28. **Coastal Management Program:**

For each route, indicate whether the route is located, either in whole or in part, within the coastal management program boundary as defined in 31 T.A.C. §503.1. If any route is, either in whole or in part, within the coastal management program boundary, indicate whether any part of the route is seaward of the Coastal Facilities Designation Line as defined in 31 T.A.C. §19.2(a)(21). Using the designations in 31 T.A.C. §501.3(b), identify the type(s) of Coastal Natural Resource Area(s) impacted by any part of the route and/or facilities.

Not applicable. None of the routes are located within the coastal management program boundary as defined in 31 T.A.C. § 503.1.

29. **Environmental Impact:**

Provide copies of any and all environmental impact studies and/or assessments of the project. If no formal study was conducted for this project, explain how the routing and construction of this project will impact the environment. List the sources used to identify the existence or absence of sensitive environmental areas. Locate any environmentally sensitive areas on a routing map. In some instances, the location of the environmentally sensitive areas or the location of protected or endangered species should not be included on maps to ensure preservation of the areas or species.

Refer to the Environmental Assessment, labeled as Attachment 1.

Within seven days after filing the application for the project, provide a copy of each environmental impact study and/or assessment to the Texas Parks and Wildlife Department (TPWD) for its review at the address below. Include with this application a copy of the letter of transmittal with which the studies/assessments were or will be sent to the TPWD.

Wildlife Habitat Assessment Program
Wildlife Division
Texas Parks and Wildlife Department
4200 Smith School Road
Austin, Texas 78744

The applicant shall file an affidavit confirming that the letter of transmittal and studies/assessments were sent to TPWD.

A copy of the Environmental Assessment, Attachment 1 to this CCN Application Form, was sent to TPWD on the day of the filing of this application. The affidavit confirming that a letter of transmittal and the Environmental Assessment were sent to TPWD will be filed separately in this docket.

30. **Affidavit**

Attach a sworn affidavit from a qualified individual authorized by the applicant to verify and affirm that, to the best of their knowledge, all information provided, statements made, and matters set forth in this application and attachments are true and correct.

The sworn affidavit of Darrell W. Cline for this project is attached.

AFFIDAVIT

STATE OF TEXAS
COUNTY OF Dallas

I, Darrell W. Cline, after first being duly sworn state the following: I am filing this application as Chief Financial Officer of Garland Power & Light. I am qualified and authorized to file and verify this application, and am personally familiar with the information supplied in this application; and to the best of my knowledge, all information provided, statements made, and matters set forth in this application and attachments are true and correct; and all requirements for the filing of this application have been satisfied. I further state that this application is made in good faith and that this application does not duplicate any filing presently before the commission.

Darrell W. Cline

SUBSCRIBED AND SWORN TO BEFORE ME, a Notary Public in and for the State of Texas, this 24th day of February, 2016.

SEAL

Notary Public

My Commission Expires: 09·28·2016

JOANNA RIVES
MY COMMISSION EXPIRES
September 28, 2016

BURNS McDONNELL

Environmental Assessment and Alternative Route Analysis Report

The City of Garland, dba Garland Power and Light

Rusk to Panola 345-kV Transmission Line
Project No. 87824

2/16/2016

Environmental Assessment and Alternative Route Analysis Report

prepared for

The City of Garland, dba Garland Power and Light
Rusk to Panola 345-kV Transmission Line
Garland, Texas

Project No. 87824

2/16/2016

prepared by

Burns & McDonnell Engineering Company, Inc.
Kansas City, Missouri

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LIST OF ABBREVIATIONS

Abbreviation	Term/Phrase/Name
A.D.	Anno Domini
AM	Amplitude Modulation (radio)
APLIC	Avian Power Lines Interaction Committee
B.C.	Before Christ
BMP	Best Management Practices
Burns & McDonnell	Burns & McDonnell Engineering Company, Inc.
CCN	Certificate of Convenience and Necessity
EMST	Ecological Mapping Systems of Texas
EPA	Environmental Protection Agency
ERCOT	Electric Reliability Council of Texas
ESA	Endangered Species Act
ESSS	Ecologically Significant Stream Segment
ESRI	Environmental Systems Research Institute, Inc.
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FM	Farm-to-Market (road) or Frequency Modulation (radio)
ft.	feet/foot
Garland	City of Garland
GP&L	Garland Power and Light

Abbreviation	Term/Phrase/Name
GIS	Geographic Information System
HPA	High Probability Area
IPaC	Information, Planning, and Conservation System
ISD	Independent School District
kV	kilovolt
LWCRP	Land and Water Conservation and Recreation Plan
MW	megawatt
NAIP	National Agriculture Imagery Program
NFDC	National Flight Data Center
NHD	National Hydrology Dataset
NPS	National Park Service
NRCS	Natural Resource Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetland Inventory
Oncor	Oncor Electric Delivery Company LLC
PUCT	Public Utility Commission of Texas
PURA	Public Utility Regulatory Act
Preliminary Alternative Routes	Routes developed prior to and then shown to the public at the open houses
Primary Routes	Routes remaining after modifications discussed in Chapter 7.0 following the open houses
Proposed Routes	A subset of the Primary Routes that will be filed with the PUCT and are evaluated in Chapter 8.0
Rusk	Rusk Interconnection LLC
RRC	Railroad Commission of Texas

Abbreviation	Term/Phrase/Name
ROW	right-of-way
SCT Project	Southern Cross Transmission Project
SERC	SERC Reliability Corporation
SH	State Highway
SHPO	State Historic Preservation Office
SWPPP	Storm Water Pollution Prevention Plan
TCEQ	Texas Commission on Environmental Quality
THC	Texas Historical Commission
TNRIS	Texas Natural Resource Information System
TPWD	Texas Parks & Wildlife Department
TWDB	Texas Water Development Board
TXDOT	Texas Department of Transportation
TXNDD	Texas Natural Diversity Database
USCB	U.S. Census Bureau
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

1.0 INTRODUCTION

The City of Garland (Garland), doing business as Garland Power and Light (GP&L), a not-for-profit municipally owned utility, in conjunction with Rusk Interconnection LLC (Rusk), proposes to design and construct a new double circuit 345-kilovolt (kV) transmission line connecting Oncor Electric Delivery Company LLC's (Oncor) proposed Rusk Switching Station located approximately 8 miles northeast of Mount Enterprise in Rusk County, Texas, to GP&L's proposed Panola Switching Station located on the eastern edge of Panola County adjacent to the Louisiana border, approximately 9 miles north of Joaquin (The study are for the proposed project is shown in Figure 1-1). The proposed transmission line would be approximately 37 - 40 miles in length.

Garland and Rusk retained Burns & McDonnell Engineering Company, Inc. (Burns & McDonnell) to prepare an Environmental Assessment and Alternative Route Analysis Report (EA) to support Garland's Application for a Certificate of Convenience and Necessity (CCN) to be filed with the Public Utility Commission of Texas (PUCT). This report has been prepared to provide information and address requirements of Public Utility Regulatory Act (PURA) § 37.056 (c)(4)(A)-(D), 16 Tex. Admin. Code § 25.101(3)(b), and the PUCT CCN Application form. This report may also be used in support of any additional local, state, or federal permitting activities and ROW activities that may be required for the proposed project.

This EA contains a discussion of the information collected and analysis completed to identify a set of proposed route alternatives to present to the PUCT, including a route recommended by Garland and Rusk as best meeting the requirements of PURA and the PUCT's rules. It includes a description of the project and engineering considerations in Chapter 2.0 and a summary of the route selection methodology in Chapter 3.0. Chapters 4.0 through 8.0 contain detailed descriptions of activities summarized in Chapter 3.0, including a description of the existing environment in the study area in Chapter 4.0; a discussion of the process used to identify and categorize the preliminary alternative routes and primary routes in Chapter 5.0; a detailed description of the agency and public involvement program and a summary of comments received in Chapter 6.0; a description of the modifications made to the preliminary alternative routes following the public open houses in Chapter 7.0; and a detailed description of the route selection methodology, selection of the proposed routes, and a discussion of the potential impacts of the proposed routes in Chapter 8.0. References used throughout the report can be found in Chapter 9.0. Appendices include: copies of agency correspondence (Appendix A), public involvement program materials (Appendix B), detailed segment descriptions and notice maps (Appendix C); primary route evaluation data tables (Appendix D), and a list of landowners who received notice for the project (Appendix E).

