TransWest Express Transmission Project

Notice to Proceed Plan of Development

March 2023

TRANSWEST EXPRESS LLC

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TRANSWEST EXPRESS TRANSMISSION PROJECT NOTICE TO PROCEED PLAN OF DEVELOPMENT

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ACRONYMS AND ABBREVIATIONS

AC	alternating current
AO	Authorized Officer
APLIC	Avian Power Line Interaction Committee
ATV	all-terrain vehicle
BLM	Bureau of Land Management
BMP	best management practice
BOR	U.S. Bureau of Reclamation
CCR	Code of Colorado Regulations
CCSM Project	Chokecherry and Sierra Madre Wind Energy Project
CDOT	Colorado Department of Transportation
CDPHE	Colorado Department of Public Health and Environment
CFR	Code of Federal Regulations
CIC	Compliance Inspection Contractor
CRS	Colorado Revised Statues
CWA	Clean Water Act
DC	direct current
DEQ	Department of Environmental Quality
DOE	U.S. Department of Energy
EI	Environmental Inspector
EIS	Environmental Impact Statement
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FLPMA	Federal Land Policy and Management Act of 1976
FO	Field Office
GHG	greenhouse gas
GWh/yr	gigawatt-hours per year
IOP	Interagency Operating Procedures
IPP	Intermountain Power Plant
IRA	Inventoried Roadless Area
kV	kilovolt
MW	megawatt
NAC	Nevada Administrative Code
NDEP	Nevada Division of Environmental Protection
NEPA	National Environmental Policy Act of 1969

NERC	North American Electric Reliability Corporation
NESC	National Electrical Safety Code
NOI	Notice of Intent
NREL	National Renewable Energy Lab
NRS	Nevada Revised Statutes
NTP	Notice to Proceed
O&M	operations and maintenance
OPGW	optical ground wire
PA	Programmatic Agreement
PL	Public Law
PM	Project Manager
POD	Plan of Development
Project	TransWest Express Transmission Project, or TWE Project
REC	renewable energy credit
RES	Renewable Energy Standard
RMP	Resource Management Plan
ROD	Record of Decision
ROW	right-of-way
RPS	Renewable Portfolio Standards
SHPO	State Historic Preservation Officer, or State Historic Preservation Office
SCADA	Supervisory Control and Data Acquisition
SWPPP	Stormwater Pollution Prevention Plan
TAC	The Anschutz Corporation
TransWest	TransWest Express LLC
TWE Crystal Substation	TransWest Express Crystal Substation
TWE Project	TransWest Express Transmission Project, or Project
UHF	ultra-high frequency
USACE	U.S. Army Corps of Engineers
USC	United States Code
USDA	U.S. Department of Agriculture
USDOI	U.S. Department of the Interior
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
VHF	very high frequency
WAPA	Western Area Power Administration
WECC	Western Electricity Coordinating Council
WGA	Western Governors' Association
WWEC	West-wide Energy Corridor

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1.0 INTRODUCTION

TransWest Express LLC (TransWest) proposes to construct, operate, and maintain the TransWest Express Transmission Project (TWE Project, or Project). The TWE Project is a high-voltage transmission system that will extend across four states from south-central Wyoming to southern Nevada (Map Exhibit 1). The TWE Project will include approximately 735 miles of transmission line, two terminals located in Wyoming and Utah, two ground electrode systems in proximity to the Wyoming and Utah Terminals, and three substations located in Utah and Nevada. The system will be capable of transmitting 3,000 megawatts (MW) of electric energy (enough energy to power more than 1,800,000 homes) and will incorporate both high-voltage direct current (DC) and high-voltage alternating current (AC) technology.

This *Notice to Proceed Plan of Development* (POD) provides a detailed description of the TWE Project, including its design, construction, operation and maintenance (O&M) features and its environmental attributes. This POD also demonstrates fulfillment of the requirements and stipulations of the federal agencies' Records of Decision (RODs) (Bureau of Land Management [BLM] 2016; U.S. Bureau of Reclamation [BOR] 2017; U.S. Forest Service [USFS] 2017; Western Area Power Administration [WAPA] 2017), which are referred to as ROD requirements throughout this POD and its appendices. The ROD requirements include applicant-committed mitigation measures, additional mitigation adopted through the National Environmental Policy Act (NEPA) process, West-wide Energy Corridor (WWEC) best management practices (BMPs), Bureau of Land Management (BLM) Field Office (FO) stipulations, U. S. Forest Service (USFS) stipulations and BMPs (USFS 2003a, 2003b, 2006, and 2012), reasonable and prudent measures from the U.S. Fish and Wildlife Service's (USFWS) Biological Opinion (BLM 2016: Appendix C), and requirements of the Programmatic Agreement (PA) (BLM 2016: Appendix E) for the TWE Project.

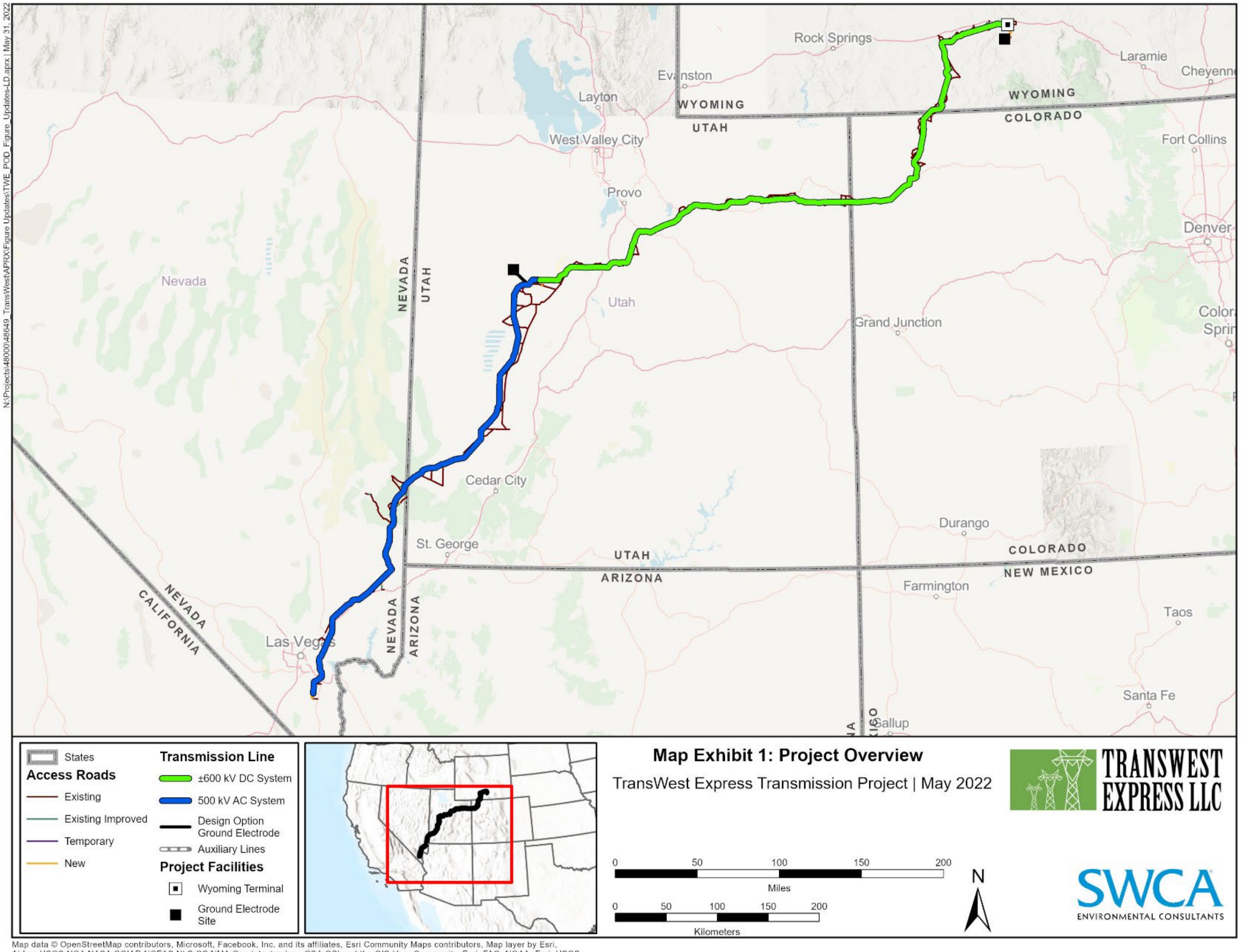
ABC-123

The ROD requirements considered in the main POD (i.e., this document) are listed in Section 9.4, Record of Decision Requirements Addressed in Plan. When requirements are directly addressed in the text, they are accompanied by a gray box with the corresponding requirement number (see example to right). The POD appendices also reference and consider ROD requirements, where applicable. A full list of ROD requirements and the location where they are addressed in the POD is available in Appendix Z, Record of Decision Requirements Index.

In some instances, the RODs include location-specific requirements of the Project, which are described in Section 8.0, Location-Specific Information. Colorado, Utah and USFS in Utah, and Nevada have location-specific requirements described in this document. Wyoming does not have location-specific requirements that apply to this document and is therefore not included in Section 8.0, Location-Specific Information. The POD appendices also include references to location-specific ROD requirements, where applicable.

1.1 Project Background

TransWest filed a right-of-way (ROW) application with the U.S. Department of the Interior's (USDOI's) BLM in 2007 because approximately two-thirds of the route is sited on federal land managed by BLM, USFS, and U.S. Bureau of Reclamation (BOR) (TransWest 2007). The application was revised by TransWest in 2008 and again in 2009, 2010, 2014, and 2015 (TransWest 2008, 2009, 2010, 2014, 2015). Pursuant to the NEPA, the TWE Project has been analyzed in a comprehensive federal Environmental Impact Statement (EIS) (BLM and WAPA 2015). WAPA, a power marketing agency of the U.S. Department of Energy (DOE), has the option to participate as a joint owner in the TWE Project under its Transmission Infrastructure Program. Therefore, BLM and WAPA acted as joint lead federal agencies in preparing the EIS for the TWE Project.



MAP EXHIBIT 1 TWE PROJECT LOCATION

As part of the NEPA process, public scoping was conducted in 2011. In July 2013, BLM and WAPA published the Draft EIS for the TWE Project. Following the 2013 publication, public comment meetings were conducted. In April 2015, BLM and WAPA published the *TransWest Express Transmission Project Final Environmental Impact Statement* (Final EIS) (BLM and WAPA 2015). A Notice of Availability of the Final EIS was published in the *Federal Register* on May 1, 2015 (BLM 2015). The Final EIS analyzed approximately 2,600 miles of alternatives. The approximately 2,550-page Final EIS resulted from more than 6 years of extensive environmental analysis, public input, and collaboration among the cooperating agencies. The report informed the public of various factors associated with the TWE Project, including its potential ecological, aesthetic, cultural, economic, and social effects. After review of thousands of miles of potential routes and consideration of public input, the Final EIS identified the agencies' preferred alternative from south-central Wyoming to the Marketplace Hub in southern Nevada.

On December 13, 2016, following 8 years of comprehensive federal environmental review, BLM issued its *Record of Decision and TransWest Express Transmission Project and Resource Management Plan Amendments* approving the TWE Project (BLM 2016). On January 13, 2017, WAPA issued its ROD selecting the route for the TWE Project (WAPA 2017). Subsequently, USFS issued its ROD on May 31, 2017, and BOR issued its ROD on June 14, 2017 (BOR 2017; USFS 2017). The BLM's *Right-of-Way Grant/Temporary Use Permit* for the TWE Project was authorized on June 23, 2017 (BLM 2017). USFS issued an *Electric Transmission Line Easement* for the Project on June 26, 2018 (USFS 2018), and a USFS *Temporary Special Use Permit* for the Project was executed on May 16, 2019 (USFS 2019).

The TWE Project initially considered three Design Options, introduced by TransWest in the *TransWest Express Transmission Project Preliminary Right-of-Way Application SF 299* (amended from December 2008) (TransWest 2010). TransWest amended the Preliminary ROW Application SF 299 to eliminate Design Option 1 from further consideration in August 2012. Design Options 2 and 3 were fully analyzed during the NEPA process. Both Design Options were approved in the federal agencies' RODs, which directed TransWest to notify BLM of the Design Option selection prior to BLM's issuance of a Notice to Proceed (NTP) for construction of the Project. Design Option 2 was formally selected by TransWest on February 2, 2018 (Garry Miller, personal communication) and is summarized in Section 1.2, Project Overview, and described throughout this POD.

1.2 Project Overview

The TWE Project consists of the construction, and O&M of a ±600 kilovolt (kV) DC transmission system (DC System) and a 500 kV[1] AC transmission system (AC System). The DC System will transmit power from Wyoming, across Colorado to Utah with maximum efficiency, and the AC System will transmit power from Utah to southern Nevada with the flexibility to connect with other systems along the route. The terminals in both Wyoming and Utah will allow the TWE Project's DC System to interconnect with other local AC systems. The Wyoming Terminal[2] will interconnect with Power Company of Wyoming LLC's Chokecherry and Sierra Madre Wind Energy Project (CCSM Project) and PacifiCorp's Energy Gateway West and potentially Energy Gateway South transmission lines. The Utah Terminal[3] will interconnect with the existing Intermountain Power Plant (IPP) and the 500 kV AC transmission line segment to the TWE Crystal Substation in Nevada. A series compensation station will be constructed in Iron County, Utah, and connected to the 500 kV AC line. The TWE Crystal Substation will interconnect

[1] TransWest has elected to build a 500 kV AC transmission line instead of a 600 kV line as described in the Final EIS (BLM and WAPA 2015).
[2] The Wyoming Terminal is synonymous with the "Northern Terminal" referenced in the Final EIS (BLM and WAPA 2015: Section 2.1.1). The name has been updated to provide geographic clarity.
[3] The Utah Terminal is synonymous with the "DC/AC converter station in Utah" described in the Final EIS (BLM and WAPA 2015: Section 2.1.2.1). The name has been updated to provide geographic clarity.

with a new substation[4] interconnected to DesertLink's existing Harry Allen – Eldorado 500 kV transmission line, NV Energy's existing Crystal 500 kV substation, and 500 kV AC transmission line segment to the Nevada AC Substation[5] that will interconnect with four existing substations at the Marketplace Hub.

TWE-1
TWE-51
ROW-31

The construction, O&M, and decommissioning of the TWE Project will be in accordance with the agencies' RODs, BLM's ROW grant stipulations, USFS Special Use Permit stipulations, and requirements of other permitting agencies. TransWest engineered and sited the Project to maximize efficient use of available space within corridors currently used for transmission, where practicable. This POD is based on the TWE Project final design. BLM will issue a NTP after reviewing and accepting the final design. The TWE Project will meet or exceed the requirements of the National Electrical Safety Code (NESC), standards set by the U.S. Department of Labor's Occupational Safety and Health Administration, and TransWest's requirements for safety and protection of landowners and their property.

The cost estimate for the construction of the TWE Project is approximately $3.0 billion. The cost estimate for O&M of the TWE Project is approximately $25 million per year. The life of the TWE Project is anticipated to be 50 years or more. TWE Project facilities will be maintained to provide safe, reliable operation for the life of the system. The TWE Project consists of the components described below.

1.2.1 Direct Current System

- A 405-mile ± 600 kV DC transmission line between south-central Wyoming and Utah. A 250-foot-wide ROW is required for the DC transmission line.
- Two terminals associated with the DC System: the Wyoming Terminal will be located near Sinclair, Wyoming, and will include the CCSM Project Interconnection, the Gateway West 500 kV and potentially the Gateway South 500 kV Interconnections; and the Utah Terminal that will include the interconnection with the IPP Transmission System to be located near Delta, Utah, and will include the IPP 345 kV Interconnection.
- Two ground electrode systems associated with the DC System, to be located in proximity to the Wyoming and Utah Terminals. A low-voltage overhead line will be needed to connect the ground electrode systems to their respective terminals.

1.2.2 Alternating Current System

- A 330-mile 500 kV AC transmission line between Utah and southern Nevada. A 250-foot-wide ROW is required for the AC transmission line.
- Three substations associated with the AC System: the series compensation station as part of the AC System in Iron County, Utah; the TWE Crystal Substation, and the Nevada AC Substation located south of Boulder City, Nevada, near the Marketplace Hub in the Eldorado Valley, with interconnections to the existing regional AC transmission grid.

1.2.3 Components Common to Direct Current and Alternating Current Systems

Components common to the DC and AC Systems are listed below.

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[4] The new Substation is being permitted as a separate project.
[5] The Nevada AC Substation is synonymous with the "Southern Terminal" referenced in the Final EIS (BLM and WAPA 2015: Section 2.1.1). The name has been updated to provide geographic clarity.

- Two independent communications systems, including a dedicated fiber optic network, for command and control of the transmission system. The fiber optic network will require regeneration sites approximately every 50 miles along the transmission line. Regeneration sites will be located in the transmission line ROW and, in most cases, will be co-located with transmission tower sites. The second communication system will use existing private networks. Microwave antennas may be located at the terminals to connect into these private systems.
- Access roads to the TWE Project facilities. The TWE Project will use existing roads in their current condition to the extent practicable, make improvements to existing roads, construct new roads, and use overland access methods for the construction, operation, and maintenance of the TWE Project.
- Temporary work areas will be required during construction of the TWE Project including structure work areas; staging areas; material storage areas; fly yards; pulling, tensioning, and splicing sites; and batch plants.

1.3 Purpose of the Plan of Development

A POD provides documentation for various phases of a federal ROW project's construction, O&M, and decommissioning, and provides plans for environmental protection (see 43 Code of Federal Regulations [CFR] 2804.25). The EIS PODs supported the analysis and publication of BLM's Final EIS (BLM and WAPA 2015). The ROD POD supported the federal agencies' RODs (BLM 2016; BOR 2017; USFS 2017; WAPA 2017), and this NTP POD (POD), including Appendices A through AA, supports an issuance of a NTP for the TWE Project.

This POD reflects the Project's final design. The final design is the product of the final engineering process that considered results of environmental resource surveys, land acquisition status, and engineering constraints. The final design illustrates the TWE Project siting, including locations of transmission structures, access roads, temporary work areas, and terminal/substation facilities. The final design complies with the requirements of the ROD and is presented for the BLM NTP in this POD.

Modifications to the final design following approval of this POD will be in accordance with the variance process outlined in Appendix G, Environmental Compliance and Monitoring Plan.

The TWE Project POD serves many purposes, including those listed below.

- Describes TransWest's construction plans and specifications, engineering field data, and environmental survey results for the Project final design.
- Incorporates the federal agency ROD requirements, including federal agency stipulations, conditions of approval, environmental requirements, and BMPs.
- Establishes the basis for BLM to issue a NTP for construction of the Project.
- Provides the Project description and technical information necessary for the federal agencies to conduct required environmental monitoring of the Project, including compliance with the ROD requirements.

The POD will serve as the reference for construction, and O&M of the TWE Project.

1.4 Organization of the Plan of Development

This POD is a comprehensive Project-wide plan that includes a description of the TWE Project; details of the final design; access road layouts; construction plans; practices and procedures for construction, O&M,

and decommissioning; and processes and procedures for complying with the RODs. In addition to this introductory section, the POD describes the TWE Project according to the following topics.

Section 2.0, Project Purpose and Need, describes the TWE Project purpose and need including TWE Project objectives and needs, North American Electric Reliability Corporation (NERC) standards and Western Electricity Coordinating Council (WECC) criteria, and renewable energy and transmission.

Section 3.0, Plan Updates, describes updates to the POD.

Section 4.0, Roles and Responsibilities, summarizes roles and responsibilities of each major TWE Project entity including TransWest, WAPA, BLM, USFS, other federal agencies, compliance inspection contractor(s), and Project contractor(s).

Section 5.0, Project Components, provides a description of TWE Project components and includes details of facilities and temporary and permanent land disturbance estimates.

Section 6.0, Construction, describes the construction practices that will be performed for the TWE Project, including standard construction activities, schedules, equipment/manpower requirements, and special construction practices which will be used in selective areas or sensitive environments.

Section 7.0, Operations and Maintenance, summarizes O&M practices for the TWE Project, with reference to Appendix O, Operations and Maintenance Plan.

Section 8.0, Location-Specific Information, contains the location-specific information for the TWE Project including location-specific guidance and ROD requirements. In this POD, location-specific information and requirements are described for Colorado, Utah, and Nevada in their respective sections. Wyoming does not have location-specific requirements related to topics in this POD and, therefore, is not included in Section 8.0, Location-Specific Information. The appendix plans also address location-specific requirements, when applicable, for Wyoming, Colorado, Utah, and Nevada.

Section 9.0, Record of Decision Requirements, summarizes ROD requirements based on the final design and includes relevant information about the source of the requirements. Section 9.0, Record of Decision Requirements, also includes a table of ROD requirements included in the POD. Additional ROD requirements are addressed in the POD appendices listed below.

Section 10.0, Literature Cited, contains a list of references for this document.

The POD is supported by Appendices A through AA. The POD appendices include in-depth information for environmental protection, monitoring, safety, response, management, ROD requirements, and mapping for the TWE Project. The appendices will be used to implement the environmental compliance program for the Project. Table 1 lists the appendices included with the POD.

TABLE 1 APPENDICES INCLUDED IN THE POD

Appendix Designation	Name	Description
A	Access Road Siting and Management Plan	Describes the type and locations of improved and new access roads associated with the TWE Project's construction and O&M activities.
B	Avian Protection Plan	Addresses measures to avoid and minimize effects on resident and migrant birds that may interact with the TWE Project.
C	General Blasting Plan	Describe how TransWest will prevent adverse effects on human health and safety, property, and the environment that could possibly occur because of blasting activities during Project construction.
D	Cultural Resources Protection and Management Plan	Outlines the Section 106-related requirements and includes the PA and Tribal Consultation Agreements.
E	Dust Control and Air Quality Plan	Describes how TransWest will prevent and/or minimize fugitive dust and air emissions generated from Project-related activities.
F	Emergency Preparedness and Response Plan	Provides procedures and information to prepare for and effectively respond to emergency situations to prevent adverse impacts to human health, property, and the environment.
G	Environmental Compliance and Monitoring Plan	Describes how TransWest will address ROD requirements and demonstrate that requirements are monitored for compliance.
H	Fire Protection Plan	Provides safe procedures, environmental protection measures, and other specific stipulations and methods to prevent and respond to fires during construction and O&M of the Project.
I	Flagging, Fencing, and Signage Plan	Provides information on the field demarcation (i.e., flagging, fencing, and signage) that will be used to identify the approved Project access, limits of disturbance, and exclusion areas to protect areas containing sensitive resources where access, construction, or travel is to be restricted or excluded during Project activities.
J	Geotechnical Plan	Provides guidelines TransWest will follow to gather geotechnical information to inform design and construction of the TWE Project.
K	Greater-Sage Grouse Habitat Equivalency Analysis, Mitigation and Monitoring Plan	Provides the mitigation strategy, approach, and results of the Habitat Equivalency Analysis.
K-1	Lands with Wilderness Characteristics Mitigation Plan	Provides the mitigation plan TransWest will implement regarding BLM lands with wilderness characteristics.
L	Hazardous Materials Management Plan	Provides measures TransWest will take to reduce risks associated with the use, storage, transportation, and disposal of hazardous materials.
M	Health and Safety Plan	Identifies precautionary measures TransWest will implement to avoid and minimize safety-related situations that could occur and provides procedures to protect workers and the public during Project activities.
N	Noxious Weed Management Plan	Provides requirements and associated practices to be used by TransWest to manage noxious and invasive weeds.
O	Operations and Maintenance Plan	Provides measures TransWest will take during O&M to comply with requirements; maintain consistency across jurisdictions; implement necessary O&M activities in a timely, cost-effective, and safe manner; and avoid or minimize effects on the environment.

Appendix Designation	Name	Description
P	Paleontological Resources Management and Mitigation Plan	Provides information on the processes TransWest has used to identify sensitive paleontological resources, outlines measures to avoid and mitigate impacts to sensitive paleontological resources, and describes the reporting and mitigation protocol that will be used if paleontological discoveries are made during Project activities.
Q	Reclamation Plan	Describes the process TransWest will use to reclaim natural habitats on federal land that support native vegetation in areas disturbed by Project activities.
R	Right-of-Way Preparation and Vegetation Management Plan	Describes the vegetation management actions TransWest will carry out to meet regulatory requirements for ROW clearing and maintenance, and fuels management, and to support reclamation actions.
S	Spill Prevention and Response Plan	Describes measures TransWest will use to prevent, respond to, and control spills of hazardous materials, and to describe measures to minimize a spill's effect on the environment.
T	Stormwater and Erosion Control Plan	provide an overview of stormwater and erosion control measures (design, notification requirements, construction, operation, maintenance, and reclamation) that will be incorporated into and implemented via location-specific, detailed Stormwater Pollution Prevention Plans, as applicable.
U	Traffic and Transportation Management Plan	Outlines procedures for TransWest's safe and authorized use of public roads, to describe the common types of construction vehicles and equipment the Project will use, and to describe the types of traffic controls TransWest will implement to avoid and/or minimize transportation-related impacts to public roads.
V	Visual Resources Management Plan	Describes visual resource environmental mitigation measures and compliance requirements that will be implemented during construction and O&M of the TWE Project.
W	Water Resources Protection Plan	Describes how TransWest will control Project-related erosion and sedimentation discharge into streams and wetlands and will minimize disturbance and erosion of streambeds and banks to protect water resources from potential impacts during construction and O&M.
X	Wildlife and Plant Conservation Measures Plan	Describes how ROD requirements will be applied during construction and O&M of the Project to avoid and minimize impacts to threatened, endangered, candidate, and sensitive plant and wildlife species and other protected wildlife resources (e.g., raptors and migratory birds, big game, and wild horses) observed during protocol-level surveys.
Y	Waste Management Plan	Addresses waste management for the TWE Project and includes relevant ROD requirements.
Z	Record of Decision Requirements Index	Comprehensive list of requirements of the RODs. Includes TWE Project disposition (placement) of the requirements within the POD documents and implementation synopses.
AA	Map Sets	Map sets depicting TWE Project final design, final structure locations, final access road layout, facilities, and environmental constraints.

The map books provided in Appendix AA, Map Sets, are based on the TWE Project final design, updated resource surveys, field review, and the ROD requirements listed in Appendix Z, Record of Decision Requirements Index. The following paragraphs provide a brief description of the map books included in Appendix AA, Map Sets.

1.4.1 TransWest Express Transmission Project Maps

Maps have been produced at multiple scales with specific purposes, and the underlying data are also being provided via a web-based map application for appropriate personnel.

An Overview Map Set is at 1:75,000 scale. This map set defines general Project areas with categorical concerns and/or considerations and index map sheets depicting the Resource Map Set. The Overview Map Set consists of one series of approximately 30 sheets from north to south.

The Resource Map Set is at 1:24,000 scale. This map set depicts locations of Project facilities and identifies the areal extent of resources established through resource surveys to be referenced by BLM and Contractors. The Resource Map Set consists of multiple series, each approximately 300 sheets from north to south, including a few sheets for Project facilities located outside the map sheets depicting the transmission line ROW.

The Engineering Map Set is at 1:6,000 scale. This map set details the types and locations of Project facilities, including transmission line tower types, access road types, water crossing types, and locations where site-specific detailed designs have been completed.

The web-based map application contains Project facilities and requirements, resource data, and administrative information. Location and scale of the map view can be controlled by the user, and pertinent data can be toggled on or off. An individual web-based map application has been produced for each BLM FO and for the USFS.

1.5 Relationship with Other Environmental Documents

This POD has been prepared to support the issuance of a NTP for the TWE Project. An EIS was prepared by BLM and WAPA, in compliance with the requirements and guidelines of the NEPA and the Federal Land Policy and Management Act of 1976 (FLPMA) (BLM and WAPA 2015). The federal agencies' RODs for the TWE Project were signed in 2016 and 2017 (BLM 2016; BOR 2017; USFS 2017; WAPA 2017) and the BLM ROW Grant issued in 2017 (BLM 2017). This POD reflects the decisions reached in the federal agencies' RODs, and incorporates the requirements contained within the RODs and their associated appendices, including the USFWS Biological Opinion (BLM 2016: Appendix C), the Project's executed PA (BLM 2016: Appendix E), and additional Project-specific mitigation measures. Other federal, state, and local permit applications also rely on this POD for descriptions of Project design and practices.

1.6 Background on TransWest Express LLC

TransWest is a limited liability company organized in Delaware. TransWest's primary purpose is to develop, construct, and operate the TWE Project. TransWest is wholly owned by Wyoming Renewable Resources LLC, which in turn is wholly owned by The Anschutz Corporation (TAC). TAC is a privately held, multibillion-dollar diversified company with worldwide investments in natural resources including oil and gas development, pipelines, ranching, and agriculture and in other industries such as real estate, telecommunications, transportation, sports, entertainment, film production, movie theaters, hospitality, and newspaper and internet publishing. TAC has extensive experience in developing, financing, constructing, and operating many large projects in the natural resource, real estate, sports, and entertainment industries. TAC, a Delaware Corporation, is headquartered in Denver, Colorado.
The principal offices of TAC and TransWest are located at 555 Seventeenth Street, Suite 2400, Denver, Colorado 80202.

1.7 Federal, State, and Local Permits

TransWest is responsible for acquiring applicable federal, state, and local permits, licenses, and agreements for the TWE Project. A list of potential permit requirements was provided through the NEPA process and incorporated into this POD for the TWE Project. The TWE Project will necessitate crossings of existing electrical transmission lines, U.S. and State Highways, and railroads. The line crossings will be coordinated with the appropriate entity and TransWest will obtain the required licenses, permits, or agreements following NTP and prior to construction of the affected segments. A list of the authorizations, permits, and reviews that may be needed for the TWE Project to be constructed, based on the final design, is provided in Table 2.

TABLE 2 SUMMARY OF FEDERAL, STATE, AND LOCAL PERMITS AND ENVIRONMENTAL REVIEW REQUIREMENTS

Issue	Action Requiring Permit, Approval, or Review	Agency	Permit, License, Compliance, or Review	Relevant Laws and Regulations
Federal				
National Environmental Policy Act of 1969 (NEPA) compliance	Federal action: to grant right-of-way (ROW) across land under federal jurisdiction	Lead agencies (Bureau of Land Management [BLM] and Western Area Power Administration [WAPA]); affected land-managing agencies; cooperating agencies (i.e., U.S. Forest Service [USFS] and U.S. Bureau of Reclamation [BOR],and including the Central Utah Project Completion Act Office and Utah Reclamation Mitigation and Conservation Commission)	Environmental Impact Statement (EIS) and Record of Decision (ROD)	NEPA (42 United States Code [USC] 4321); Council on Environmental Quality (40 Code of Federal Regulations [CFR] 1500–1508); Department of Energy (DOE) NEPA implementing Regulations (10 CFR 1021)
ROW across land under federal management	Pre-construction surveys including geotechnical surveys; construction, operation, maintenance, and abandonment	BLM	ROW Grant	Federal Land Policy and Management Act (FLPMA) of 1976 (Public Law [PL] 94–579); 43 USC 1761–1771; 43 CFR 2800
		BLM	Short-Term ROW Grant	FLPMA (PL 94–579); 43 USC 1761–1771; 43 CFR 2800
		BLM	Resource Management Plans	BLM requirements
		BLM	Plan of Development	BLM requirements
		BLM	Notice to Proceed	48 CFR 2800
		BLM	Pesticide Use Proposal(s)	*Final Programmatic Environmental Impact Statement Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in 17 Western States* (BLM 2007)
		BOR	License Agreement	Technology Transfer Act of 1986 (PL 99–502), Section 11. Act of Congress of June 17, 1902 (32 Stat. 388), Act of Congress of August 4, 1939 (53 Stat. 1187), Section 10, and 43 CFR 429
		USFS	Temporary Special Use Permit including road use authorization, and USFS Electric Transmission Line Easement	43 USC 1761 and 36 CFR 251
		USFS	Operations and Maintenance Plan	USFS requirements

Issue	Action Requiring Permit, Approval, or Review	Agency	Permit, License, Compliance, or Review	Relevant Laws and Regulations
		USFS	Authorization to proceed (must meet conditions of Temporary Special Use Permit and USFS Electric Transmission Line Easement	48 CFR
		USFS	Pesticide Use Proposal	Forest Service Manual 2150 (USFS 2014)
		Utah Reclamation Mitigation and Conservation Commission	License Agreement to cross Federal Land	Central Utah Completion Act (43 CFR 1000)
	Transmission line across or within Federal Highway Administration highway ROWs	Federal Highway Administration	Permits to cross Federal Aid Highway; 4 (f) compliance	U.S. Department of Transportation Act, (23 CFR 1.23 and 1.27; 23 USC 109 and 315; 23 CFR 645; 23 CFR 771)
Biological resources	Grant ROW by federal land-managing agency	U.S. Fish and Wildlife Service (USFWS)	Endangered Species Act (ESA) compliance by federal land-managing agency and lead agency	ESA of 1973 as amended (16 USC 1531 *et seq.*)
	Protection of migratory birds	USFWS	Compliance	Migratory Bird Treaty Act of 1918 (16 USC 703–712; 50 CFR)
	Protection of bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*)	USFWS	Compliance	Bald and Golden Eagle Protection Act of 1972 (16 USC 668)
Ground disturbance and water quality degradation	Construction in or modification of floodplains	Federal lead agency	Compliance	42 USC 4321, EO 11988, Floodplains
	Construction in or modification of wetlands	Federal lead agency	Compliance	42 USC 4321, EO 11990, Wetlands
	Potential discharge into waters of the state (including wetlands and washes)	USACE (and states); U.S. Environmental Protection Agency (EPA) on tribal land	Section 401 Water Quality Certification	Clean Water Act (CWA) (33 USC 1344)
	Discharge of dredged or fill material into waters of the United States, including wetlands	USACE; EPA on tribal land	Section 404 Permit, Individual or Nationwide Permit	CWA (33 USC 1344)
	Potential pollutant discharge during construction, operation, and maintenance	EPA	Spill Prevention, Control, and Countermeasure Plan for oil-filled equipment	Oil Pollution Act of 1990 (40 CFR 112)

Issue	Action Requiring Permit, Approval, or Review	Agency	Permit, License, Compliance, or Review	Relevant Laws and Regulations
Cultural resources	Disturbance of historic properties	Federal lead agency, State Historic Preservation Officers (SHPOs), Advisory Council on Historic Preservation	Section 106 consultation and signed programmatic agreement prior to ROD	National Historic Preservation Act of 1966 (16 USC 470) (36 CFR 800)
	Potential conflicts with freedom to practice traditional American Indian religions	Federal lead agency, federal land-managing agency	Consultation with affected American Indians	American Indian Religious Freedom Act (42 USC 1996)
	Disturbance of graves, associated funerary objects, sacred objects, and items of cultural patrimony	Federal land-managing agency	Consultation with affected Native American group regarding treatment of remains and objects	Native American Graves Protection and Repatriation Act of 1990 (25 USC 3001–3002)
	Investigation of cultural resources	Affected land-managing agencies	Permit for study of historical and archaeological resources	Antiquities Act of 1906 (16 USC 432–433)
	Investigation of cultural resources; excavation of archaeological resources	Affected land-managing agencies	Permits to excavate and remove archaeological resources on federal land; American Indian tribes with interests in resources must be consulted prior to issuance of permits	Archaeological Resources Protection Act of 1979 (16 USC 470aa–470ee) (43 CFR 7)
	Protection of segments, sites, and features related to national trails	Affected land-managing agencies	National Trails System Act compliance	National Trails System Act (PL 90-543) (16 USC 1241–1249)
Paleontological resources	Ground disturbance on federal land or federal aid project	BLM	Compliance with BLM mitigation and planning standards for paleontological resources of public land	FLPMA of 1976 (43 USC 1701–1771); Antiquities Act of 1906 (16 USC 431–433); Paleontological Resources Preservation Act of 2009 (16 USC 470aaa–470aaa-11)
Air traffic	Location of structures regarding airport facilities and airspace	Federal Aviation Administration (FAA)	A "Determination of No Hazard to Air Navigation" for structure heights, lighting, and locations in proximity to public airports, landing strips, and military bases	Federal Aviation Act of 1958 (PL 85-726) (14 CFR 77) **PHS-3**
Rate regulation	Sales for resale and transmission services	Federal Energy Regulatory Commission	Federal Power Act compliance by power seller	Federal Power Act (16 USC 792)
Tribal				
Ute Tribe				
Access permit/ Temporary business permit	Accessing work sited via public roads on Tribal lands	Ute Tribe, Energy and Minerals Department	Permit	Access Permit

Issue	Action Requiring Permit, Approval, or Review	Agency	Permit, License, Compliance, or Review	Relevant Laws and Regulations
Wyoming				
State				
Wildlife resources	Permitting within greater sage-grouse (*Centrocercus urophasianus*) core areas	All state agencies	Compliance with Executive Order (EO) 2011-5	Wyoming Executive Order 2011-5, *Greater Sage-Grouse Core Area Protection*
Utility siting	Construction of an industrial facility	Department of Environmental Quality (DEQ), Industrial Siting Division	Industrial Development Information and Siting Act Permit	WS 35-12
ROW encroachment	Non-roadway easement across state land	State Board of Land Commissioners	ROW Easement	WS 36-2-107 and 36-9-118
	Encroachment into state roadway ROW	Wyoming Department of Transportation	ROW encroachment permit and accompanying traffic control plan	WS 1-26-813
Ground disturbance and water quality degradation	Construction sites with greater than one acre of land disturbed	DEQ	Wyoming Pollutant Discharge Elimination System Permit (Section 402), Section 401 Water Quality Certification, Notice of Intent (NOI), and SWPPP(s)	WS 35-11-3 CWA, Section 401
Fish and wildlife	Project impacts to fish and wildlife species and associated habitat	Wyoming Game and Fish Department	Compliance	Wyoming Game and Fish Department requirements
Air quality	Fugitive dust emissions generated during construction	DEQ, Air Quality Division	Construction Permit	40 CFR 63
Cultural resources	Surveying and limited testing on state land	State Historic Preservation Office (SHPO); Office of State Lands and Investments	Permit	Wyoming Antiquities Act of 1935; WS 36-1-114-116
	Archaeological data recovery or extensive testing on state land			
	Disturbance of cultural resources	BLM and SHPO	Section 106 Consultation	National Historic Preservation Act of 1966, (16 USC 470) (36 CFR 800)
Explosives	Storage and use of explosives	Varies	Explosives Permit	18 USC 40
Local				
Land use	Construction and operation of transmission lines greater than 69 kV	Carbon County	Conditional Use Permit	2015 Carbon County Zoning Resolution, Chapter 5, Section 5.4(d)(2)
			Building Permit	2015 Carbon County Zoning Resolution, Chapter 5, Section 5.4(d)(2)

