Data Layer : Water Bodies

Data File Name (Feature Class/Shapefile/Raster): LCRA_CPT_WAT_Waterbody_NHD
Data File Type: Vector
Data Source: US Geological Survey, National Hydrography Dataset, NHDWaterbody
Data Current As Of: September 2017
Acquired/Downloaded: Septemeber 2017
Download Link:
ftp://nhdftp.usgs.gov/DataSets/Staged/States/FileGDB/HighResolution/

Data Layer : Element Occurrences

Data File Name (Feature Class/Shapefile/Raster):
LCRA_CPT_BIO_ElementOccurrence_TPWD
Data File Type: Vector
Data Source: Texas Parks & Wildlife
Data Current As Of: September 2017
Acquired/Downloaded: September 2017
Download Link: L:\AGE\Projects\ENV\LCRA\60551452_LCRA_Task #1 Cooks Point\900-CAD GIS\920-GIS\LCRA_CooksPoint.gdb(Local Server)

Data Layer : Wetlands

Data File Name (Feature Class/Shapefile/Raster): LCRA_CPT_ENV_Wetlands_NWI
Data File Type: Vector
Data Source: United States Fish and Wildlife Service (USFWS) – National Wetland Inventory (NWI), CONUS_wet_poly
Data Current As Of: September 2017
Acquired/Downloaded: September 2017
Download Link: http://www.fws.gov/wetlands/Data/State-Downloads.html

Data Layer : Texas Ecological Systems

Data File Name (Feature Class/Shapefile/Raster):
LCRA_CPT_ENV_EcoSystemsofTexas_TPWD
Data File Type: Vector
Data Source: Texas Parks and Wildlife (TPWD)
Data Current As Of: August 2016
Acquired/Downloaded: September 2017
Download Link: http://www.tpwd.state.tx.us/gis/

Data Layer : Land Use

Data File Name (Feature Class/Shapefile/Raster): LCRA_CPT_ENV_LandUse_AECOM
Data File Type: Vector
Data Source: URS – digitized from field investigations and LCRA 2017 aerial imagery and modeled canopy cover
Data Current As Of: March 2018
Acquired/Downloaded: N/A
Download Link: L:\AGE\Projects\ENV\LCRA\60551452_LCRA_Task #1 Cooks Point\900-CAD GIS\920-GIS\LCRA_CooksPoint.gdb(Local Server)

Data Layer : Communication Towers

Data File Name (Feature Class/Shapefile/Raster): LCRA_CPT_UTIL_CommunicationTowers_FCC
Data File Type: Vector
Data Source: URS with Federal Communications Commission (FCC)
Data Current As Of: September 2017
Acquired/Downloaded: September 2017
Download Link: L:\AGE\Projects\ENV\LCRA\60551452_LCRA_Task #1 Cooks Point\900-CAD GIS\920-GIS\LCRA_CooksPoint.gdb(Local Server)

Data Layer : Oil/Gas Pipelines

Data File Name (Feature Class/Shapefile/Raster): LCRA_CPT_UTIL_OilGasPipeline_Penwell
Data File Type: Vector
Data Source: Penwell via LCRA
Data Current As Of: Unknown
Acquired/Downloaded: March 2018
Download Link: L:\AGE\Projects\ENV\LCRA\60551452_LCRA_Task #1 Cooks Point\900-CAD GIS\920-GIS\LCRA_CooksPoint.gdb(Local Server)

Data Layer : Oil/Gas Wells

Data File Name (Feature Class/Shapefile/Raster): LCRA_CPT_UTIL_OilGasWells_RRC
Data File Type: Vector
Data Source: Texas Railroad Commission (TxRRC)
Data Current As Of: September 2017
Acquired/Downloaded: September 2017
Download Link: http://gis2.rrc.state.tx.us/public/

Data Layer : Habitable Structures

Data File Name (Feature Class/Shapefile/Raster): LCRA_CPT_BLD_Buildings_LCRA
Data File Type: Vector
Data Source: Planimetric data provided by LCRA, updated by URS as needed
Data Current As Of: April 2018
Acquired/Downloaded: February 2018
Download Link: L:\AGE\Projects\ENV\LCRA\60551452_LCRA_Task #1 Cooks Point\900-CAD GIS\920-GIS\LCRA_CooksPoint.gdb(Local Server)

Data Layer : Water Wells/Springs

Data File Name (Feature Class/Shapefile/Raster):
LCRA_CPT_WAT_GroundwaterWells_TWDB
Data File Type: Vector
Data Source: Texas Water Development Board (TWDB)
Data Current As Of: May 2017
Acquired/Downloaded: September 2017
Download Link: http://www.twdb.texas.gov/mapping/gisdata.asp