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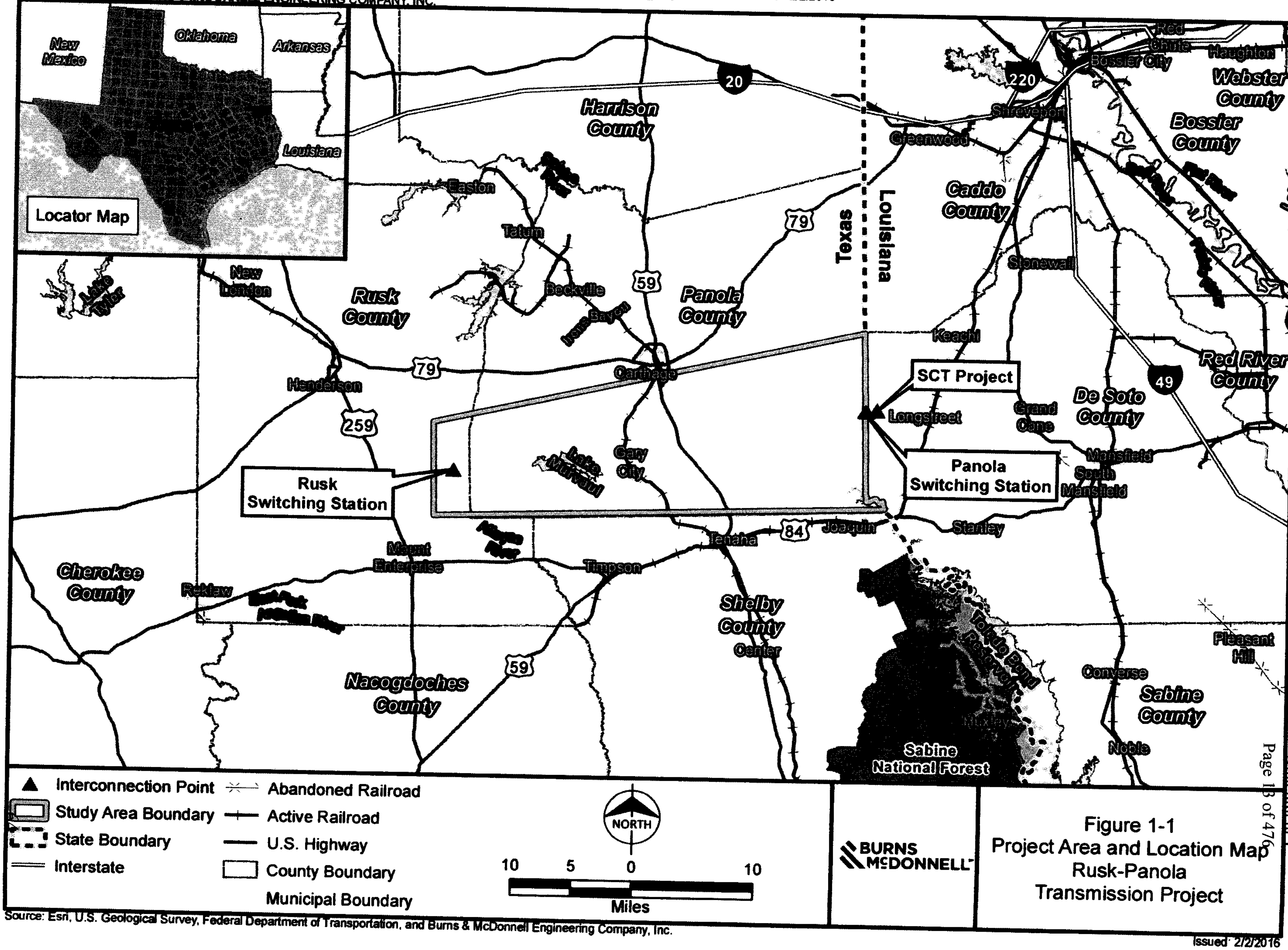

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2.0 PROJECT DESCRIPTION

This chapter provides a description of the project including the purpose and need, proposed design, construction activities, and right-of-way (ROW) requirements.

2.1 Purpose and Need for the Project

The Project is an approximately 37-40-mile double-circuit 345-kV transmission line to connect the new Rusk Switching Station in Rusk County, Texas, to the new Panola Switching Station in Panola County, Texas, on the Texas-Louisiana border. At the western endpoint of the Project, the Rusk Station will be owned by Oncor Electric Delivery Company ("Oncor") and will interconnect with several existing Oncor 345-kV transmission lines in the vicinity of the Station. At the eastern endpoint of the Project, the Panola Station will be owned by Garland and will connect at the Texas-Louisiana border with the Southern Cross Transmission ("SCT") project's high-voltage direct current converter station of located adjacent to the Panola Station in Louisiana. The purpose of the Project and the associated switching stations is to connect the SCT project to the ERCOT transmission grid.

Garland is filing this application under several provisions that were added to PURA[1] § 37.051 during the last legislative session. In particular, §37.051(c-1) requires that a CCN be obtained before a facility can be interconnected to the ERCOT transmission grid that enables additional power to be imported into or exported out of the ERCOT grid, and § 37.051(g) requires that a municipally owned utility obtain a CCN to construct, install or extend a transmission facility outside of its municipal boundaries. This application is filed under both of those subsections.

Subsections (c-2) and (i) of § 37.051 contain virtually identical provisions governing the Commission's review of a facility that is to be constructed under an interconnection agreement appended to an offer of settlement approved in FERC Docket No. TX11-01-001 directing connection between the ERCOT and SERC regions under Sections 210, 211, and 212 of the Federal Power Act (FPA). The statute is clearly referring to FERC Docket No. TX11-1-001, *Southern Cross Transmission LLC*, 147 FERC ¶ 61,113 (2014), which directs physical connection between the ERCOT and SERC regions under Sections 210, 211, and 212 of the FPA. The Project was ordered in the *Southern Cross* docket, and § 37.051(c-2) and (i) therefore apply to this application. Those subsections provide that the Commission shall approve the application not later than the 185th day after it is filed and may prescribe reasonable conditions to protect the public interest that are consistent with the FERC order.

[1] The Public Utility Regulatory Act, Tex. Util. Code §§ 11.001, *et seq.*

2.2 Description of Proposed Construction

This section provides a description and drawings of the transmission line design, including structures, conductors, ROW, and access for the proposed transmission line project.

2.2.1 Transmission Line Design

Garland and Rusk propose using self-supporting tubular steel monopole structures (monopoles) (Figure 2-1). The project could require tangent (Figure 2-1), double-circuit deadend (Figure 2-2), and single-circuit deadend structures (Figure 2-3). The public indicated a preference for the use of monopole structures over lattice structures (see Chapter 6.0 for a discussion of the public involvement efforts for the project). If, during detailed design, it is determined that the monopoles are not sufficient in certain areas, such as where the route requires heavy angles, Garland and Rusk may use lattice structures (Figure 2-4). Design criteria will be in compliance with applicable statutes, the appropriate edition of the National Electrical Safety Code, and acceptable engineering design practice. Structures will be supported by foundations that are appropriate and compatible with the structure design. For monopoles, this likely will be a combination of direct-burial of monopoles for in-line structures and drilled pier foundations for corner and angle structures.