Issue	Action Requiring Permit, Approval, or Review	Agency	Permit, License, Compliance, or Review	Relevant Laws and Regulations
Land use	Construction and operation of transmission lines	Sweetwater County	Zoning Permit for Construction	2015 Sweetwater County Zoning Resolution, Section 4(B)
			Temporary Use Permit	2015 Zoning Resolution Section 8
Transportation / Access	Accessing work sites via county roads	Sweetwater County	County Road Crossings and Access Permits	Sweetwater County Public Works Department Utility Permits/Access Permits
			County Utility Crossing License - Type B	Sweetwater County Public Works Department Utility Permits/Access Permits
Water resources	Discharging wastewater	Sweetwater County	Small wastewater permits	Water quality standards per Sweetwater County District Board of Health
Colorado				
State				
Air quality	Land development	Colorado Department of Public Health and Environment (CDPHE), Air Pollution Control Division	Land Development Air Pollutant Emission Notice and Application for Construction Permit	5 Code of Colorado Regulations (CCR) 1001-5
Pesticides	Applying pesticides	CDPHE, Water Quality Control Division	Pesticide General Permit	Colorado Revised Statues (CRS) 25-8-101
Hazardous materials	Transporting hazardous materials on state roads	Public Utilities Commission, Colorado Department of Public Safety	Hazardous Materials Transportation Permit	8 CCR 1507-25
	Using explosives for excavation	Division of Public Safety	Type II Explosives Permit	Division of Public Safety regulations
Transportation / Access	Transporting oversized and overweight loads on state roads	Colorado Department of Transportation (CDOT)	Transport Permit for Movement of Extra-Legal Vehicles or Loads	2 CCR 601-4
	Accessing state roads	CDOT	State Highway Access Permit	State Highway Access Code
ROW encroachment	ROW across state land	State Lands Trust	ROW Easement	State Land Board policies
	Encroachment into state road ROW	CDOT	Utility / Special Use Permit	CRS 9-1.5-103
Ground disturbance and water quality degradation	Construction sites with greater than one acre of land disturbed	CDPHE, Water Quality Control Division	CWA Section 402 Permit - Construction Stormwater General Permit/SWPPP and Construction Dewatering Permit	5 CCR 1002-61 and CRS 25-8-101

Issue	Action Requiring Permit, Approval, or Review	Agency	Permit, License, Compliance, or Review	Relevant Laws and Regulations
Cultural and archaeological resources	Disturbance of cultural or archeological resources	Office of the State Archaeologist, Office of Archaeology and Historic Preservation	Potential permit	CRS 24-80-401-410
	Treatment of unmarked human graves	Office of the State Archaeologist, Office of Archaeology and Historic Preservation, County Coroner	Review	CRS 24-80-1301-1305
Local				
Land use	Construction and operation of transmission lines	Moffat County	Conditional Use Permit	Moffat County Zoning Resolution, Article IV
Transportation / Access	Accessing work sites via county roads	Moffat County	ROW Access Permit	Moffat County Resolution No. 2010-102
	Transporting oversized and overweight loads on county roads	Moffat County	Transport Permit	
Utilities	Installing utilities in county road ROW	Moffat County	Utilities Installation Permit	Moffat County Road Department Policies and Procedures
Utah				
State				
Permitting process	Proposed transmission line facility	Resource Development Coordinating Committee	Expedites Review of Permitting Process for all State Agencies	Utah Code 63-38d-501, Utah Code 63-38d-504
ROW encroachment	Encroachment on, through or over state land	Division of Forestry, Fire, and State Lands	Application approval	Utah Code Title 65A
		School and Institutional Trust Lands Administration	Application approval	Utah Code Title 53C
	Encroachment into state roadway ROW	Utah Department of Transportation	ROW Encroachment Permit, Grant of Access Permit, and Traffic Impact Study	Utah Code 63-46b-3
Ground surface disturbance	Crossing state land	Division of Forestry, Fire, and State Lands	Easement onto state land. Bond may be required.	Utah Code 65A-7-8, R 652-40
Cultural, paleontological, and biological resources	Crossing state land	Division of Forestry, Fire, and State Lands	Provide a cultural and/or paleontological and/or biological survey and submit procedures for reasonable mitigation actions	R 652-40-500
Historical and cultural review	Impact on historical sites	Division of State History	Notification of Planning Stage and before Construction	Utah Code 9-8-306
Archaeological resources	Survey or excavation of archaeological resources on land owned or controlled by the state	Governor's Public Lands Policy Coordinating Office	Permit to survey or excavate	Utah Code 9-8-305, R 694-1

Issue	Action Requiring Permit, Approval, or Review	Agency	Permit, License, Compliance, or Review	Relevant Laws and Regulations
Cultural resources	Discovery of Native American grave on state or non-federal land	Antiquities Section, Division of State History	Notification	Utah Code R456-1-1-17
Air quality	Construction and operation	Air Quality Board	Approval Order for construction activity and accompanying NOI, Fugitive Dust Plan Permit	Utah Code 19-2-108
Water resources	Construction and operation	Water Quality Board	Utah Pollutant Discharge Elimination System General Permit for Construction Activities, NOI and SWPPP	Utah Code 19-5-107
	Alteration of bed or banks of a natural stream	Utah Department of Natural Resources, Division of Water Rights	Stream alteration permit	Utah Code 73-3-29, Administrative Rule R655-13
Wildlife	Modification of habitat	Division of Wildlife Resources	Easement for Use of State Wildlife Resource land	Utah Code Title 23
Local				
Land use	Construction and operation of transmission lines	Uintah County	Administrative Conditional Use Permit	Uintah County Zoning Ordinance, Chapter 17.08
			Building Permit	Uintah County Building Code, Chapter 14.16
Water resources	Development in a special flood hazard area	Uintah County	Floodplain Development Permit	Uintah County Zoning Ordinance, Chapter 17.26
Transportation / Access	Encroaching onto county road ROW	Uintah County	ROW Encroachment Permit	Uintah County Road Department requirements
Transportation / Access	Constructing approaches to county roads	Duchesne County	Permit	Duchesne County Code, Title 6
Utilities	Installing utilities in county road ROW	Duchesne County	Utility Easement	Duchesne County Code, Title 6
Land use	Construction and operation of transmission lines	City of Ballard (Uintah County)	Conditional Use Permit	Ballard City Municipal Code, Title 13
Transportation / Access	Encroaching onto city road ROW	City of Ballard (Uintah County)	Encroachment Permit	Ballard City Municipal Code, Title 12
Land use	Construction and operation of transmission lines	Wasatch County	Conditional Use Permit	Wasatch County Land Use and Development Code, Chapter 16
			Building Permit	Wasatch County Land Use and Development Code, Chapter 16
Transportation / Access	Encroaching onto county road ROW	Wasatch County	Driveway Encroachment Permit; Grading Permit	Wasatch County Land Use and Development Code, Chapter 14

Issue	Action Requiring Permit, Approval, or Review	Agency	Permit, License, Compliance, or Review	Relevant Laws and Regulations
Water resources	Development in a special flood hazard area	Wasatch County	Floodplain Development Permit	Wasatch County Land Use and Development Code, Chapter 16
Land use	Construction and operation of transmission lines	Utah County	Zoning Compliance Permit	Utah County Land Use Ordinance, Chapter 7
			Temporary Use Permit	Utah County Land Use Ordinance, Chapter 3
			Building Permit	Utah County Land Use Ordinance, Chapter 7
Transportation / Access	Accessing work sites via county roads	Utah County	Access Permit	Utah County Code, Chapter 17
Utilities	Installing utilities	Utah County	Utility Installation Permit	Utah County Land Use Ordinance, Chapter 7
Land use	Construction and operation of transmission lines	Juab County	Conditional Use Permit	Juab County Land Use Code, Section 12-1-15
			Building Permit	Juab County Land Use Code, Section 12-1-306
Transportation / Access	Construction activities in county road ROW	Juab County	ROW Encroachment Permit	Juab County Road Department requirements
Land use	Construction and operation of transmission lines	Sanpete County	Conditional Use Permit	Sanpete County Land Use Ordinance, Chapter 14.68
Transportation / Access	Construction activities in county road ROW	Sanpete County	ROW Excavation License	Sanpete County Building Department requirement
Land use	Construction and operation of transmission lines	Millard County	Conditional C-2 Use Permit	Millard County Code, Titles 7 and 10
			Building Permit	
			Development Permit for flood control	
Transportation / Access	Accessing work sites via county roads	Millard County	Encroachment Permit	
Land use	Construction and operation of transmission lines	Beaver County	Conditional Use Permit	Beaver County Zoning Ordinance, various chapters
			Building Permit	Beaver County Building Department requirements
Transportation / Access	Encroaching onto county road ROW	Beaver County	ROW Encroachment Permit	
Water resources	Construction in a flood-related erosion-prone area	Beaver County	Flood Control Development Permit	Beaver County Zoning Ordinance, Chapter 10.26
Land use	Construction and operation of transmission lines	Iron County	Building Permit; Conditional Use Permit	Iron County Code, as amended, Titles 12, 15, and 17

Issue	Action Requiring Permit, Approval, or Review	Agency	Permit, License, Compliance, or Review	Relevant Laws and Regulations
Transportation / Access	Encroaching onto county road ROW	Iron County	ROW Encroachment Permit	Iron County Code, as amended, Titles 12, 15, and 17
Nevada				
State				
Utilities	Project construction	Nevada Public Utilities Commission	Utility Environmental Protection Act Permit	Nevada Revised Statutes (NRS) 704.865
ROW encroachment	Encroachment into state roadway ROW	Nevada Department of Transportation	Occupancy Permit for utilities in state ROW; ROW Encroachment Permit and accompanying Traffic Control Plan	NRS 408.423, 408.210
Ground surface disturbance	Project construction	Division of Environmental Protection (NDEP)	Registration certificate	Nevada Administrative Code (NAC) 445.704
Ground disturbance and water quality degradation	Construction in or near 100-year floodplains, streams and rivers, or waters of the state	NDEP	Floodplain use permits, CWA Section 401, 402, and 404 permits	Nevada State Statutes—State Water Quality Certification rules
	Pollutant discharge	NDEP	National Pollutant Discharge Elimination System Construction Stormwater General Permit, NOI, SWPPP, and Spill Prevention, Control, and Countermeasure Plan	
Cultural and paleontological resources	Investigation of Paleontological, archaeological, and historic sites	Nevada State Museum	Permit to investigate antiquities	Nevada Antiquities Law (NRS 381.195 to 381.227)
	Disturbance of American Indian burial sites on state and private land	Nevada SHPO	Notification of discoveries, consultation with affiliated groups	Nevada Protection of Indian Burial Sites (NRS 383.150) (NRS 383.190)
Air quality	Construction and operation	NDEP	Authority to construct, permit to operate	NRS 445
			Surface Area Disturbance Permit for non-agricultural activities of more than 5 acres	

Issue	Action Requiring Permit, Approval, or Review	Agency	Permit, License, Compliance, or Review	Relevant Laws and Regulations
Biological resources	Modification of sensitive plant species habitat	Division of Forestry	Compliance to survey for identification of plant species	NRS 527.270, NRS 527.050
	Controlling pests	Department of Agriculture	License to engage in pest control	NRS 555.280
	Construction and operation in areas of rare and endangered animal species	Department of Wildlife	Compliance	NRS 501, Nevada Administrative Code (NAC) 503
	Modification of habitat of threatened and endangered species	Department of Wildlife	Special permit	NAC 504.510 through 504.550
Local				
Land use	Construction and operation of transmission lines	Lincoln County	Special Use Permit	Lincoln County Code, Title 13, Chapters 6 and 8
			Building Permit	Lincoln County Code, Title 11, Chapter 2
Air quality	Construction activities	Clark County Department of Air Quality	Dust Control Permit	Clark County Department of Air Quality requirements
Biological resources	Construction activities	Clark County	Desert Tortoise Assist	Clark County Desert Conservation Program requirements
	Removal or possession of cactus and / or yucca	Division of Forestry (State, Private & County Lands) / BLM (Federal Lands)	Yucca/Cactus Harvesting Permits	NRS 527.060 through 527.120
Land use	Construction and operation of transmission lines	Clark County	Administrative Design Review	Clark County Code, Title 30
			Building and Grading Permits	Clark County Code, Title 30
			Drainage Compliance Report, if applicable	Clark County Department of Building
			Geotechnical Report, if applicable	
Transportation / Access	Encroaching onto county road ROW	Clark County	Encroachment Permit	Clark County Code, Title 30
	Accessing work sites via county roads	Clark County	Traffic Control Plan	Clark County Department of Public Works requirements
Ground disturbance and water quality degradation	Construction activities	Clark County	Stormwater Pollution Prevention documentation	Clark County Department of Building requirements
Land use	Construction and operation of transmission lines	City of Henderson (Clark County)	Design Review	Henderson Development Code, Sections 19.5, 19.6, 19.7
			Building Permit	
			Grading Permit	
Transportation / Access	Encroaching onto county road ROW	City of Henderson (Clark County)	Encroachment Permit	Henderson Public Works Department requirements

Issue	Action Requiring Permit, Approval, or Review	Agency	Permit, License, Compliance, or Review	Relevant Laws and Regulations
Hazardous activity	Blasting	City of Henderson (Clark County)	Fire Department Permit	Henderson Fire Department requirements

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2.0 PROJECT PURPOSE AND NEED

2.1 TransWest Express Transmission Project Objectives and Needs

The primary objective of the TWE Project is to provide the transmission infrastructure and capacity necessary to reliably and cost-effectively transmit up to 3,000 MW of electric power from Wyoming to the Desert Southwest. The following are TransWest's objectives for the TWE Project. TransWest will work within the TWE Project-specific objectives listed below.

- Provide for the efficient, cost-effective, and economically feasible transmission of approximately 20,000 gigawatt hours per year (GWh/yr) of clean and sustainable electric energy from Wyoming to markets in the Desert Southwest region. This estimate is based on 8,760 hours per year of 3,000-MW transmission capacity.
- Meet NERC Reliability Standards and WECC planning criteria and line separation requirements.
- Maximize the use of designated federal utility corridors and existing access roads to the extent practicable to minimize adverse effects of the TWE Project.
- Maximize co-location of the TWE Project with existing linear infrastructure and existing transmission infrastructure, to the extent practicable, to minimize adverse effects of the TWE Project.
- Provide these benefits in a timely manner to the Desert Southwest region and the broader western United States to meet the region's pressing environmental and energy needs. TransWest has identified a need for the TWE Project by the expected in-service date of December 2024.
- Provide for flexibility, and maximize the use of infrastructure, to increase future transmission capacity by configuring the TWE Project to allow for interconnection with the IPP transmission system near Delta, Utah.
- Expand regional economic development through increased employment and enlargement of the property tax base.
- Maintain the standard of living associated with highly reliable electricity service.

2.2 North American Electric Reliability Corporation Standards and Western Electricity Coordinating Council Criteria

The reliability standards used within the electric utility industry for the bulk power electrical grid are developed by the NERC. The WECC develops regional criteria that supplement the NERC standards. The WWEC Final Programmatic EIS includes a comprehensive overview of this subject (DOE et al. 2008: Chapter 2, Section 2.6.3). The overview includes a description of how NERC and WECC regulate the industry through a wide series of standards that address all facets of the bulk electricity transmission grid, including engineering, design, planning, operations, infrastructure and cyber security, communication, coordination, and operational safety.

These reliability standards affect the technical aspects of the TWE Project in several ways. Reliability standards limit the operational capacity of any single transmission system element based on a complex contingency analysis that considers the impact to grid operations following various events (e.g., equipment failures, line outages).

Reliability standards affect the TWE Project ROW requirements and separation requirements from other high-voltage lines. As a single transmission system element, the TWE Project is effectively limited in capacity to approximately 3,000 MW.

The contingency analysis required for new transmission projects such as the TWE Project involves examining several types of events including the loss of "Adjacent Transmission Circuits" and the loss of multiple transmission lines within a corridor.

WECC's Regional Criteria address separation distances based on the location of a project from Adjacent Transmission Circuits. WECC requires a minimum separation distance between high-voltage transmission lines. The WECC Regional Criteria specify that to avoid being rated as Adjacent Transmission Circuits, or common transmission system elements, circuits must be separated by "at least 250 feet between the transmission circuits" (WECC 2012). The applicability of this portion of the Regional Criteria is for circuits greater than or equal to 300 kV. The loss of multiple lines within a corridor involves analyzing impacts after a line outage of the TWE Project transmission line and other transmission line(s) within the corridor. The most likely event would be the loss of the TWE Project and an adjacent transmission line.

The likelihood of having a line outage of two transmission lines is even higher in instances where transmission lines cross one another. The mechanical failure of the top line would typically cause the line below to also fail. The practicality of needing transmission lines to cross is recognized in the standards; however, the number of crossings needs to be minimized to reduce the likelihood of such an event.

Reliability analysis examining the scenario where multiple lines are lost, including the TWE Project, has shown that this loss will have a significant impact on transmission grid performance, including local and widespread transmission grid blackouts. This reliability analysis has found that the higher the capacity of the line lost along with the TWE Project, the more severe the transmission grid performance consequences. The reliability analysis also demonstrated that it is not feasible for the TWE Project and another transmission project to use common structures for any portion of the route.

TransWest has developed minimum line separation requirements based on the "tower height" dimensions adopted by WECC in 2012. This structure height dimension takes into consideration both the height and width of typical transmission line structures and is meant to prevent a structure failure of one line from impacting the adjacent line. Application of the NERC and WECC reliability standards and preliminary transmission system contingency analyses indicate that the TWE Project transmission line centerline should be optimally no closer than 250 feet from parallel transmission line centerlines rated 230 kV and above. The 250-foot separation criteria will allow for safe and reliable operation of the Project, and more efficient use of designated and existing utility corridors and will reduce the extent of the disturbance associated with access roads and other potential impacts caused by construction in a new transmission corridor.

2.3 Renewable Energy and Transmission

The TWE Project will provide the transmission infrastructure and capacity necessary to reliably, and cost-effectively, deliver approximately 20,000 GWh/yr of clean and sustainable electric power generated primarily from renewable wind energy resources in Wyoming to the Desert Southwest. Another major benefit of the TWE Project is to help Desert Southwest states meet their renewable energy needs and Renewable Portfolio Standards (RPS).

Wind and solar have been cited in numerous studies as the most economic large-scale resources that can be used to meet the Nation's demand for renewable and clean energy. However, developable solar and wind resources are typically found in remote areas, located far from urban centers where the demand is the greatest. Thus, transmission infrastructure is required to enable renewable energy development that will meet both the demand for energy and environmental policy objectives.

In its July 2008 report entitled *20% Wind Energy by 2030, Increasing Wind Energy's Contribution to U.S. Electricity Supply* (DOE 2008), DOE recognized the challenge of bringing wind energy to market. According to the DOE report:

> If the considerable wind resources of the United States are to be utilized, a significant amount of new transmission will be required. Transmission must be recognized as a critical infrastructure element needed to enable regional delivery and trade of energy resources, much like the interstate highway system supports the nation's transportation needs…. Significant expansion of the transmission grid will be required under any future electric industry scenario. Expanded transmission will increase reliability, reduce costly congestion and line losses, and supply access to low-cost remote resources, including renewables. (DOE 2008:112)

In discussing required improvements to the nation's transmission infrastructure necessary to achieve 20% wind energy by 2030, the DOE report concludes:

> The 20% Wind Scenario would require widespread recognition that there is national interest in ensuring adequate transmission. Expanding the country's transmission infrastructure would support the reliability of the power system; enable open, fair, and competitive wholesale power markets; and grant owners and operators access to low-cost resources. Although built to enable access to wind energy, the new transmission infrastructure would also increase energy security, reduce GHG [greenhouse gas] emissions, and enhance price stability through fuel diversity. (DOE 2008:119)

Federal Energy Regulatory Commission (FERC) staff produced a *Report on Barriers and Opportunities for High Voltage Transmission* for Congress, pursuant to the 2020 Further Consolidated Appropriations Act signed in December 2019. Issued in June 2020, this report provides further evidence of how difficult and time-consuming it is to develop interstate transmission lines as well as the immense electrical and economic benefits such transmission lines can provide to the United States.

The *Report on Barriers and Opportunities for High Voltage Transmission* underscores how projects like the TWE Project can deliver multiple benefits:

> High voltage transmission can improve the reliability and resilience of the transmission system by allowing utilities to share generating resources, enhance the stability of the existing transmission system, aid with restoration and recovery after an event, and improve frequency response and ancillary services throughout the existing system. High voltage transmission also provides greater access to location-constrained resources in support of renewable resource goals. (FERC 2020:page 3)

In fact, the TWE Project serves as the only example in the *Report on Barriers and Opportunities for High Voltage Transmission* of a specific State Policy Opportunity project:

> High voltage transmission can help states achieve their renewable portfolio standards (RPSs) and renewable portfolio goals…These regulatory mandates and voluntary targets are contributing to the build-up of renewable energy resources (e.g., solar, wind, hydropower, and geothermal) that are often located in remote areas far from population centers. Transmission developers have proposed numerous high voltage transmission projects in the United States that could integrate renewable energy resources onto the grid and connect them to regions with high electricity demand. For example, the proposed TransWest Express Transmission Project (TransWest Express) would eventually provide 3,000 MW of transmission capacity to deliver wind energy generated in southern

> Wyoming to consumers in Arizona, Nevada, and southern California. ... If constructed, the TransWest Express could help deliver the renewable energy needed for Arizona, Nevada, and California to achieve their RPSs. (FERC 2020: page 11)

The electrical demand for the Desert Southwest region is also expected to increase. According to the U.S. Census Bureau, the western United States has experienced population growth of approximately 10% from 2000 to 2006. The U.S. Census Bureau expects the growth in population to increase by 33% between 2006 and 2030. The U.S. Census Bureau's latest projection of population growth between 2000 and 2030 for the combined area of Arizona, California, and Nevada is nearly 50% (U.S. Census Bureau 2005a). Arizona and Nevada were identified as the fastest growing states during this period (U.S. Census Bureau 2005b).

Population increase is a key driver in the projected increase in electrical demand, although it is not the only factor. The amount of electricity used per person is also expected to increase as the scope and expectation for the uses of electricity increases. The per capita increase is because of the continued electrification of daily life, including the expanded deployment of air conditioning, computers, high-definition televisions, and electric-powered automobiles. While this upward trend in per capita electricity usage is countered by conservation efforts in the form of energy efficiency standards, utility programs, and individual responsibility, overall per capita electricity usage is still expected to increase (Global Environment Fund and Global Smart Energy 2008). Therefore, even accounting for conservation programs, the electricity demand is expected to increase on the order of 2% per year in the Desert Southwest region (ICF International 2009).

2.3.1 Relevant State Laws and Regulations—Renewable Energy Resources and Standards

Arizona, California, and Nevada have adopted Renewable Energy Standards (RES) and/or RPS. These states have enacted legislation that requires utilities to meet a portion of the overall customer energy supply with renewable energy resources by specific dates. Each state has adopted programs that vary in the portion of overall renewable energy required, the deadlines, and the type of resources that can be used. A summary of each state's RPS requirements follows.

Arizona: In November 2006, the Arizona Corporation Commission adopted final rules to expand the state's RES to 15% by 2025. In June 2007, the state attorney general certified the rule as constitutional, allowing the new rules to go forward. Investor-owned utilities serving retail customers in Arizona are subject to the standard.

Utilities subject to the RES must obtain renewable energy credits (RECs) from eligible renewable resources to meet 15% of their retail electric load by 2025 and thereafter. Of this percentage, 30% (i.e., 4.5% of total retail sales in 2025) must come from distributed renewable resources by 2012 and thereafter.

California: California's RPS was initially established by the State of California legislature in 2002. In 2011, the State of California legislature enacted Senate Bill 2 that codified a 33% RPS by 2020 that would apply to utilities, including publicly owned municipal utilities. In 2018, the State of California legislature enacted Senate Bill 100 that codified a 60% RPS by 2030 and it is California state policy that eligible renewable energy resources and zero-carbon resources supply 100% of all retail sales of electricity to California end-use customers and 100% of electricity procured to serve all state agencies by December 31, 2045.

Nevada: Nevada established a RPS in 1997 legislation. Under the standard, NV Energy (parent company of Nevada Power, Sierra Pacific Power, and Sierra Pacific Resources) must use eligible renewable energy resources to supply a minimum percentage of the total electricity it sells. In 2001, the state increased the minimum requirement by 2% every 2 years, culminating in a requirement of 15% by 2013. This portfolio requirement has been subsequently revised, most recently by Senate Bill 358 of 2019, which increased the requirement to 50% by 2030. In addition, Nevada has established a clean energy goal of 100% by 2050.

2.3.2 Greenhouse Gas Reduction Goals

In addition to RPS mandates, states and the federal government are also considering various greenhouse gas (GHG) reduction policies. Several western governors, including the governors of Arizona, California, and Utah, formed the Western Climate Initiative in 2007 to jointly reduce regional GHG levels. A regional goal has been established by the Western Climate Initiative members and details of the economy-wide (e.g., electricity, transportation, industry) program were developed. During 2011, Western Climate Initiative, Inc., was formed, and California has since implemented regulations based on recommendations of this initiative. GHG reduction policies have also been considered at the federal level. The need for additional renewable energy could be greater depending on how GHG reduction is implemented by utilities (DOE 2008; ICF International 2009; State of California 2013).

2.3.3 Wyoming's Abundant and Cost-Effective Resources

According to the National Renewable Energy Lab (NREL), Wyoming has one of the densest concentrations of high-class wind energy potential in the country (NREL 2006, 2008). NREL data show that over 50% of the best quality (Class 6 and Class 7) wind capacity in the continental United States is in Wyoming. This Class 6 and Class 7 wind resource has an energy potential of 235,000 GWh/yr. Wyoming's Class 4 and above wind resource has a potential of 944,000 GWh/yr.

The existing transmission capacity available to export electric energy from Wyoming is fully committed. These constraints led to the recommendations for transmission expansion along similar routes as the TWE Project included in *Rocky Mountain Area Transmission Study* (NREL 2004), and the *Clean Energy, a Strong Economy and a Healthy Environment* (Western Governors' Association [WGA] 2006). In addition to wind resources, Wyoming has several other natural energy resources that could be developed for production of electricity and transmitted to the growing markets in the Desert Southwest region. The WGA and DOE have identified over 14,000 MW of high-quality, developable wind resources in Wyoming (WGA and DOE 2009).

Two studies, one by the Western Electric Industry Leaders Group, have looked specifically at regional renewable energy alternatives, including remote resources supplied through new transmission infrastructure, to meet the needs of the Desert Southwest region. Wyoming wind resources were identified as one of the most economic alternatives to meet a portion of the overall needs (NREL 2006, 2008). The TWE Project will cost-effectively provide up to 20,000 GWh/yr of the estimated 55,000 GWh/yr of renewable energy needed in the Desert Southwest region.

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3.0 PLAN UPDATES

The POD is a dynamic document that was updated as the Project progressed through the NEPA review, analysis, and RODs. This POD has been updated for the NTP to include requirements of the RODs. TransWest will be responsible for implementing their detailed work procedures within the practices described and may update this POD if additional procedures or Project details are warranted. Actions described below may be subject to change if monitoring and associated adaptive management warrant other, more effective strategies. Updates to this POD or the approaches described herein will take place in concert with the agencies and with concurrence from the Authorized Officer (AO).

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4.0 ROLES AND RESPONSIBILITIES

The following section describes the roles and responsibilities of each major TWE Project entity. If other parties become engaged in the TWE Project as additional participants, they will be responsible for functioning and abiding by the roles and responsibilities outlined in this section, and their reporting relationships will be according to their jurisdiction, expertise, and/or the nature of their involvement. The information in this section summarizes information described in Appendix G, Environmental Compliance and Monitoring Plan. If the information in this section conflicts with the information below, Appendix G, Environmental Compliance and Monitoring Plan, will be the controlling guidance.

4.1 TransWest Express LLC

ROW-3

TransWest will be responsible for compliance with the BLM ROW Grant (BLM 2017) and coordination with Contractor(s). TransWest and its Contractor(s) will be responsible for the construction, O&M, and decommissioning of the transmission line and ancillary facilities in compliance with the conditions outlined in the ROW grants, special use authorizations, and other permits listed in Table 2. TransWest will be responsible to coordinate with other existing ROW holders as necessary on compatibility and reclamation and will work cooperatively where ROW uses overlap. TransWest will perform its operations in a good and workmanlike manner to protect the environment and the health and safety of the public, consistent with the ROW stipulations and this POD. TransWest will be the ultimate authority for its Contractor(s); however, this document refers specifically to the Contractor(s) when necessary to define its activities. To confirm construction activities are conducted in a manner that complies with federal, state, and local regulations, TransWest will contract with or employ a multi-disciplinary team of Environmental Inspectors (EIs) and resource monitors to work jointly and cooperatively with the third-party Compliance Inspection Contractor (CIC). TransWest will also maintain regular and consistent communication with the Contractor(s) to track the success of environmental protection, mitigation, and compliance efforts before, during, and after construction.

ROW-9

In addition, TransWest will designate a representative(s) who has the authority to act upon and to implement instructions from the AO when applicable; and will be available for communication with the AO within a reasonable timeframe when construction or other surface-disturbing activities are underway.

ROW-7

TransWest will be responsible for furnishing appropriate bonds for the Project which includes bonding for construction, mitigation, reclamation, and decommissioning in accordance with the ROW Grant and RODs. TransWest will plan appropriately for the administration of bond funds and pay reasonable monitoring fees for the TWE Project according to the stipulations outlined in the BLM ROW Grant (BLM 2017).

4.2 Western Area Power Administration

WAPA acted as a joint lead agency with BLM in the preparation of the Final EIS for the TWE Project. WAPA issued its ROD in January 2017. Currently, WAPA's role in the TWE Project is limited to its option for 1% of the TWE Project capacity and a 25% interest in the all-digital fiber communications. To date, WAPA has not exercised its option or made a final decision. Regardless, WAPA would not have a significant role in the construction of the TWE Project.

4.3 Bureau of Land Management, U.S. Forest Service, and Other Federal Land Management Agencies

ROW-1
ROW-5

The role of BLM, USFS, and other federal land management agencies is to administer the ROW grants, special use authorizations, and RODs and to confirm that the stipulations and requirements of the authorizations and POD are implemented and complied with during the construction, operation, and maintenance of the TWE Project on the land they manage. Oversight will be provided by a federal AO and Federal Project Manager(s) (PM) or delegate(s) for each involved federal agency. The federal agencies may elect to develop a FO or local point-of-contact structure, to facilitate communication up to the AO and PM(s) or delegate(s) for location-specific issues or concerns. Additional information regarding communication of construction-related issues is provided in Appendix G, Environmental Compliance and Monitoring Plan. The AO will retain the right of access to the land included within the ROW at any time and may enter any facility on the ROW in accordance with 43 CFR 2805.15(a). Assignment of the BLM ROW Grant (BLM 2017) is subject to approval of the AO and must comply with the requirements of the regulations in 43 CFR 2800. The BLM ROW Grant (BLM 2017) will not hinder the AO's management of the authorization or the associated public land.

ROW-3

The AO will have ultimate authority for issues and decisions pertaining to ROW grants and authorizations. The AO will work in conjunction with the federal PM(s) and/or their designees to verify that TransWest is meeting the requirements of applicable laws, permits, regulations, and agreements. The AO, in coordination with others, will determine if noncompliance events, for which TransWest is accountable, qualify as violations of the terms and conditions of any ROW grant or authorization. Only the AO, in accordance with 43 CFR 2807.16 and 36 CFR 251.60, will have the authority to suspend or terminate a ROW grant or authorization if TransWest and/or its Contractor(s) do not comply with the stipulations or conditions, or other applicable laws and regulations. The AO will be the primary federal agent to issue decisions unless otherwise delegated to a federal PM(s). The AO will retain the right of temporary suspension and reinstatement of the NTP.

GEN-6

Federal PM(s) will be primarily responsible for verifying adherence to the ROD requirements listed in Appendix Z, Record of Decision Requirements Index, during TWE Project construction, O&M, and decommissioning. The federal PM(s) may continue using the state office and FO-specific point of contact structure used during pre-NTP coordination for communication during construction. Additional information regarding communication of construction-related issues is contained in Appendix G, Environmental Compliance and Monitoring Plan. The federal PM(s) will verify that compliance monitoring during construction is done in a manner which facilitates timely and efficient construction while protecting the public interest and the environment. They will also be responsible for comparing environmental impacts with those analyzed in the Final EIS and will manage the CIC. Federal PM(s) will coordinate with agency points of contact and resource specialists for their technical expertise and input when needed. Federal PM(s) will be responsible for notifying TransWest of grant or authorization violations resulting from noncompliance; issuing work stoppage orders, if needed; issuing resume work orders; resolving conflicts that arise relating to the Project on the land they administer; and other work as delegated by the AO. When concurrent development projects are proposed and implemented within the approved TWE Project ROW, the federal PM(s) will be responsible for coordinating among projects to provide consistency regarding regulatory compliance and consultation requirements, and to avoid duplication of effort.

LU-1
ROW-24

If adjustments to the TWE Project become necessary, they may be made with the written concurrence of the AO through a variance, which may require additional analysis or NEPA disclosure. Three levels of variances are described in Appendix G, Environmental Compliance and Monitoring Plan. Level 1 is accomplished by resolution in the field. Level 2 (beyond field resolution, but not requiring an amendment to the BLM ROW Grant [BLM 2017]) variance requests will require approval by the appropriate federal PM(s) and Level 3 (requires an amendment to the BLM ROW Grant [BLM2017]) variance requests will require approval by the appropriate federal PM(s) and AO. The AO or their delegate(s) has authority to approve variances for the TWE Project, as described in Appendix G, Environmental Compliance and Monitoring Plan.

4.4 Compliance Inspection Contractor

ROW-23

TransWest and the federal agencies have agreed to use a third-party CIC, funded by TransWest, to act on behalf of BLM and other federal land management agencies to provide oversight during construction and interim reclamation of the TWE Project and verify compliance with the terms, conditions, and stipulations of the BLM ROW Grant (BLM 2017) and applicable laws and regulations. TransWest will hire the CIC prior to issuance of NTP to allow adequate time for the CIC to review documents and develop on-the-ground familiarity with the TWE Project. The CIC will report directly to the federal PM(s) and will be authorized to oversee the requirements of the POD, stipulations of the BLM ROW Grant (BLM 2017), and Project authorizations. It is not the role of the CIC to direct the work of either TransWest or its Contractor(s), or to take direction from them with respect to times, places, or manner of conducting compliance monitoring. Rather, the CIC's primary role is to observe work activities and bring noncompliant situations to the attention of the appropriate party and offer recommendations on how to prevent and resolve noncompliance. The CIC will have access to inspect Project work areas. Access to work areas will not be unreasonably withheld provided that the CIC and their field personnel have received required safety training before entering the work area. The CIC will deploy an adequate number of field personnel to work with the EIs and resource monitors to sufficiently monitor construction activities and fulfill the responsibilities listed above. Additional responsibilities of the CIC are discussed in Appendix G, Environmental Compliance and Monitoring Plan.

4.5 Project Contractor(s)

Contractors may be utilized by TransWest throughout all phases of the TWE Project. The Contractor(s) for the Project will be contractually bound to comply with laws, regulations, and permit requirements, including the implementation of ROD requirements listed in Appendix Z, Record of Decision Requirements Index.

Contractor(s) hired to perform Project construction (Construction Contractor[s]) will be engaged by TransWest after BLM issues its NTP. The Construction Contractor(s) will document their detailed work procedures and construction compliance efforts that will be implemented to comply with the requirements described in this POD and its appendix plans.

Contracted personnel entering the ROW will be required to participate in TWE Project Orientation Training Program before entering the ROW. Construction crews will also be required to cooperate and support the work of the EIs, resource monitors, and CIC to build the Project safely and in compliance with Project terms and conditions; federal, state, and local laws and regulations; and landowner agreements. If a noncompliance event occurs during construction, the Contractor(s) will be responsible for notifying TransWest and the CIC, and for fully cooperating in developing and implementing a solution as soon as possible to resolve the noncompliance. The Contractor(s) will also be responsible for the removal of noncompliant personnel, as necessary. The Contractor(s) will involve the CIC in key Project management meetings and the Project safety program.

SOCIO-2

TransWest will encourage its Contractor(s) to purchase materials, equipment, and supplies locally, or to have non-locally purchased materials and supplies delivered to the counties in which the materials will be used. TransWest will also encourage prompt completion of sales and issues reports regarding taxable purchases so that sales and use tax revenues can be properly attributed in a timely manner.

4.6 Communication Procedures

Effective communication and the sharing of information between parties will be critical to achieving and maintaining environmental compliance throughout the construction of the TWE Project. It is especially important for construction crews to communicate daily with the EIs, resource monitors, and CIC concerning work schedules and locations. The Contractor(s) will be responsible for assuring that field crews can communicate effectively and will implement solutions if communication problems arise.