Data Layer : Roads/Highways

Data File Name (Feature Class/Shapefile/Raster):
LCRA_CPT_TRAN_Roads_TNRISTXDOT
Data File Type: Vector
Data Source: Texas Natural Resources Information System (TNRIS)
Data Current As Of: 2015
Acquired/Downloaded: September 2017
Download Link: http://www.tnris.org/get-data

Data Layer : Railroads

Data File Name (Feature Class/Shapefile/Raster):
LCRA_CPT_TRAN_Railroads_TNRISTXDOT
Data File Type: Vector
Data Source: Texas Natural Resources Information System (TNRIS)
Data Current As Of: 2015
Acquired/Downloaded: September 2017
Download Link: http://www.tnris.org/get-data

Data Layer : Study Area

Data File Name (Database/Shapefile): LCRA_CPT_DEV_PreliminaryStudyArea
Data File Type: Vector
Data Source: AECOM
Data Current As Of: September 2017
Acquired/Downloaded: N/A
Download Link: L:\AGE\Projects\ENV\LCRA\60551452_LCRA_Task #1 Cooks Point\900-CAD GIS\920-GIS\LCRA_CooksPoint.gdb(Local Server)

Data Layer : Alternative Route Segments

Data File Name (Feature Class/Shapefile/Raster):
LCRA_CPT_DEV_PreliminaryRouteSegments_AECOM
Data File Type: Vector
Data Source: AECOM – digitized from field investigations and LCRA 2017 aerial imagery
Data Current As Of: May 2018
Acquired/Downloaded: N/A

Download Link: L:\AGE\Projects\ENV\LCRA\60551452_LCRA_Task #1 Cooks Point\900-CAD GIS\920-GIS\LCRA_CooksPoint.gdb(Local Server)

Data Layer : Alternative Routes

Data File Name (Feature Class/Shapefile/Raster): LCRA_CPT_DEV_FinalPrimaryRoutes_AECOM
Data File Type: Vector
Data Source: AECOM – digitized from field investigations and LCRA 2017 aerial imagery
Data Current As Of: May 2018
Acquired/Downloaded: N/A
Download Link: L:\AGE\Projects\ENV\LCRA\60551452_LCRA_Task #1 Cooks Point\900-CAD GIS\920-GIS\LCRA_CooksPoint.gdb(Local Server)

Data Layer : County Boundaries

Data File Name (Feature Class/Shapefile/Raster): LCRA_CPT_BND_CountyBoundaries
Data File Type: Vector
Data Source: Texas Natural Resources Information System (TNRIS)
Data Current As Of: January 2013
Acquired/Downloaded: July 2015
Download Link: http://www.tnris.org/get-data

Data Layer : Texas Department of Transportation Projects

Data File Name (Feature Class/Shapefile/Raster): LCRA_CPT_TRAN_TPP_TXDOT
Data File Type: Vector
Data Source: Texas Department of Transportation (TxDOT)
Data Current As Of: September 2017
Acquired/Downloaded: September 2017
Download Link: http://gis-txdot.opendata.arcgis.com/datasets?q=Projects

Data Layer : Vegetation

Data File Name (Feature Class/Shapefile/Raster): LCRA_CPT_ENV_EMST_TPWD
Data File Type: Vector
Data Source: Texas Parks and Wildlife Department (TPWD)
Data Current As Of: September 2016
Acquired/Downloaded: September 2017
Download Link: https://tpwd.texas.gov/gis/programs/landscape-ecology/by-ecoregion-vector

Data Layer : Critical Habitat

Data File Name (Feature Class/Shapefile/Raster): LCRA_CPT_ENV_CriticalHabitat_USFWS
Data File Type: Vector
Data Source: United States Fish and Wildlife Service (USFWS)

Data Current As Of: September 2016
Acquired/Downloaded: September 2017
Download Link: https://ecos.fws.gov/ecp/report/table/critical-habitat.html

Data Layer : Houston Toad Modeled Habitat

Data File Name (Feature Class/Shapefile/Raster):
LCRA_CPT_ENV_HoustonToadHabitat_URS
Data File Type: Vector
Data Source: URS
Data Current As Of: Delineated November 2017
Acquired/Downloaded: N/A
Download Link: L:\AGE\Projects\ENV\LCRA\60551452_LCRA_Task #1 Cooks Point\900-CAD GIS\920-GIS\LCRA_CooksPoint.gdb(Local Server)