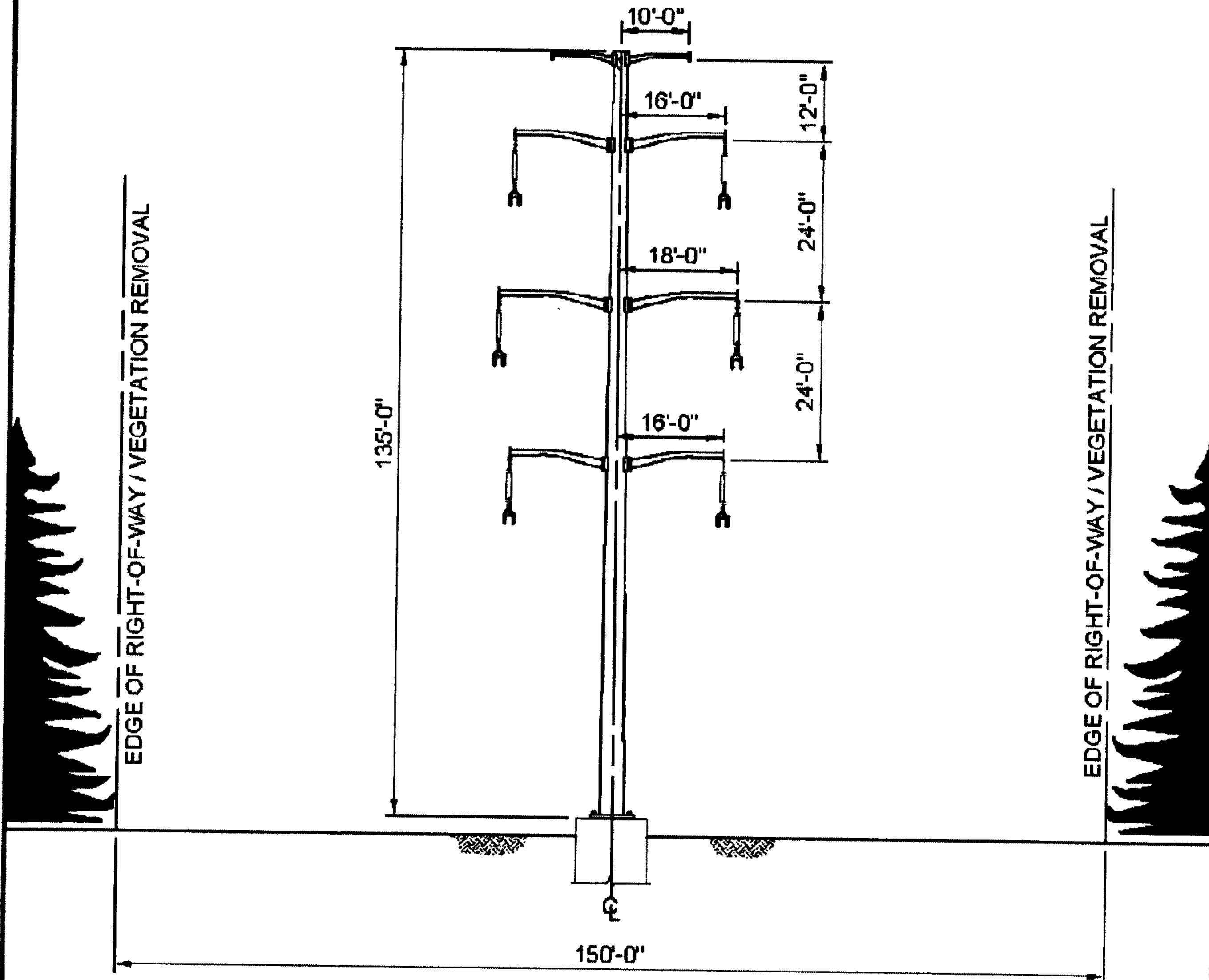
The typical structure heights above ground will vary between 135 feet (ft.) and 145 ft. However, this height will vary depending upon terrain, span requirements, and engineering constraints.

2.2.2 Right-of-Way Requirements

The proposed ROW width for this project will be between approximately 150 ft. and 160 ft. The proposed transmission line will be located mostly along the centerline of the ROW. Additional ROW may be required at line angles and at dead-ends. In some locations, aerial ROW may be utilized where the transmission line structures will not occupy the surface but the conductor may occupy aerial property above the surface property. New easements would need to be acquired for the new line for any proposed route.

2.2.3 Clearing Requirements

The proposed transmission line project will be constructed primarily on land that is currently forested and will require clearing of the ROW. In areas that are already cleared, very little or no clearing will be required. In the wooded areas, all trees, brush, and undergrowth within the ROW, except for low-growing vegetation, will be removed. Any required clearing will be conducted using techniques that are appropriate to the terrain and vegetation conditions and following applicable local, state, and federal regulations pertaining to environmental protection.



PRELIMINARY CROSS SECTION

NOT TO SCALE

Notes:
Proposed structure heights are typical and are subject to change during detailed engineering.

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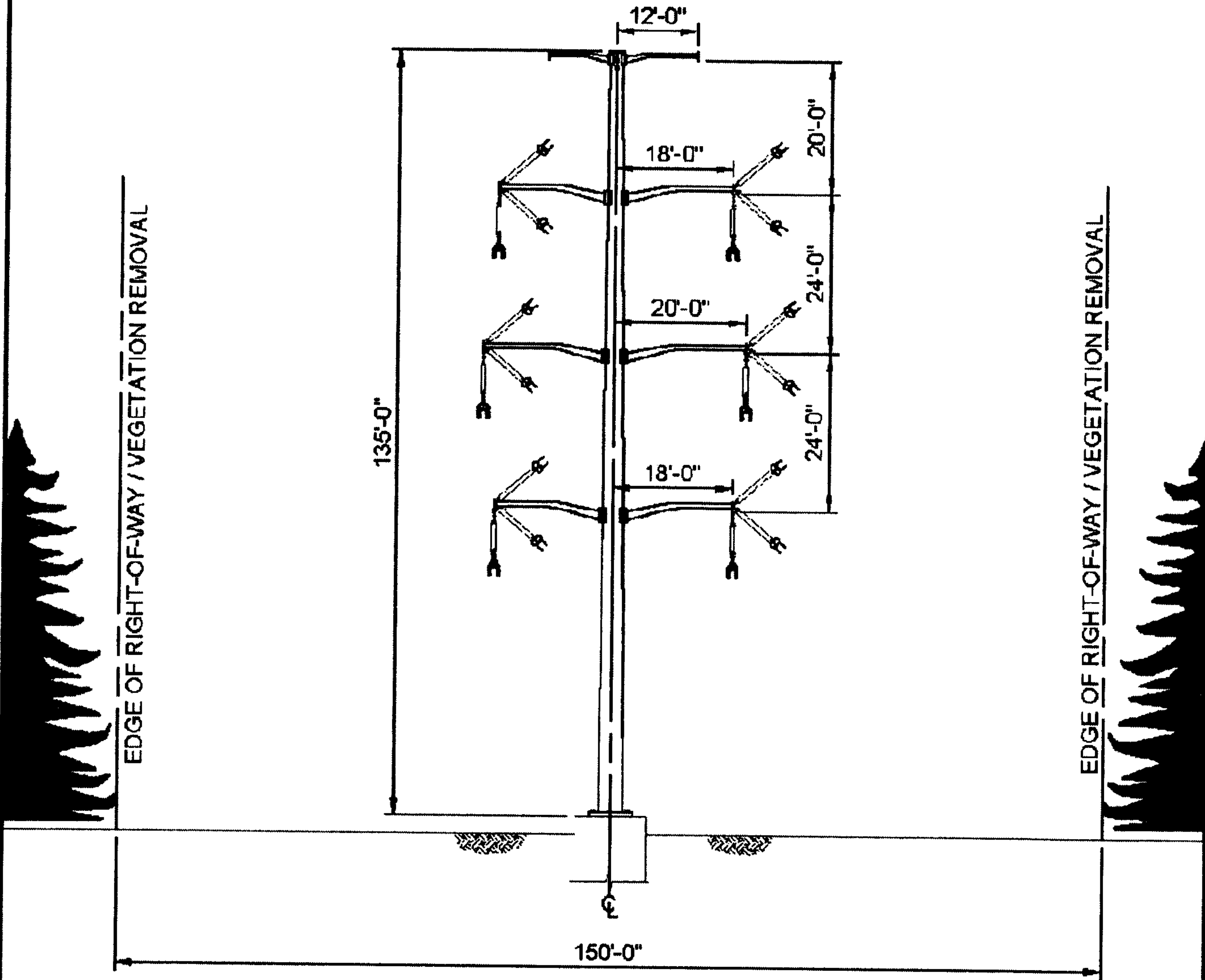
Figure 2-1
Typical 345-kV Double Circuit Monopole Structure
Rusk-Panola Transmission Project

Source: Burns & McDonnell Engineering Company Inc.

Issued 2/3/2016



PRELIMINARY CROSS SECTION

NOT TO SCALE

Notes:
Proposed structure heights are typical and are subject to change during detailed engineering.