SOCIO-4

TransWest will be responsible for ongoing communications with the agencies' AO and with local governments during TWE Project activities to inform them of construction schedules and progress, specifically related to the anticipated timing of activities or other aspects of the TWE Project that could affect management, safety, or provisioning of service considerations along the alignment. Given the scope and complexity of the TWE Project, it will be critical that communications involving key decisions, safety, approvals, noncompliance, or variances be documented in writing. Oral communication will not substitute for written approvals. Additional information concerning communication procedures can be found in Appendix F, Emergency Preparedness and Response Plan, in Appendix G, Environmental Compliance and Monitoring Plan, and in Appendix U, Traffic and Transportation Management Plan.

5.0 PROJECT COMPONENTS

The TWE Project includes a ±600 kV DC System and a 500 kV AC System. The DC System crosses the BLM Rawlins, Little Snake, White River, Vernal, Salt Lake, Richfield, and Fillmore FO segments; the Utah Reclamation Mitigation and Conservation Commission segment; and the USFS segment. The DC System also includes the Wyoming and Utah Terminals. The AC System crosses BLM Fillmore, Cedar City, Caliente, and Las Vegas FO segments. The AC System also includes the series compensation station, TransWest Express Crystal Substation (TWE Crystal Substation), and Nevada AC Substation.

Section 5.2 describes the typical design characteristics of the DC System facilities and associated permanent and temporary land disturbance estimates.

- Section 5.2.1—the DC transmission line, including structure designs and foundations, conductors, insulators and associated hardware, overhead shield (ground) wires, grounding rods, minor hardware, and system interconnection lines
- Section 5.2.2—the Wyoming and Utah Terminals, including the AC/DC converter stations and substation equipment
- Section 5.2.3—the ground electrode facilities and low-voltage electrode connector line(s) to the Wyoming and Utah Terminals
- Section 5.2.4—the communication system for the DC System

Section 5.3 describes the typical design characteristics of the AC System facilities and associated permanent and temporary land disturbance estimates.

- Section 5.3.1—the AC transmission line, including structure designs and foundations, conductors, insulators and associated hardware, overhead shield (ground) wires, grounding rods, minor hardware, and system interconnection lines
- Section 5.3.2—the series compensation station in Utah, the TWE Crystal Substation in Nevada, and the Nevada AC Substation
- Section 5.3.3—the communication system for the AC System

5.1 Current Project Design Disturbance Model

TransWest Express LLC has calculated disturbance from the final Project components within each of the Project route's four regions, as defined in the Final EIS (BLM and WAPA 2015). Region I includes the Project's route in Wyoming and most of the route in Colorado. Region II includes the remainder of the route in Colorado, and the route across Central Utah. Region III includes the route in Southwestern Utah, and into Nevada. Region IV includes the route near Las Vegas and its termination at Marketplace.
In addition to the route in the four regions, also modeled are disturbances for "other" Project components, including the Wyoming Terminal, Northern Ground Electrode, Utah Terminal, Southern Ground Electrode, Series Compensation Station, and Nevada AC Substation. TransWest finds that, with a high level of confidence, the final design structure total disturbance area will fall within the total Final EIS disturbance "budget" overall and in regions I, II, III, and IV (Wixom 2020). These disturbance estimates are compared with the Final EIS numbers in Table 3.

TABLE 3 FINAL PROJECT DESIGN DISTURBANCE MODEL COMPARED WITH THE FINAL EIS

	Acres of Disturbance											
	Region I		Region II		Region III		Region IV		Other		Total	
Disturbance Model	Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
Access Roads												
Final design disturbance	480	42	1,095	121	1,008	81	114	6	167	46	2,864	296
Disturbance Final EIS "budget"	456	456	990	990	638	638	120	120	229	229	2,433	2,433
% under or **over** Final EIS budget	**5%**	91%	**11%**	88%	**58%**	87%	5%	95%	27%	80%	**18%**	88%
Structures and Regeneration Sites												
Final design disturbance	688	5	1,028	12	1,186	10	158	2	–	–	3,060	29
Disturbance Final EIS "budget"	746	15	1,181	24	1,303	27	177	4	–	–	3,407	70
% under or **over** Final EIS budget	8%	65%	13%	51%	9%	63%	11%	59%	–	–	10%	59%
Stringing/Tensioning and Mid-span Optical Ground Wire Sites												
Final design disturbance	585	–	967	–	950	–	149	–	–	–	2,650	–
Disturbance Final EIS "budget"	520	–	927	–	884	–	161	–	–	–	2,492	–
% under or **over** Final EIS budget	**13%**	–	**4%**	–	**7%**	–	7%	–	–	–	**6%**	–
Yards								–	–	–		–
Final design disturbance	199	–	305	–	334	–	29	–	–	–	866	–
Disturbance Final EIS "budget"	379	–	604	–	675	–	89	–	–	–	1,747	–
% under or **over** Final EIS budget	47%	–	50%	–	51%	–	68%	–	–	–	50%	–
Other Lines												
Final design disturbance	–	–	–	–	–	–	–	–	259	2	259	2
Disturbance Final EIS "budget"	–	–	–	–	–	–	–	–	718	9	718	9
% under or **over** Final EIS budget	–	–	–	–	–	–	–	–	64%	82%	64%	82%
Facilities												
Final design disturbance	–	–	–	–	–	–	–	–	516	516	516	516
Disturbance Final EIS "budget"	–	–	–	–	–	–	–	–	586	437	586	437
% under or **over** Final EIS budget	–	–	–	–	–	–	–	–	12%	**18%**	12%	**18%**

Disturbance Model	Acres of Disturbance											
	Region I		Region II		Region III		Region IV		Other		Total	
	Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
Additional ROW Clearing												
Final design disturbance	3,276	–	5,193	–	5,759	–	759	–	346	0	15,334	0
Disturbance Final EIS "budget"	3,310	–	5,250	–	6,089	–	771	–	0	–	15,420	0
% under or **over** Final EIS budget	1%	–	1%	–	5%	–	2%	–	0%	–	1%	–
Overall Project												
Final design disturbance	5,229	47	8,588	133	9,240	95	1,212	11	1,288	564	25,557	850
Disturbance Final EIS "budget"	5,411	471	8,952	1,014	9,589	665	1,318	124	1,533	675	26,803	2,949
% under or **over** Final EIS budget	3%	90%	4%	87%	4%	86%	8%	91%	16%	16%	5%	71%

Note: In many cases, these modeled disturbances overlap each other. Overlays were performed in the GIS to eliminate these overlaps and the double-counting of disturbance that would result. Overlaps between permanent and temporary disturbances were eliminated. Permanent disturbances were given priority over temporary disturbances. In this table, construction disturbance is the sum of the temporary and permanent disturbance. Operation disturbance is the permanent disturbance alone. Within these two categories, overlaps were resolved by the following hierarchy (highest to lowest priority): Access roads, structure footprints, facilities, series compensation station, regen sites, structure work areas, pulling/tensioning sites, mid-span/ optical ground wire (OPGW) work areas, guard structure work areas, additional ROW clearing. Disturbance values are based on 3/14/2023 design.

5.2 Design Characteristics of the Direct Current System

5.2.1 Direct Current Transmission Line

The TWE Project ±600 kV DC transmission line will be approximately 405 miles long, located within a ROW that is 250 feet wide. The design characteristics of the ±600 kV DC transmission line are summarized in Table 4 and are described in this section. Design characteristics for the DC transmission line's access roads are presented in Appendix A, Access Road Siting and Management Plan. Short segments of 230 kV and 345 kV AC transmission lines will be required near the Wyoming and Utah Terminals to connect to the existing and planned regional transmission grid. Their design characteristics are described below.

The BLM ROW Grant (BLM 2017) allows the TWE Project a ROW width of 250 feet for the long-term O&M of the transmission line. This width will accommodate TransWest's structure designs. Any exceptions are subject to the variance process described in Appendix G, Environmental Compliance and Monitoring Plan. ROW width for the TWE Project is based on engineering studies that considered the items listed below.

- Structure configuration (horizontal vs. vertical conductor configurations), pole spacing, and insulator configuration (I-string vs. V-string insulator configurations).
- Operating voltage, elevation, and clearance criteria (NESC and TWE Project-specific).
- Conductor size, weight, number, and configuration of conductors in the bundle, and tensions and sag.
- Span length between structures and conductor blowout (conductor movement envelope per pre-defined wind conditions).
- Structure footprint (guyed vs. self-supported), terrain, and maintenance access (space requirements for maintenance equipment at each structure site).
- Audible noise levels at the edge of the ROW.
- Potential co-location with buried high-pressure natural gas and other petroleum pipelines in the same corridor. The DC transmission line can be in its own ROW, adjacent to the pipeline ROW, in these situations.

TABLE 4 TYPICAL ±600 KV DC TRANSMISSION LINE DESIGN CHARACTERISTICS

Feature	Description
Physical Properties	
Line length	405 miles ±600 kV DC
Structure type	Tangent Structure: guyed steel lattice. Alternate Tangent Structures: self-supporting steel lattice and tubular steel poles. Dead-end and Angle Structure: self-supporting steel lattice. Alternate Dead-end and Angle Structure: tubular steel poles.
Structure height	Typical guyed steel lattice: 90–180 feet; self-supporting steel lattice: 90–195 feet; tubular steel poles: 90–195 feet. TWE Project does not contain structures over 200 feet high.
Span length	Guyed lattice: 900–1,600 feet (typical); self-supporting steel lattice: 900–1,600 feet (typical); tubular steel poles: 700–1,200 feet. Some locations may require spans greater than 1,600 feet based on terrain and access.
Number of structures per mile	3–8, depending on structure type, terrain, and other engineering factors. Typical steel lattice (guyed or self-supporting): 3–5 Typical tubular steel poles: 5–8

Feature	Description
ROW width	250 feet; any exceptions are subject to the variance process described in Appendix G, Environmental Compliance and Monitoring Plan.
Temporarily Disturbed Land	
Structure work area	ROW width (250 feet) × 200 feet per structure
Wire-pulling and tensioning sites	ROW width (250 feet) × 500 feet for dead-end structure (two sites at all dead-end structures) ROW width (250 feet) × 500 feet for mid-span conductor and shield wire (approximately every 8,500 feet); 100 × 500 feet for fiber optic cable set-up sites (approximately every 18,000 feet)
Material storage yards	Located approximately every 30 miles of transmission line Typical material storage yard area: approximately 20 acres
Staging areas / Fly yards	Located approximately every 5 miles of transmission line Typical staging areas / fly yards: approximately 7 acres
Batch plant sites	Located approximately every 15 miles of transmission line Stand-alone temporary batch plants, estimated size: approximately 5 acres
Guard structures	100 × 250 feet at road and existing overhead electrical line crossings
Permanently Disturbed Land	
Structure base*	Guyed lattice (tangent): 500 square feet [100 square feet mast foundation + (4 × 100 square feet for anchors)] Self-supporting lattice (tangent): 900 square feet (30 × 30 feet structure base) Self-supporting lattice (angle): 1,225 square feet (35 × 35 feet structure base) Self-supporting lattice (dead-end): 1,600 square feet (40 × 40 feet structure base) Tubular steel pole (tangent): 40 square feet (7-foot-diameter foundation) Tubular steel pole (dead-end/angle): 100 square feet (two poles × 8-foot-diameter foundations)—only used in extremely unusual and very limited circumstances
Regeneration sites	Located approximately every 50–75 miles of transmission line, each approximately 10,000 square feet (100 × 100 feet). Located within the transmission line ROW and co-located with transmission tower sites, where practicable.
Electrical Properties	
Nominal voltage	±600 kV DC
Nominal capacity	3,000 MW (as measured at the Utah Terminal)
Circuit configuration	DC Bi-Pole Bundled
Conductor size	Approximately 1.5-inch-diameter aluminum conductor steel reinforced conductor bundled with three sub-conductors per pole.
Ground clearance of conductor	34 feet minimum above, 40+ feet above railroads, 35+ feet above highways at a conductor temperature of 176°F

* Structure types by location are reflected in design details of the TWE Project presented in Appendix AA, Map Sets.

Structure Types

There are three main structure types for the TWE Project transmission line: 1) tangent structures; 2) angle structures; and 3) dead-end structures. Tangent structures are used in straight line segments, they are the most common type of structure, and they make up most of the structures on a line—often 80% to 90%. Angle structures are used when a transmission line changes direction up to a specified threshold line angle (commonly 20–30 degrees). Dead-end or strain structures are typically needed for extremely long spans, when the line angle exceeds the threshold of an angle structure, in highly varied terrain which can create uplift conditions on the structures, or when there is a need for a failure containment structure. Dead-end structures are structures where the conductors are separated and connected (electrically) by a jumper. Angle and dead-end structures must resist larger loads and therefore are stronger/heavier and require larger diameter and deeper foundations than do tangent structures.

The TWE Project ±600 kV DC transmission line will be constructed primarily with guyed lattice tangent structures (Figure 1) and self-supporting steel lattice angle and dead-end structures. The guyed lattice structure shown in Figure 1 was selected as the tangent design for most locations because of its smaller disturbance area, constructability, and overall cost considerations. Self-supporting steel lattice and single-shaft tubular steel poles (Figures 2 and 3, respectively) will be used in limited tangent structure locations where the setting and design criteria determine that the guyed lattice steel structure is not appropriate. Table 5 summarizes the general applicability of the tangent transmission structure designs by characteristic settings. Figure 4 illustrates each structure design in a typical 250-foot-wide ROW.

In addition to tangent structure configurations, angle and dead-end structures have been identified. In most locations, the angle and dead-end structures will be constructed with self-supporting lattice structures. In limited circumstances, special tubular steel angle and/or dead-end structures will be used to address site-specific engineering constraints, for example, size or height limitations.

TWE-45
TWE-55
FR-6

The main structure types meet the Project-specific design criteria and are illustrated in the final design. These Project-specific design criteria address industry standards and guidelines, legislated requirements, anticipated environmental conditions, terrain, applications (settings), and land use. The TWE Project is designed in accordance with guidelines established by the Avian Power Line Interaction Committee (APLIC) (1994, 2006, 2012) and outlined in Appendix B, Avian Protection Plan. The TWE Project is also designed to comply with FAA safety requirements concerning lighting and marking, and avoids impacting airports, military bases or training areas, or landing strips. Where appropriate, micro-siting of transmission line structures has occurred to locate them within recently burned areas to reduce vegetation management and minimize resource impacts.

TABLE 5 ±600 KV DC TRANSMISSION STRUCTURE DESIGN ALTERNATIVES POTENTIALLY USED IN CHARACTERISTIC SETTINGS

Characteristic Setting	Guyed Steel Lattice	Self-Supporting Steel Lattice	Tubular Steel Pole
Flat to rolling terrain	X	X	X
Steep to mountainous terrain and steep-sided slopes	–*	X	X
Open land	X	X	X
Agricultural fields, urban areas	–	X	X
Heavier line angles and dead-end strain structures	–	X	X

* Should helicopter-erection of structures be preferred or required, guyed lattice steel structures or self-supporting steel lattice structures may be used, as determined by TransWest, and reflected in the design details. In steep to mountainous terrain with excessively steep side slopes, self-supporting lattice structures will be required.

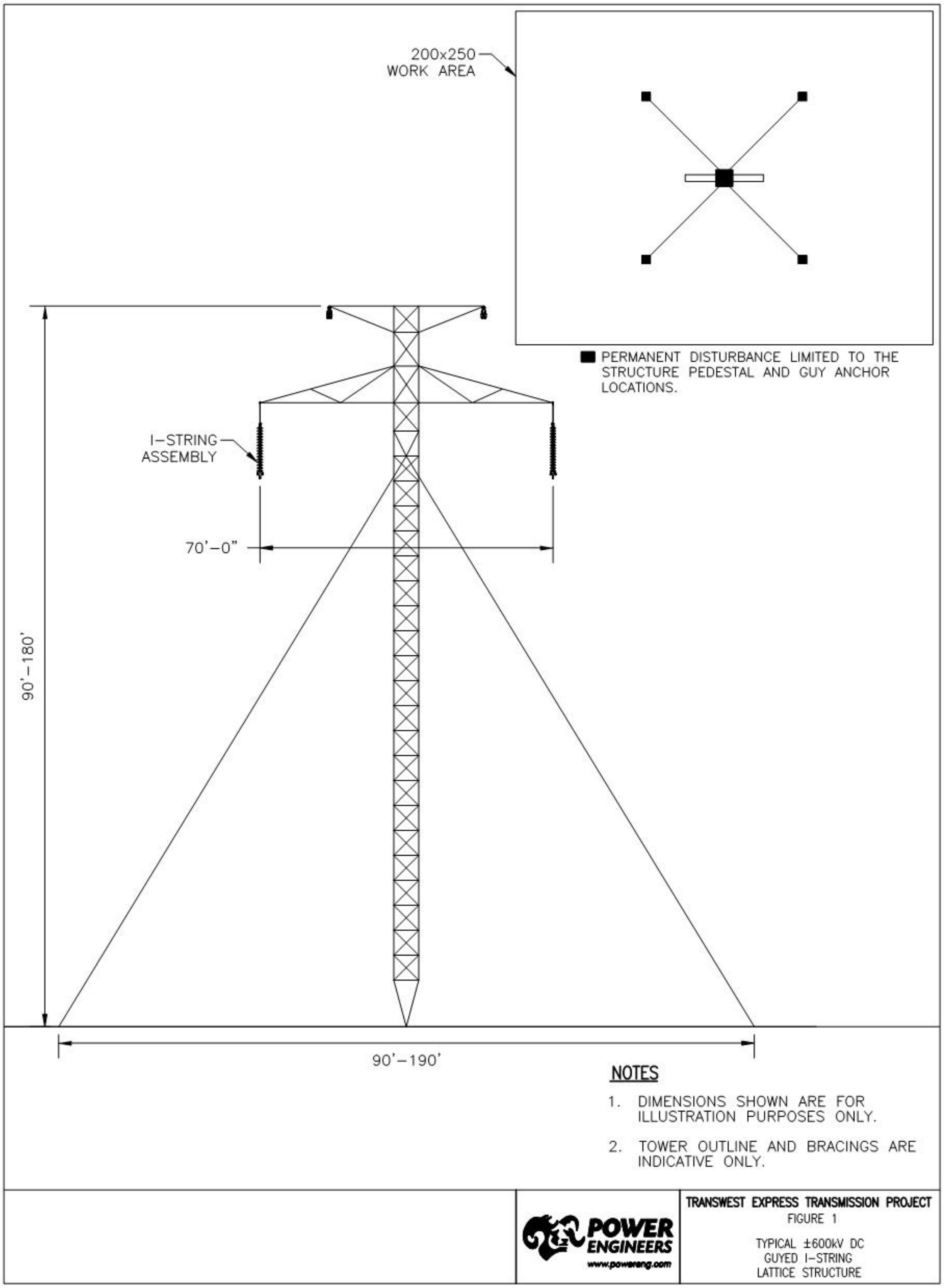


FIGURE 1 TYPICAL ±600 KV DC GUYED I-STRING LATTICE STRUCTURE

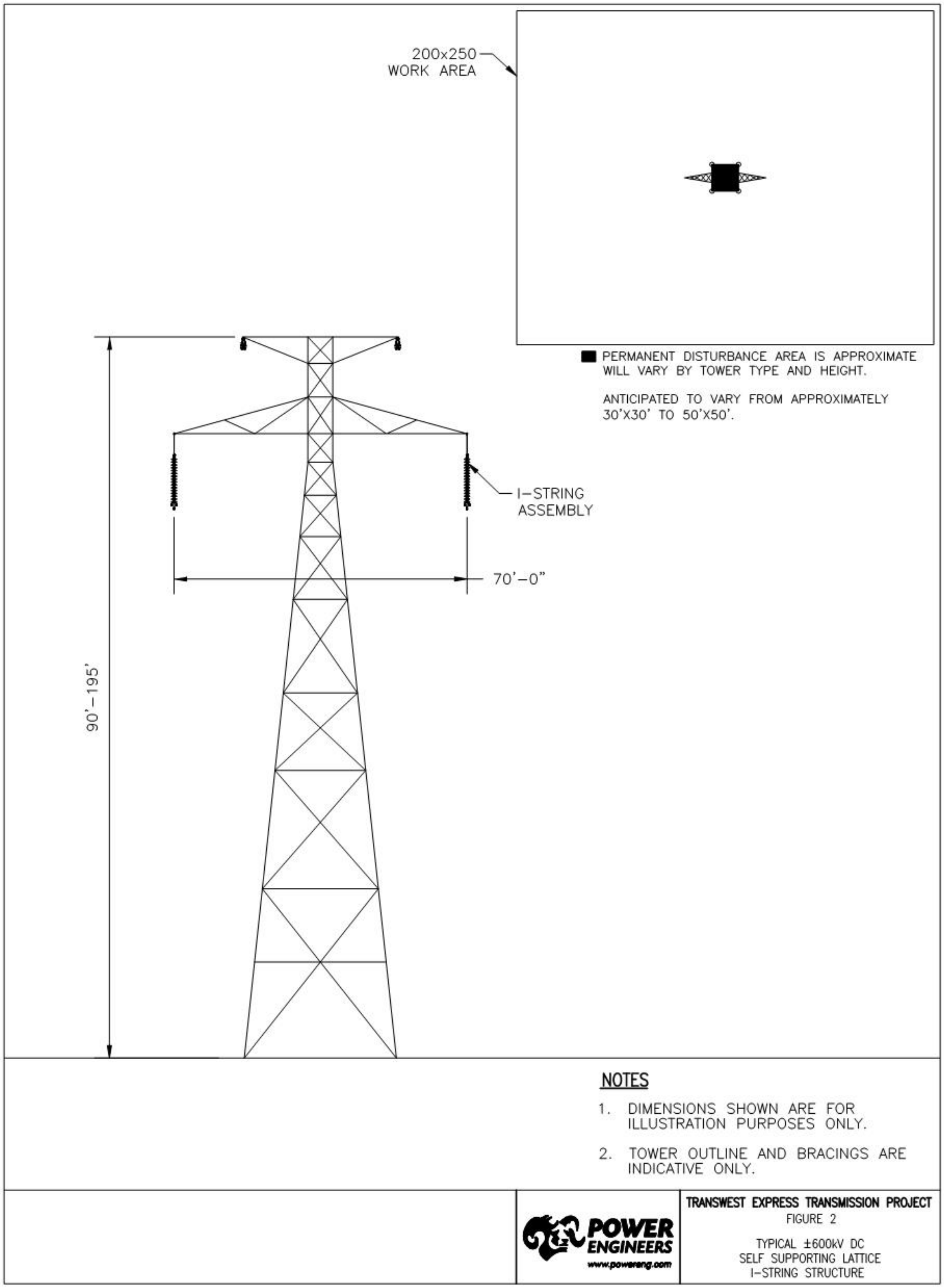


FIGURE 2 TYPICAL ±600 KV DC SELF-SUPPORTING LATTICE I-STRING STRUCTURE

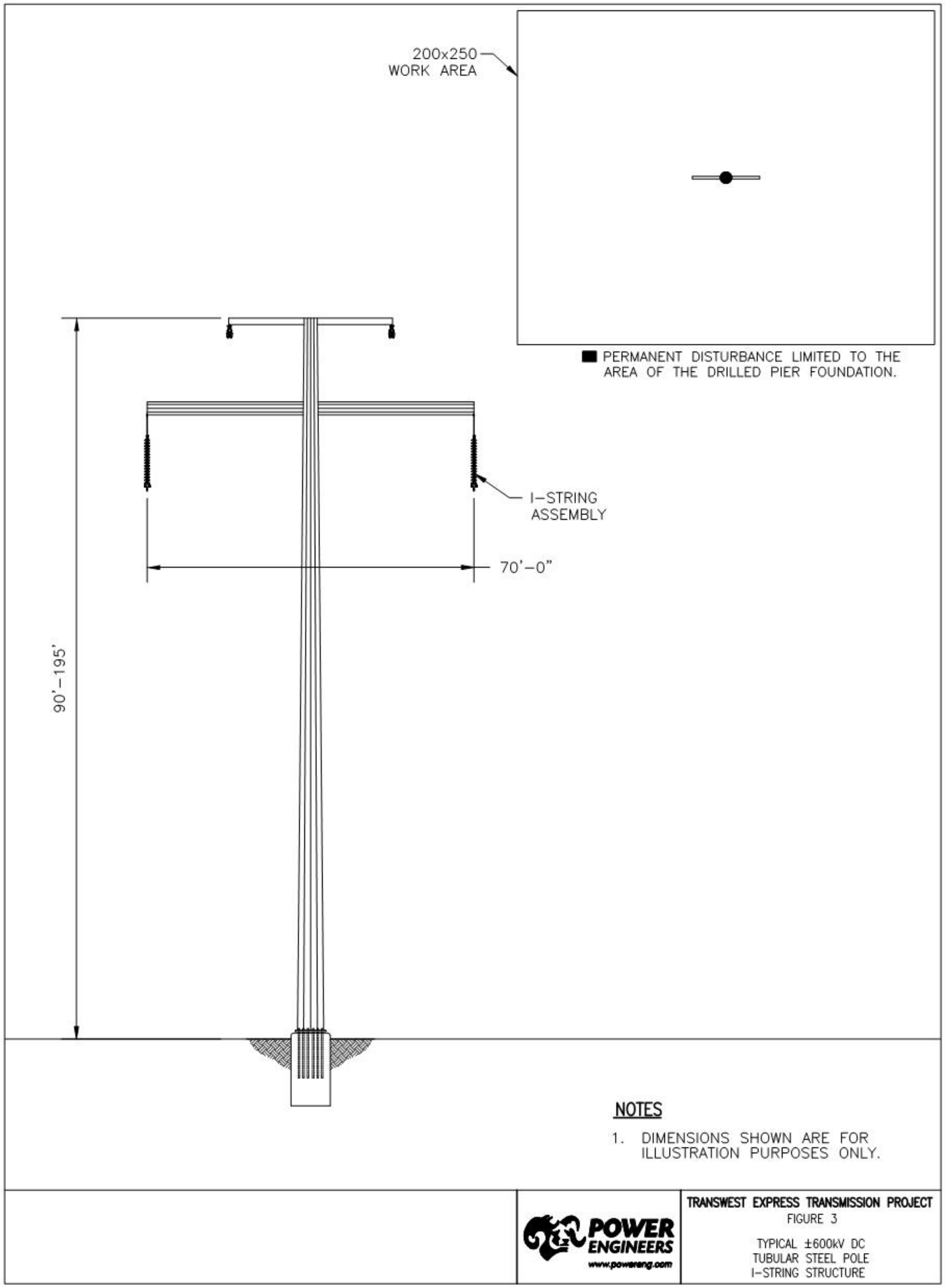


FIGURE 3 TYPICAL ±600 KV DC TUBULAR STEEL POLE I-STRING STRUCTURE

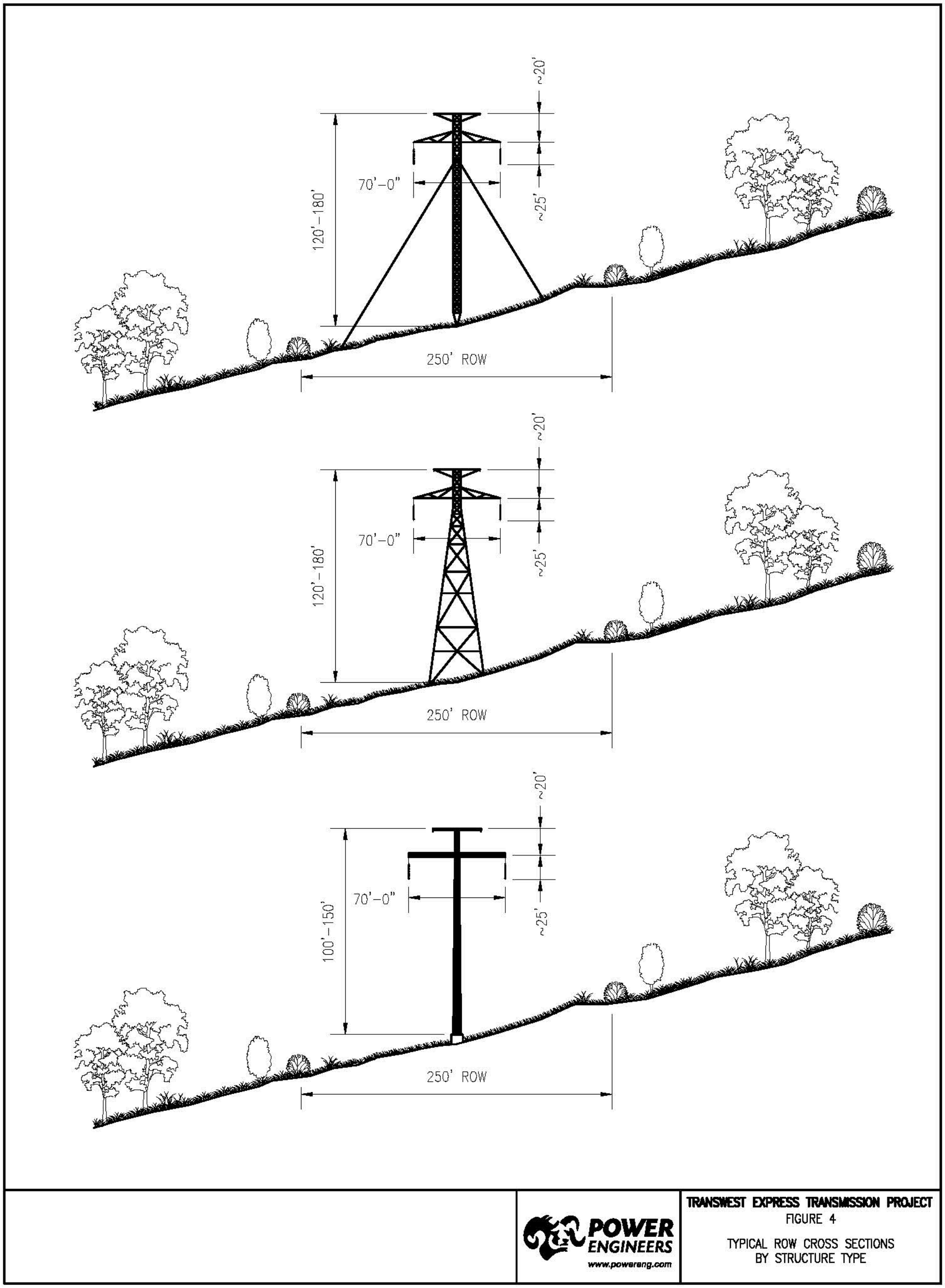


FIGURE 4 TYPICAL ROW CROSS SECTIONS BY STRUCTURE TYPE

Structure Foundations

The guyed steel lattice structures require one pre-cast concrete support pedestal for the structure base and four anchors for guy cables. Pre-cast concrete support pedestals are manufactured offsite and trucked to the structure locations. Some guyed steel lattice structure foundations may require a special foundation (e.g., cast-in-place, reinforced concrete support pedestal, or a pedestal supported by micro-piles) because of site-specific characteristics such as weak soils or rock. The anchors for attachment of the guy cables will be anchors designed for soil/rock conditions at each site. Several different types of anchors will be used, including plate anchors, screw anchors, screw piles, grouted anchors, or rock anchors. Figures 5, 6, and 7 show typical details for a pre-cast pedestal, a helical anchor, and a grouted anchor.

Regardless of structure type, excavated material (surplus non-topsoil soil and/or rock) from structure foundation excavations will be managed on-site in accordance with Appendix Q, Reclamation Plan, or disposed of offsite in accordance with Appendix Y, Waste Management Plan.

Hauling concrete to the structure installation site will be eliminated for guyed steel lattice structure because pre-cast concrete support pedestals will be manufactured offsite and trucked to the structure locations. In addition, the excavation necessary for installation of the support pedestal and guy wires will be minimal. Excavated material from foundation installation will be minimal (0–2 cubic yards per site) and will be utilized on-site where feasible.

Self-supporting lattice structures require four foundations with one foundation on each of the four corners (legs) of the lattice structures. The foundation diameter and depth will be determined prior to construction, after the geotechnical survey has been completed, because dimensions are dependent on the type of soil or rock present at each specific site. Typically, the foundation for each leg of the structure is a reinforced, cast-in-place concrete drilled pier, with the typical self-supporting tangent structure foundation having a diameter of 3 to 4 feet and a depth of approximately 12 to 25 feet. The total concrete necessary for the four-legged foundations of each tangent self-supporting lattice structure is estimated at 28 cubic yards per structure. The resulting excavated material will total 25 to 30 cubic yards per structure. Foundations for dead-end and angle structures are larger, typically ranging from 5 to 8 feet in diameter and 20 to 50 feet deep.

Tubular steel pole tangent structures require one cast-in-place concrete foundation per steel pole. These tubular steel structures will be installed on a single reinforced concrete pier with anchor-bolts connecting the tubular pole base plate to the foundation. The foundation diameter and depth will be determined prior to construction, after the geotechnical survey has been completed, because dimensions will be dependent on the type of soil or rock present at each specific site. Foundations for these structures are typically 6 to 10 feet in diameter and 20 to 60 feet deep. The total concrete necessary for the foundation of each tubular steel pole is estimated at 60 cubic yards per pole with approximately 55 to 60 cubic yards of excavated material per pole.

Typical drilled pier foundations are shown in Figure 8. In a limited number of locations, specialized foundations (for any structure type) may be required to address shallow rock; landslide-prone areas; unstable soils; corrosive soils; weak, sandy soils; or a shallow water table. These site-specific, or sub-regional-specific, foundation designs may include micro-pile, helical pile, grouted, epoxy, grillage, driven pile, vibratory pile, and/or steel caisson-type designs. Specialized foundations will be determined prior to construction, after the geotechnical survey has been completed.