Data Layer : Navasota Ladies' Tresses Modeled Habitat

Data File Name (Feature Class/Shapefile/Raster):
LCRA_CPT_ENV_NavasotaLadiesTressesHabitat_URS
Data File Type: Vector
Data Source: URS
Data Current As Of: Delineated November 2017
Acquired/Downloaded: N/A
Download Link: L:\AGE\Projects\ENV\LCRA\60551452_LCRA_Task #1 Cooks Point\900-CAD GIS\920-GIS\LCRA_CooksPoint.gdb(Local Server

Data Layer : Floodplain

Data File Name (Feature Class/Shapefile/Raster): LCRA_CPT_ENV_Floodplain_FEMA
Data File Type: Vector
Data Source: FEMA
Data Current As Of: January 2011
Acquired/Downloaded: January 2018
Download Link: L:\AGE\Projects\ENV\LCRA\60551452_LCRA_Task #1 Cooks Point\900-CAD GIS\920-GIS\LCRA_CooksPoint.gdb(Local Server

Data Layer : Parcel Boundaries

Data File Name (Feature Class/Shapefile/Raster): LCRA_CPT_BND_ParcelBoundaries_UFS
Data File Type: Vector
Data Source: Universal Field Services
Data Current As Of: March 2018
Acquired/Downloaded: March 2018
Download Link: L:\AGE\Projects\ENV\LCRA\60551452_LCRA_Task #1 Cooks Point\900-CAD GIS\920-GIS\LCRA_CooksPoint.gdb(Local Server

Data Layer : Historic Markers

Data File Name (Feature Class/Shapefile/Raster): LCRA_CPT_HIS_HistoricMarkers_THC
Data File Type: Vector
Data Source: Texas Historic Commission
Data Current As Of: 2017
Acquired/Downloaded: September 2017
Download Link: https://atlas.thc.state.tx.us/Data/GISData

Data Layer : Cemeteries

Data File Name (Feature Class/Shapefile/Raster): LCRA_CPT_HIS_CemeteryPoly_THC
Data File Type: Vector
Data Source: Texas Historic Commission
Data Current As Of: 2017
Acquired/Downloaded: September 2017
Download Link: https://atlas.thc.state.tx.us/Data/GISData

Data Layer : Museums

Data File Name (Feature Class/Shapefile/Raster): LCRA_CPT_HIS_Museums_THC
Data File Type: Vector
Data Source: Texas Historic Commission
Data Current As Of: 2017
Acquired/Downloaded: September 2017
Download Link: https://atlas.thc.state.tx.us/Data/GISData

Data Layer : Geology

Data File Name (Feature Class/Shapefile/Raster): LCRA_CPT_GEO_Geology_BEG
Data File Type: Vector
Data Source: Bureau of Economic Geology
Data Current As Of: 2017
Acquired/Downloaded: September 2017
Download Link: L:\AGE\Projects\ENV\LCRA\60551452_LCRA_Task #1 Cooks Point\900-CAD GIS\920-GIS\LCRA_CooksPoint.gdb(Local Server

Data Layer : Soils (SSURGO)

Data File Name (Feature Class/Shapefile/Raster): LCRA_CPT_GEO_SSURGOSoils_USDA
Data File Type: Vector
Data Source: United States Department of Agriculture-Natural Resources Conservation Service (USDA-NRCS)
Data Current As Of: 2016
Acquired/Downloaded: September 2017
Download Link: https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

Data Layer : Soils (STATGO)

Data File Name (Feature Class/Shapefile/Raster): LCRA_CPT_GEO_STATSGOSoils_USDA

Data File Type: Vector
Data Source: United States Department of Agriculture-Natural Resources Conservation Service (USDA-NRCS)
Data Current As Of: 2016
Acquired/Downloaded: September 2017
Download Link: https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

Data Layer : Imagery

Data File Name (Feature Class/Shapefile/Raster): Multiple Rasters
Data File Type: Raster
Data Source: LCRA
Data Current As Of: December 2017
Acquired/Downloaded: January 2018
Download Link: L:\AGE\Projects\ENV\LCRA\60551452_LCRA_Task #1 Cooks Point\900-CAD GIS\920-GIS\LCRA_CooksPoint.gdb(Local Server)

Data Layer : Base Map – World Topo Map

Data File Name (Feature Class/Shapefile/Raster): World Topo Map
Data File Type: Web-enabled Map Service
Data Source: ESRI
Data Current As Of: August 2017
Acquired/Downloaded: August 2017
Download Link: http://goto.arcgisonline.com/maps/World_Topo_Map

(This page intentionally left blank)