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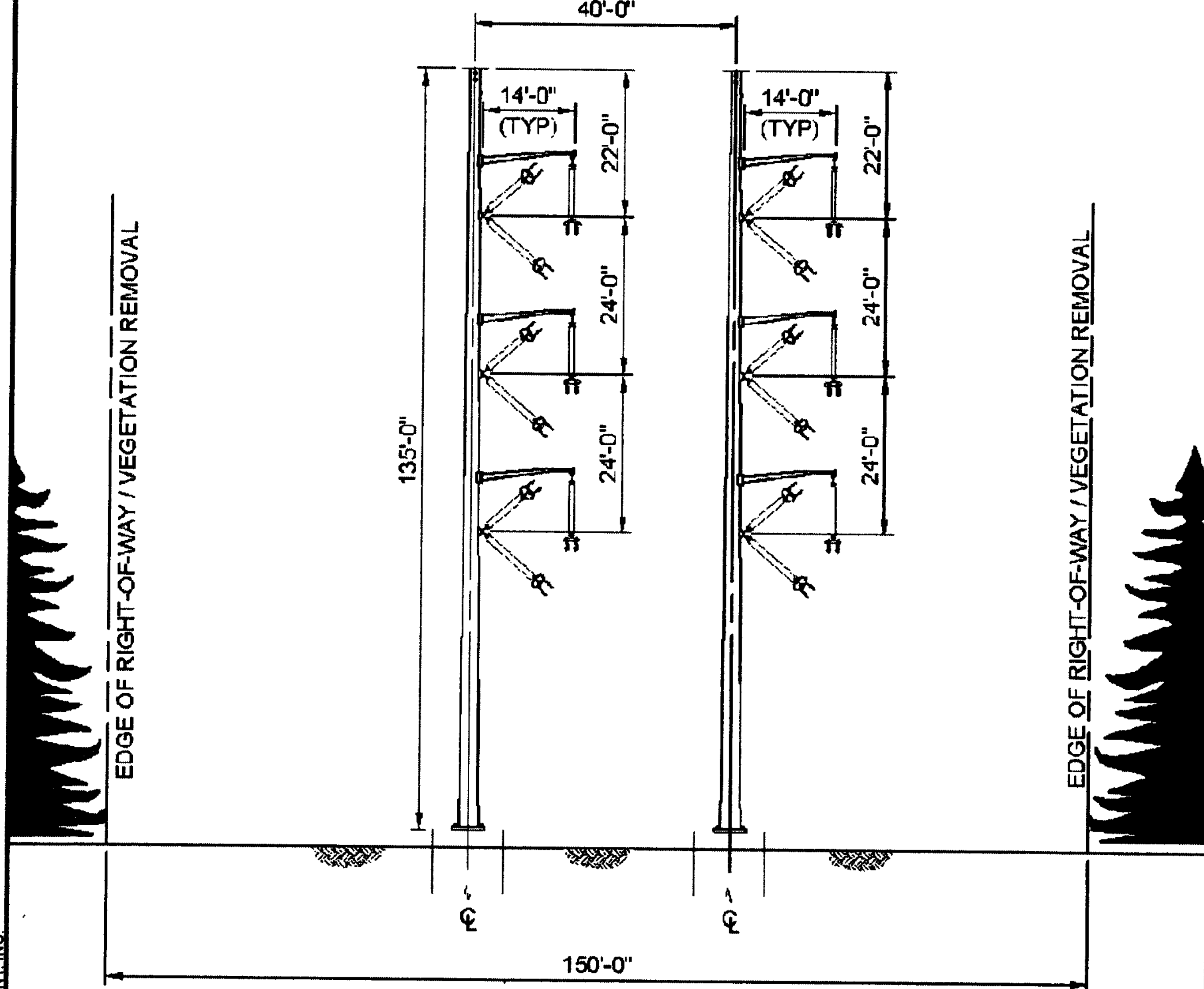
Figure 2-2
Typical 345-kV Double Circuit Deadend Structure
Rusk-Panola Transmission Project

Source: Burns & McDonnell Engineering Company Inc.

Issued 2/9/2016



PRELIMINARY CROSS SECTION

NOT TO SCALE

Notes: Proposed structure heights are typical and are subject to change during detailed engineering.	BURNS McDONNELL	Figure 2-3 Typical 345-kV Single Circuit Deadend Structure Rusk-Panola Transmission Project

Source: Burns & McDonnell Engineering Company Inc.

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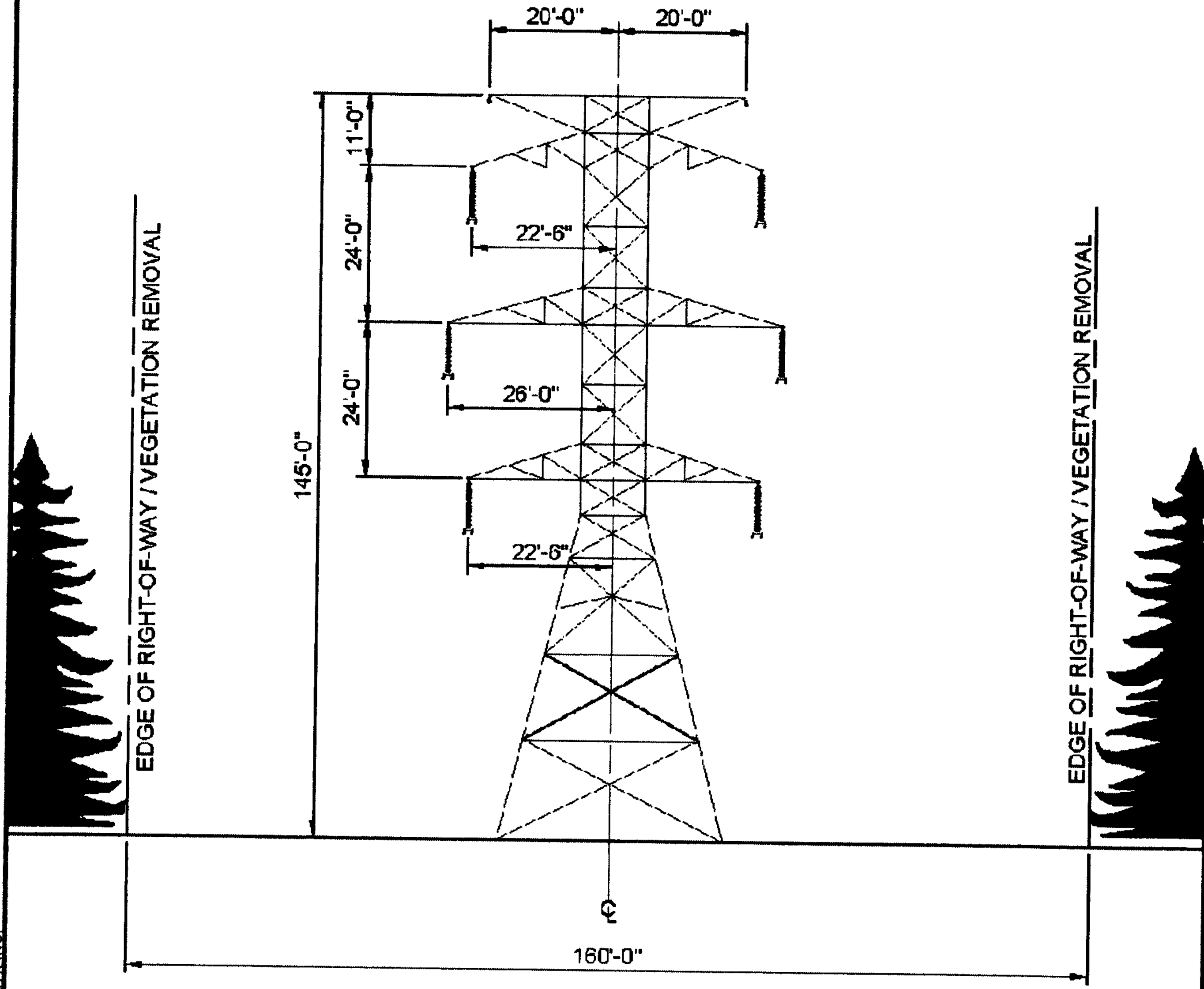

PRELIMINARY CROSS SECTION

NOT TO SCALE

Notes:
Proposed structure heights are typical and are subject to change during detailed engineering.