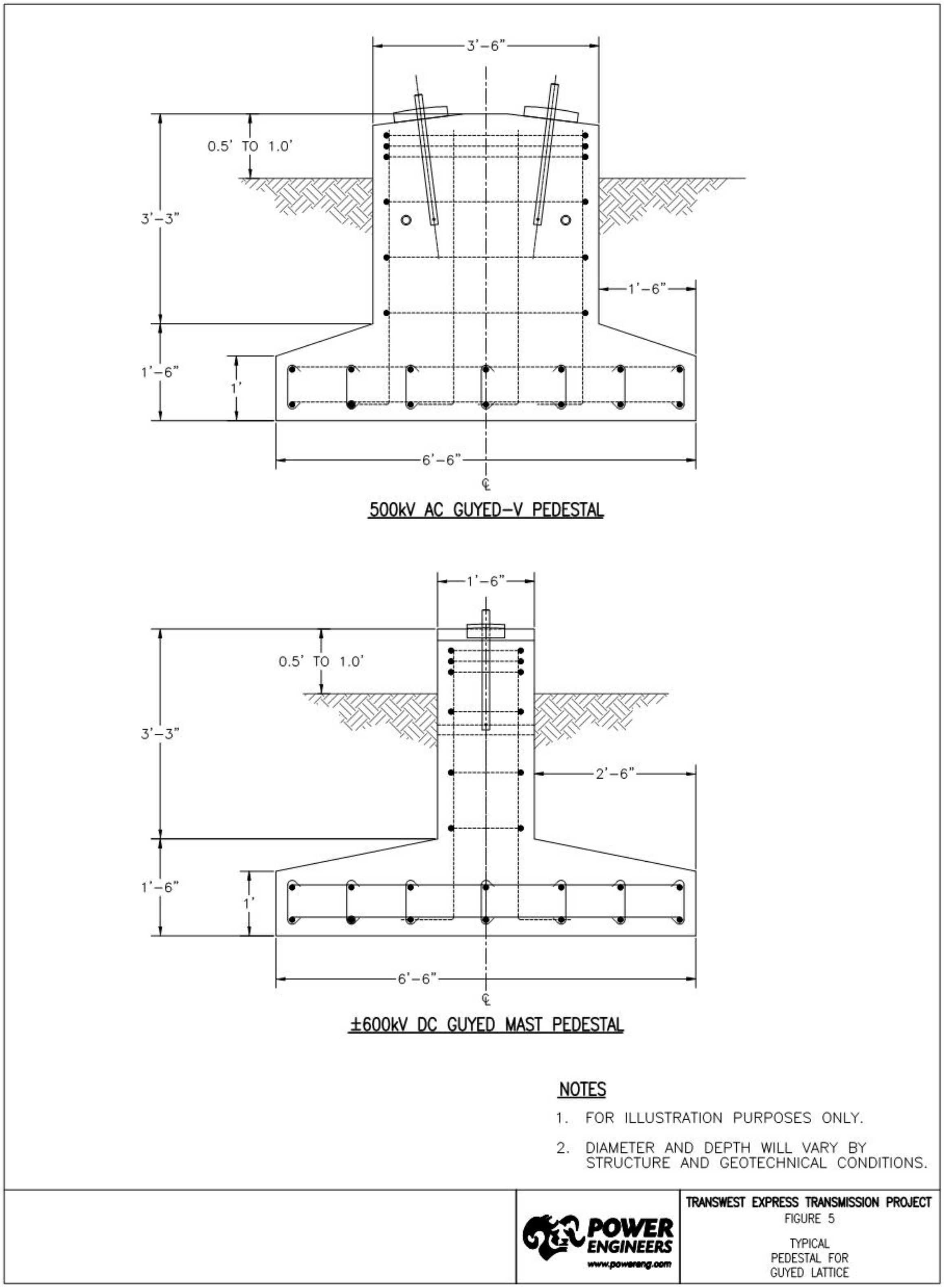
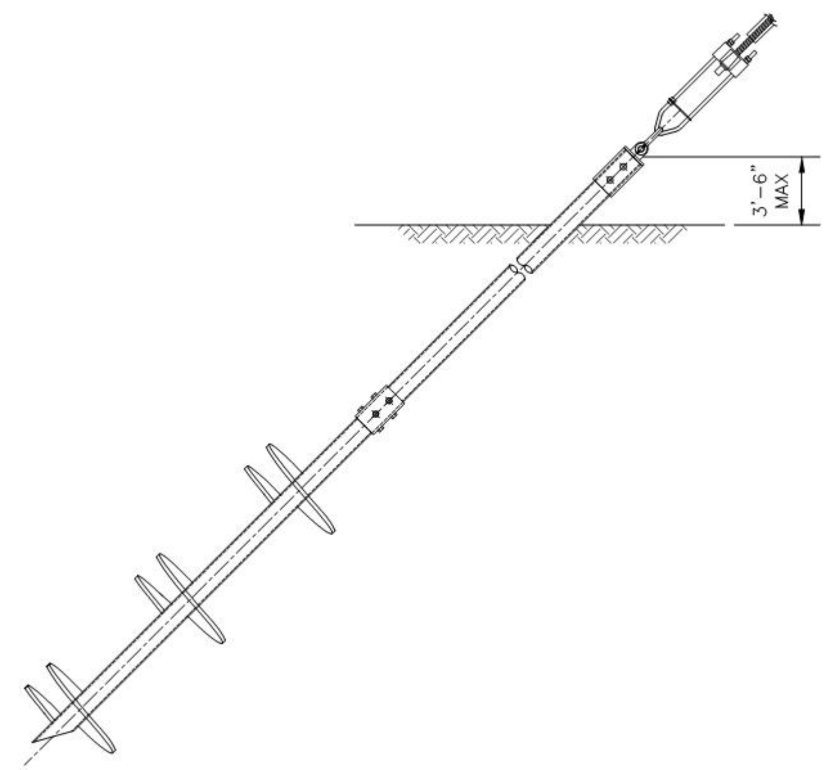


FIGURE 5 TYPICAL PEDESTALS FOR GUYED LATTICE



NOTES

1. FOR ILLUSTRATION PURPOSES ONLY
2. DIAMETER AND DEPTH WILL VARY BY TOWER AND GEOTECHNICAL CONDITIONS.
3. ANCHOR TYPE MAY VARY BY DESIGN AND GEOTECHNICAL CONDITIONS

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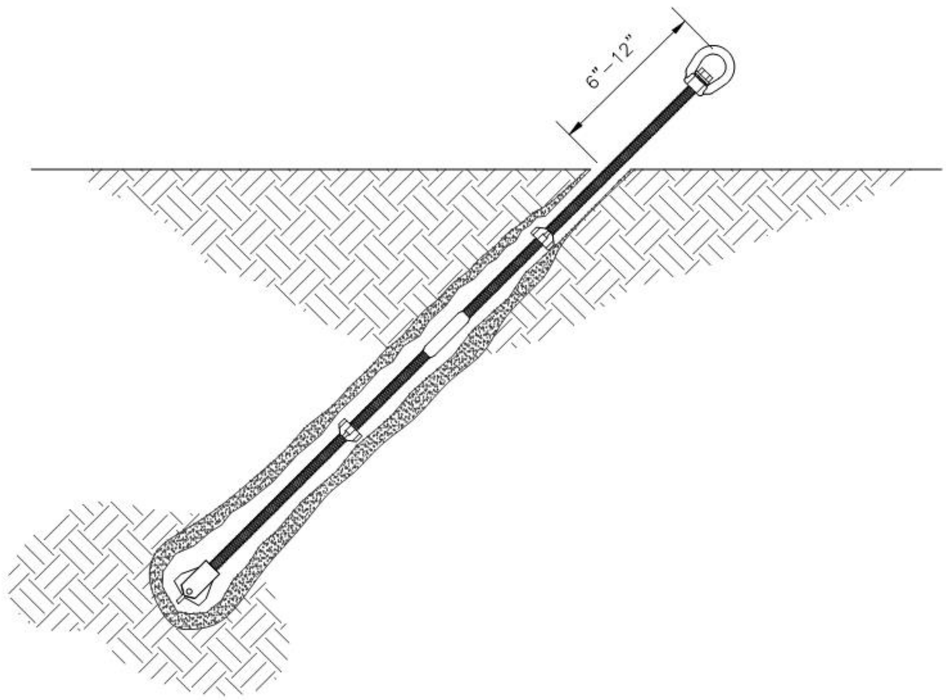
TRANSWEST EXPRESS TRANSMISSION PROJECT
FIGURE 6
TYPICAL
HELICAL ANCHOR

FIGURE 6 TYPICAL HELICAL ANCHOR



NOTES

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TRANSWEST EXPRESS TRANSMISSION PROJECT
FIGURE 7
TYPICAL
GROUTED ANCHOR

FIGURE 7 TYPICAL GROUTED ANCHOR

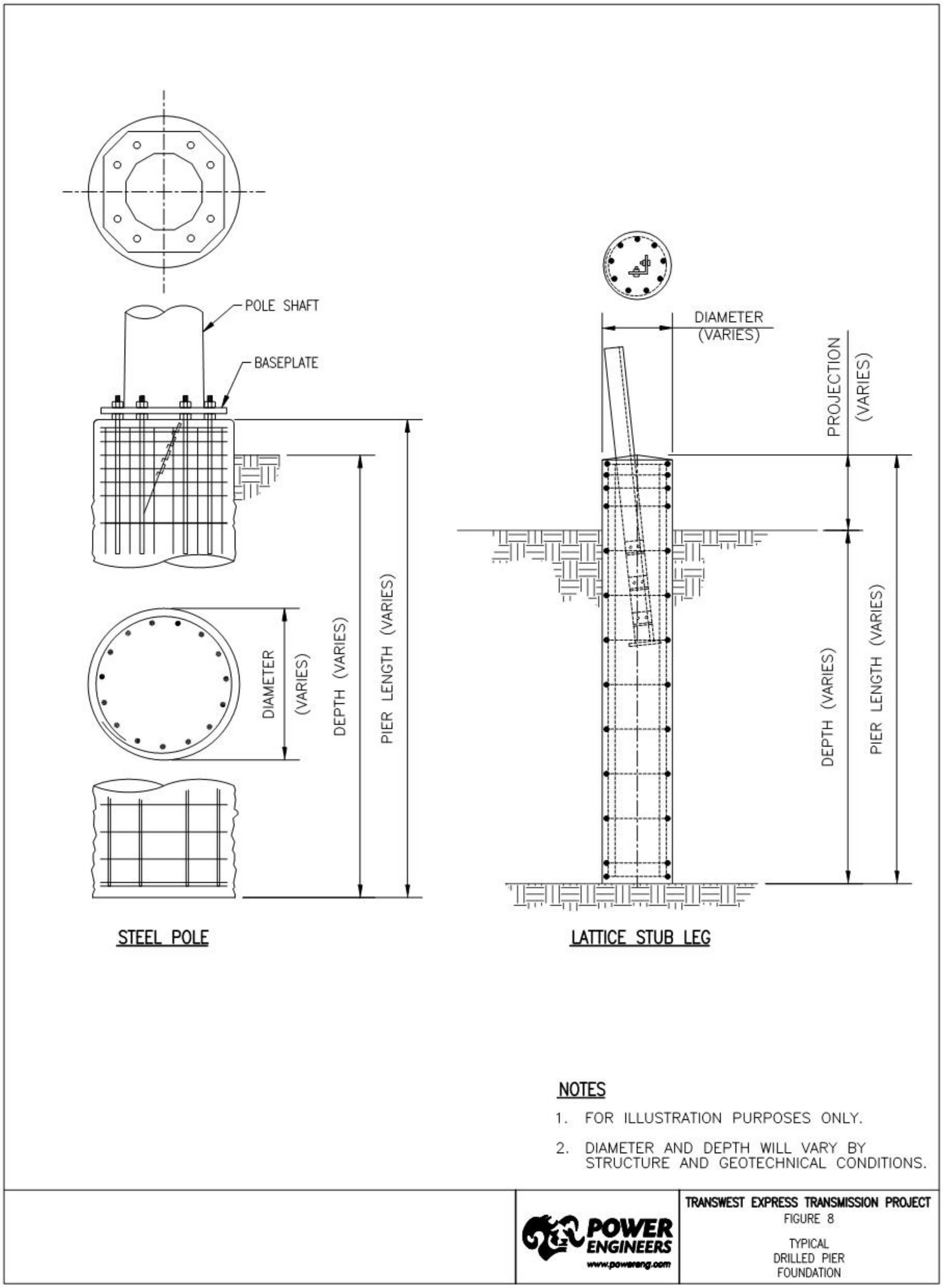


FIGURE 8 TYPICAL DRILLED PIER FOUNDATION

Design Characteristics

TWE-44

The conductor for the DC transmission line will be an Aluminum Conductor Steel Reinforced/Trapezoidal Wire conductor approximately 1.5 inches in diameter. Each pole of the ±600 kV bipole[6] line will be composed of three subconductors in a triple-bundle configuration. The individual conductors will be bundled in a triangular configuration (triple-bundle) with spacing of approximately 18 inches between subconductors. The bundled configuration is designed to provide adequate current carrying capacity and to provide a reduction in audible noise and radio interference as compared to a single large-diameter conductor. Each ±600 kV subconductor will have a non-specular finish[7] to reduce potential visual impacts.

Ground Clearance Requirements and Guidelines

Conductor phase-to-phase and phase-to-ground clearance parameters are determined in accordance with the NESC and ANSI C2 requirements (IEEE 2017). The NESC provides for minimum distances between the conductors and ground, crossing points of other lines and the transmission support structure and other conductors, and minimum working clearances for personnel during energized O&M activities.
The clearance requirements for conductor heights above ground are based on the current and potential use of the land being crossed.

The minimum ground clearance for the TWE Project ±600 kV DC conductor is 34 feet. For a ±600 kV DC transmission line, the minimum conductor heights above ground will typically range from 34 feet for rangeland to 40 feet or more above railroad tracks. Clearances above highways will typically be 35 to 45 feet. Agricultural land with center-pivot irrigation or that is aerially sprayed will typically use a minimum ground clearance of 34 feet.

The clearance requirements for vertical separation at crossings over existing transmission lines are also governed by NESC. In addition to the minimum NESC requirements, additional clearances or buffers are added to account for additional safety, construction tolerances, wire movements, differential wire temperatures, and utility-specific requirements. The vertical separation typically ranges from approximately 18 feet for distribution and lower voltage lines to approximately 25 feet or more for 600 kV extra high voltage (HVDC) lines. The exact clearance criteria for each voltage class being crossed will be determined prior to construction.

Standard industry practice suggests that the higher voltage line will cross over the lower voltage line and if voltages are the same, the line rated for the higher electrical loading will cross over the line rated for the lower electrical loading. These standards will be followed at line crossing locations in coordination with each facility owner or manager unless field conditions dictate otherwise. To optimize the crossing structure heights, the line crossing locations are typically at mid-spans of the lines being crossed over, near existing structures of lines being crossed under, and at right angles to each other, to the extent practicable. Depending on the terrain and heights of the facility being crossed, taller structures for the TWE Project transmission line may be required at the line crossing locations. Guard structures will be installed, if required, to protect underlying wires and structures during wire-stringing operations. These guard structures intercept the wire should it drop below a conventional stringing height, preventing damage to underlying wires and structures. In addition to guard structures, during construction, the Construction Contractor(s) for the TWE Project will be required to coordinate with the owner(s) or operator(s) of the line(s) being crossed to comply with outage and other utility-specific requirements.

[6] A bipole high-voltage DC transmission line consists of two poles—positive and negative. A pole may consist of one conductor or multiple conductors (i.e., subconductors) bundled together.
[7] Non-specular finish refers to a “dull” finish rather than a “shiny” finish.

Because of the static nature of DC electrical and magnetic fields, the DC transmission line will not induce current in oil and gas wellheads. The transmission line will be sited such that oil or gas wellheads, and associated above ground facilities at the wellhead, will not be located within the transmission line ROW. In addition, a 250-foot-wide buffer from oil and gas wellheads was used as a siting criterion for locating the centerline of the ±600 kV DC transmission line.

Insulators and Associated Hardware

As shown in Figures 1, 2, and 3, insulator assemblies for ±600 kV DC tangent structures will consist of a single string of insulators normally referred to as an I-String. These insulator strings are used to suspend each conductor bundle (pole) from the structure, maintaining the appropriate electrical clearance between the conductors, the ground, and the structure. The I-String configuration of the ±600 kV DC insulators is free to swing, and structures are designed to allow for swinging toward and away from the structure while maintaining electrical clearances. Dead-end insulator assemblies for ±600 kV DC transmission lines will use a similar I-shaped configuration, which consists of insulators connected horizontally from either a structure dead-end arm or a dead-end pole. Individual insulators for both suspension and dead-end applications will be composed of glass, porcelain, or polymer.

TWE-49

Transmission line materials have been designed to minimize corona, which is a small electric discharge produced by a localized electric field near energized components and conductors. The hardware and conductor design will limit audible noise, radio interference, and television interference because of corona. Tension will be maintained on insulator assemblies to assure positive contact between insulators, thereby avoiding sparking. Caution will be exercised during construction to avoid scratching or nicking the conductor surface that may provide points for corona to occur.

Overhead Shield (Ground) Wires

Design Characteristics

To protect the ±600 kV DC transmission line from direct lightning strikes, two lightning protection shield wires, also referred to as ground wires, will be installed on the peaks or top arms of each structure. Electrical current from lightning strikes will be transferred through the shield wires and structures into the ground.

Standard Configuration

TWE-44

The shield wires will be composed of two wire types. Both wire types will have a non-specular finish (i.e., the outside of the cable will be galvanized steel that will de-glare within a few months). One of the shield wires will be composed of extra high strength steel wire approximately 0.5 inch in diameter. The second shield wire will be an optical ground wire (OPGW) constructed of aluminum and steel, which will carry 48 glass fibers in its core. The OPGW will have a diameter of approximately 0.65 inch. The glass fibers inside the OPGW will facilitate data transfer between the Wyoming Terminal, Utah Terminal, and the series compensation station, TWE Crystal Substation, and Nevada AC Substation that are part of the AC System. The data will be used for system control and monitoring.

Ground Rods

A grounding system, which is distinct from the ground electrode system, will be installed at the base of each transmission structure and will consist of copper ground rods embedded in the ground in immediate proximity to the structure foundation, and connected to the structure by a buried copper lead. After the ground rods have been installed, the grounding will be tested to determine the resistance to ground. If the resistance to ground for a transmission structure is excessive, then counterpoise will be installed to lower the resistance. Counterpoise consists of a bare copper-clad or galvanized-steel cable buried a minimum of 12 inches deep, extending from one or more legs of a structure for approximately 100 feet in the ROW.

Minor Additional Hardware

In addition to the conductors, insulators, and overhead shield wires, other associated hardware will be installed on the structures as part of the insulator assembly to support the conductors and shield wires. This hardware will include clamps, shackles, links, plates, and various other pieces composed of galvanized steel and aluminum.

Other hardware, not associated with the transmission of electricity, may be installed as part of the TWE Project. This hardware may include aerial marker spheres or aircraft warning lighting as required for the conductors or structures per FAA regulations. Structure proximity to airports and structure height are the determinants of whether FAA regulations regarding lighting and marking will apply based on an assessment of wire/structure strike risk. TransWest does not anticipate that structure lighting will be required because structures will be less than 200 feet tall and will be located to avoid airport impacts to the greatest extent feasible. However, if special circumstances (e.g., a tall crossing) require structures taller than 200 feet, FAA regulations regarding lighting and marking will be followed.

In areas TransWest identifies as posing a high-risk for avian collisions or in areas identified as having high collision mortality based on post-construction reporting, TransWest may install flight diverters or line markers, as appropriate. TransWest may install guy wire markers in select locations as determined by TransWest during final design of the Project or based upon a risk assessment conducted by TransWest using post-construction observations (see Appendix B, Avian Protection Plan).

Grid Interconnections

The TWE Project will connect to existing and planned 500 kV and 230 kV transmission grids in Wyoming, and to existing 345 kV transmission grids in Utah. Specific structure types are included in Appendix AA, Map Sets. A typical self-supporting lattice structure, used for a single-circuit 500 kV AC line connection, is shown in Figure 9. A typical self-supporting single pole structure, used for a single-circuit 345 kV AC line connection, is shown in Figure 10a. A typical single pole structure, used for a single-circuit 230 kV AC line connection, is shown in Figure 10b. The components for the 500 kV, 345 kV, and 230 kV structures, including foundations, conductors, insulators and associated hardware, overhead shield (ground) wires, and grounding rods are similar to those described for the ±600 kV DC transmission line.

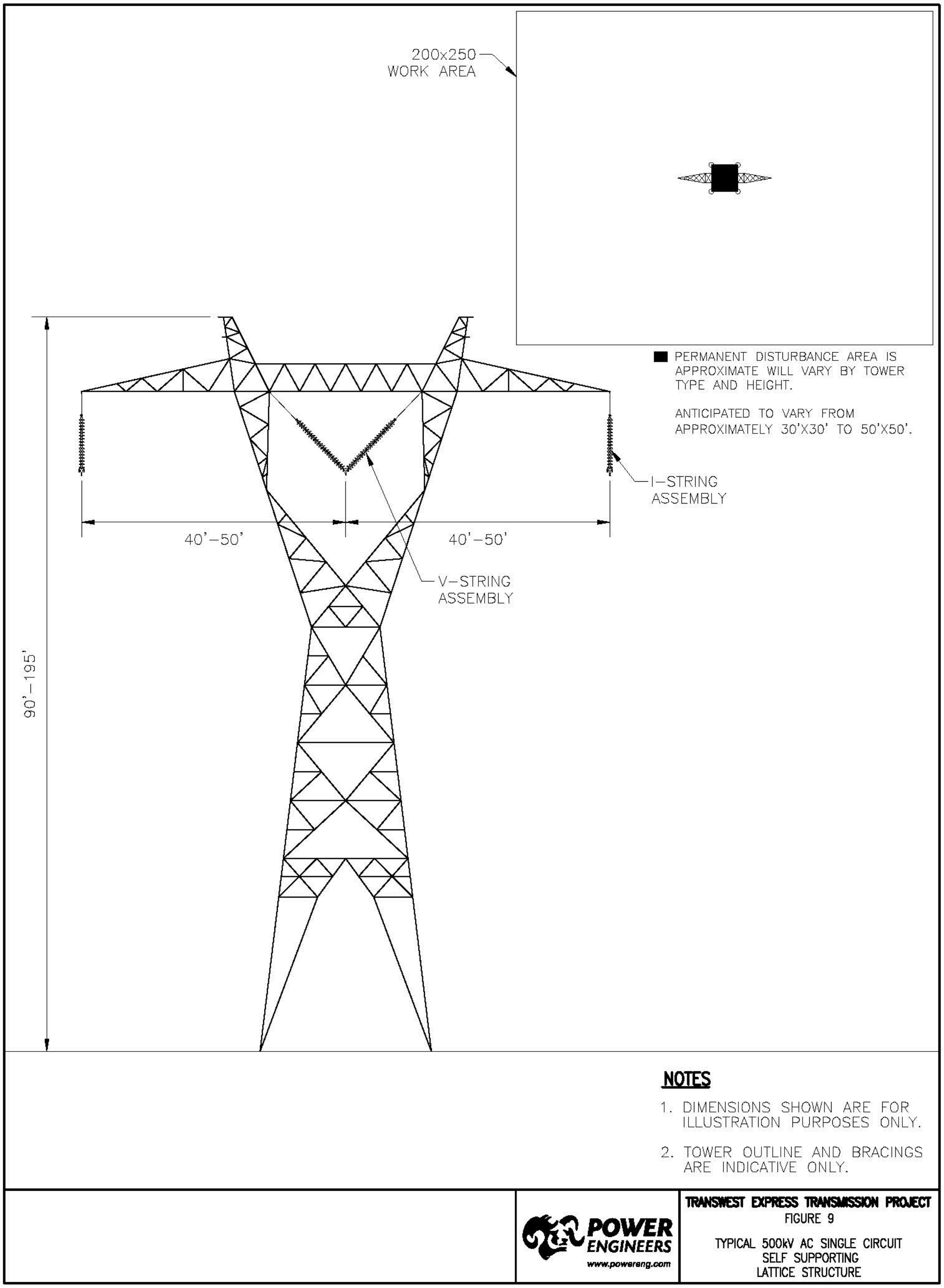


FIGURE 9 TYPICAL 500 KV AC SINGLE-CIRCUIT SELF-SUPPORTING LATTICE STRUCTURE

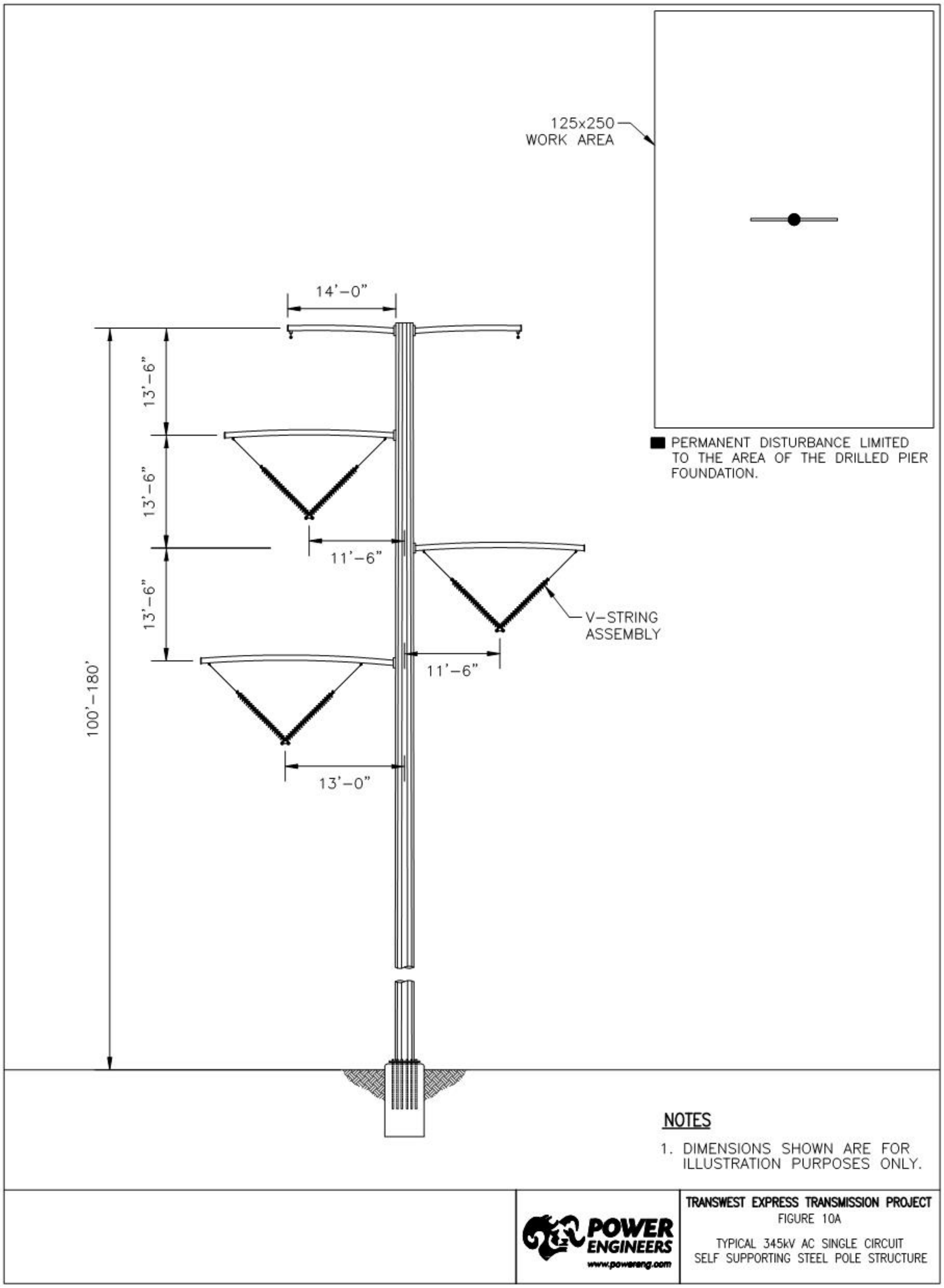


FIGURE 10A TYPICAL 345 KV AC SINGLE-CIRCUIT SELF-SUPPORTING POLE STRUCTURE

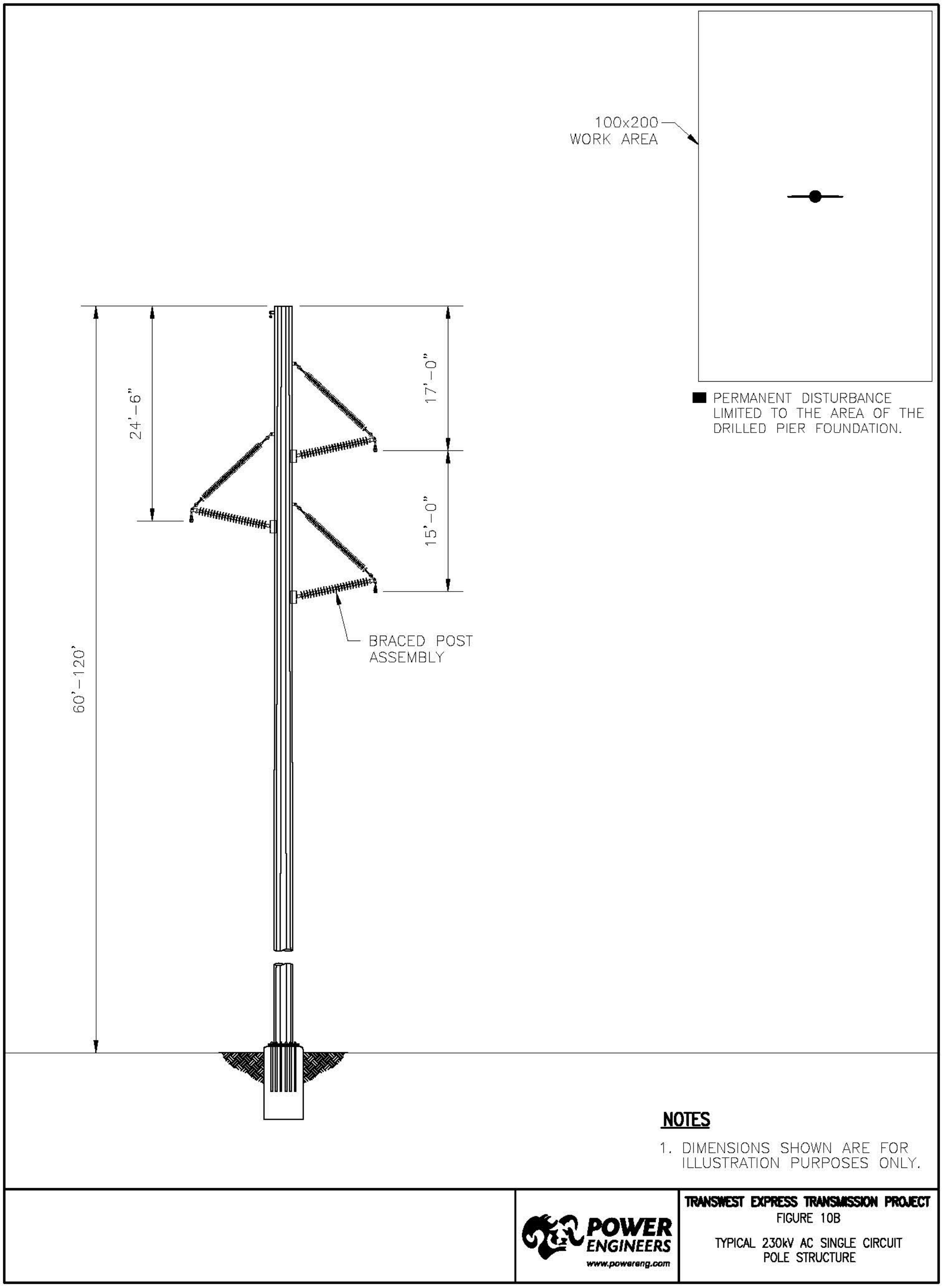


FIGURE 10B TYPICAL 230 KV AC SINGLE-CIRCUIT POLE STRUCTURE

5.2.2 Wyoming and Utah Terminals

The terminal stations for the TWE Project will be designed to include the AC/DC converter station and an adjacent AC substation. The AC/DC converter station will include a ±600 kV DC switchyard, AC/DC conversion equipment, transformers, and multiple equipment, control, maintenance, and administrative buildings. Two buildings will house the AC/DC conversion equipment, each approximately 200 feet long × 80 feet wide × 60 to 80 feet tall. Smaller buildings will house the control room, control and protection equipment, auxiliary equipment, and cooling equipment. The AC substations at each terminal will be 500/345 kV substations. The AC substations will include a switchyard, transformers, control equipment, and control buildings. A photograph of a representative AC/DC terminal (converter station and adjacent AC substation) is provided in Figure 11a. The general design characteristics of the terminals are summarized in Table 6. Design characteristics for the terminals' access roads are presented in Appendix A, Access Road Siting and Management Plan.

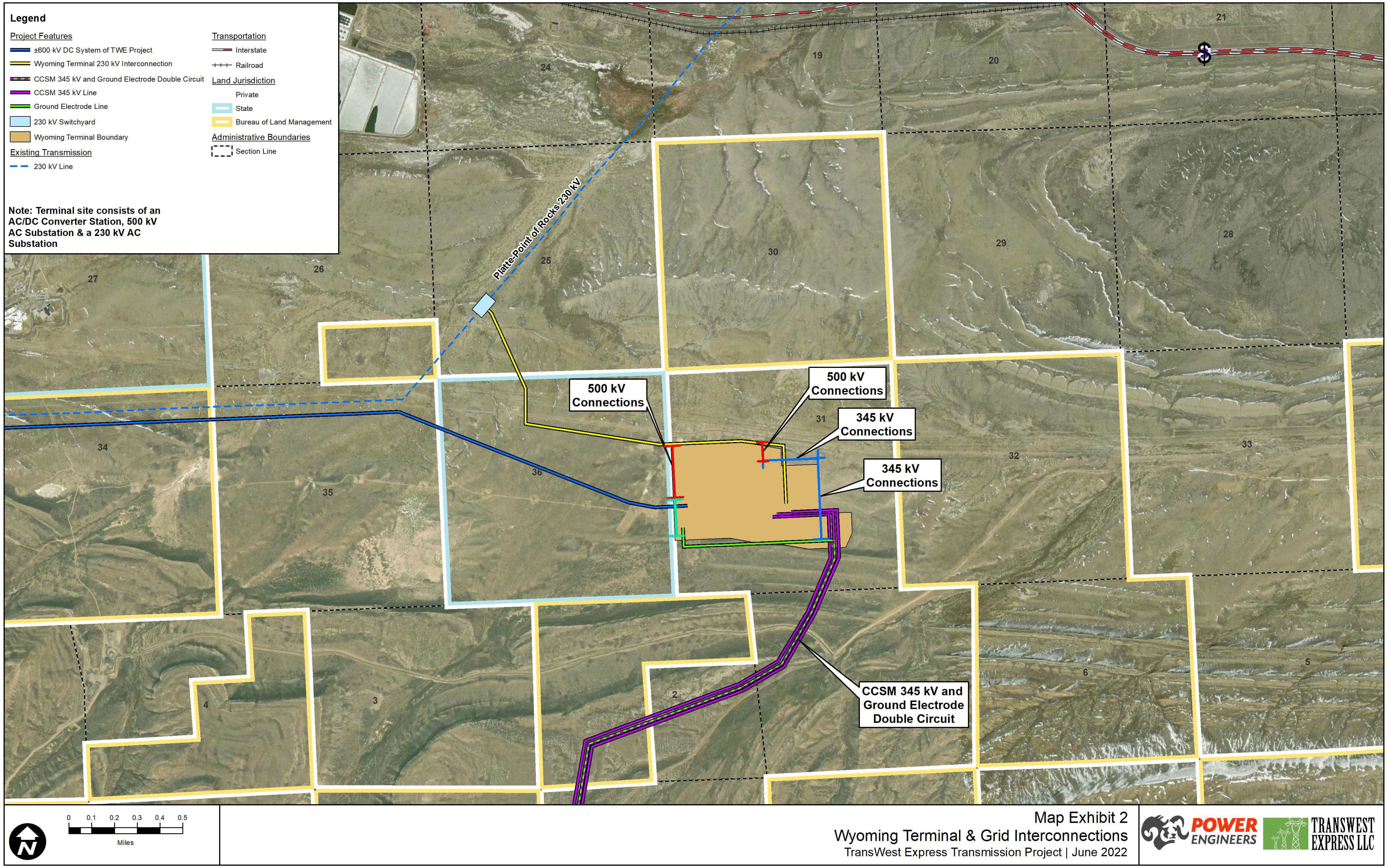
FIGURE 11A TYPICAL AC/DC CONVERTER STATION

TABLE 6 DESIGN CHARACTERISTICS OF TERMINALS

Feature	Description
Terminals	
Wyoming Terminal	Four 500 kV AC line positions, two 500/345 kV transformer banks, eight 345 kV line positions, two AC filter bank line positions, two reactive support device positions and four DC line positions with transformers, converter building(s), and AC and DC filter yards. The reactive support equipment will require other structures and building development within the complex. Maintenance and storage facilities will be developed as required and as appropriate for this location. Certain assigned shift operators, maintenance staff, and site security staff may always be on-site, although no permanent residence(s) will be established. On-site fire protection and emergency/security staff will support O&M staff at the facility in accordance with local, state, and federal government requirements.
Utah Terminal	One 500 kV AC line position, one 500/345 kV transformer bank, three 345 kV phase shifting transformers, three 345 kV line positions, two AC filter line positions and two DC line positions with transformers, converter building(s), and AC and DC filter yards. Maintenance and storage facilities will be developed as required and as appropriate for this location. Certain assigned shift operators, maintenance staff, and site security staff may always be on-site, although no permanent residence(s) will be established. On-site fire protection and emergency/security staff will support O&M staff at the facility in accordance with local, state, and federal government requirements.
Physical Properties of Interconnection Lines	
Line length	2 miles of 230 kV AC line (Wyoming Terminal) 5 miles each for two 345 kV AC lines (Utah Terminal)
Structure type	Self-supporting lattice for 500 kV line Single pole tubular steel for 345 kV line Single pole tubular steel for 230 kV line
Number of structures per mile	Approximately four 500 kV structures, six 345 kV structures, and eight 230 kV structures
ROW width	250 feet for 500 kV line 250 feet total for two 345 kV lines 100 feet for 230 kV line
Land Temporarily Disturbed	
Storage and Concrete Batch Plant	7.5 acres total for combined batch plant
Structure work areas for interconnection lines	100 × 200 feet per 230 kV structure; approximately 8 per mile of transmission line (Wyoming Terminal only) 125 x 200 feet per 345 kV structure; approximately 6 per mile of transmission line 200 × 250 feet per 500 kV structure; approximately 4 per mile of transmission line
Wire-pulling, tensioning, and splicing sites for interconnection lines	ROW width × 500 feet; mid-span conductor and shield wire sites every 9,000 feet and fiber optic set-up sites every 18,000 feet
Land Permanently Disturbed	
Converter station and substations	180 acres (Wyoming Terminal), 130 acres (Utah Terminal)
Structure base 500 kV interconnection lines	Self-supporting lattice (tangent): 1,225 square feet (35 × 35 feet structure base) Self-supporting lattice (angle): 1,600 square feet (40 × 40 feet structure base) Self-supporting lattice (dead-end): 2,025 square feet (45 × 45 feet structure base)
Structure base 345 kV and 230 kV interconnection lines	Single pole tubular (tangent): 40 square feet Single pole tubular (angle): 45 square feet Single pole tubular (dead-end): 50 square feet

Wyoming Terminal

The Wyoming Terminal will consist of an AC/DC converter station (a ±600 kV DC switchyard and a converter building containing power electronics and control equipment), a 500/345 kV AC substation, and a potential 230 kV AC substation (Map Exhibit 2). The facilities will be located on private land in Carbon County, Wyoming, approximately 2.5 miles southwest of the town of Sinclair, Wyoming.
The Wyoming Terminal will connect to the exiting Gateway West 500 kV transmission line and may connect to the existing Platte–Point of Rocks 230 kV line located approximately 1 mile from the terminal and/or the planned Gateway South 500 kV transmission line.



MAP EXHIBIT 2 WYOMING TERMINAL AND GRID INTERCONNECTIONS

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The Wyoming Terminal will require the components listed below.

- An AC/DC converter station approximately 30 acres in size.
- A 500/345 kV AC substation approximately 110 acres in size adjacent to the converter station.
- A 345 kV AC substation approximately 40 acres in size adjacent to the converter station.
- An electrical connection from the AC/DC converter station to the ±600 kV DC transmission line connecting to the Utah Terminal. Facilities for this connection are incorporated into the ±600 kV DC transmission line.
- A potential new 230 kV substation within the existing Platte–Point of Rocks line ROW, with three breakers in a ring bus configuration. The substation will have three line positions, with connections to Platte, Point of Rocks, and TransWest. The existing Platte–Point of Rocks 230 kV line will be rerouted into and out of the new 230 kV substation.
- A new single-circuit 230 kV transmission line, approximately 2 miles long, will connect the new 230 kV substation to the AC substation that is adjacent to the converter station. A typical structure design for the 230 kV transmission line connections is provided in Figure 10b.

Construction of the Wyoming Terminal is estimated to require approximately 500 acres including permanent and temporary disturbance. Approximately 180 acres of this area will be permanently dedicated and fenced for the Wyoming Terminal, including the AC/DC converter station and substations. The Wyoming Terminal also includes an access road; transmission line structures; transmission line structure work areas; pulling, tensioning, and splicing sites; and interconnection line access roads.