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Figure 2-4
Typical 345-kV Double Circuit Lattice Structure
Rusk-Panola Transmission Project

Source: Burns & McDonnell Engineering Company Inc.
Issued. 2/9/2016

2.2.4 Access Roads

Access roads may need to be built in remote areas where the transmission line ROW is not accessible by the existing road infrastructure. The location and number of access roads required will be determined following the detailed engineering of the transmission line.

2.2.5 Support Structure Assembly and Erection

The first step in structure assembly and erection will be the establishment of a solid foundation support system. Typically, this will begin with auger drilling of a cylindrical shaft(s) of appropriate diameter and depth in the soil to provide necessary support to the structure.

For directly embedded monopoles, the bottom section of the monopole will be centered in a cylindrical shaft, and the annulus between the monopole and the shaft will be backfilled with either crushed rock or concrete to create a strong foundation for the structure.

For base-plated monopoles and lattice towers, a steel reinforcing bar "cage" and an anchor bolt "cage" will be placed in the shaft(s), and the shaft will be filled with concrete to create a sturdy foundation for the structure. Once this foundation has been constructed for each structure, the remaining structure will be assembled and erected on top of this foundation.

Equipment required for this construction will likely include a combination of cranes, trucks, augers, and in some specialty situations, helicopters. Equipment will have tracks when required by terrain, weather conditions, and environmental permitting requirements.

The following is a description of the construction of tubular steel poles. In most scenarios when access to structure sites is readily available by land, tubular pole sections can be transported to the structure site and assembled quickly either utilizing slip joints or bolted flange plates to connect the adjoining sections. Pole sections can be assembled either while laying on their side or stacked together in place. If assembled on their side, the poles are then tilted into place on foundations with preset anchor bolt cages or into direct embed pole shafts. As expected, stacking poles in place does present a significantly greater need for climbing of the towers during construction.

The following is a description of the construction of lattice towers. In most scenarios when access to structure sites is readily available by land, and when portions of the ROW can be utilized at the sites to stage the structures, lattice towers can be assembled on their side, member by member working from the outer frame to main braces, and followed by the insertion of minor bracing members. This method limits the overall requirement for construction personnel to climb towers during assembly. The nut and bolt connections are typically made to be hand tight during the initial assembly and tightened to meet specification once all bracing is in place. The towers are then tilted and lifted in to place on foundations with preset stub angles. When necessary, due to ROW restrictions or available area for suitable lifting equipment, towers can also be assemble in place from the bottom up. In these cases, the towers are typically built section by section in similar manner starting with the outer frame and utilizing main bracing members to hold the tower's shape during construction. As expected, this does present a significantly greater need for climbing of the towers during construction.

Alternatively, towers can also be assembled off site in laydown yards or other portions of the ROW that are more level or generally provide for ease of assembly. When assembly is done in an offsite yard, the method is typically governed by the equipment to be used for transport to the structure site. Land cranes are regularly used, but another common practice is to utilize heavy lift helicopters for the transport of preassembled sections of tower to structure sites that are not easily accessible by land crane. When transporting preassembled sections of tower to a site the section sizes are determined by the lifting capacity of the equipment used for transport. Generally crews will be located both at the site and in the assembly yard simultaneously. The crew in the yard is tasked with rigging the tower sections so that balance of the particular components can be achieved during transport and the crews on site are tasked with "catching" the tower sections on arrival. Towers are caught by inserting key bolts in to foundation stub angles or lower sections of the towers as applicable prior to removing the transport rigging and releasing the load from the air or land crane in use. It is important to note that, regardless of the construction method utilized, that method must be considered during tower design to ensure section weights are appropriate and member splices and connections are located to be conducive with the construction plan.

2.2.6 Conductor Stringing

Once a series of support structures have been erected along the transmission line, the conductor stringing phase can begin. Insulators will be installed, and then specialized equipment will be attached to those insulators that will properly support and protect the conductor during the pulling, tensioning, and sagging operations. Once the conductors and shield wire are in place, and tension and sag are verified, suspension units will be installed at each suspension point to maintain conductor position. Conductor stringing will continue until the transmission line construction is complete.

2.2.7 Post-Construction Site Restoration

The cleanup operation involves the leveling of all disturbed areas, the removal of all construction debris, and the restoration or compensation of any items damaged by the construction of the project.

The following criteria provide for the cleanup of construction debris and the restoration of the area's natural setting. Further requirements might be imposed by public agencies and/or private property owners whose land the line crosses or who might have regulatory authority over the cleanup activities.

1. If site factors make it unusually difficult to establish a protective vegetative cover, other restoration procedures will be used, such as the use of gravel, rocks, concrete, etc.

2. Sears, cuts, fill, or other aesthetically degraded areas will be allowed to seed naturally or might be reseeded with native species to reduce erosion, restore a natural appearance and to provide food and cover for wildlife.

3. If temporary roads are removed, the original slopes will be restored.

4. Construction equipment and supplies will be dismantled and removed from the ROW when construction is completed.

5. Clearing down to the mineral soil might be required for road access. In this case, water diversion berms, velocity dissipaters, or other erosion-control devices will be used to reduce erosion potential.

6. Construction waste will be removed prior to completion of the project.

7. Replacement of soil adjacent to water crossing for access roads will be at slopes less than the normal angle of repose for the soil type involved and will stabilized/revegetated to avoid erosion.

8. Compliance with any applicable permit or regulatory approval.

9. Any roads, bridges, or other utilities damaged during construction or from movement of materials or equipment will be repaired.

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3.0 SUMMARY OF THE ROUTE SELECTION METHODOLOGY

The objective of this study was to identify and evaluate alternative transmission line routes for Garland's proposed double circuit 345-kV transmission line project. Burns & McDonnell used a comprehensive transmission line routing and evaluation methodology to identify and evaluate alternative transmission line routes. Methods used to identify and evaluate potential routes were in accordance with PURA § 37.056 (c)(4)(A)-(D), the PUCT's CCN Application form, and 16 Tex. Admin. Code § 25.101(3)(b).

The following sections provide a summary of the process that consisted of study area delineation, data collection, constraints mapping, identification of preliminary alternative routes, implementation of a public involvement program, modification and addition of routes following the public open-house meetings, route evaluation, and identification of proposed routes. Throughout this report, the terms "environmental" or "environment" include the human environment as well as the natural environment.

3.1 Study Area Delineation

Selecting a study area is the first step in the identification of alternative routes. This area needed to encompass the proposed location for the Rusk Switching Station, the proposed location for the Panola Switching Station, and an area large enough for a reasonable number of alternative routes to be identified for the proposed transmission line between those two endpoints. The study area identified is shown in Figure 3-1 and is approximately 35.5 miles by 14.5 miles and encompasses approximately 254,470 acres.

3.2 Data Collection

Data was collected from local, state, and federal officials and agencies, as well as from a field reconnaissance survey. The data collection effort was an ongoing process. Results of the various data collection activities (e.g., request for information from local, state, and federal officials and agencies; file/records review; a visual reconnaissance survey; GIS mapping; etc.) are presented throughout Chapters 4.0 and 8.0 of this report.

3.3 Constraints Mapping

After the study area boundary was identified (Figure 3-1), the Burns & McDonnell project team initiated the information gathering process and the identification of environmental and land use constraints within the study area. The result of the information gathering process was a constraint map that plotted environmental and land use constraints and was utilized in identifying preliminary alternative routes.

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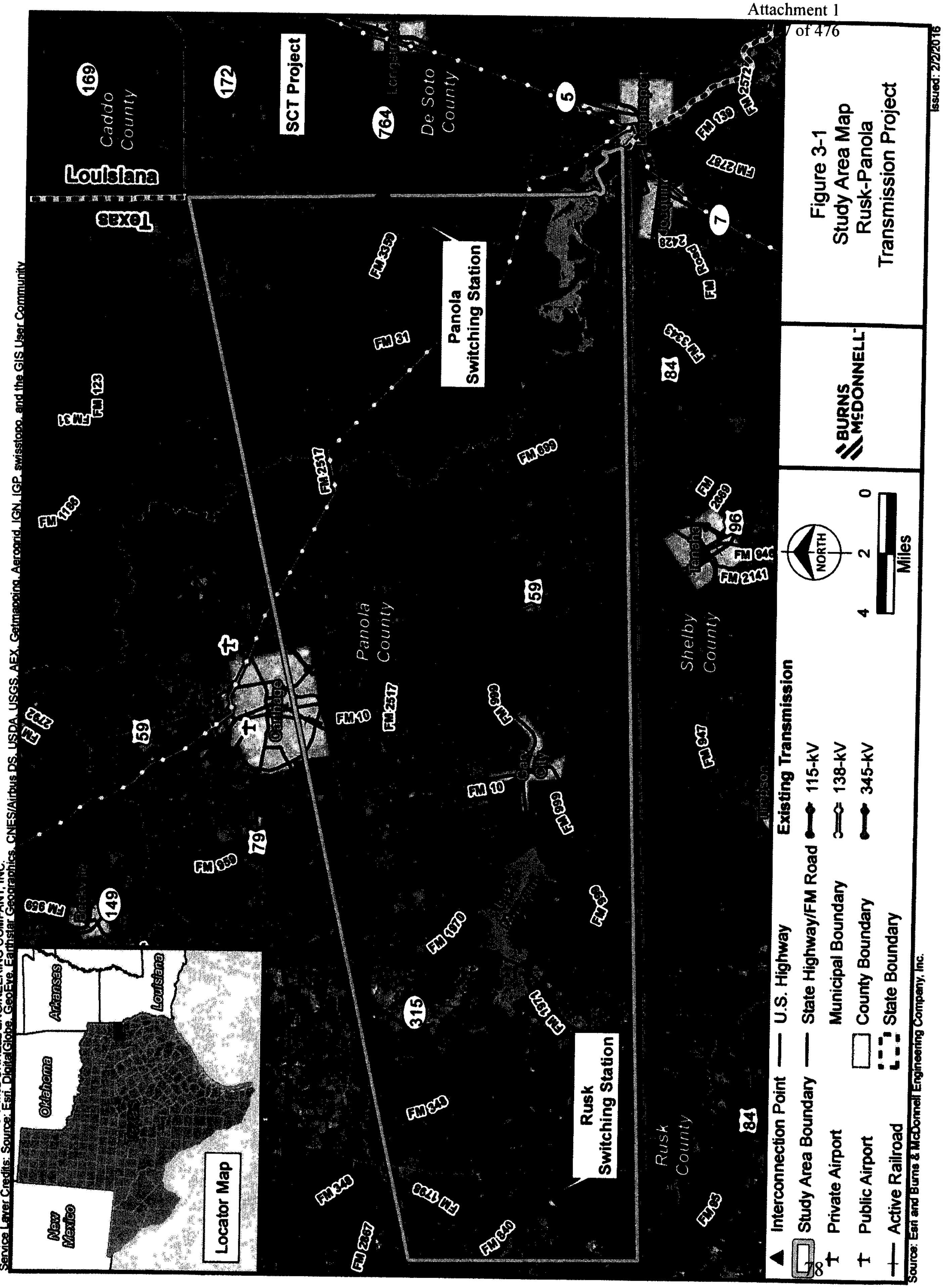

Figure 3-1
Study Area Map
Rusk-Panola
Transmission Project

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The geographic locations of environmentally sensitive areas, restrictive areas, exclusion areas, land use constraints, etc., within the study area were identified on an aerial photograph base map (Figure 3-2) that is located in map pockets at the end of this report.

3.4 Identification of Preliminary Alternative Routes

Upon completion of the various data collection activities and constraint mapping process, the next step was to identify preliminary alternative routes to connect the proposed Rusk and Panola Switching Stations. The preliminary alternative routes were identified in accordance with PURA § 37.056 (c)(4)(A)-(D) and 16 Tex. Admin. Code § 25.101(3)(b), including the PUCT policy of prudent avoidance. It was Burns & McDonnell's intent to identify an adequate number of alternative routes which were environmentally acceptable, considering such factors as community values, park and recreational areas, historical and aesthetic values, environmental integrity, length of route parallel to or utilizing existing compatible ROWs, length of route parallel to apparent property boundaries, and the PUCT's policy of prudent avoidance. The preliminary alternative routes identified by Burns & McDonnell, as shown on Figure 3-3, were then presented at two public open-house meetings. A more detailed discussion of the preliminary alternative route identification process is provided in Chapter 4.0.

3.5 Public Involvement Program

Burns & McDonnell executed a public involvement program to engage potentially impacted landowners, elected officials, and other stakeholders. The program consisted of one-on-one meetings with the County Judge of both counties in which the project will be constructed, county commissioners who represent the majority of the study area, and local electric cooperatives who provide service in the area. The program also included two public open houses designed to solicit public comments and share project information, as well as a project website that provided the public with access to route maps and a questionnaire provided both at the open houses and online in which to provide their input.

Burns & McDonnell mailed written notice of the meetings to all owners of property within 500 ft. of the centerline for the preliminary alternatives routes shown on Figure 3-3. At each open-house meeting, Burns & McDonnell set up information stations in the meeting space. Representatives from Garland, Rusk, and Burns & McDonnell manned each of the information stations and were available to answer the public's questions. The public received a questionnaire at the open houses and Burns & McDonnell also provided an online option for landowners to provide input on their issues of greatest concern related to the project. After the public open-house meetings, Burns & McDonnell reviewed and evaluated each questionnaire that was submitted at the meetings or provided at a later date by mail or online, as well as any areas of concern documented by open house attendees at the computer stations.

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Following adjustments made to the preliminary alternative route segments after the open houses (see Section 3.6), notification letters were sent out to newly-affected landowners within 500 ft. of the new or modified segments and to previously notified landowners where the route location was modified on their property.

A more detailed discussion of the public involvement activities is provided in Chapter 6.0.

3.6 Addition/Modification of Preliminary Alternative Routes following the Open-House Meetings

Following the open-house meetings, as a result of input from the meeting attendees, two preliminary alternative route segments were removed from consideration; one new route segment was added; and the alignments of six preliminary alternative route segments were adjusted. The additions and modifications to the existing segments occurred in various portions of the study area and are further described in Chapter 7.0.

3.7 Evaluation of the Primary Routes

After modifications to the existing segments were made, a total of 96 primary routes were identified (Appendix D). Figure 3-4 shows the segments that comprise the primary routes. The Burns & McDonnell project team then initiated a detailed evaluation of each primary route (see Chapter 8.0 for a detailed discussion of the evaluation and results). In evaluating the primary routes, a variety of environmental and land use criteria were considered as well as the results of the public involvement program. Thirty-nine environmental and land use criteria were quantified. The criteria were based on routing factors set forth in PURA § 37.056 (c)(4)(A)-(D), the PUCT CCN Application form, 16 Tex. Admin. Code § 25.101(3)(b).

The analysis of each primary route involved taking inventory and tabulating the number or quantity of each environmental and land use criterion located along the centerline of each route (e.g., number of stream crossings, the length across agricultural land, etc.). These criteria were developed and tailored to the specific characteristics that were identified in the study area. For instance, Burns & McDonnell identified a number of county and Farm-to-Market roads (FM roads) as well as existing transmission lines as existing corridors within the study area. Paralleling and/or utilizing existing compatible corridors are desirable criteria to be considered in the selection and evaluation of primary routes. Each criterion was quantified primarily by reviewing recent color aerial photography and by a reconnaissance survey, where possible. Burns & McDonnell was able to verify the location of a majority of these resources within the study area during the reconnaissance survey.

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Burns & McDonnell used a statistical z-score analysis to screen the 96 primary routes and select the 12 proposed routes to be evaluated further in Chapter 8.0.

3.8 Identification of the Proposed Routes

After evaluating the 96 primary routes, Burns & McDonnell selected 12 proposed routes (a subset of the 96 primary routes) to carry forward through the rest of the evaluation process and to submit to the PUCT in the Application (Figure 3-5). While Figure 3-3 shows the segments which comprise the preliminary alternative routes shown to the public at the open house meetings, Figure 3-4 shows the segments as modified following the open house meetings which comprise the 96 primary routes, and Figure 3-5 shows the segments which comprise the 12 proposed routes. These 12 proposed routes represented the top-ranking route in the North, Central, and South corridors, as described in Chapter 5.0, and certain lower-ranking routes (that were the highest ranked routes that used all acceptable route segments). The 12 proposed routes were then further evaluated and reviewed as described in Chapter 8.0. Table 3-1 lists the proposed route designations, their component segments, and their lengths.