The CCSM Project has multiple facilities, that have been previously approved under its separate actions, that are located at the Wyoming Terminal. The TWE Project plans include use of several of these CCSM Project approved facilities for temporary construction needs at the Wyoming Terminal, including the CCSM Project rail facility, CCSM Project materials storage/laydown yard, and CCSM Project concrete batch plant. This use of CCSM Project facilities will minimize the amount of new disturbance required for the TWE Project.

Land outside of the fenced terminal area will be used for access roads. Terminal access will require an estimated 10 acres of permanent disturbance. Except for the associated interconnection lines, no other permanent development outside of the fenced area for this facility is anticipated. A tabulation of disturbance associated with the final design of these components is included in Appendix AA, Map Sets.

Utah Terminal

The Utah Terminal will consist of an AC/DC converter station (a ±600 kV DC switchyard and a converter building containing power electronics and control equipment), a 345 kV substation for the Utah interconnection, and 500 kV AC substation for interconnection for the AC System to Nevada (Map Exhibit 3). The facilities will be located approximately 5 miles from the IPP site, approximately 13.5 miles north of Delta, in Millard County, Utah. The Utah Terminal will connect to the exiting IPP 345 kV substation.

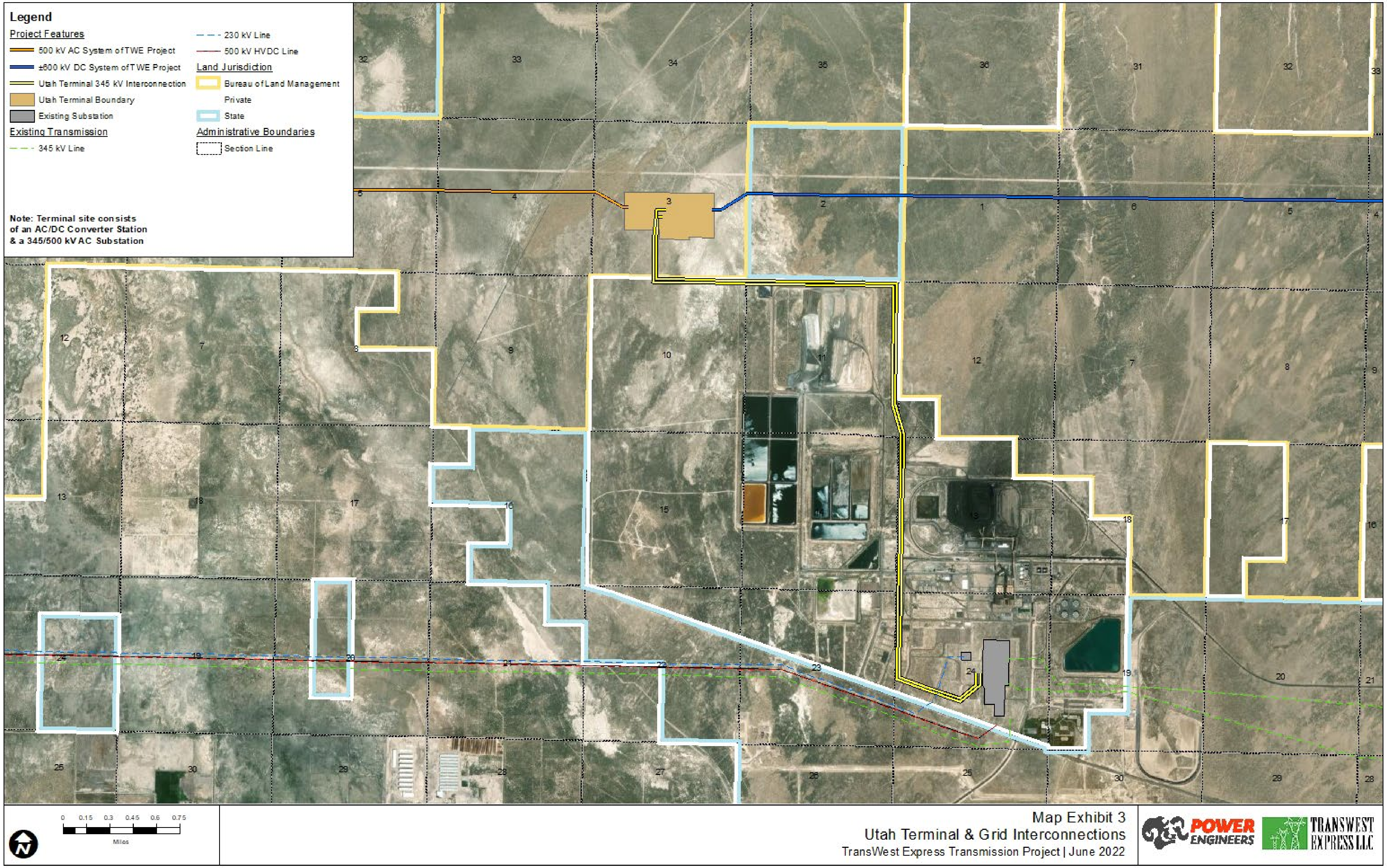
The Utah Terminal will require the components listed below.

- An AC/DC converter station, approximately 30 acres in size.
- A 500 kV and 345 kV AC substation, approximately 100 acres in size, adjacent to the converter station.

- An electrical connection from the AC/DC converter station to the ±600 kV DC transmission line connecting to the Wyoming Terminal. Facilities for this connection are incorporated into the ±600 kV DC transmission line.
- Construction of two single-circuit 345 kV transmission lines from the new 345 kV AC substation to the IPP 345 kV substation. Each 345 kV transmission line is estimated to be 5 miles in length. A typical structure configuration for the 345 kV transmission line connections is provided in Figure 10a.

Construction of the Utah Terminal on BLM land is estimated to require approximately 500 acres. Approximately 130 acres of this area will be permanently dedicated and fenced for the Utah Terminal, including the AC/DC converter station and switchyards as shown in Map Exhibit 3. The Utah Terminal also includes an access road, transmission line structures, and interconnection line access roads.

A tabulation of disturbance associated with the final design of these components is included in Appendix AA, Map Sets.



MAP EXHIBIT 3 UTAH TERMINAL AND GRID INTERCONNECTIONS

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5.2.3 Ground Electrode Facilities

Two ground electrode facilities are included in the design of the TWE Project, one connecting to the Wyoming Terminal and one connecting to the Utah Terminal. The design characteristics of the ground electrode facilities are provided in Table 7. The sites for the Wyoming and Utah ground electrode facilities are shown on Map Exhibits 4 and 5, respectively. Design characteristics for the ground electrode facilities' access roads are presented in Appendix A, Access Road Siting and Management Plan.

TABLE 7 GROUND ELECTRODE FACILITIES DESIGN CHARACTERISTICS

Feature	Description
Physical Properties of Overhead Electrode Lines	
Line length	15.0 miles (Wyoming Terminal) 22.7 miles (Utah Terminal)
Structure type	Wood/wood pole equivalent for low-voltage electrode line (similar to 34.5 kV line)
Number of structures per mile	18
ROW width	50 feet
Land Temporarily Disturbed	
Material storage yards	10 acres per electrode site
Structure work areas for 34.5 kV line	ROW (50 feet) × 100 feet
Wire-pulling, tensioning, and splicing sites for Interconnection lines	75 × 150 feet; two at every dead-end 75 × 100 feet; mid-span conductor site every 9,000 feet
Line/ Well access	30 acres combined
Land Permanently Disturbed	
Ground electrode site	45 acres combined
Line/ Well access	30 acres combined
Structure base electrode line (similar to 34.5 kV line)	Wood / wood pole equivalent (tangent): 16 square feet Wood / wood pole equivalent (angle): 25 square feet plus 25 square feet per anchor (two per structure location) Wood / wood pole equivalent (dead-end): 36 square feet plus 25 square feet per anchor (four per structure location)

The two ground electrode facilities will establish and maintain electrical current continuity during normal operations and immediately following an unexpected outage of one of the two poles (or circuits) of the ±600 kV DC terminal or converter station equipment.

During a DC transmission disturbance where one pole (or "circuit") becomes inoperable, the ground electrodes will carry a short-term, large current that was previously flowing in the inoperable pole. The electrodes will be sized and designed to disperse this current into the ground at levels which are safe for people and animals in the vicinity. The contingency conditions that result in high ground electrode currents are most often the result of an unexpected outage on the transmission line or equipment in the AC/DC converter station. The high current operation of the ground electrode facilities and the use of the earth as a return path is limited to emergency conditions and typically only operated for 10 minutes to less than 1 hour following the loss of a pole. For planning purposes, 12 to 16 unexpected disturbances resulting in the loss of a pole are anticipated each year. Although the ground electrode facilities will be designed to operate at high current levels for up to 200 hours per year, typical yearly use at high currents is expected to be less than 30 hours.

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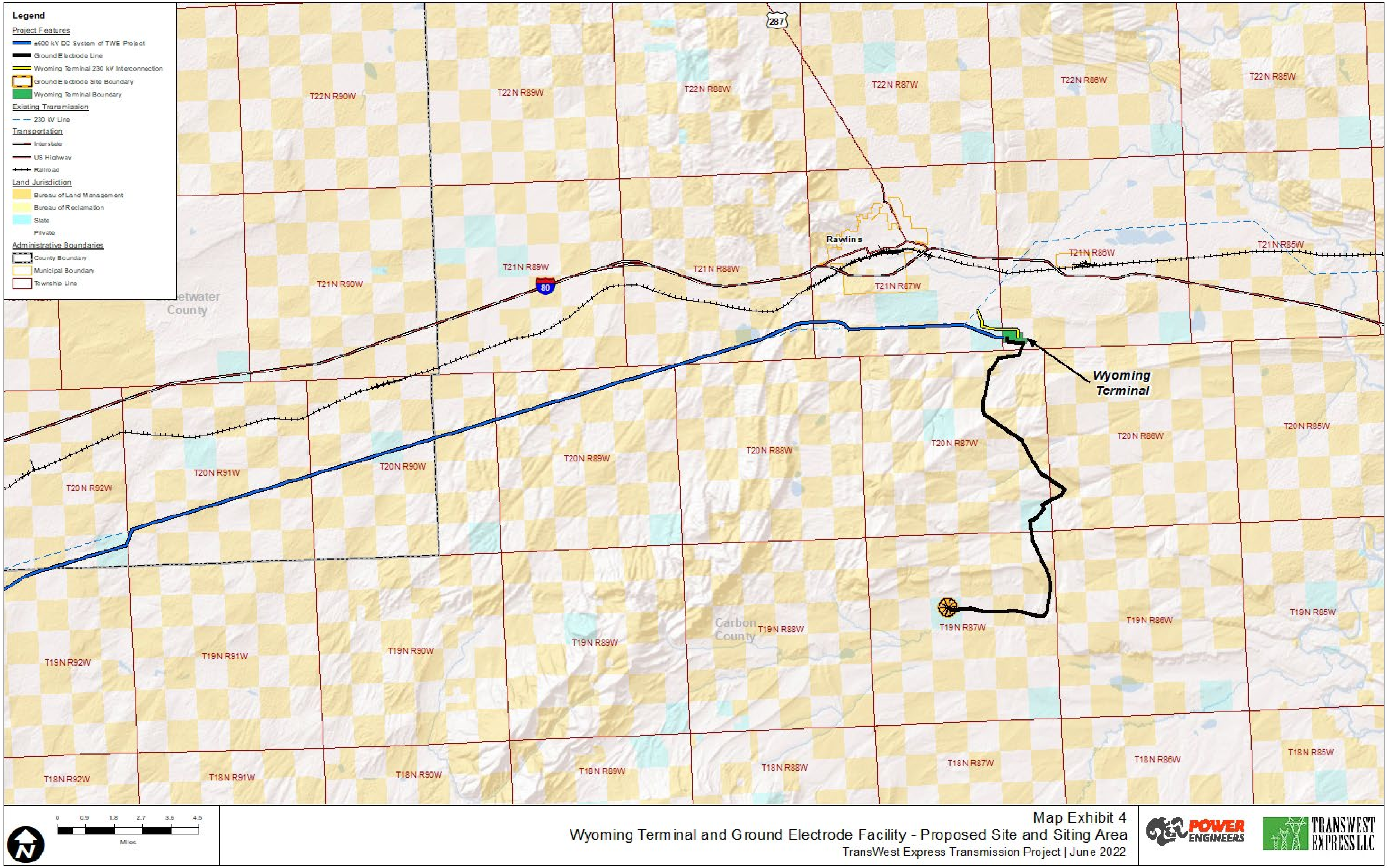
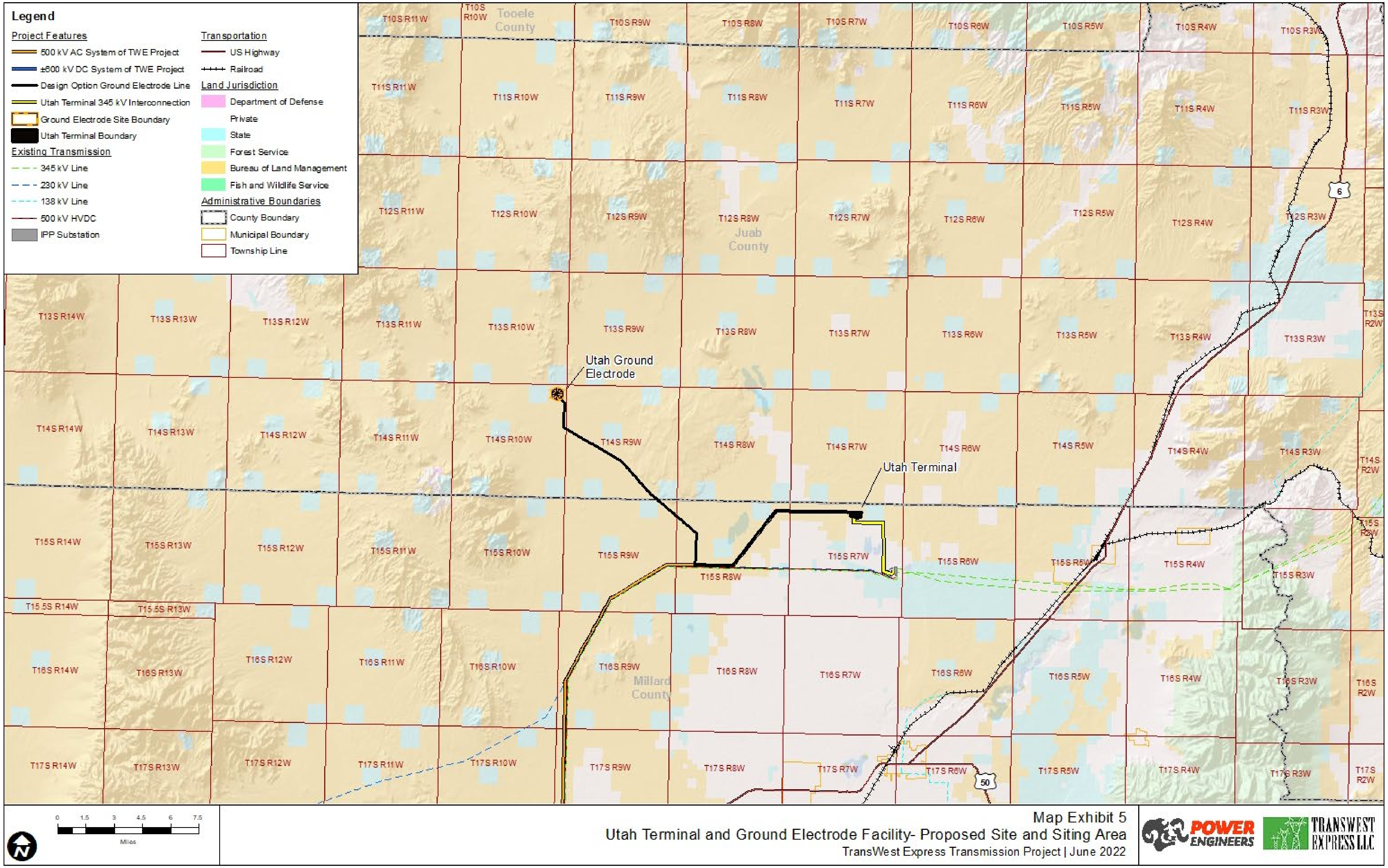


MAP EXHIBIT 4 WYOMING TERMINAL AND GROUND ELECTRODE FACILITY—SITE AND SITING AREAS



MAP EXHIBIT 5 UTAH TERMINAL AND GROUND ELECTRODE FACILITY—SITE AND SITING AREAS

The use of these ground electrode facilities allows system operators to maintain a portion of the TWE Project's power transmission capacity to support power network reliability. This feature will provide network operators with critical time to determine the extent of the electrical disturbance and reconfigure the transmission and generation systems into a more stable configuration that minimizes disruption of customer loads.

Each ground electrode facility will consist of a network of approximately 60 deep-earth electrode wells arranged along the perimeter of a circle expected to be about 3,000 feet in diameter. Wells at a site will be electrically interconnected and wired to a small control building via low-voltage underground cables. A typical site plan for a ground electrode system is shown in Figure 11b, a photograph of a typical aboveground facility is provided in Figure 11c, and a detail of a typical electrode well is shown in Figure 11d.

A low-voltage electrode line will be required to connect the ground electrode facilities to the AC/DC converter stations (at the Wyoming and Utah Terminals). The overhead electrode line will be located on single-pole structures built in a separate, 50-foot-wide ROW. The electrode line will consist of two, high-temperature, high-capacity conductors. A typical single-pole structure design that will be used for the overhead electrode line is depicted in Figure 11e.

Once construction is completed, approximately 0.5 acre or less will be fenced. The fenced area will surround the center of the electrode site containing the control house. Agricultural land uses outside of the fenced area, such as grazing and cultivated crops, will be allowed.

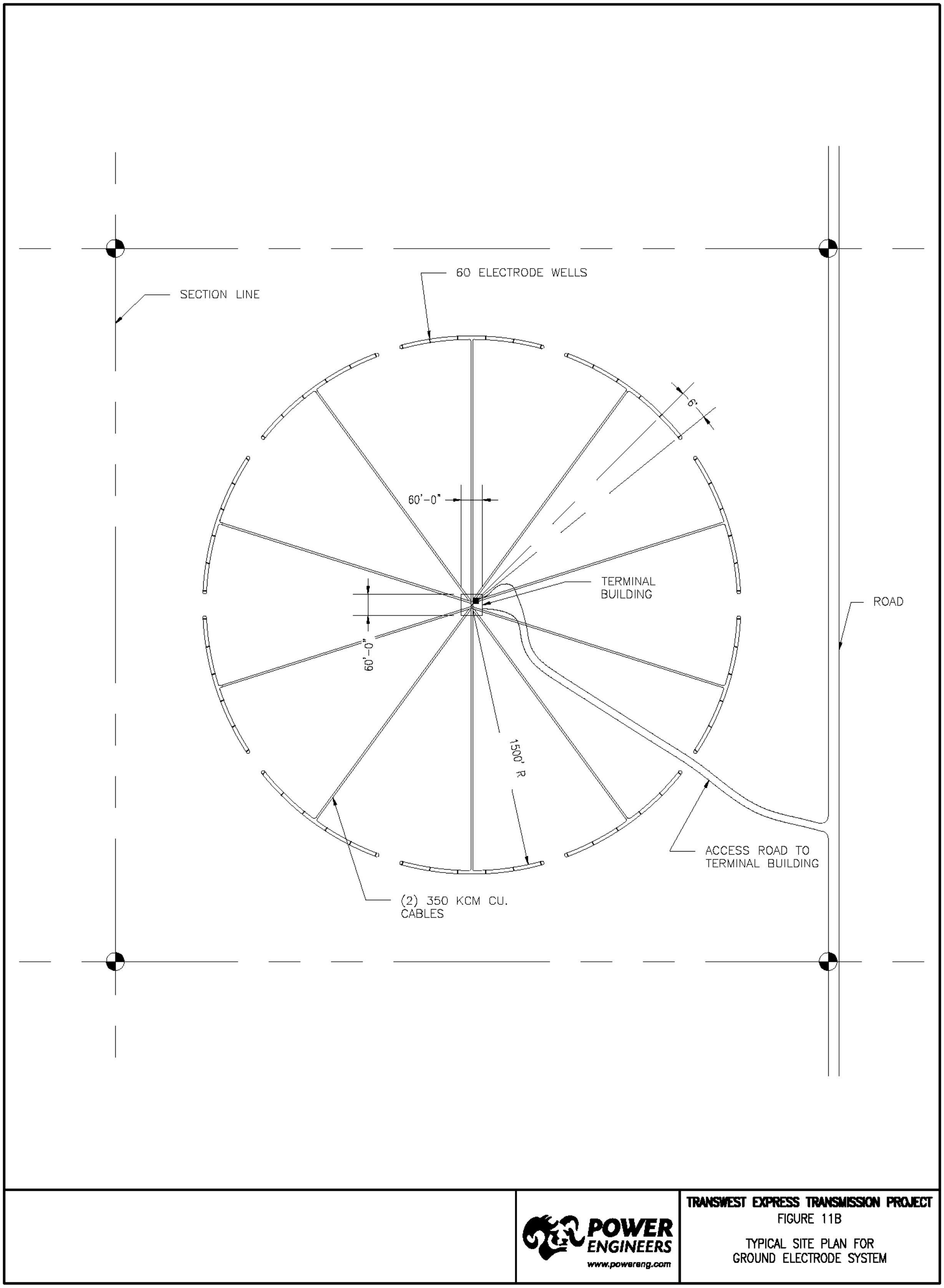
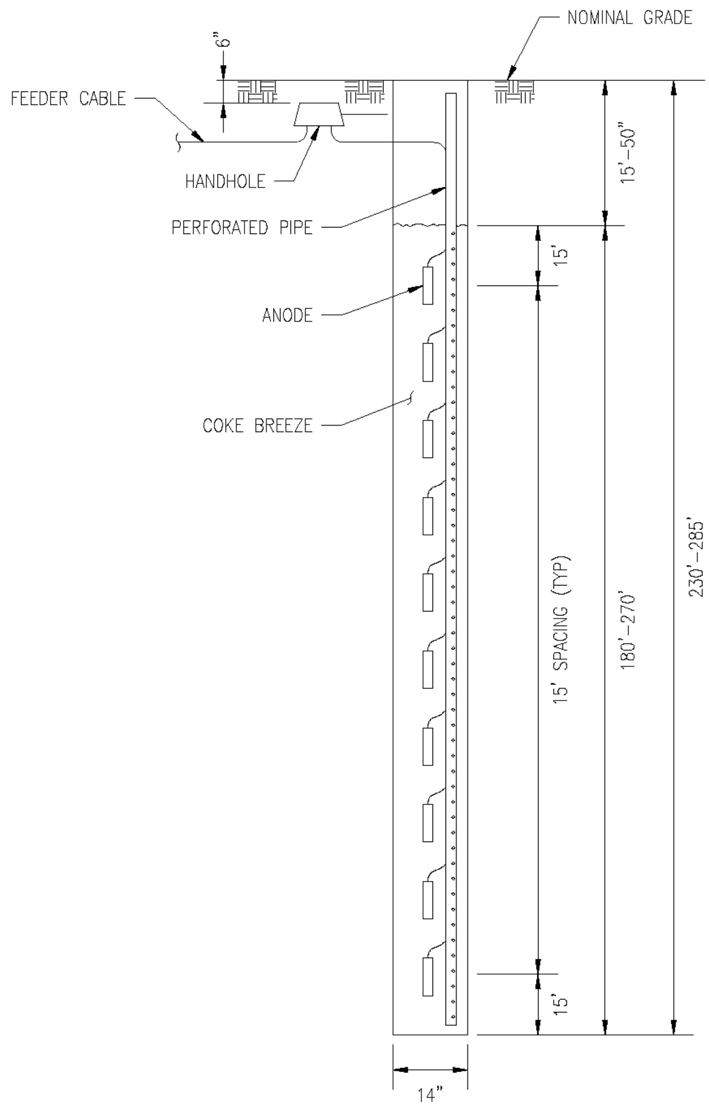


FIGURE 11B TYPICAL SITE PLAN FOR GROUND ELECTRODE SYSTEM

FIGURE 11C TYPICAL ABOVEGROUND CONSTRUCTION AT THE GROUND ELECTRODE FACILITY



NOTES

1. DIMENSIONS ARE NOT TO SCALE FOR CLARITY.
2. DIMENSIONS PER IEEE TRANSACTIONS ON POWER DELIVERY, VOL. 3, NO. 4. DESIGN, COMMISSIONING AND TESTING OF IPP GROUND ELECTRODES, PAGE 2040, DETAIL 6.

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TRANSWEST EXPRESS TRANSMISSION PROJECT
FIGURE 11D
TYPICAL
DEEP WELL–GROUND ELECTRODE

FIGURE 11D TYPICAL GROUND ELECTRODE WELL

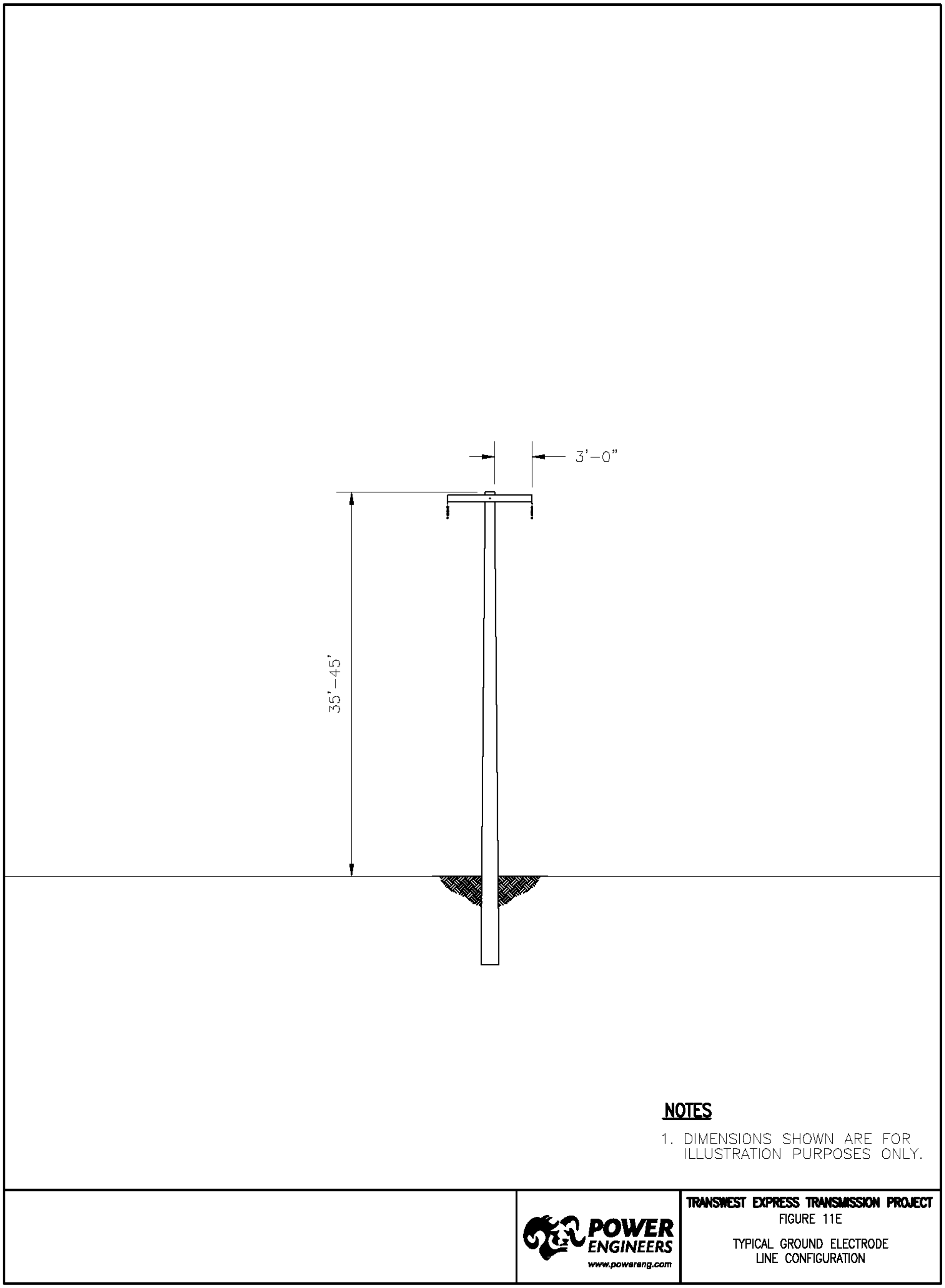


FIGURE 11E TYPICAL GROUND ELECTRODE LINE CONFIGURATION

5.2.4 Communication Systems

The DC System will require several critical telecommunication support subsystems. These systems will be configured and designed to support the overall availability and reliability requirements for the operation of the DC terminal facilities and supporting substations. To provide secure and reliable communications for the control system real-time requirements, protection, and day-to-day O&M needs, a mixture of telecommunication systems will be used. The primary communications for protection and control will be provided via the OPGW installed in the shield wire position on the transmission line. For redundancy purposes, a secondary communication path will be provided via existing or expanded/upgraded microwave systems or existing buried fiber paths in the vicinity of the TWE Project.

In addition to protection and control, the communication system will be used for Supervisory Control and Data Acquisition (SCADA). The SCADA system is a computer system for gathering and analyzing real-time data, which is used to monitor and control the system's transformers and transmission lines, and auxiliary pumps and cooling systems. A SCADA system gathers information, such as the status of a transmission line, and transfers the information back to a central site, alerting the central site that the line has opened. The SCADA system also performs necessary analysis and control, such as determining if outage of the line is critical and displaying the information in a logical and organized fashion.

The primary communication system will be an all-digital fiber system with repeater/regeneration facilities using the OPGW located on the transmission line structures. The optical data signal degrades with distance as it travels through the optical fiber cable. Consequently, signal regeneration sites are required to amplify the signals if the distance between stations or regeneration sites exceeds approximately 50 to 75 miles. In total, approximately 10 to 15 regeneration sites will be required for the DC System. The regeneration sites will be located within the transmission line ROW, co-located with transmission tower sites and are typically 10,000 square feet (100 × 100 feet) or less in size. Communication regeneration sites will be finalized after NTP and prior to construction by the Construction Contractor(s). These facilities will be located entirely within the structure footprints. Figure 12 shows a typical prefabricated communications regeneration facility building of 200 square feet (20 × 10 feet) that would be located within the 10,000 square foot cleared area.

The secondary communication path for the TWE Project will be provided either by a private microwave system or by purchasing/leasing capacity on existing utility-dedicated communication networks in the TWE Project region. If required, a private microwave system will be structured to use existing developed communications sites, access roads, and utility-managed sites to the maximum extent practicable.

To facilitate mobile communications along the transmission line route for transmission line patrol, inspection, routine maintenance, and emergency operations, a mobile ultra-high frequency (UHF)/very high frequency (VHF) radio communications system will be implemented. UHF/VHF radio equipment, structures, antennae, and repeaters are planned to be installed at each regeneration site.

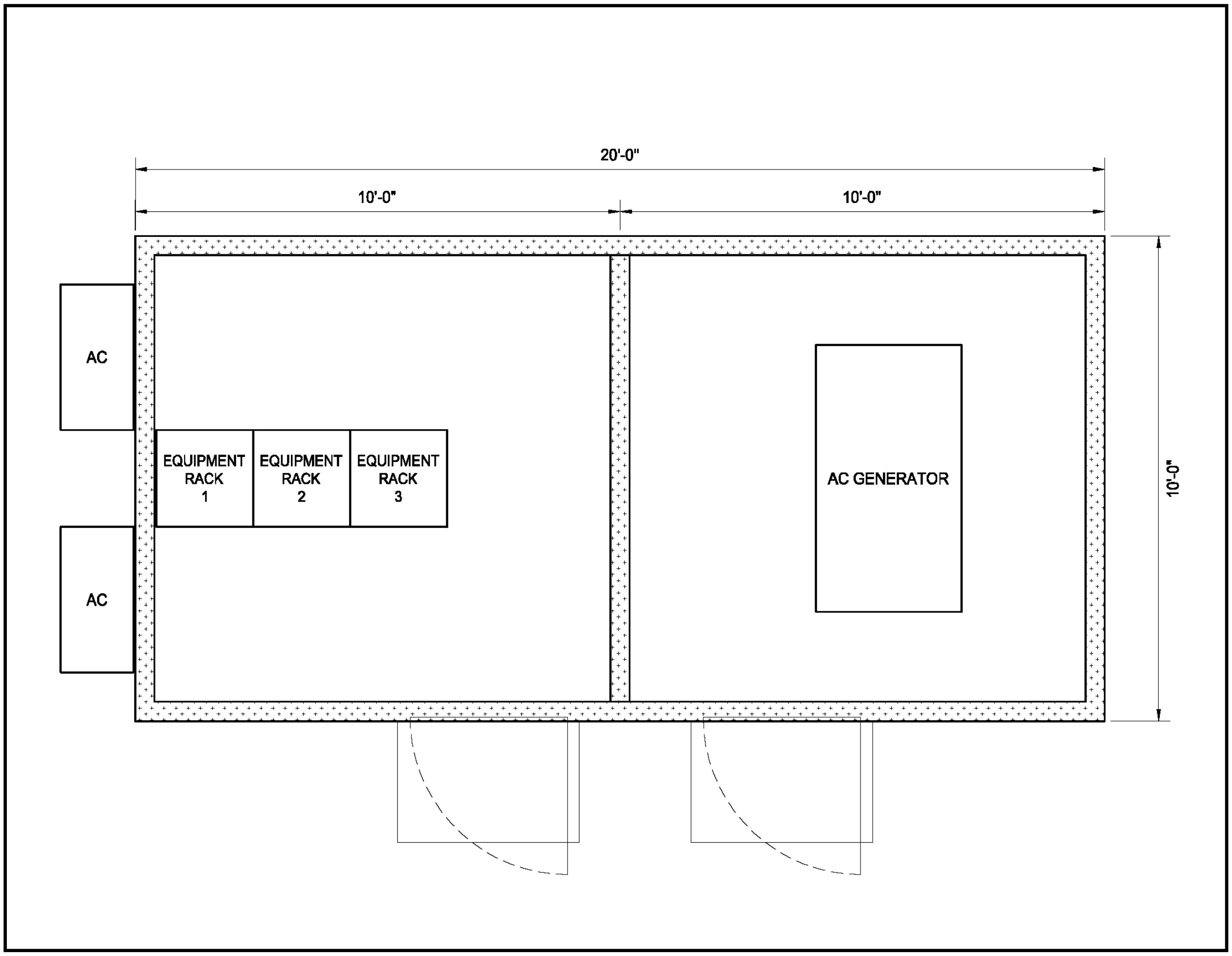


FIGURE 12 PREFABRICATED COMMUNICATION REGENERATION FACILITY

5.3 Design Characteristics of the Alternating Current System

5.3.1 Alternating Current Transmission Line

The TWE Project 500 kV AC transmission line will be approximately 330 miles long, located in a ROW that is 250 feet wide. The design characteristics of the 500 kV AC transmission line are summarized in Table 8 and are described in this section. Design characteristics for the AC transmission line's access roads are presented in Appendix A, Access Road Siting and Management Plan.

The BLM ROW Grant (BLM 2017) allows the TWE Project a ROW width of 250 feet for the long-term O&M of the transmission line. This width will accommodate TransWest's structure designs. Any exceptions are subject to the variance process described in Appendix G, Environmental Compliance and Monitoring Plan. ROW width for the TWE Project is based on engineering studies that considered the items listed below.

- Structure configuration (horizontal vs. vertical configurations), pole spacing, and insulator configuration (I-string vs. V-string insulator configurations).
- Operating voltage, elevation, and clearance criteria (NESC and Project-specific).
- Conductor size, weight, number, and configuration of conductors in the bundle, tensions, and sag.

- Span length between structures and conductor blowout (conductor movement envelope per pre-defined wind conditions).
- Structure footprint (guyed vs. self-supported), terrain, and maintenance access (space requirements for maintenance equipment at each structure site).
- Audible noise levels at the edge of the ROW.
- Potential co-location with buried underground high-pressure natural gas and other petroleum pipelines in the same corridor. The AC transmission line can be in its ROW adjacent to the ROW for such pipelines.

TransWest will complete computer modeling of AC interference effects in locations where the AC transmission line is near a pipeline. TransWest or the facility owners will install the necessary mitigation prior to energizing the AC transmission line. Additional information about this and other ROW safety requirements is included in Appendix O, Operations and Maintenance Plan.