Table 3-1: Proposed Routes

Route Designation	Segments	Route Length (miles)
RP4	1,7,8,15,26,28,31,34,41,43	37.4
RP5	1,7,8,15,26,28,31,34,42,48	37.1
RP8	1,7,8,15,26,28,31,35,45,49,51	38.0
RP10	1,7,9,13,23,24,28,31,34,42,48	37.7
RP16	2,3,5,7,8,14,27A,27B,38,42,48	37.4
RP28	2,3,6,10,13,23,24,28,31,34,42,48	37.6
RP41	2,3,6,11,12,16,18,21,24,28,31,34,42,48	39.8
RP46	2,3,6,11,12,16,19,29,31,34,42,48	39.7
RP50	2,3,6,11,12,16,19,30,36,44,46,48	38.1
RP53	2,3,6,11,12,17,32,36,44,46,48	39.2
RP82	2,4,12,17,33,39,50,51	39.3
RP93	1,7,8,14,27A,52,37,43	36.9

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4.0 IDENTIFICATION AND DESCRIPTION OF THE STUDY AREA

Selecting a study area is the first step in the identification of alternative routes. This area needed to encompass the proposed location for the Rusk Switching Station, the proposed location for the Panola Switching Station, and an area large enough for a reasonable number of alternative routes to be identified.

4.1 Study Area Delineation

Burns & McDonnell reviewed maps provided by Rusk, data from Ventyx Energy Velocity and other sources, and aerial photography produced by the National Agriculture Imagery Program (NAIP) to develop and identify the study area boundary for this project. Burns & McDonnell used the above data to identify the locations of the proposed Rusk Switching Station and the proposed Panola Switching Station, existing transmission lines, and major land use features (such as major roadways, municipalities, existing pipelines, and related features) in the vicinity of the proposed project. Based on this evaluation, the study area boundary, as depicted in Figure 3-1, was developed. The study area is approximately 35.5 miles by 14.5 miles and encompasses approximately 254,470 acres.

The purpose for delineating a study area for the project was to establish boundaries and limits for the information gathering process (i.e., identifying environmental and land use constraints). The delineation of the study area also allowed Burns & McDonnell to focus its evaluation on a specific area associated with the proposed project. The study area for this project was developed to take advantage of existing corridors that run in the same general direction as the proposed transmission line, which included various existing transmission lines in the vicinity of the proposed Rusk Switching Station, State Highway (SH) 315, the existing east/west transmission line located south of Carthage, and the existing north/south transmission lines in the eastern portion of the study area, while minimizing the number of potentially affected counties and municipalities involved in the project.

4.2 Data Collection

Data was collected within the study area from local, state, and federal officials and agencies, as well as from field reconnaissance survey, as described below.

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

Burns & McDonnell created a list of officials and agency personnel, including state and/or federal agencies that may have potential permitting requirements for the proposed project, to be mailed a consultation letter regarding the proposed project. Letters were sent to these stakeholders to inform them of the proposed project and give them the opportunity to provide information they may have regarding the study area. The feedback provided by some of these officials and agencies was used during the routing analysis.

Other data collection activities consisted of file and record reviews conducted at various state regulatory agencies, a review of published literature, available Geographic Information System (GIS) data, and review of a variety of maps, including recent color aerial photography, U.S. Geological Survey (USGS) topographic maps, various roadway maps, and county appraisal district land parcel boundary maps.

4.2.2 Field Reconnaissance Survey

During the course of the above-mentioned data collection activities, the Burns & McDonnell project team personnel conducted a reconnaissance survey of the study area to confirm the findings of the previous research and data collection activities and to identify potential constraints that may not have been previously noted. The site visit was also used to assist in the route selection process. The reconnaissance survey was conducted by visual observations from public roads and public ROW located within the study area. Burns & McDonnell conducted one reconnaissance survey on April 14-17, 2015.

4.3 Constraints Mapping

The information collected during the data collection phase was used to develop an environmental and land use constraints map (Figure 3-2, located in map pockets at the end of this report). The constraints map, various public maps, recently flown aerial photography, and a reconnaissance survey was used to identify and select preliminary alternative routes within the study area. Burns & McDonnell was able to identify and select preliminary alternative routes that limited potential impacts to the extent practicable. The geographic locations of environmentally sensitive areas within the study area were located and considered during transmission line route identification and were classified as exclusion areas, avoidance areas, or opportunity areas.

An exclusion area is defined as an area that cannot be crossed by a transmission line due to federal, state, or local laws or regulations. For example, the Federal Aviation Administration (FAA) is responsible for regulating most public airport facilities. Overhead electric transmission lines on or adjacent to airports may pose a hazard to aircraft which use the airport. Therefore, an airport runway would be considered an exclusion area.

Avoidance areas include those areas for which there is no law or regulation that prohibits crossing by a transmission line, but that would require special considerations or mitigation measures. A few examples of avoidance areas are parks, schools, cemeteries, federally owned land (e.g.., U.S. Army Corps of Engineers [USACE] land), or environmentally sensitive areas (e.g., habitat for threatened or endangered species). Avoidance areas can be generally broken down into different levels (i.e., low, medium, and high) depending upon the type of constraint. For example, a forested wetland might be classified as a high avoidance area due to the requirement to obtain a permit and required mitigation measures for impacts, while an archeological site may be considered a low or medium avoidance area since actual disturbance of the site could likely be avoided by spanning the transmission line over the site. Likewise, a residential subdivision might be classified as a medium or high avoidance area due to aesthetics and other landowner concerns, and therefore should be avoided, according to PUCT policy of prudent avoidance[2], if reasonable and otherwise acceptable alternatives exist.

In addition to identifying constraint areas, the project team also identified opportunity areas which included existing corridors like SH 315 and the existing transmission lines in the study area. Opportunity areas are considered lower-impact areas, or those areas with a relatively low likelihood of containing existing natural, human, or cultural resources that could be negatively impacted by a transmission line.

The following sections describe the natural, social, and cultural resources found within the project study area.

4.4 Natural Resources

The following is a description of the natural resources in the study area that are potentially impacted by the project. These resources are topography, soils, hydrology, vegetation, wetlands, wildlife, and threatened and endangered plant and animal species. An evaluation of the potential impacts of this project upon these resources is described in Chapter 8.0.

4.4.1 Topography

The study area is situated within the Southeastern Mixed Forest ecoregion. This ecoregion is composed of irregular plains primarily sloping towards the sea, with relief typically ranging from 100 to 600 ft. above sea level. Streams within this ecoregion are typically slow running with marshes, lakes, and swamps prevalent (Bailey, 1995).

The study area is located within the central portion of the Haynesville-Bossier Shale, a region rich in natural gas (Railroad Commission of Texas [RRC], 2015). According to data acquired from the RRC, the study area contains approximately 2,640 active oil and gas wells (primarily natural gas wells).

[2] The PUCT defines "prudent avoidance" as "[t]he limiting of exposures to electric and magnetic fields that can be avoided with reasonable investments of money and effort." 16 Tex. Admin. Code § 25.101(a)(4).

4.4.2 Soils

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

Specific soil classifications are called soil map units. Soil map units describe the soil characteristics in a specific geographic area. The study area is dominated by Sacul, Nahatche, Estes-Mantachie, Cart-Erno, Bowie, Eastwood, Kullit, Cuthbert, Scottsville-Latex-Eastwood, and Mantachie soil series. Table 4-1 provides a detailed description of the dominant soil associations located in the study area (Table 4-1 does not list all soil associations found in the study area, only those that represent a large portion of the study area).

Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops. It also is well suited for cropland, pastureland, rangeland, or forestland. It has the soil quality needed to economically produce sustained high yields of crops when treated and managed, including water management, according to acceptable farming methods (NRCS, 1993). Table 4-1 includes prime farmland information for dominant soils located in the study area.

4.4.3 Hydrology

According to the Texas Water Development Board (TWDB) GIS data, the study area receives an average of approximately 49 to 52 inches of rain per year (TWDB, 2015a). The majority of the study area is located within the Sabine River Basin; the extreme southwest corner of the study area falls within the Neches River Basin. Other rivers and streams are labeled on Figure 3-2. Murvaul Creek runs easterly through the central portion of the study area in both Rusk and Panola Counties. Other major drainages in the study area include Brushy Creek and Sixmile Creek that run easterly through the southern and northern portions of the study area, respectively. Mill Creek, Socagee Creek, and the Sabine River all run southerly through the eastern portion of the study area. There are two Ecologically Significant Stream Segments (ESSS) (Irons Bayou and the Sabine River) within the study area. Texas Parks & Wildlife Department (TPWD) defines an ESSS as a segment of a river that meets one of the following criteria:

- Displays significant overall habitat value including both quality and quantity;
- Fringed by habitats that perform valuable hydrological functions;
- Fringed by significant areas in public ownership;

- Segments that are significant due to unique or critical habitats and exceptional aquatic life uses dependent on high water quality; or
- Segments where water development projects would have significant detrimental effects on state or federally listed threatened or endangered species (TPWD, 2015a).

Table 4-1: Dominant Soil Series within Study Area

Soil Map Unit	Acres within Study Area	Percentage of Study Area	Characteristics
Sacul fine sandy loam	46,140	18.1%	• Nearly level to steep uplands • Moderately well drained, medium to very high runoff • Very deep, loamy and clayey soils • Mainly used as woodland and pasture
Nahatche Complex	19,670	7.7%	• Nearly level, found on floodplains • Somewhat poorly drained and moderate permeability • Loamy alluvial sediment with shallow water table • Mainly used as woodland and pasture
Estes-Mantachie Association	19,360	7.6%	• Nearly level, found on floodplains • Somewhat poorly drained and moderate permeability • Loamy alluvial sediment with shallow water table • Mainly used as woodland and pasture
Cart-Erno Complex	17,300	6.8%	• Nearly level to gently sloping stream terraces • Well drained and moderate permeability • Mainly used as woodland and pasture • Prime farmland
Bowie Fine Sandy Loam	16,540	6.5%	• Nearly level • Very deep, well drained soils • Mainly used as woodland and pasture
Eastwood Very Fine Sandy Loam	13,370	5.3%	• Gently sloping to steep side slopes • Well drained with very slow permeability • Primarily found on interstream divides • Mainly used as woodland and pasture
Kullit Fine Sandy Loam	11,970	4.7%	• Nearly level to gently sloping uplands • Deep, moderately well drained • Prime farmland • Mainly used as woodland, pasture, and some cropland
Cuthbert Fine Sandy Loam	11,410	4.5%	• Strongly sloping to steep uplands • Moderately deep, well drained • Weakly consolidated sandstone and shale • Mainly used as woodland and pasture

Soil Map Unit	Acres within Study Area	Percentage of Study Area	Characteristics
Scottsville-Latex-Eastwood Complex	10,860	4.3%	• Nearly level to gently sloping uplands • Moderately well drained and very slow permeability • Thin loamy sediments and clayey deposits • Mainly used as woodland, pasture, and some cropland
Mantachie Clay Loam	10,690	4.2%	• Nearly level, found on floodplains • Somewhat poorly drained and moderate permeability • Loamy alluvial sediment • Mainly used as cropland

Source: NRCS, 2015

According to the TWDB, Rusk and Panola Counties are part of the East Texas (I) Regional Water Planning Area. Its total existing water supply is projected to be 4,124,518 acre-ft./year in 2020, decreasing 0.4 percent to 4,107,155 acre-ft./year in 2070. Surface water supplies, approximately 87 percent of the total water supply to the region, come from the many rivers and reservoirs within the region. The Carrizo-Wilcox Aquifer is the source of most of the groundwater within the study area (TWDB, 2015b).

The Carrizo-Wilcox Aquifer is a major aquifer extending from the Rio Grande northeast into Arkansas and Louisiana and supplies water to all or parts of 60 counties. The aquifer is composed primarily of sand, with pockets of gravel, silt, clay, and lignite present. Water quality is generally hard but fresh (less than 500 milligrams per liter of total dissolved solids). Irrigation pumping from the aquifer accounts for just over half of the water pumped, with municipal supply accounting for approximately another 40 percent (TPWD, 2015b).

Lake Murvaul is a major reservoir that is located in the western portion of the study area. A very small portion of Toledo Bend Reservoir is also located in the extreme southeastern portion of the study area (TPWD, 2015b). In addition to these reservoirs, several small lakes occur within the study area. From west to east they are: Panola Lake, Dixie Lake, Calhoun Lake, Moore Lake, Prior Lake Number 1, Prior Lake Number 2, Poss Lake, Hill Lake, Alexander Lake, and Clear Lake (National Hydrology Dataset [NHD], 2015).

The Federal Emergency Management Agency (FEMA) has only mapped floodplains within the portions of the study area that are in Rusk County and in the cities of Gary and Carthage in Panola County. The floodplains located within the Rusk County portion of the study area are typically associated with

Murvaul Creek and its tributaries. Most of the floodplains as mapped by FEMA are fairly wide and may require that structures be placed within the floodplains.

4.4.4 Vegetation

Based on data from TPWD, there are four main plant communities located within the study area. These plant communities are: willow oak-water oak-blackgum forest, bald cypress-water tupelo swamp, young forest/grassland, and pine-hardwood forest.

Commonly associated plants of the willow oak-water oak-blackgum forest community typically include: American beech (*Fagus grandifolia*), overcup oak (*Quercus lyrata*), chestnut oak (*Quercus muehlenbergii*), cherrybark oak (*Quercus pagoda*), elm (*Ulmus spp.*), sweetgum (*Liquidambar styraciflua*), sycamore (*Platanus spp.*), southern magnolia (*Magnolia grandiflora*), white oak (*Quercus alba*), black willow (*Salix nigra*), bald cypress (*Taxodium distichum*), swamp laurel oak (*Quercus laurifolia*), hawthorn (*Crataegus spp.*), bush palmetto (*Sabal minor*), common elderberry (*Sambucus spp.*), southern arrowwood (*Viburnum dentatum*), poison oak (*Toxicodendron spp. Mill.*), supplejack (*Berchemia scandens (Hill)*), trumpet creeper (*Campsis radicans*), crossvine (*Bignonia capreolata*), greenbrier (*Smilax spp.*), blackberry (*Rubus spp.*), rhomboid copperleaf (*Acalypha rhomboidea*), and St. Andrew's cross (*Hypericum hypericoides*) (McMahan, Grye, Brown, & TPWD, 2015).

Commonly associated plants of the bald cypress-water tupelo swamp community typically include: water oak (*Quercus nigra*), water hickory (*Carya aquatica*), swamp blackgum (*Nyssa sylvatica*), red maple (*Acer rubrum*), swampprivet (*Forestiera spp.*), buttonbush (*Cephalanthus spp.*), possumhaw (*Ilex decidua*), water elm (*Ulmus americana*), black willow, eardrop vine (*Brunnichia ovata*), supplejack, trumpet creeper, climbing hempweed (*Mikania scandens*), bog hemp (*Boehmeria cylindrica*), duckweed (*Lemna spp.*), water hyacinth (*Eichhornia crassipes*), bladderwort (*Utricularia*), beggar-ticks (*Bidens*), water paspalum (*Paspalum modestum*), and St. John's wort (*Hypericum perforatum*) (McMahan, Grye, Brown, & TPWD, 2015).

Commonly associated plants of the young forest/grassland community typically include: southern red oak (*Quercus falcate*), sweetgum, post oak (*Quercus stellata*), white oak, black hickory (*Carya texana*), blackgum, elm, hackberry (*Celtis*), water oak, hawthorn, poison oak, sumac (*Rhus*), holly (*Ilex*), wax myrtle (*Morella cerifera*), blueberry (*Vaccinium*), blackberry, and redbay (*Persea borbonia*) (McMahan, Grye, Brown, & TPWD, 2015).

Commonly associated plants of the pine-hardwood forest community typically include: loblolly pine (*Pinus taeda*), black hickory, sandjack oak (*Quercus incana*), flowering dogwood (*Cornus florida*),