TABLE 8 TYPICAL 500 KV AC TRANSMISSION LINE DESIGN CHARACTERISTICS

Feature	Description
Physical Properties	
Line length	330 miles
Structure type	Tangent structure: guyed steel lattice. Alternate tangent structures: self-supporting steel lattice and tubular steel poles and H-frame tubular poles used in limited characteristic settings. Dead-end and angle structure: self-supporting steel lattice. Alternate dead-end and angle structure: tubular steel poles.
Structure height	Typical guyed steel lattice: 90–180 feet; self-supporting steel lattice: 90–195 feet; tubular steel poles: 90–195 feet. TWE Project does not contain structures over 200 feet high.
Span length	Typical guyed lattice: 900–1,600 feet; typical self-supporting steel lattice: 900–1,600 feet; Tubular steel poles and H-frames: 700–1,200 feet. Some locations require spans of over 1,600 feet based on terrain and access.
Number of structures per mile	3–8, depending on structure type, terrain, and other engineering factors. Steel lattice (guyed or self-supporting): 3–5 Tubular steel poles: 5–8
ROW width	250 feet; any exceptions are subject to the variance process described in Appendix G, Environmental Compliance and Monitoring Plan.
Land Temporarily Disturbed	
Structure work area	ROW width (250 feet) × 200 feet per structure
Wire-pulling and tensioning sites	ROW width (250 feet) × 500 feet for dead-end structure (two sites at all dead-end structures) ROW width (250 feet) × 500 feet for mid-span conductor and shield wire (approximately every 8,500 feet); 100 × 500 feet for fiber optic cable set-up sites (approximately every 18,000 feet)
Material storage yards	Located approximately every 30 miles of transmission line Typical material storage yard area: approximately 20 acres
Staging areas/Fly yards	Located approximately every 5 miles of transmission line Typical staging areas/ fly yards: approximately 7 acres
Batch plant sites	Located approximately every 15 miles of transmission line Stand-alone temporary batch plants, estimated size: approximately 5 acres
Guard structures	100 × 250 feet at road and existing overhead electrical line crossings

Feature	Description
Land Permanently Disturbed	
Structure base*	Guyed lattice (tangent): 500 square feet (100 square feet mast foundation + 4 × 100 square feet for anchors) Self-Supporting Lattice (tangent): 900 square feet (30 × 30-foot structure base) Self-Supporting Lattice (angle): 1,225 square feet (35 × 35-foot structure base) Self-Supporting Lattice (dead-end): 1,600 square feet (40 × 40-foot structure base) Tubular Steel Pole (tangent): 40 square feet (7-foot-diameter foundation) Tubular Steel Poles (tangent/H-frame): 60 square feet (2 × 6-foot-diameter foundation) Tubular Steel Pole (dead-end/angle): 150 square feet (3 poles × 8-foot-diameter foundations)
Regeneration sites	Located approximately every 50 to 75 miles of transmission line, located on the transmission line ROW, primarily co-located with transmission tower sites, and each approximately 10,000 square feet (100 × 100 feet).
Electrical Properties	
Nominal voltage	500 kV AC
Nominal capacity	1,500 MW (as measured at the Nevada AC Substation)
Circuit configuration	AC 3-phase Bundled
Conductor size	Approximately 1.5-inch-diameter aluminum conductor steel reinforced conductor bundled with three sub-conductors per pole.
Ground clearance of conductor	33 feet minimum above ground, 40+ feet above railroads, and 35+ feet above highways at a conductor temperature of 167 degrees Fahrenheit

* Structure types by location are reflected in design details of the TWE Project presented in Appendix AA, Map Sets.

Structure Types

There are three main structure types for the TWE Project transmission line: 1) tangent structures; 2) angle structures; and 3) dead-end structures. Tangent structures are used in straight-line segments and are the most common type of structure and make up most of the structures on a line; often 80% to 90%. Angle structures are used when a transmission line changes direction up to a specified threshold line angle (commonly 20–30 degrees). Dead-end or strain structures are typically needed for extremely long spans, when the line angle exceeds the threshold of an angle structure, in highly varied terrain which can create uplift conditions on the structures, or when there is a need for a failure containment structure. Dead-end structures are structures where the conductors are separated and connected (electrically) by a jumper. Angle and dead-end structures must resist much larger loads and therefore are much stronger/heavier and require much larger diameter and deeper foundations than do tangent structures.

The 500 kV AC transmission line will be constructed primarily with guyed lattice tangent structures (Figures 13a and 13b) and self-supporting steel lattice angle and dead-end structures. The guyed lattice structure shown on Figures 13a and 13b was selected as the tangent design for most locations because of its smaller disturbance area, constructability, and overall cost considerations. Self-supporting steel lattice (Figure 9), tubular steel H-frame (Figures 14a and 14b), single-shaft tubular steel (Figure 15), and tubular 3-pole dead-end structures (Figures 16a and 16b) will be used in limited tangent structure locations where the setting and design criteria determined that the guyed lattice steel structure is not appropriate. Table 9 indicates the general applicability of the tangent transmission structure designs by characteristic settings. Figure 17 shows each structure design in a typical 250-foot-wide ROW.

In addition to tangent structure configurations, angle and dead-end structures have been identified. In most locations, the angle and dead-end structures will be constructed with self-supporting lattice structures. In limited circumstances, tubular steel angle and/or dead-end structures are anticipated to address site-specific engineering constraints, for example, size or height limitations.

TWE-45
TWE-55
FR-6

The main structure types will meet the Project-specific design criteria and will be reflected in the design details. These Project-specific design criteria address industry standards and guides, legislated requirements, anticipated environmental conditions, terrain, applications (settings), and land use. More specifically, the TWE Project is designed in accordance with guidelines established by the APLIC (1994, 2006, 2012). Appendix B provides the TWE Project's Avian Protection Plan. The TWE Project is also designed to comply with FAA safety requirements concerning lighting and marking and avoids impacting airports, military bases or training areas, or landing strips. Where appropriate, micro-siting of transmission line structures has occurred to locate them within recently burned areas to reduce vegetation management and minimize resource impacts.

TABLE 9 500 KV AC TRANSMISSION STRUCTURE DESIGN ALTERNATIVES POTENTIALLY USED IN CHARACTERISTIC SETTINGS

Characteristic Setting	Guyed Steel Lattice	Self-Supporting Steel Lattice	Tubular Steel Pole
Flat to rolling terrain	X	X	X
Steep to mountainous terrain and steep-sided slopes	–*	X	X
Open land	X	X	X
Agricultural fields, urban areas	–	X	X
Heavier line angles and dead-end strain structures	–	X	X

***** Should helicopter erection of structures be preferred or required, guyed lattice steel structures or self-supporting steel lattice structures may be used as determined by TransWest and reflected in the design details. In steep to mountainous terrain with excessively steep side slopes, self-supporting lattice structures will be required.

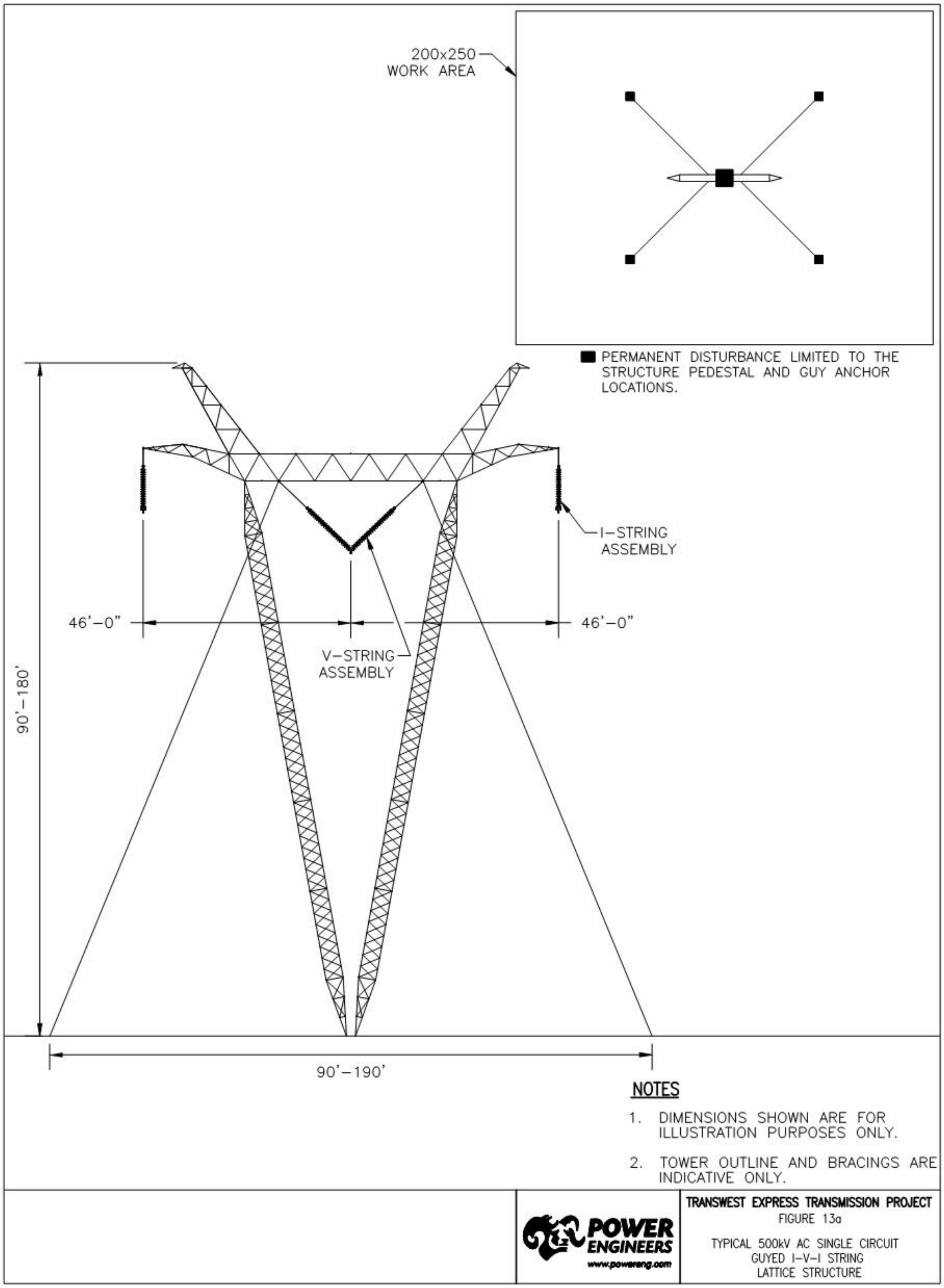


FIGURE 13A TYPICAL 500 KV AC SINGLE-CIRCUIT GUYED I-V-I STRING LATTICE STRUCTURE

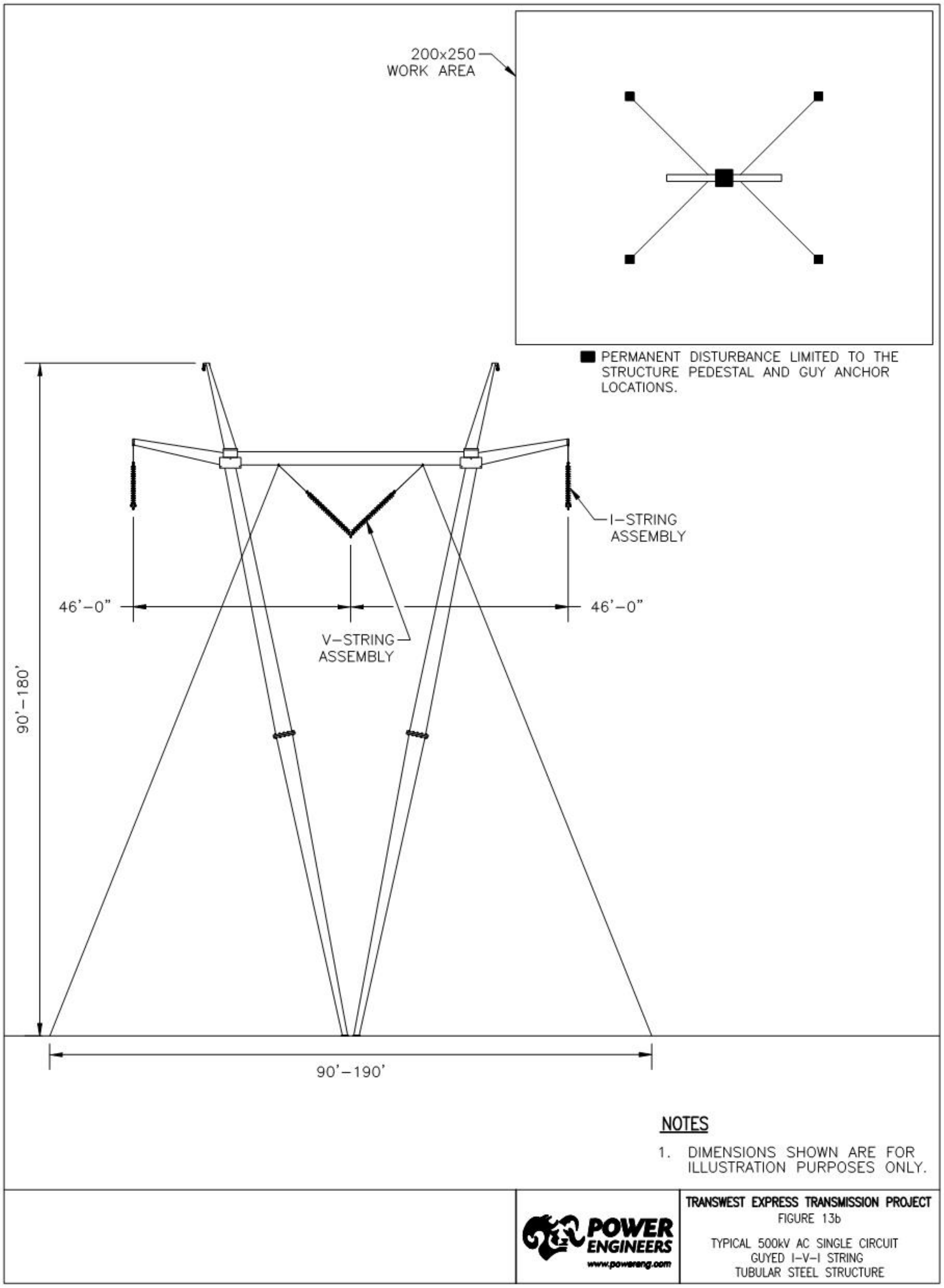


FIGURE 13B TYPICAL 500 KV AC SINGLE-CIRCUIT GUYED I-V-I STRING TUBULAR STRUCTURE

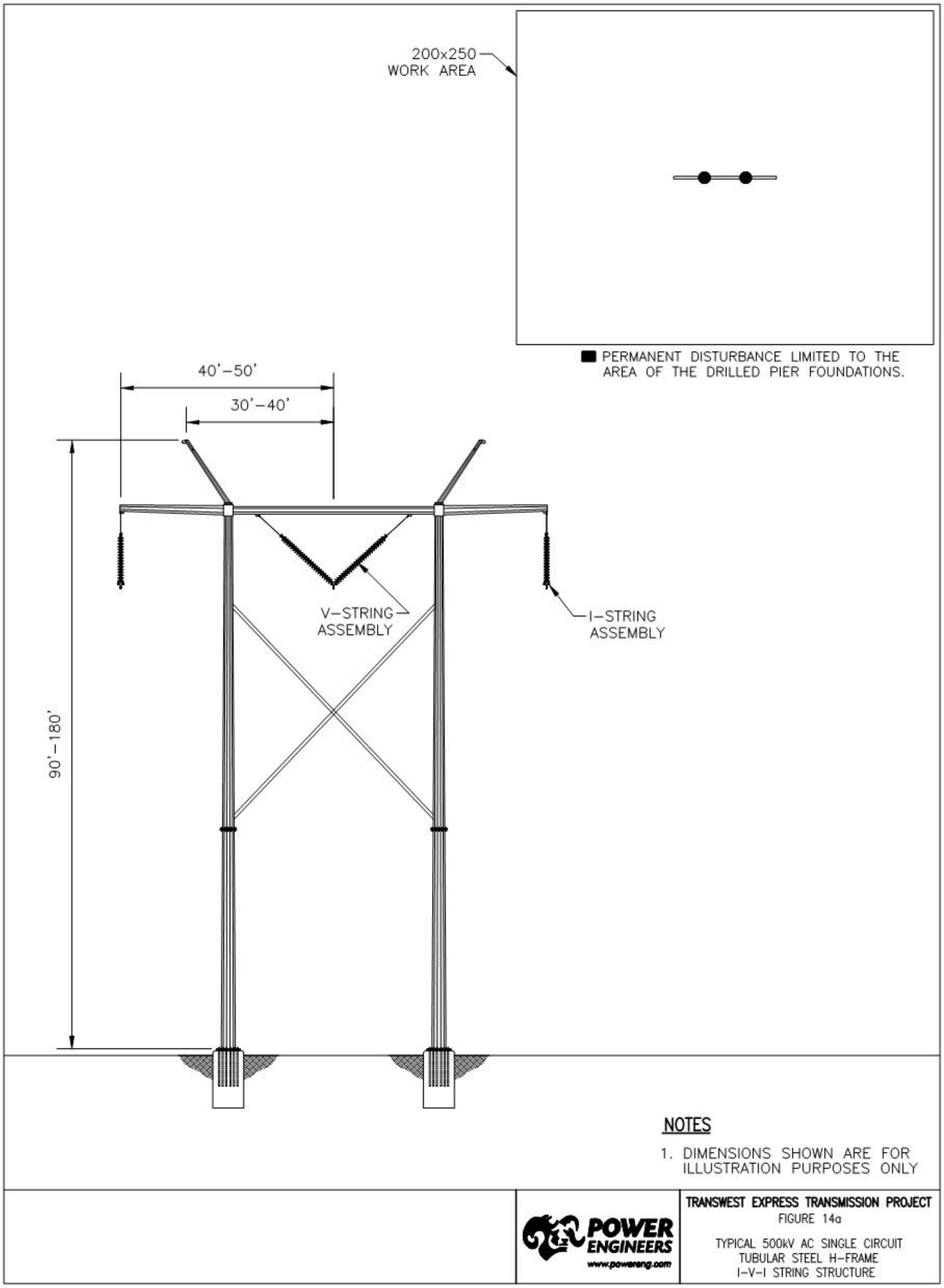


FIGURE 14A TYPICAL 500 KV AC SINGLE-CIRCUIT TUBULAR STEEL H-FRAME I-V-I STRING STRUCTURE

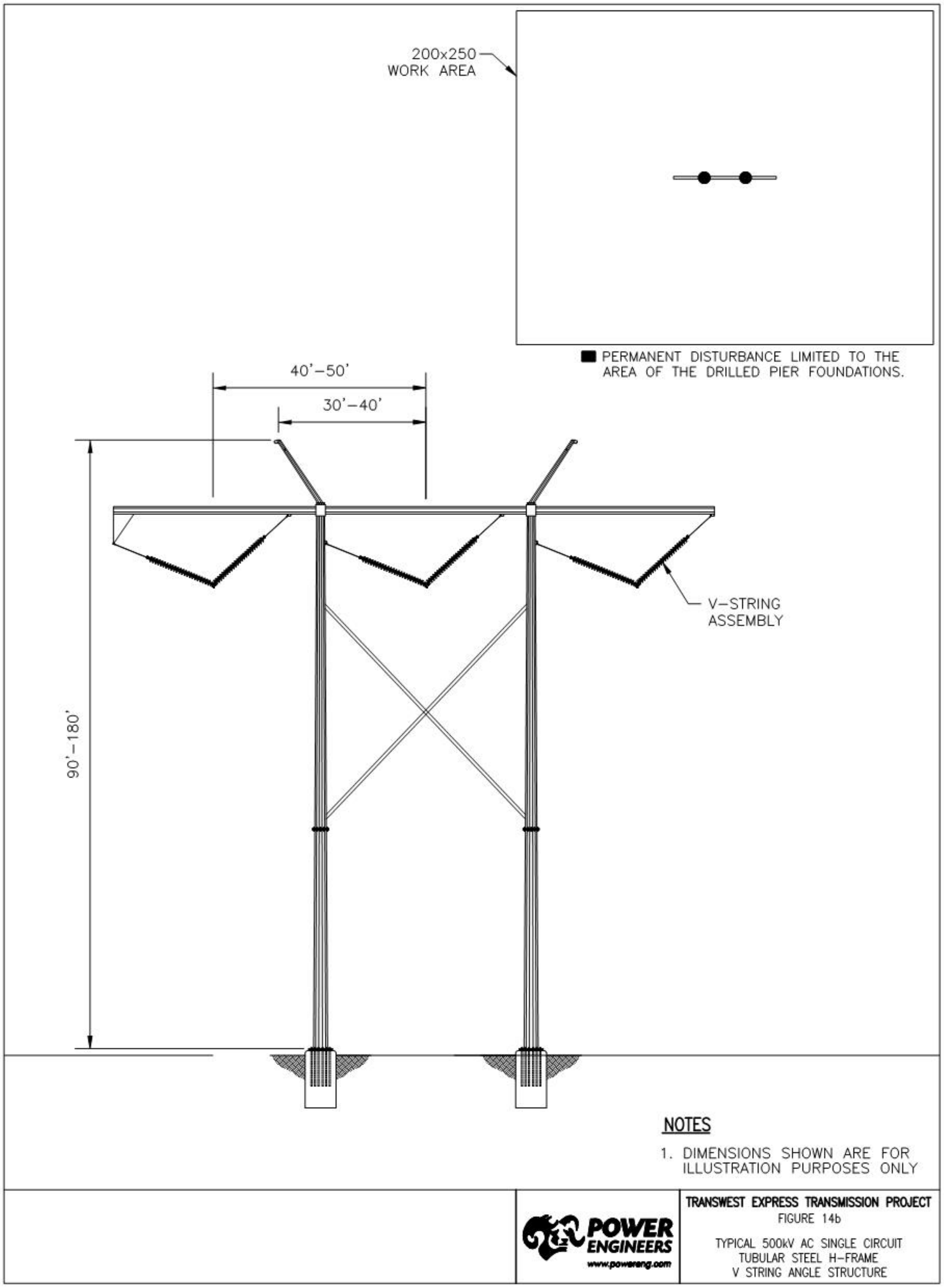


FIGURE 14B TYPICAL 500 KV AC SINGLE-CIRCUIT TUBULAR STEEL H-FRAME V STRING STRUCTURE

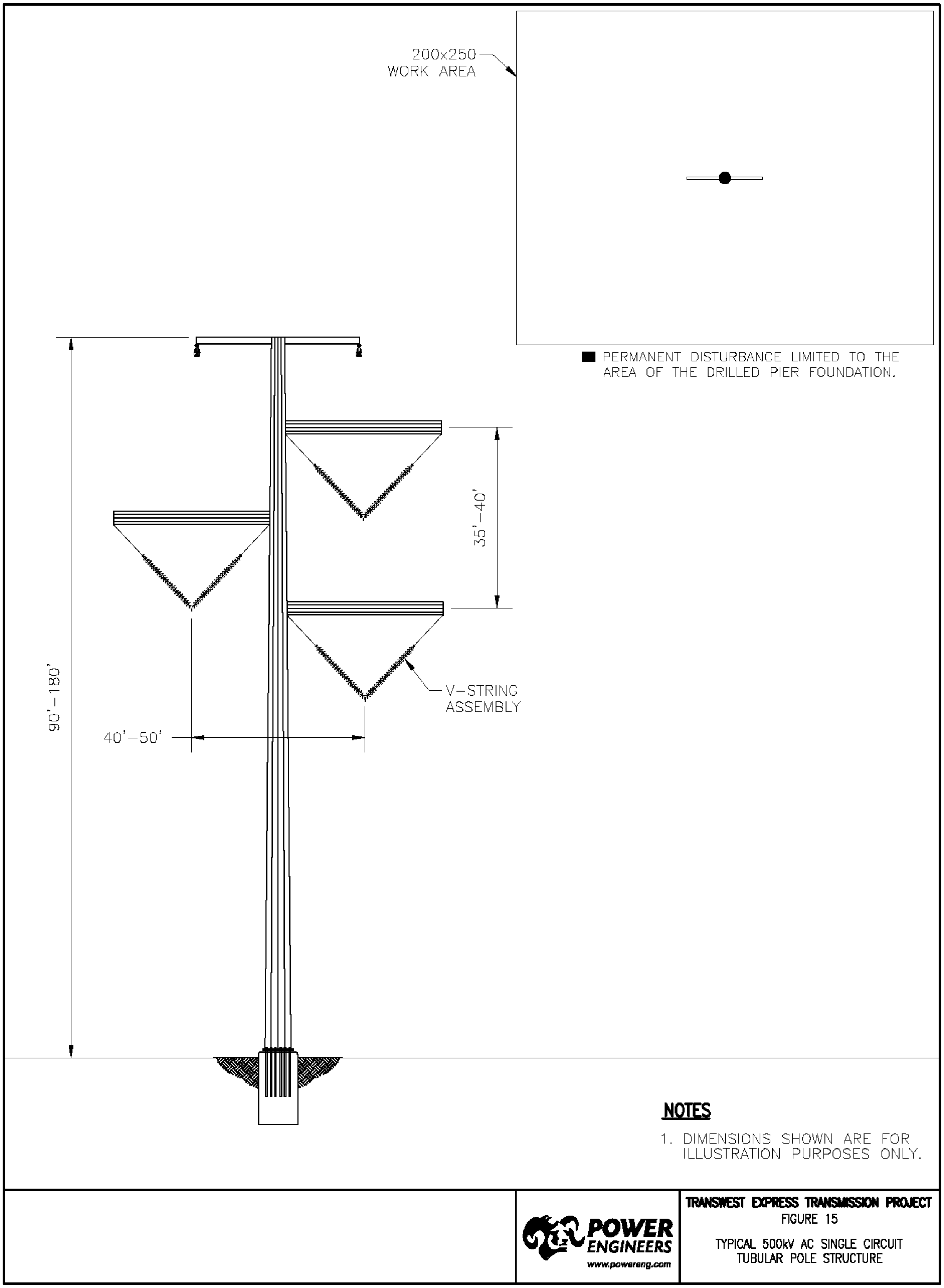


FIGURE 15 TYPICAL 500 KV AC SINGLE-CIRCUIT TUBULAR POLE STRUCTURE

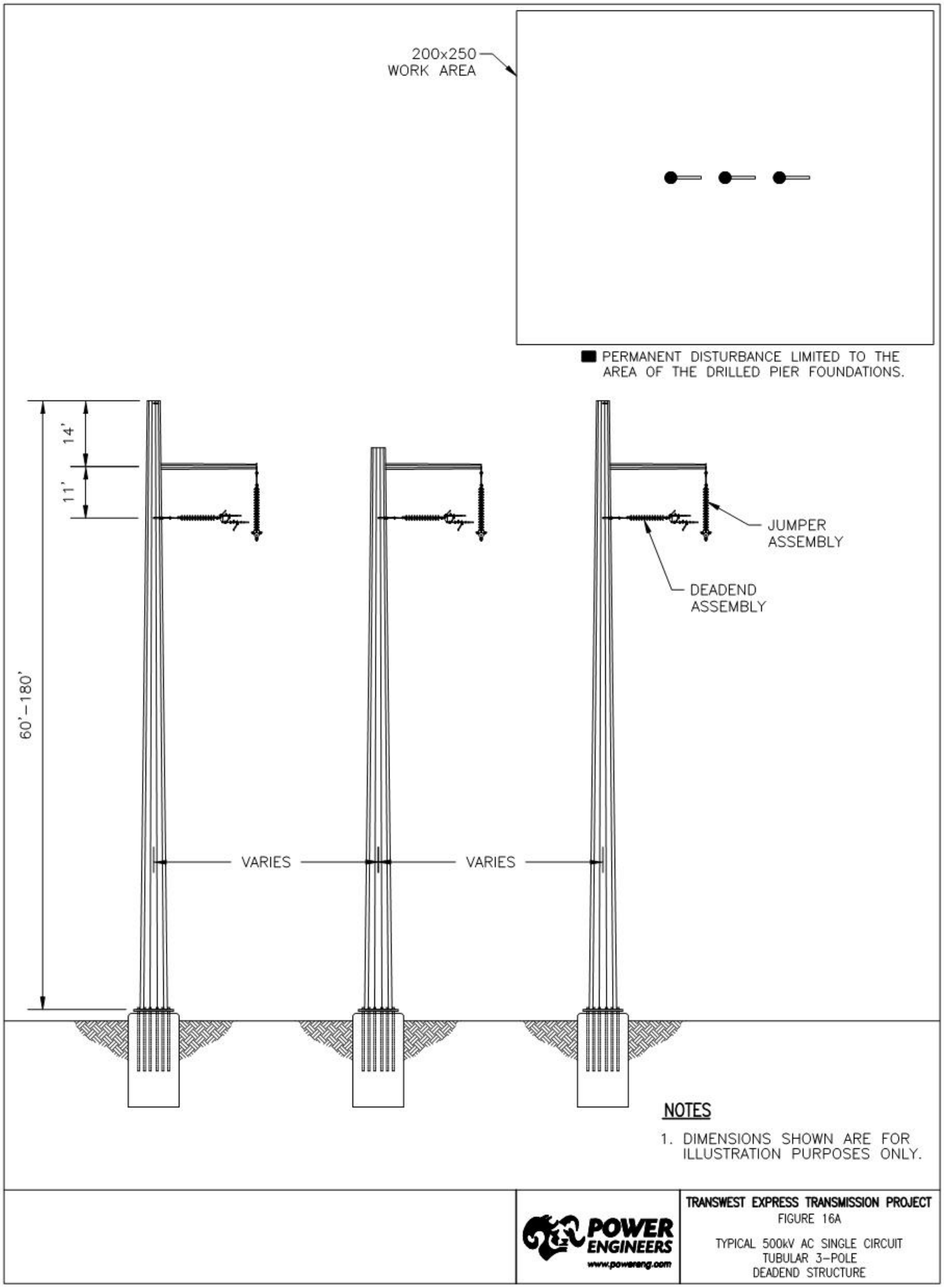


FIGURE 16A TYPICAL 500 KV AC SINGLE-CIRCUIT TUBULAR 3-POLE DEAD-END STRUCTURE

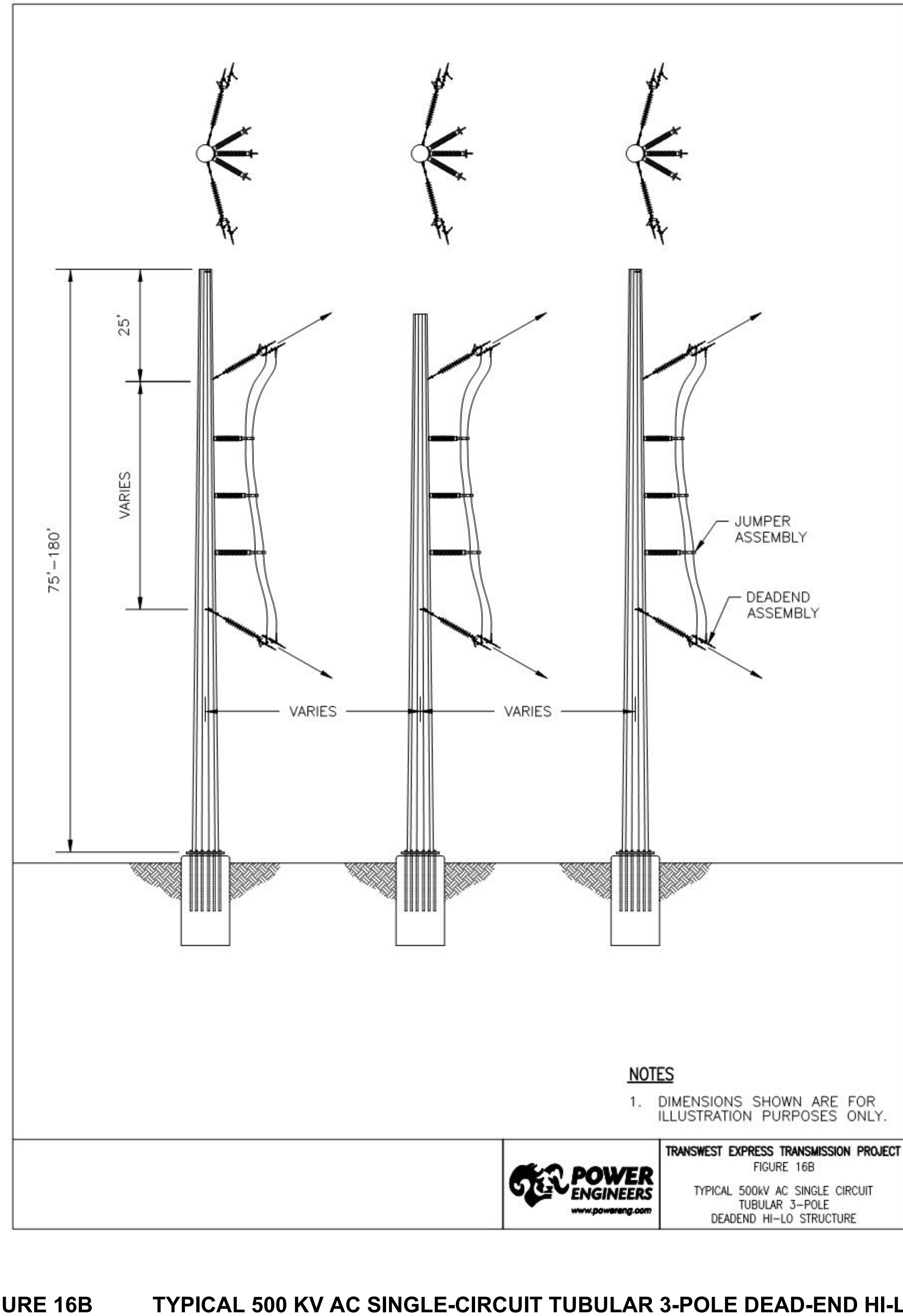


FIGURE 16B TYPICAL 500 KV AC SINGLE-CIRCUIT TUBULAR 3-POLE DEAD-END HI-LO STRUCTURE

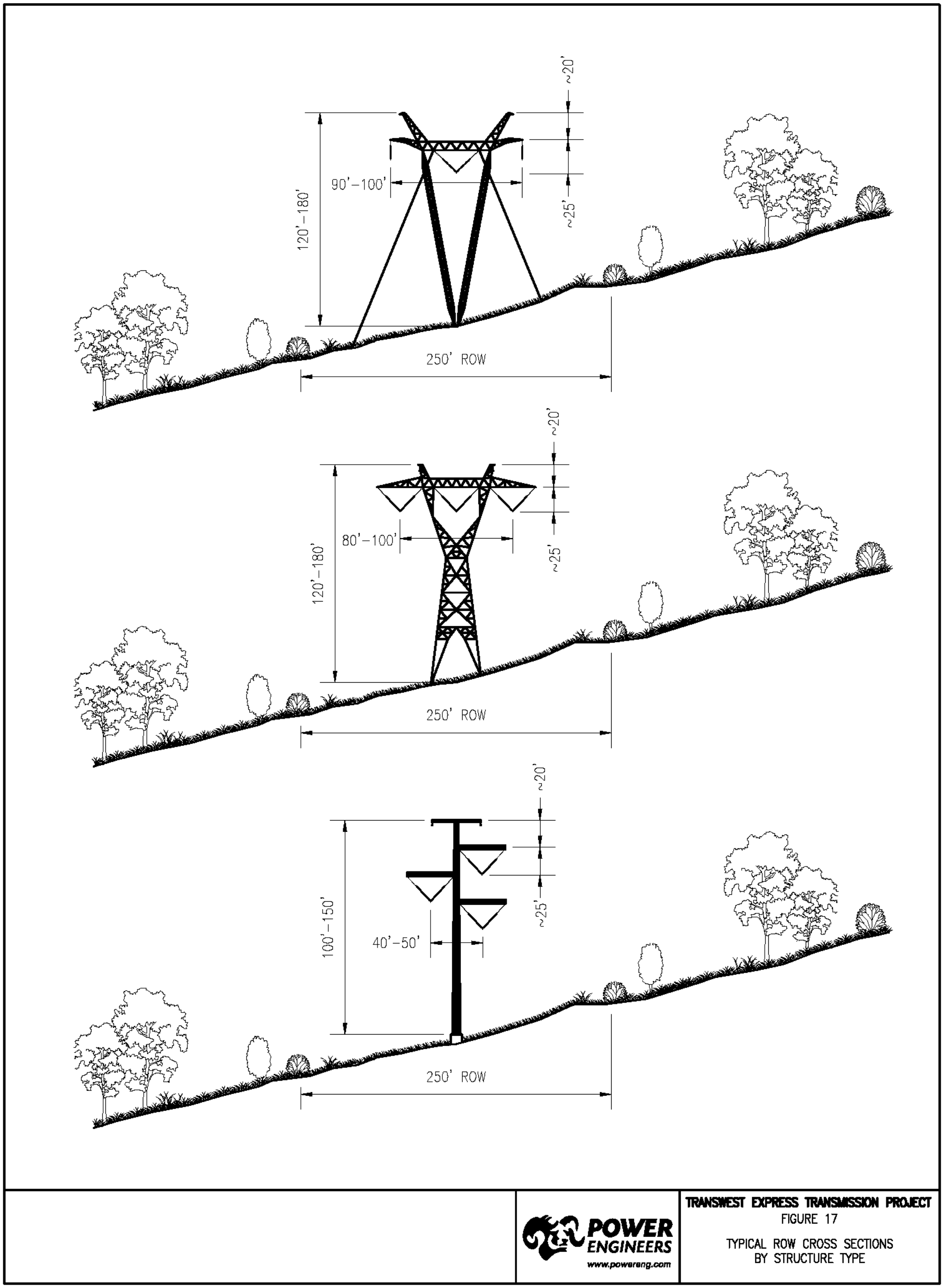


FIGURE 17 TYPICAL ROW CROSS SECTIONS BY STRUCTURE TYPE

Structure Foundations

The guyed steel lattice structures will require one pre-cast concrete support pedestal for the structure base and four anchors for guy cables. Pre-cast concrete support pedestals are manufactured offsite and trucked to the structure locations. Rarely, some guyed steel lattice structure foundations may require a special foundation (cast-in-place reinforced concrete support pedestal or a pedestal supported by micro-piles) because of site-specific characteristics such as extremely weak soils or rock. The anchors for attachment of the guy cables will be anchors designed for soil/rock conditions at each site. Several different types of anchors will be used including plate anchors, screw anchors, screw piles, grouted anchors, or rock anchors. Figures 5, 6, and 7 show typical details for a pre-cast pedestal, a helical anchor, and a grouted anchor.

Regardless of structure type, excavated material (surplus non-topsoil soil and/or rock) from structure foundation excavations will be managed on-site in accordance with Appendix Q, Reclamation Plan, or disposed of offsite in accordance with Appendix Y, Waste Management Plan.

Hauling of concrete to the structure installation site is eliminated for guyed steel lattice structures because pre-cast concrete support pedestals are manufactured offsite and trucked to the structure locations. In addition, the excavation necessary for installation of the support pedestal and guy wires is minimal. Excavated material from foundation installation is minimal (0 to 2 cubic yards per site) and will be utilized on-site where feasible.

Self-supporting lattice structures will require four foundations with one foundation on each of the four corners (legs) of the lattice structures. The foundation diameter and depth will be determined prior to construction, after the geotechnical survey has been completed and are dependent on the type of soil or rock present at each specific site. Typically, the foundation for each leg of the structure is a reinforced cast-in-place concrete drilled pier, with the typical self-supporting tangent structure foundation having a diameter of 3 to 4 feet and a depth of approximately 12 to 25 feet. The total concrete necessary for the four-leg foundations of each tangent self-supporting lattice structure is estimated at 28 cubic yards per structure. The resulting excavated material will total 25 to 30 cubic yards per structure. Foundations for dead-end and angle structures will be larger, typically ranging from 5 to 8 feet in diameter and 20 to 50 feet deep.

Tubular steel pole tangent structures will require one cast-in-place concrete foundation per steel pole. These tubular steel structures will be installed on a single reinforced concrete pier with anchor-bolts connecting the tubular pole base plate to the foundation. The foundation diameter and depth will be determined prior to construction, after the geotechnical survey has been completed and are dependent on the type of soil or rock present at each specific site. Foundations for these structures will typically be 6 to 10 feet in diameter and 20 to 60 feet deep. The total concrete necessary for the foundation of each tubular steel pole is estimated at 60 cubic yards per pole with approximately 55 to 60 cubic yards of excavated material per pole.

Typical drilled pier foundations are shown in Figure 8. In a limited number of locations, specialized foundations (for any structure type) may be required to address shallow rock; landslide-prone areas; unstable soils; corrosive soils; weak, sandy soils; or a shallow water table. These site-specific or sub-regional specific foundation designs may include micro-pile, helical pile, grouted, epoxy, grillage, driven pile, vibratory pile, and/or steel caisson-type designs. Specialized foundations will be determined prior to construction, after the geotechnical survey has been completed.

Conductors

Design Characteristics

TWE-44

The conductor for the AC transmission line is an aluminum conductor steel reinforced conductor approximately 1.5 inches in diameter. Each phase of the 500 kV AC line will be composed of three subconductors in a triple-bundle configuration. The individual conductors will be bundled in a triangular configuration with spacing of approximately 18 inches between subconductors. The bundled configuration is designed to provide adequate current-carrying capacity and to provide a reduction in audible noise and radio interference as compared to a single large-diameter conductor. Each 500 kV subconductor will have a non-specular finish to reduce potential visual impacts.

Ground Clearance Requirements and Guidelines

Conductor phase-to-phase and phase-to-ground clearance parameters are determined in accordance with the NESC and ANSI C2 requirements (IEEE 2017). The NESC provides for minimum distances between the conductors and ground, crossing points of other lines and the transmission support structure and other conductors, and minimum working clearances for personnel during energized O&M activities.
The clearance requirements for conductor heights above ground are based on the current and potential use of the land being crossed.

The minimum ground clearance for the TWE Project 500 kV AC conductor is 33 feet. For a 500 kV AC transmission line, the minimum conductor clearance will typically range from 33 feet for range land to 40 feet or more above railroad tracks. Clearances above highways will typically be 35 feet or more. Land with center-pivot irrigation or land that is aerially sprayed will typically use a minimum ground clearance of 33 feet.

The clearance requirements for vertical separation at crossings over or under existing transmission lines are also governed by NESC. In addition to the minimum NESC requirements, additional clearances or buffers are added to account for additional safety, construction tolerances, wire movements, differential wire temperatures, and utility-specific requirements. The vertical separation typically ranges from approximately 14 feet for distribution and lower voltage lines to approximately 25 feet or more for 500 kV extra high voltage lines. The exact clearance criteria for each voltage class being crossed will be determined prior to construction.

Standard industry practice suggests that the higher voltage line will cross over the lower voltage line and if voltages are the same, the line rated for the higher electrical loading will cross over the line rated for the lower electrical loading. These standards will be followed at the line crossing locations in coordination with each facility owner or manager, unless field conditions dictate otherwise. To optimize the crossing structure heights, the line crossing locations are typically at mid-spans of the lines being crossed over, near existing structures of lines being crossed under, and at right angles to each other to the extent practicable. Depending on the terrain and heights of the facility being crossed, taller structures for the TWE Project transmission line may be required at the line crossing locations. Guard structures will be installed, if required, to protect underlying wires and structures during wire-stringing operations. These guard structures intercept the wire should it drop below a conventional stringing height, preventing damage to underlying wires and structures. In addition to guard structures, during construction, the Construction Contractor(s) for the TWE Project will be required to coordinate with the owner(s) or operator(s) of the line(s) being crossed to comply with outage and other utility-specific requirements.

Unlike the TWE Project ±600 kV DC transmission line, which presents no risk of inducing currents because of the static nature of the DC electrical and magnetic fields, AC transmission lines can induce currents. Mitigation measures for AC inductive currents will be implemented as necessary for the AC transmission line. Measures to mitigate induced current impacts on railroads, pipelines, and other land uses are described in Appendix O, Operations and Maintenance Plan.

Insulators and Associated Hardware

As shown in Figures 9 and 13a through 16b, insulator assemblies for 500 kV AC tangent structures will consist of insulator assemblies that consist of two strings of insulators normally in the form of a “V”, a single “I” string assembly, or a combination of both. These insulator strings are used to suspend each conductor bundle (phase) from the structure, maintaining the appropriate electrical clearance between the conductors, the ground, and the structure. The V-shaped configuration of the 500 kV AC insulators also restrains the conductor so that it will not swing into contact with the structure in strong winds. The I-string configuration of the 500 kV AC insulators are free to swing, and structures are designed to allow for swinging toward and away from the structure while maintaining electrical clearances. Dead-end insulator assemblies for 500 kV AC transmission lines will use a similar I-shaped configuration, which consists of insulators connected horizontally from either a structure dead-end arm or a dead-end pole. Individual insulators for both suspension and dead-end applications will be composed of glass, porcelain, or polymer.

TWE-49

Transmission line materials have been designed to minimize corona, which is a small electric discharge produced by a localized electric field near energized components and conductors. The hardware and conductor design will limit the audible noise, radio interference, and TV interference because of corona. Tension will be maintained on insulator assemblies to assure positive contact between insulators, thereby avoiding sparking. Caution will be exercised during construction to avoid scratching or nicking the conductor surface that may provide points for corona to occur.

Overhead Shield (Ground) Wires

Design Characteristics

To protect the 500 kV AC transmission line from direct lightning strikes, two lightning protection shield wires, also referred to as ground wires, will be installed on the peaks or top arms of each structure. Electrical current from lightning strikes will be transferred through the shield wires and structures into the ground.

Standard Configuration

TWE-44

The shield wires will be composed of two wire types. Both wire types will have a non-specular finish (i.e., the outside of the cable will be galvanized steel that will de-glare within a few months). One of the shield wires will be composed of extra high-strength steel wire approximately 0.5 inch in diameter. The second shield wire will be an OPGW constructed of aluminum and steel, which will carry 48 glass fibers in its core. The OPGW will have a diameter of approximately 0.65 inch. The glass fibers inside the OPGW will facilitate data transfer between the Wyoming and Utah Terminals, the series compensation station, the TWE Crystal Substation, and Nevada AC Substation. The data will be used for system control and monitoring.

Ground Rods

A grounding system, which is distinct from the ground electrode system, will be installed at the base of each transmission structure and will consist of copper ground rods embedded in the ground in immediate proximity to the structure foundation, and connected to the structure by a buried copper lead. After the ground rods have been installed, the grounding will be tested to determine the resistance to ground. If the resistance to ground for a transmission structure is excessive, then counterpoise will be installed to lower the resistance. Counterpoise consists of a bare copper-clad or galvanized-steel cable buried a minimum of 12 inches deep, extending from one or more legs of a structure for approximately 100 feet in the ROW.

Minor Additional Hardware

In addition to the conductors, insulators, and overhead shield wires, other associated hardware will be installed on the structures as part of the insulator assembly to support the conductors and shield wires. This hardware will include clamps, shackles, links, plates, and various other pieces composed of galvanized steel and aluminum.

Other hardware not associated with the transmission of electricity may be installed as part of the TWE Project. This hardware may include aerial marker spheres or aircraft warning lighting as required for the conductors or structures per FAA regulations. Structure proximity to airports and structure height are the determinants of whether FAA regulations regarding lighting and marking will apply based on an assessment of wire/structure strike risk. TransWest does not anticipate that structure lighting will be required because structures will be less than 200 feet tall and will be located to avoid airport impacts the greatest extent feasible. However, if special circumstances (for example, a tall crossing) require structures taller than 200 feet, or if required by the Department of Defense in the Sevier B Military Operations Area, FAA regulations regarding lighting and marking will be followed.

In areas TransWest identifies as posing a high-risk for avian collisions or in areas identified as having high collision mortality based on post-construction reporting, TransWest may install flight diverters or line markers, as appropriate. TransWest may install guy wire markers in select locations as determined by TransWest during final design of the Project or based upon a risk assessment conducted by TransWest using post-construction observations (see Appendix B, Avian Protection Plan).

Grid Interconnections

The TWE Project will connect to the existing 500 kV transmission grid in Nevada. Specific structures are included in Appendix AA, Map Sets. The components for the 500 kV AC structures including foundations, conductors, insulators and associated hardware, overhead shield (ground) wires, and grounding rods are similar to those described for the 500 kV AC transmission line.

5.3.2 Alternating Current Substations

The AC System includes three 500 kV AC substations. These include the series compensation station located in Utah at a point approximately half the distance between the Utah Terminal, the TWE Crystal Substation, and the Nevada AC Substation at the terminus of the Project. The AC substations are described in the following sections and an example of an AC substation is provided as Figure 18.

The Utah Terminal described as part of the DC System will include a 500 kV AC substation that provides the northern connection for the AC System. Description of that Project component is provided in Section 5.2.2, Wyoming and Utah Terminals.

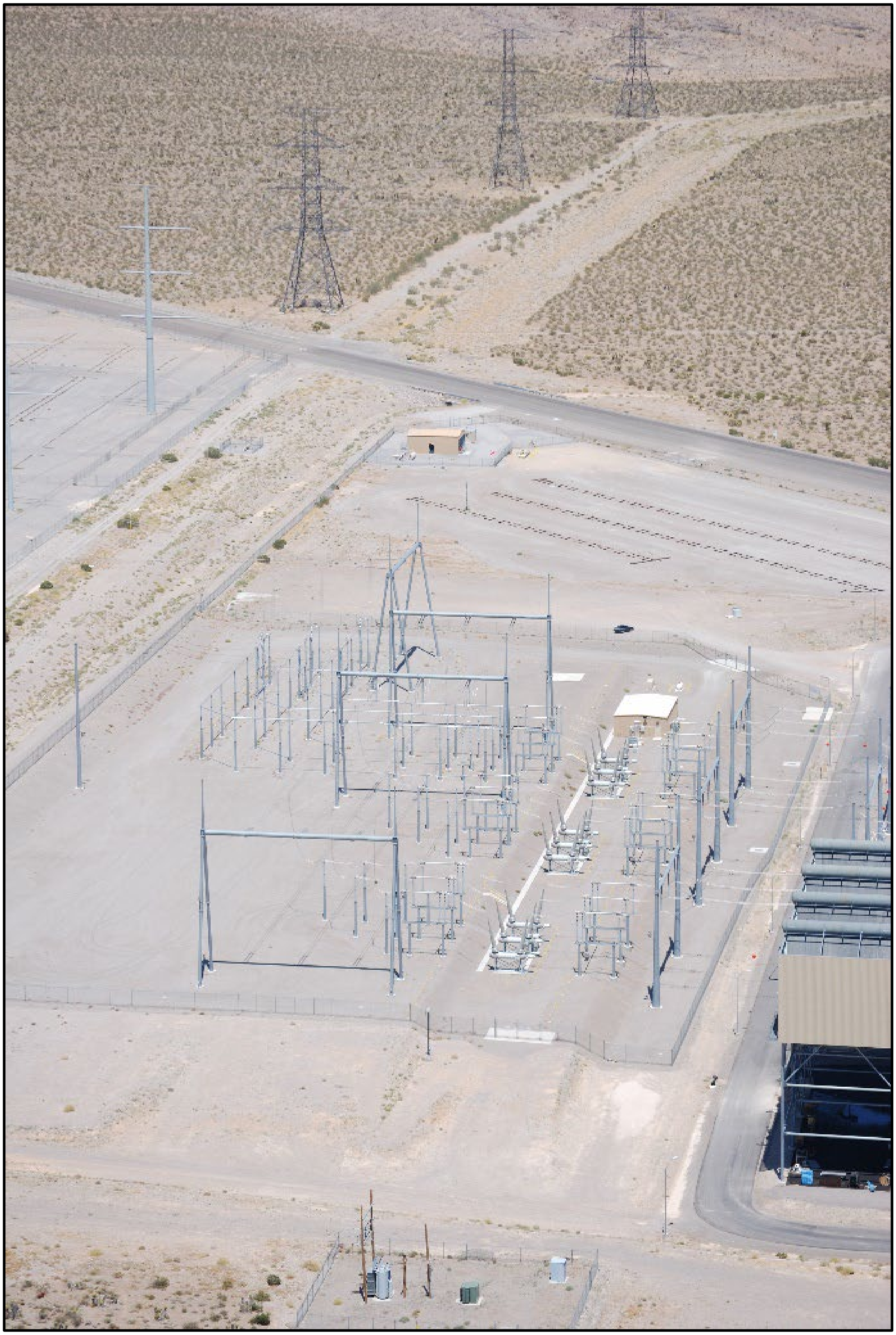


FIGURE 18 TYPICAL 500 KV AC SUBSTATION

Series Compensation Station

SDA-15

The series compensation station is a fixed series capacitor bank station and shunt reactor that will be located approximately halfway between the Utah Terminal and Nevada AC Substation. The purpose of the series compensation station is to reduce line losses to allow for efficient power transfer on the transmission line. The siting area for the series compensation station does not include any special designation areas. The station will be located partly in the ROW of the 500 kV AC transmission line.

The series compensation station will require the following components.

- A station location approximately 5 acres in size.
- An electrical connection to the 500 kV AC line from the Utah Terminal.
- An electrical connection to the 500 kV AC line to the Nevada AC Substation.

Construction of the series compensation station on private land is estimated to require approximately 5 acres. The station will share access and the ROW that was acquired for the 500 kV AC transmission line.

The series compensation station's general location is shown in Map Exhibit 6. Appendix AA, Map Sets, includes the specific location of the series compensation station.

TransWest Express Crystal Substation

The TWE Crystal Substation will include a 500 kV AC substation, configured as a breaker and a half, and interconnection facilities (Map Exhibit 7). The facilities will be just north of NV Energy's existing Crystal North Substation on BLM land, approximately 20 miles north of Las Vegas, in Clark County, Nevada. The TWE Crystal Substation will connect the TWE Project 500 kV AC transmission line from the Utah Terminal to DesertLink's Harry Allen to Eldorado 500 kV line with a proposed new 500 kV[8] substation located just west of NV Energy's existing Crystal South Substation and the existing NV Energy Crystal 500 kV substation.

The TWE Crystal Substation will require the following components (Table 10). Figures 5 and 13a through 16b show typical structure designs for the 500 kV transmission line connections.

- A 500 kV AC substation approximately 40 acres in size. The site will be graded and surrounded by chain-link fencing topped with barbed wire. Approximately 30 acres of the 40-acre site would be fenced.
- Four-position breaker-and-one-half bus configuration with a loop-in of the TransWest 500 kV AC transmission line and connections to NV Energy's existing Crystal North Substation and to the proposed DesertLink Switchyard.
- Addition of approximately 0.4 mile of new access road outside the substation. Road surface to be approximately 20 feet wide with gravel surfacing.
- Up to four new 500-kV single-circuit transmission line segments totaling approximately 2 miles in length. Structure types to be a mixture of lattice steel and tubular steel with configurations similar to that used for the TransWest transmission line. A 20-acre material storage yard located just south of NV Energy's existing Crystal Substation would be utilized for construction staging,

[8] The proposed new 500 kV substation is being developed in response to an interconnection request made by TransWest to connect the TWE Project AC system to the Harry Allen to Eldorado 500 kV line owned by DesertLink. The new 500 kV substation is being permitted under a separate Standard Form 299.

and material storage. This yard will also be used for construction of the TransWest Express 500 kV AC transmission line.

TABLE 10 DESIGN CHARACTERISTICS FOR THE TWE CRYSTAL SUBSTATION

Feature	Description
Substations	
TWE Crystal Substation	Four 500 kV AC line positions. Maintenance and storage facilities will be developed as required and as appropriate for this location.
Physical Properties of Interconnection Lines	
Line length	2 miles of 500 kV AC in up to four segments
Structure type	Self-supporting lattice for 500 kV AC lines (typ)
Number of structures per mile	Approximately 4–7 500 kV structures
ROW width	250 feet for 500 kV line
Land Temporarily Disturbed	
Material storage yard	20 acres
Structure work areas for interconnection lines	200 × 250 feet per 500 kV structure; approximately 4–7 per mile of line
Wire-pulling, tensioning, and splicing sites for interconnection lines	ROW width × 500 feet – mid-span conductor and shield wire sites every 9,000 feet and fiber optic set-up sites every 18,000 feet
Land Permanently Disturbed	
AC Substation	30 acres (fenced area)
Structure base 500 kV interconnection line	Self-supporting lattice (tangent): 1,225 square feet (35 × 35-foot structure base) Self-supporting lattice (angle): 1,600 square feet (40 × 40-foot structure base) Self-supporting lattice (dead-end): 2,025 square feet (45 × 45-foot structure base)
New access roads	See Appendix A, Access Road Siting and Management Plan

Nevada AC Substation

The Nevada AC Substation will include a 500 kV AC substation, configured as a breaker and a half, and interconnection facilities (Map Exhibit 8). The facilities will be in the Eldorado Valley on private land, approximately 15 miles south of Boulder City, in Clark County, Nevada. The Nevada AC Substation will connect the TWE Project 500 kV AC transmission line from the Utah Terminal to the four existing 500 kV substations located at the Marketplace Hub. These four substations are the Mead, Eldorado, Marketplace, and McCullough Substations.

The Nevada AC Substation will require the following components. Figures 5 and 13a through 16b show typical structure designs for the 500 kV transmission line connections.

- A 500 kV AC substation approximately 50 acres in size.
- An electrical connection to the 500 kV AC line from the Utah Terminal.
- Three three-phase phase shifting transformers electrically connected between the Nevada AC Substation and the Mead, Marketplace, Eldorado, and McCullough interconnections.
- Two electrical connections from the existing Mead–Marketplace 500 kV transmission line to the new 500 kV AC substation. These connections will connect the Nevada AC Substation to both the Mead and Marketplace Substations via the existing Mead–Marketplace 500 kV transmission line. These two connections require 500 kV transmission facilities to connect the new 500 kV AC substation to the existing Mead–Marketplace 500 kV transmission line.

- Construction of a 500-kV transmission line from the new 500 kV AC substation to the Eldorado Substation. This single-circuit 500 kV transmission line is approximately 3 miles long.
- Construction of a 500-kV transmission line from the new 500 kV AC substation to the McCullough Substation. This single-circuit 500 kV transmission line is approximately 3 miles long.
- Construction of the Nevada AC Substation on BLM land requires approximately 350 acres. Approximately 100 acres of this area will be permanently dedicated which will include the approximately 50-acre AC substation, access roads, transmission line structures, and interconnection line access roads. The approximate 50-acre area surrounding the Nevada AC Substation will be fenced. Approximately 250 acres of the Nevada AC Substation site is estimated to be temporarily disturbed for construction work areas, including land for storage and a concrete batch plant, transmission line structure work areas, and pulling, tensioning, and splicing sites.

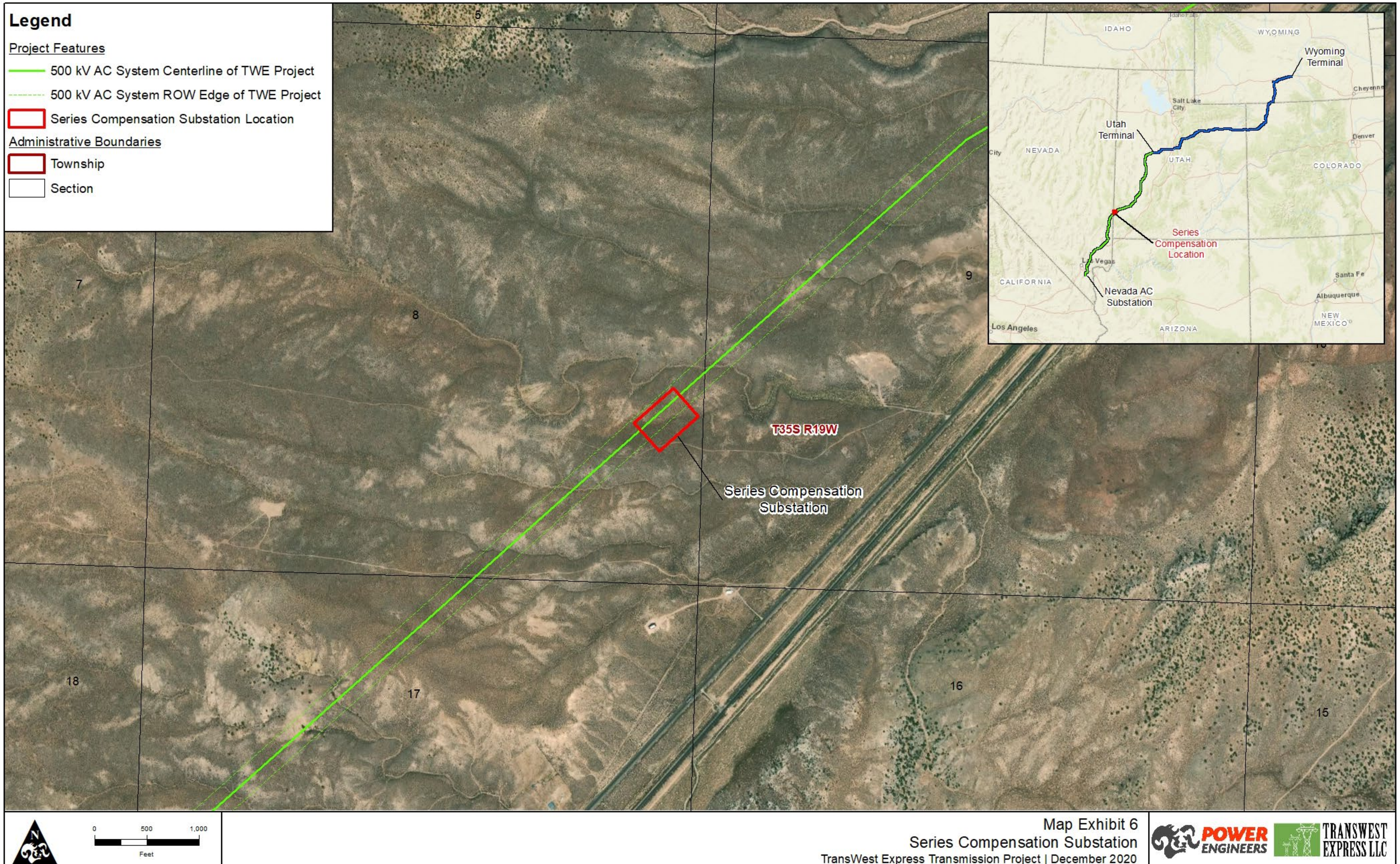
Access to the Nevada AC site require approximately 15 acres of permanent disturbance. Except for the associated interconnection lines, no other permanent development outside of the fenced area for this facility is anticipated. The design characteristics of the Nevada AC Substation are summarized in Table 11.

TABLE 11 DESIGN CHARACTERISTICS FOR THE NEVADA AC SUBSTATION

Feature	Description
Terminals	
Nevada AC Substation	Six 500 kV AC line positions. Maintenance and storage facilities will be developed as required and as appropriate for this location.
Physical Properties of Interconnection Lines	
Line length	10 miles of 500 kV AC; 1–3 miles per interconnection line
Structure type	Self-supporting lattice for 500 kV AC line (typ)
Number of structures per mile	Approximately 4–7 500 kV structures
ROW width	250 feet for 500 kV line
Land Temporarily Disturbed	
Storage and concrete batch plant	7.5 acres for combined batch plant
Structure work areas for interconnection lines	200 × 250 feet per 500 kV structure; approximately 4 per mile of line
Wire-pulling, tensioning, and splicing sites for interconnection lines	ROW width × 500 feet – mid-span conductor and shield wire sites every 9,000 feet and fiber optic set-up sites every 18,000 feet
Land Permanently Disturbed	
AC Substation	50 acres (fenced area)
Structure base 500 kV interconnection line	Self-supporting lattice (tangent): 1,225 square feet (35 × 35-foot structure base) Self-supporting lattice (angle): 1,600 square feet (40 × 40-foot structure base) Self-supporting lattice (dead-end): 2,025 square feet (45 × 45-foot structure base)
New access roads	See Appendix A, Access Road Siting and Management Plan

5.3.3 Communication Systems

The AC System will require several critical telecommunication support subsystems. These systems will be similar to those described for the DC System in Section 5.2.4. In total, approximately seven or eight regeneration sites will be required for the AC System.



MAP EXHIBIT 6 SERIES COMPENSATION STATION

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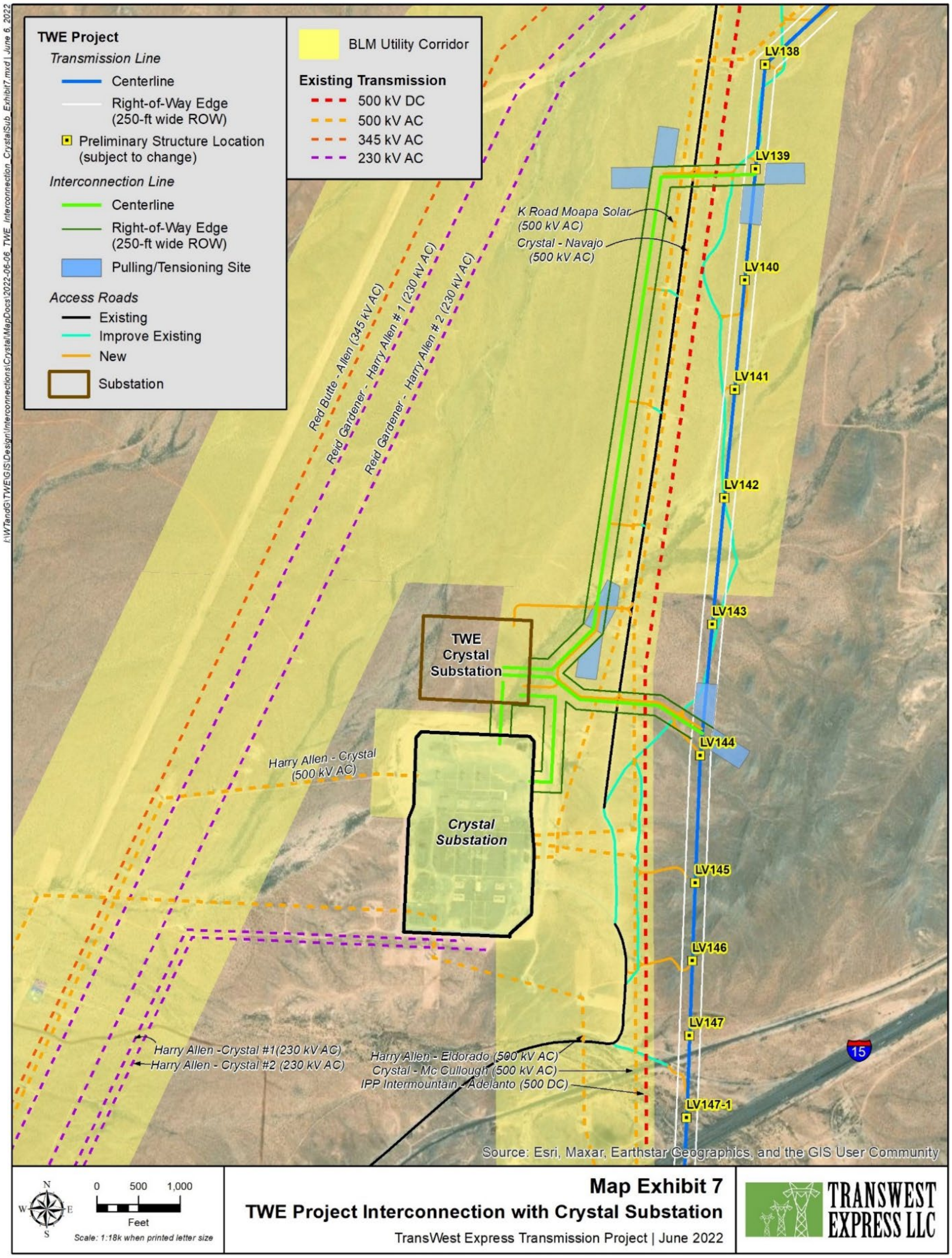

MAP EXHIBIT 7 TWE PROJECT INTERCONNECTION WITH CRYSTAL SUBSTATION

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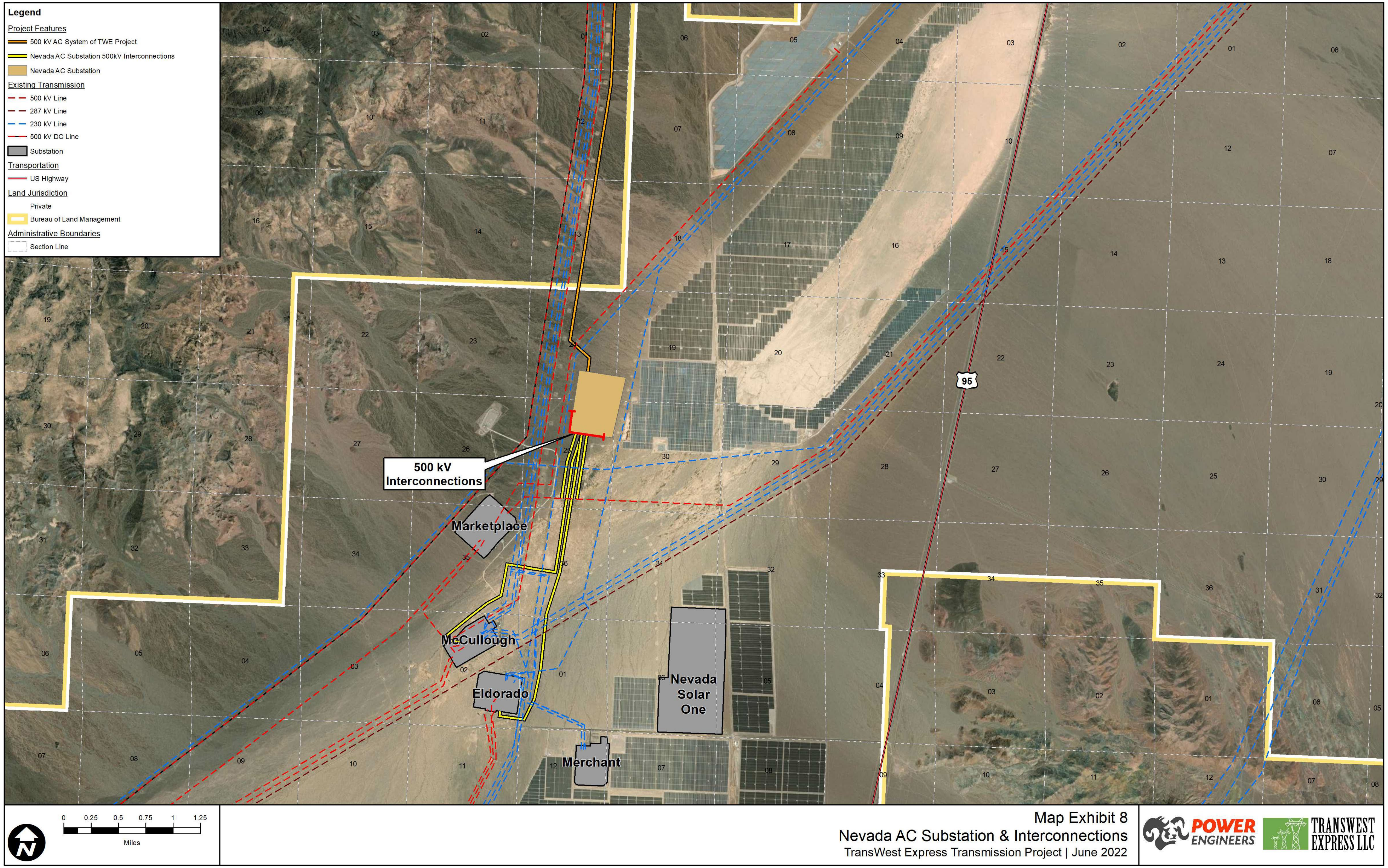

MAP EXHIBIT 8 NEVADA AC SUBSTATION AND INTERCONNECTIONS

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6.0 CONSTRUCTION

This section describes the TWE Project construction practices that will be used for the TWE Project, including the ±600 kV DC transmission line; 500 kV AC transmission line; terminals; substations; ground electrode facilities; and communication systems. Construction activities are described in the sections listed below.

- Section 6.1—Pre-construction activities to be completed prior to construction commencing.
- Section 6.2—Construction activities for the high-voltage transmission line and associated access roads.
- Section 6.3—Construction activities for the Wyoming and Utah Terminals and AC substations and series compensation station.
- Section 6.4—Construction activities for the ground electrodes (DC System only).
- Section 6.5—Construction activities for the communication systems.
- Section 6.6—Post-construction communication, cleanup, and reclamation.
- Section 6.7—Special construction methods to be used in specific sensitive locations, including blasting and helicopter construction techniques, construction techniques applicable to sensitive water resource areas, and water use during construction.
- Section 6.8—DC System construction schedules, workforce, and equipment requirements.
- Section 6.9—AC System construction schedules, workforce, and equipment requirements.

6.1 Pre-Construction Activities

LU-1

TransWest has obtained applicable federal, state, and local permits; acquired easements and ROW grants for the TWE Project facilities; and conducted pre-construction engineering and environmental resource surveys. Prior to construction, TransWest will conduct final geotechnical surveys and testing. TransWest has developed this POD and coordinated with landowners, land managers, and agencies with jurisdictional authority on the final design, including the final structure placement, aboveground components, access roads, and permanent disturbance areas, to reach optimal compatible land use with valid, existing land uses and rights.

6.1.1 Permitting

REC-12

TransWest has acquired all primary federal, state, and local permits, licenses, and agreements. A list of potentially applicable permit requirements has been provided through the NEPA process and incorporated into this POD (see Table 2). The TWE Project will necessitate crossings of existing electrical transmission lines, U.S. and State Highways, and railroads. The line crossings will be coordinated with the appropriate entity and TransWest will obtain required licenses, permits, or agreements following NTP and prior to construction of the affected segments.

6.1.2 Right-of-Way and Property Rights Acquisition

The acquisition of ROW or properties necessary to construct, operate, and maintain the TWE Project is complete. The ROW has been acquired for the transmission line(s) with a BLM ROW Grant (BLM 2017), a USFS Easement (USFS 2018), and easements from state and local governments, other companies (for example, utilities and railroads), and private landowners.

6.1.3 Siting

AGRI-1
AGRI-2
AGRI-4
RANGE-1
RANGE-3
RANGE-6
TWE-16

Studies have been conducted to select structure sites based on engineering design criteria, terrain, geologic investigations, and input from land management agencies and private property owners regarding land use and how to minimize potential impacts to properties. Geotechnical surveys will be required at some sites. TransWest will coordinate with BLM and USFS after the NTP is issued, but prior to construction, for Project facilities that may affect livestock grazing allotments. TransWest and land management agencies may rearrange Project facilities and access roads, grazing allotment fences, and/or access roads to grazing allotments to reduce Project impacts on grazing allotments. TransWest has and will continue to coordinate with farm and ranch operators to site structures along fence lines, field lines, and roads, and consider using non-guyed structures to minimize the Project's impacts to farm operations and agricultural production from structure placement. Where guyed structures may be required in crop or hay lands, TransWest will use highly visible shield guards to cover the guy wires and will schedule construction activities to avoid planting and harvesting activities to the extent practicable, and as agreed to with the landowner(s). Property owners will be notified of damage and/or compensated for damages to livestock, crops, fences, and other property caused by surveys and studies. Similarly, watering facilities (tanks, natural springs and/or developed springs, water lines, wells, etc.) will be repaired or replaced, if damaged or destroyed by construction activities, to their pre-disturbed condition as required by the landowner or land management agency.

REC-7

Ancillary Project facilities, including the terminals, substations, ground electrode facilities, and communication systems, will not be located within 1 mile of developed recreation areas such as trails, trailheads, and campgrounds, unless approved by the AO.

6.1.4 Geotechnical Surveys and Testing

Prior to construction of the TWE Project, soil borings will be required for further, detailed geotechnical investigations. Appendix J, Geotechnical Plan, provides additional detail on pre-construction geotechnical investigations.

6.1.5 Pre-Construction Surveys

ROW-14

TransWest coordinated with BLM Cadastral Survey staff to identify and protect markers for federal land boundaries and Public Land Survey System monuments. Should the surveys and activities disturb or destroy markers, TransWest will work with BLM to restore or replace the markers in accordance with BLM requirements.

Pre-construction engineering and environmental surveys have been conducted for the TWE Project. Engineering surveys were conducted to identify the transmission line ROW centerline and width, structure sites, vegetation clearance boundaries, property boundaries, ground profiles, access routes, temporary work areas, and stream crossings. Environmental surveys were conducted to identify and avoid sensitive resources. The timing of pre-construction surveys varied depending on the resource or Project element being surveyed. Access for surveys was conducted by 4-wheel drive and all-terrain vehicle (ATV)-type vehicles using existing roads. Off-road access was conducted by low-impact vehicles with rubber treads, low-pressure tires, or specialized mechanical movement to accommodate the terrain and landscape; rubber-tired ATVs; or by non-motorized methods including on foot or horseback, depending on terrain and vegetation, and in accordance with the appropriate land management agency or private landowner requirements with applicable mitigation measures applied.

Requirements for environmental pre-construction surveys are documented in the regulatory agencies' decision documents and stipulations, and specific survey protocols were developed in coordination with and were approved by the jurisdictional agencies. Pre-construction environmental surveys included: 1) migratory bird and raptor nest surveys; 2) special-status plant and wildlife species, including those protected by USFWS, BLM, USFS, and respective state resource management agencies; 3) noxious weed identification; 4) cultural resource surveys; 5) paleontological resource identification; and 6) wetland delineations in accordance with requirements of the Clean Water Act Section 404 permit.

The following appendices in this POD provide details of required environmental and pre-construction surveys and their results.

- Appendix A: Access Road Siting and Management Plan
- Appendix B: Avian Protection Plan
- Appendix D: Cultural Resources Protection and Management Plan
- Appendix N: Noxious Weed Management Plan
- Appendix Q: Reclamation Plan
- Appendix P: Paleontological Resources Management and Mitigation Plan
- Appendix W: Water Resources Protection Plan
- Appendix X: Wildlife and Plant Conservation Measures Plan
- Appendix AA: Map Sets

6.2 Transmission Line Construction

The following sections describe the transmission line construction activities associated with the ±600 kV DC and 500 kV AC transmission lines and access roads. The general sequence of transmission line construction includes construction of access roads; clearing of ROW and temporary work areas; installation of foundations; assembly and erection of structures; installation of ground rods/counterpoise; installation of shield wires and conductors; and site cleanup and reclamation. Typical transmission line construction activities and sequencing are illustrated in Figures 19 and 20. Various construction activities will occur during the construction process, with several construction crews operating simultaneously at different locations. Sections 6.8.3, Construction Equipment, and 6.9.3, Construction Equipment, summarize the types and quantities of equipment to be used for the DC and AC transmission line construction, respectively.

6.2.1 Access Road Construction

Access roads are an essential part of the construction and O&M of the TWE Project. As such, the TWE Project will require surface access to structures and work areas during construction and O&M to allow construction vehicles and equipment to access the location of each transmission structure and Project facility. Access roads constructed as part of the TWE Project, but not required for operations, will be restored to their original condition, or left as-is according to the appropriate land management agency or private landowner requirements. Detailed information on access road design standards and construction is included in Appendix A, Access Road Siting and Management Plan.

In most cases, existing roads will be used to transport construction personnel, equipment, and materials to approved work areas. Based on TransWest's structure types (guyed lattice tangents and self-supporting angle and dead-end structures), the number of construction vehicles needed for the Project is not expected to substantially increase traffic volumes. A detailed Traffic and Transportation Management Plan is provided in Appendix U, Traffic and Transportation Management Plan.

The layout of access roads by road type to each structure location for the TWE Project is provided in Appendix AA, Map Sets. These map sets include detailed mapping of existing improved roads, existing roads requiring improvement, and new roads.

Clearing of Transmission Line Right-of-Way and Temporary Work Areas

Vegetation in the ROW will be cleared in accordance with Appendix R, Right-of-Way Preparation and Vegetation Management Plan. Figure 21 provides a plan view of typical transmission line ROW and temporary work areas.

Temporary work areas will be cleared of vegetation or flagged, as needed, prior to construction activities in the area. Temporary work areas will include staging areas; material storage yards; fly yards; pulling, tensioning, and splicing sites; work areas at each structure site; batch plant sites; and guard structures. Table 12 summarizes the temporary land disturbance required for Project construction including the typical size and spacing required for TWE Project facilities and activities.

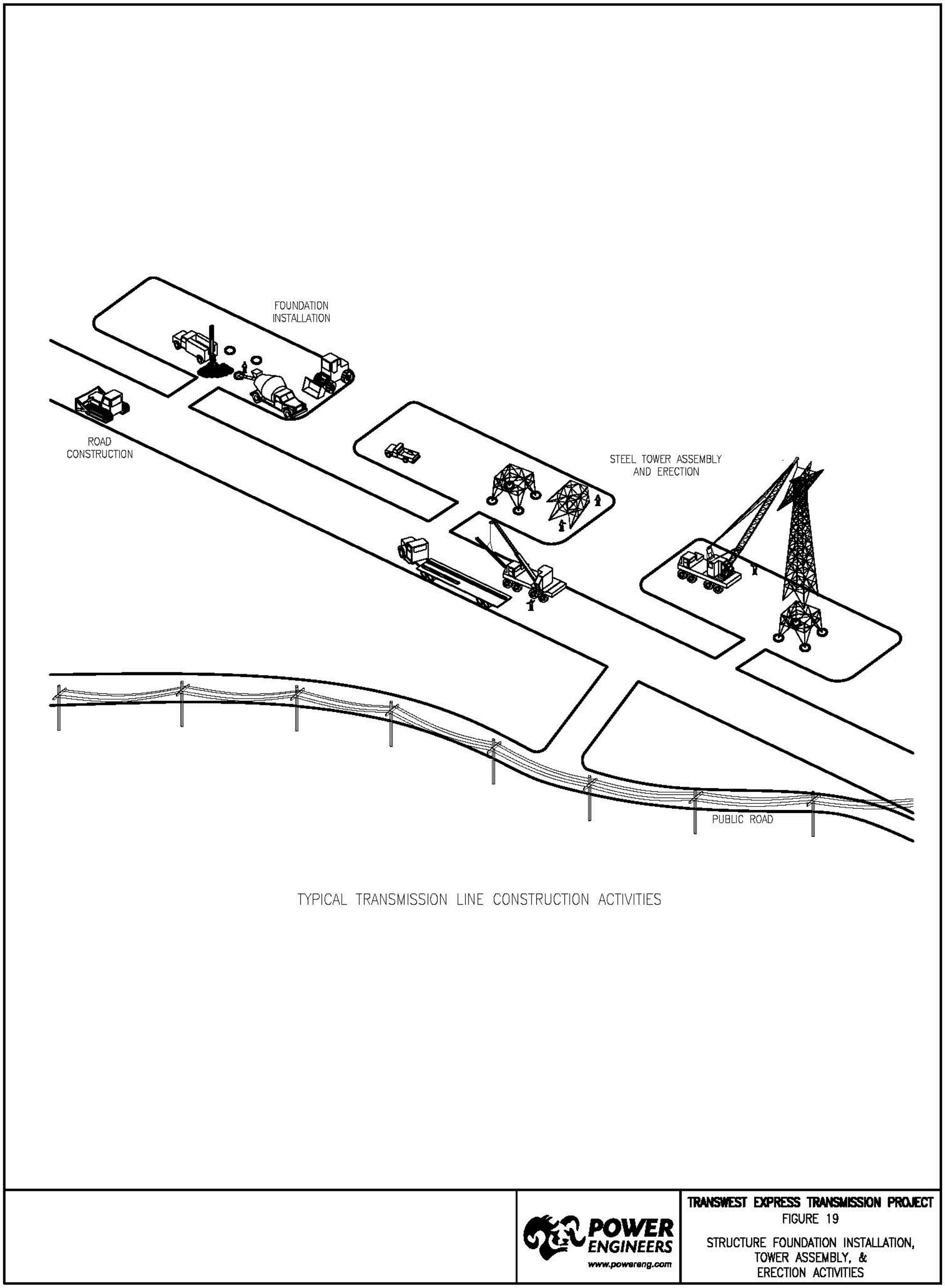

FIGURE 19 STRUCTURE FOUNDATION INSTALLATION, TOWER ASSEMBLY, AND ERECTION ACTIVITIES

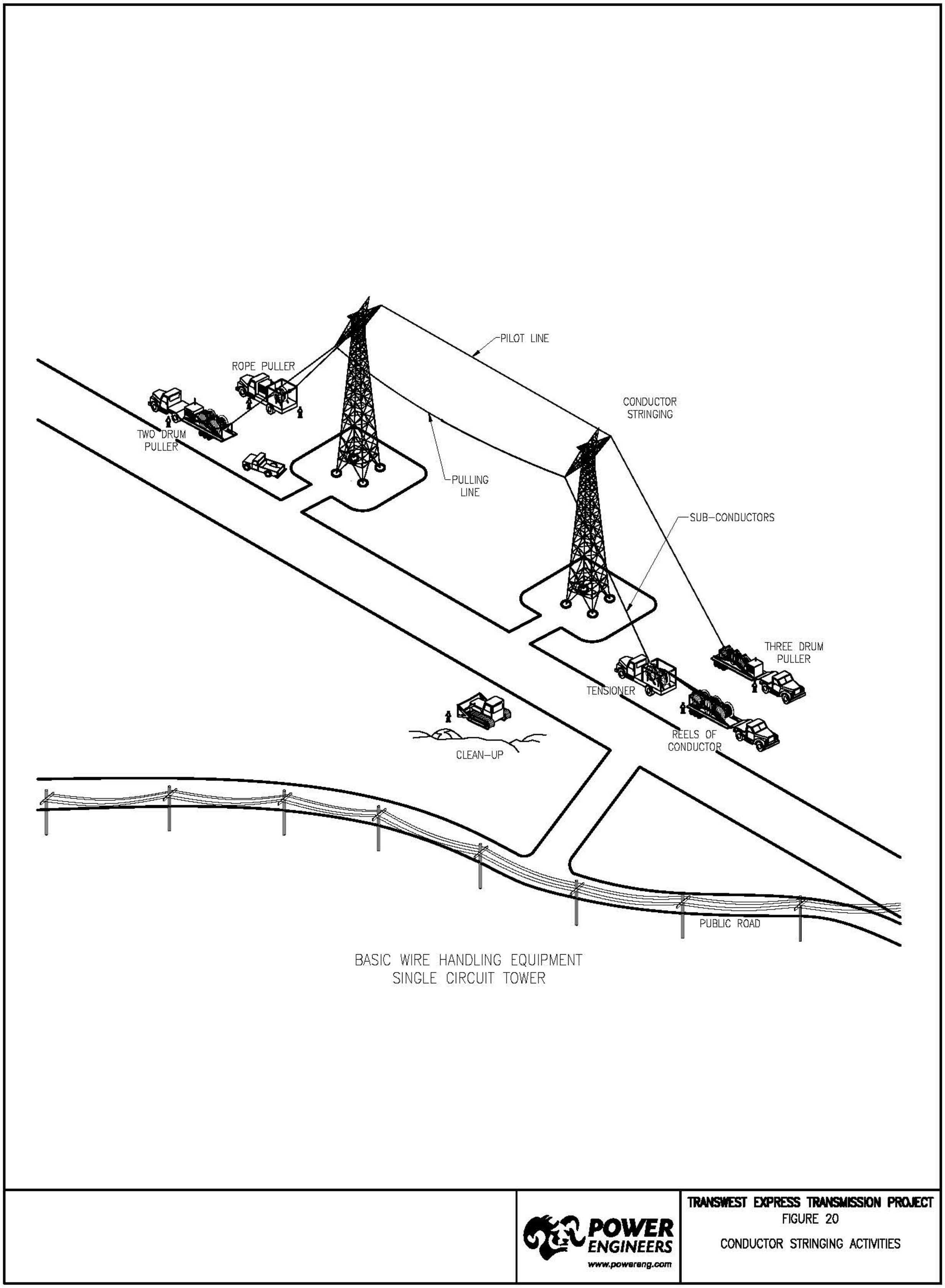

FIGURE 20 CONDUCTOR STRINGING ACTIVITIES

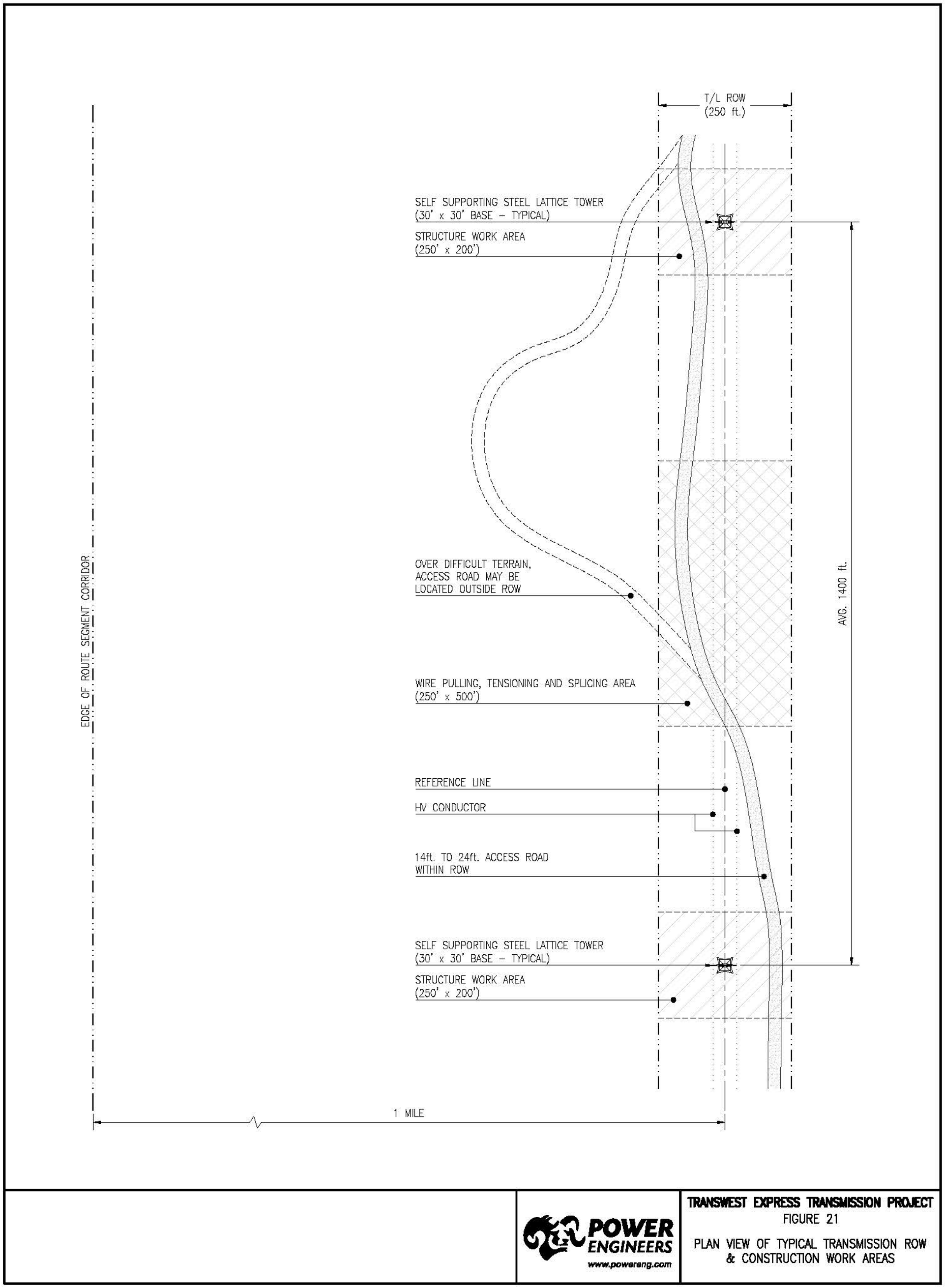

FIGURE 21 PLAN VIEW OF TYPICAL TRANSMISSION ROW AND CONSTRUCTION WORK AREAS

TABLE 12 SUMMARY OF TEMPORARY LAND DISTURBANCE FOR WORK AREAS

Temporary Work Area	Dimensions/Size	Location and Number of Frequency Needed
TWE Project Transmission Line		
Staging areas/Fly yards	Average size: 7 acres	Approximately every 5 miles
Material storage yards	Average size: 20 acres	Approximately every 30 miles
Wire pulling, tensioning, and splicing sites	ROW width × 500 feet for dead-end structure	Two sites at every dead-end structure
	ROW width × 500 feet for mid-span conductor and shield wire	Approximately every 8,500 feet
	250 × 500 feet for fiber optic cable set-up sites	Approximately every 18,000 feet
Structure work areas	250 × 200 feet per structure	All structure sites, average 4 per mile
Concrete batch plants	Average size: 5 acres	Approximately every 15 miles
TWE Project Wyoming/Utah Terminals and AC Substations/Series Compensation Station		
Storage and concrete batch plant	7.5 acres total for combined batch plant	On-site
Interconnection line structure work areas	100 × 200 feet (230 kV structures)* 150 × 200 feet (345 kV structures) 250 × 200 feet (500 kV structures)	All structure sites Approximately 8 per mile for 230 kV* Approximately 6 per mile for 345 kV Approximately 4 per mile for 500 kV
Interconnection line wire pulling, tensioning, and splicing sites	ROW width × 500 feet	Mid-span conductor and shield wire sites—every 8,500 feet
	(230 kV ROW width—100 feet)*	Fiber optic cable set-up sites—every 18,000 feet
	(345 kV ROW width-150 feet (500 kV ROW width—250 feet)	Splicing sites typically at the same locations as the pulling/tensioning sites per common construction practices
TWE Project Wyoming and Utah Ground Electrode Systems		
Overhead electrode line, structure work areas	ROW width × 100 feet (34.5 kV ROW width—50 feet)	All structure sites, average 18 per mile
Overhead electrode line, pulling, tensioning, and splicing sites	75 × 100 feet	Mid-span conductor sites—every 9,000 feet
	75 × 150 feet	All dead-end structure sites—two sites each
Material storage yards	Approximately 10 acres	One at each ground electrode site (total of two)
Line/ Well access	30 acres combined	On-site

Note: Frequency and location of material/storage yards, batch plants, and other temporary facilities may vary. Contractor may secure additional areas on private land at their discretion for the Project.

* Only applies to the Wyoming Terminal.

A tabulation of disturbance associated with the final design of these components is included in Table 3.

The following is a summary of the purpose and use of structure work areas; wire-pulling, tensioning, and splicing sites; construction staging areas/fly yards; concrete batch plants; and equipment staging and refueling sites.

Structure Work Areas

Individual structure sites will be cleared to install the transmission line structures and facilitate access for future transmission line and structure maintenance. At each structure location (±600 kV DC and 500 kV AC), an area averaging approximately 250 × 200 feet will be needed for construction laydown, structure assembly, and erection at each structure site. This temporary disturbance will occur in the ROW. To the extent necessary, the work area will be cleared of vegetation and bladed to create a safe working area for placing equipment, vehicles, and materials. After transmission line construction, areas not needed for normal transmission line maintenance, including fire and personnel safety clearance areas, will be graded to blend with the natural contours, then revegetated as required as described in Appendix Q, Reclamation Plan.

Additional equipment may be required if solid rock is encountered at a structure location. Rock-hauling, hammering, or blasting may be required to remove the rock. Excess rock that is too large or too great in volume to be used on-site will be disposed of offsite in accordance with Appendix Y, Waste Management Plan. See Section 6.2.3, Erection of Transmission Structures, for additional information on blasting activities.

Wire Pulling, Tensioning, and Splicing Sites

Wire pulling, tensioning, and splicing sites will be cleared as necessary to perform safe wire installation activities. In rare instances, terrain may dictate that some sites also be graded. During planning for wire installation activities, wire pulling, tensioning, and splicing sites will be selected to minimize clearing and blading to the extent practical, such that actual disturbance areas will not exceed those described in Table 12. After line construction, areas disturbed for wire pulling, tensioning, and splicing sites will be reclaimed as described in Appendix Q, Reclamation Plan.

Construction Staging Areas/Fly Yards

Staging areas will be in previously disturbed sites or in areas of minimal vegetative cover, where practicable. Staging areas will serve as field offices; reporting locations for workers; parking space for vehicles and equipment; and sites for material storage, fabrication assembly, concrete batch plants, and stations for equipment maintenance. Staging area dimensions and disturbance areas are summarized in Table 12. In addition, fly yards for helicopter operations will be located approximately every 5 miles along the route where helicopter construction is planned and will occupy approximately 7 acres.

Depending on location, use, type of material or equipment stored, and adjacent land use or agency or landowner requirements, the Construction Contractor(s) may be required to provide security arrangements at staging areas such as fencing and/or security guards. In some areas, the staging area may need to be scraped by a bulldozer and a temporary layer of rock laid to provide an all-weather surface. Unless otherwise directed by the landowner, the rock will be removed from the staging area upon completion of construction and the area will be reclaimed.

Concrete Batch Plant Sites

Concrete for use in structure foundations will be dispensed from portable concrete batch plants located at intervals along the ROW, with most located at staging areas adjacent to or near hard-surface roadways. Equipment typically required at a batch plant site includes gas- or diesel-powered generators, concrete trucks, front-end loaders, Bobcat loaders, dump trucks, transport trucks and trailers, water tanks, concrete storage tanks, scales, and job site trailers. Rubber-tired trucks and flatbed trailers will be used to assist in relocating the portable plant along the ROW. Commercial ready-mix concrete may be used when access to structure construction sites is economically feasible. No new concrete batch plants will be located in Clark County, Nevada (see Appendix E, Dust Control and Air Quality Plan).

Equipment Staging and Refueling Sites

Equipment will be located at staging areas, pulling and tensioning sites, or other temporary work areas previously described. These areas will be used to temporarily store equipment to be used for work on specific TWE Project activities at nearby locations.

During construction, the Construction Contractor(s) will implement standard refueling procedures for heavy equipment that is left on the ROW for long periods of time such as cranes, blades, dozers, and drill rigs. This equipment will be refueled in place. As a rule, no personal or light-duty vehicles will be allowed to refuel on the ROW. Procedures and precautions for refueling are outlined in Appendix S, Spill Prevention and Response Plan.

Staging areas and helicopter fly yards where helicopters are parked or refueled may be fenced, with security guards stationed, as necessary.

6.2.2 Excavation and Installation of Foundations and Anchors

Foundations for guyed steel lattice structures will typically be small pre-cast or cast-in-place concrete pedestals. The pre-cast pedestals will be hauled to the structure site on a flatbed truck and set in a small excavation dug by a backhoe or digger within structure work areas. Single-shaft tubular steel poles and self-supporting steel lattice structures will typically be supported by cast-in-place, drilled concrete pier foundations. For these structure types, vertical excavations for foundations will be made with power drilling equipment. Where soils permit, truck- or track-mounted augers of various sizes, depending on the diameter and depth requirements of the hole to be drilled, will be used. The required material excavation and concrete for each structure type is described below.

- **Guyed steel lattice**: Excavated material removal of approximately 2 cubic yards per structure will require one dump truck trip. No concrete will typically be required for the pedestal type foundation.
- **Self-supporting steel lattice**: Excavated material from foundation installation averages 25 to 30 cubic yards per structure. This material will likely be disposed of offsite, necessitating four to five dump truck trips per structure. Total concrete necessary for the four-leg foundations of each self-supporting tangent steel lattice structure is estimated at 28 cubic yards per structure, necessitating four to five concrete truck trips per structure.
- **Tubular steel**: Excavated material from foundation installation averages 55 to 60 cubic yards per tubular pole. This material will likely be disposed of offsite necessitating eight to nine dump truck trips per structure. Total concrete necessary for the foundation is estimated at 60 cubic yards per structure, necessitating eight to nine concrete truck trips per structure.

In rocky areas, the foundation holes may be excavated by drilling or blasting methods or installing special rock anchor or micro-pile type foundations. The rock anchoring or micro-pile system will be used in areas where site access is limited, or where adjacent structures could be damaged by blasting or rock-hauling activities. If hard rock is encountered at the planned drilling depth of structure foundations, blasting may be required to loosen or fracture rock. Blasting is described in detail in Section 6.7.1, Blasting, and Appendix C, General Blasting Plan.

In environmentally sensitive areas with very soft soils, a HydroVac, which uses water pressure and a vacuum, may be used to excavate material into a storage tank. Alternatively, a temporary casing may be used during drilling to hold the excavation open; the casing is then withdrawn as the concrete is placed in the hole. In areas where it is not possible to operate large drilling equipment because of access or environmental constraints, hand-digging may be required. Foundation or anchor holes left open or unguarded will be covered to protect the public and wildlife. Where feasible, fencing may be used.
In extremely sandy areas, water or an appropriate, approved gelling agent may be used to stabilize the soil before and during excavation.

Excavated material from any type of foundation will be used or disposed of either by hauling offsite to an approved disposal area, used on-site as fill or to maintain grade, used on-site to recontour for reclamation (see Appendix Q, Reclamation Plan, for details), or used on-site as backfill to maintain graded access roads. Each of these options will be completed in accordance with Appendix Q, Reclamation Plan, or Appendix Y, Waste Management Plan, as appropriate.

Reinforced-steel anchor bolt cages will be installed after excavation and prior to structure installation. These cages are designed to increase the structural integrity of the foundations, will be assembled at the nearest laydown yard or staging area, and delivered to the structure site via flatbed truck. These cages will be inserted in the holes prior to pouring concrete. The excavated holes containing the reinforcing anchor bolt cages will be filled with concrete.

Typically, and because of the remote location of much of the transmission line route, concrete will be provided from portable batch plants as described above. Concrete will be delivered directly to the Project site in concrete trucks with a capacity of up to 10 cubic yards. In the more developed areas along the route, the Construction Contractor(s) may use local concrete providers to deliver concrete to the site when available and economically feasible. Concrete trucks will be washed in designated areas in the ROW more than 100 feet from streams and wetlands. The hardened waste concrete will be removed from the site and properly disposed of or recycled. Additional information on concrete washout locations and activities is provided in Appendix T, Stormwater and Erosion Control Plan.

Guyed lattice structures require the installation of anchors and guy wires to support the structure. Depending on the soil type and engineering strength requirements, anchors will be either helical screw anchors, excavated plate anchors, drilled and epoxy, or grouted anchors. Screw anchors will require a small truck or track mounted drilling equipment that will drive the anchor into the ground until a set amount of torque is required to advance it further. Drilled anchors will require a small truck or track-mounted drilling equipment that will drill a hole 4 to 8 inches in diameter, 20 to 40 feet or more in depth. The anchor rod is then inserted into the open bore and secured to the soil or rock either with epoxy or grout. Plate anchors are installed in a 3- to 4-foot-diameter excavation, 10 to 20 feet deep, drilled by a small truck or track-mounted drilling rig. The anchor rod is attached to the plate anchor, placed in the hole, and the excavation is backfilled and compacted.

6.2.3 Erection of Transmission Structures

Bundles of steel members (all types of lattice structures) and associated hardware (insulators, hardware, and stringing sheaves) will be transported to each structure site by truck. Wood blocking will be hauled to each location and laid out; the structure steel bundles will be opened and laid out for assembly by sections and assembled into subsections of convenient size and weight. Typically, the leg extensions for the structures will be assembled and erected by separate crews with smaller cranes to prepare for setting of the main structure assembly. The assembled subsections will then be hoisted into place by a large crane and fastened together to form a complete structure. A follow-up crew will then tighten the bolts in the required joints. Refer to Figure 19 for a general illustration of this procedure. The use of helicopters for structure erection is described in Section 6.7.2, Helicopter Construction.

The steps in the erection of the tubular steel pole structures are substantially the same as the steel lattice structure types except for hauling to the site and assembly. The tubular steel poles have significantly fewer components (i.e., fewer, yet larger and heavier pieces) and require more care in transporting to the site, but, once at the site, take less time and manpower to assemble. For helicopter erection, a significant number of additional lifts are required to assemble and set the tubular steel pole structures. At high elevations, the tubular steel poles may become impractical because of the reduced lift capacity of helicopters, requiring the tubular steel pole to be assembled and erected in many smaller, lighter pieces.

6.2.4 Stringing of Conductors, Shield Wire, and Fiber Optic Ground Wire

Insulators, hardware, and stringing sheaves will be delivered to each structure site. The structures will be rigged with insulator strings and stringing sheaves at each shield (ground) wire and conductor position.

Interruption of road traffic on all types of roads (county, state, and federal) is not anticipated during conductor stringing and tensioning activities unless required under the terms and conditions of a specific road or highway crossing permit. Pilot lines will be pulled from structure to structure by either a helicopter (most commonly) or land-operated equipment. The use of a helicopter to pull the pilot lines is common so that impacts to road traffic are minimized or avoided. For safety and efficiency reasons, wire-stringing and tensioning activities are typically performed during daylight hours and are scheduled to coincide to the extent practicable with periods of minimal road traffic to minimize traffic disruptions.

To protect the public during stringing activities, temporary guard structures will be erected at road crossing locations where necessary. Guard structures will typically consist of H-frame wood poles placed on either side of the road to prevent ground wires, conductors, or equipment from falling on underlying facilities and disrupting road traffic. Typically, guard structures are installed just outside of the road ROW. Although the preference is for access to each of these guard structures to be located outside the road ROW, it may be necessary for access to be in the road ROW depending on topography and access restrictions imposed by the regulatory agency (e.g., the U.S. Department of Transportation, state departments of transportation, and/or county road and bridge departments). Access use in the road ROW will be performed in compliance with the stipulations of the crossing permit and regulatory agency requirements.

Site-specific road crossing locations with excessive widths (greater than 200–300 feet), such as may occur on interstate highways, will require installation of temporary guard structures in medians between opposite-traffic-flow lanes. Although TransWest does not currently anticipate needing guard structures in medians, locations requiring center median guard structures may be identified. The erection and dismantling of these temporary guard structures may require short-term traffic diversions. Traffic impacts resulting from wire-stringing include short-term traffic diversions, traffic congestion, and brief road closures (if needed) and will comply with Appendix U, Traffic and Transportation Management Plan.

Railroad crossing operations and procedures are controlled by, and permitted through, the railroad company operating the affected rail line[9]. Terms and conditions to be followed are specified in the crossing permit. Typically, stoppage of railroad traffic is not required during construction or conductor stringing and tensioning activities. Crossing activities are like those for road crossings and typically involve the use of guard structures, as discussed above. Stringing and tensioning activities will be performed in coordination with the appropriate railroad authorities. For safety and efficiency, stringing and tensioning activities are performed during daylight periods and are scheduled to coincide with times when railroad traffic is minimal. The railroad will typically provide a switchman to be present when work is being performed near or over railroad lines.

Equipment for erecting guard structures will include augers, backhoes, line trucks, boom trucks, pole trailers, and cranes. Guard structures may not be required for small roads. In such cases, other safety measures such as barriers, flagmen, or other traffic controls will be used. Following stringing and tensioning of ground wires and conductors, the guard structures will be removed, and the area reclaimed.

Pilot lines will be pulled (strung) from structure to structure by either a helicopter or land-operated equipment, then threaded through the stringing sheaves at each structure. Following pilot lines, a stronger,

[9] The Union Pacific Railroad provides an example of crossing operations and procedures on their website: https://www.up.com/real_estate/utilities/wireline/wirespecs/index.htm

larger-diameter line will be attached to conductors to pull them onto structures. This process will be repeated until the shield wire, optical ground wire, and conductor are pulled through the sheaves.

Shield wires, fiber optic cable, and conductors will be strung using powered pulling equipment at one end and powered braking or tensioning equipment at the other end of a conductor segment. Site dimensions for pulling and tensioning equipment are provided in Table 12. These sites may differ in size and dimensions depending on the structure's purpose (e.g., mid-span or dead-end), site-specific topography, and whether anchoring of the shield wire or conductor will be located at these sites. The tensioner, in concert with the puller, will maintain tension on the ground wires or conductor while they are fastened to the structures. Once each type of wire has been pulled in, the tension and sag will be adjusted, stringing sheaves will be removed, and the conductors will be permanently attached to the insulators.

Caution will be exercised during construction to avoid scratching or nicking the conductor surface, which may provide points for corona to occur. Refer to Figure 20 for a general illustration of this procedure.

At tangent and small-angle structures, the conductors will be attached to the insulators using clamps while at the larger angle dead-end structures, the conductors will be cut and attached to the insulator assemblies by "dead-ending" the conductors, either with a compression fitting or an implosive-type fitting. Both are industry-recognized methods. Before proceeding with the implosive-type fitting, appropriate land management agencies, private landowners, and public safety organizations will be notified.

Standard construction practices prior to conductor installation involve measuring the resistance of the ground to electrical current near the structures. If measurements indicate a high resistance, counterpoise will be installed, which will consist of trenching in-ground wire to a depth of 12 inches in non-cultivated land and 18 inches in cultivated land, with a ground rod driven in at the end. The counterpoise will be contained within the limits of the ROW and may be altered or doubled back and forth to meet the requirements of the TWE Project. Typical equipment used for installing ground rods includes line trucks, backhoes, and trenchers.

6.3 Terminal and Substation Construction

Terminal and substation construction activities will occur at the Wyoming and Utah Terminals and the Utah and Nevada substations. Section 6.8.3, Construction Equipment, summarizes the types of construction equipment to be used at each terminal, substation, or the series compensation station.[10]

Construction of the AC/DC terminals, substations, or the series compensation station will begin with soil borings approximately 20 to 50 feet deep and soil resistivity measurements to confirm site characteristics. A Construction Contractor will then mobilize to perform site preparation work, including grubbing and grading to establish a relatively flat (1% slope) working surface. Site preparation work will also include the construction of permanent, all-weather access roads. A fence will be erected around the perimeter of the terminal, substation, or the series compensation station as described in Section 6.3.5, Fencing and Lighting. The excavated and fill areas will be compacted to the required densities to allow structural foundation installations. Oil containment structures will be installed, as required, to prevent oil from transformers, reactors, circuit breakers, and other oil-containing equipment from getting into the ground or waterbodies in the event of a rupture or leak (see Appendix S, Spill Prevention and Response Plan).

Following foundation installation, underground electrical raceways and copper ground grid installation will take place, followed by steel structure erection and area lighting. The steel structure erection will overlap with the installation of the insulators and bus bar, and the installation of the various high-voltage apparatus typical of an electrical substation. The converter valve hall and ancillary buildings will then be

[10] Terminal construction for the TWE Project includes the adjacent substations.

erected. The installation of high-voltage transformers will require special, high-capacity cranes and specially trained crews for the unloading, setting into place, and final assembly of the transformers. While the previously mentioned activities are taking place, the enclosures that contain the control and protection equipment for the terminal, substation, and the series compensation station will be constructed, equipped, and wired. A final crushed rock surface will be placed on the subgrade to create a stable driving and access surface for the maintenance of the equipment. After the equipment has been installed, testing of the various systems will take place, followed by electrical energization of the facility. The energization of the facility is timed to take place with the completion of the transmission line work and construction of other required facilities.

6.3.1 Soil Borings

Typically, soil borings will be made on a 600-foot-grid spacing within the terminal, substation, or the series compensation station, particularly at the approximate location of large structures and equipment such as substation dead-ends and transformers, to determine the engineering properties of the soil for confirmation of foundation design. Borings will be made with truck- or track-mounted equipment. Borings will be approximately 4 inches in diameter, range from 20 to 50 feet deep, and be backfilled upon completion of soil sampling. TransWest will comply with state and local requirements regarding soil boring drilling and abandonment.

6.3.2 Site Development

The Construction Contractor(s) will perform site development work, including grubbing, grading, and construction of an all-weather access road (gravel surface). Vegetation will be cleared, as required, for the entire terminal, substation, or the series compensation station area, including approximately 8 to 10 feet outside the fence.

SOIL-2
SOIL-4

Once vegetation is cleared, the entire site will be graded nearly flat, with enough slope to provide for runoff of precipitation. The site will be graded to use existing drainage patterns to the extent practicable. Depending on the size of the site, a more complex drainage design may be required to handle larger volumes of runoff. Drainage design for large sites may require drainage zones, retention basins, and drainage structures, such as ditches or culverts. Discharge of stormwater during construction will require location-specific stormwater pollution prevention plans (see Appendix T, Stormwater and Erosion Control Plan). Creation of excessive slopes will be avoided, where practicable. Construction through areas with steep slopes, biological soil crusts, highly erodible soils, or stream channel crossings may require site-specific and specialized construction techniques, as discussed in Section 6.7.3, Water Crossings. In areas with steep slopes, site-specific grading plans will be developed. Construction of access roads, including through areas with steep slopes or sensitive soils, is further discussed in Appendix A, Access Road Siting and Management Plan. Construction through sensitive areas will be performed by adequately trained and experienced employees. In long-term disturbance areas, the entire site will be treated with a soil sterilizer to prevent vegetation growth to minimize future maintenance. Excess soil and vegetation will be disposed of in compliance with local ordinances. If needed, additional material will be obtained from existing borrow or commercial sources and will be trucked to the site using existing roads and the site access road.

Once installation of foundations, underground electrical raceways, and copper ground grid are completed, a 4- to 6-inch-deep layer of crushed rock will be applied to the finished surface of the station to provide a solid, all-weather working surface, and to protect personnel from high currents and voltages during electrical fault conditions.

6.3.3 Storage and Staging Yards

Construction material storage yards may be located outside the fenced areas of the terminal(s), substation, or the series compensation station and placed near the facility being constructed. These storage yards may be part of the terminal, substation, or the series compensation station property, or they may be temporary use areas. After construction is completed, debris and unused materials will be removed from the staging/storage yards and the yards will be returned to pre-construction conditions by the Construction Contractor(s) in accordance with Appendix Q, Reclamation Plan.

6.3.4 Grounding

A grounding system will be required in each terminal, substation, and the series compensation station for detection of faults and for personnel safety. The grounding system typically consists of buried copper conductor arranged in a grid and driven ground rods that are typically 8 to 10 feet long. The ground rods and equipment and structures are connected to the grounding conductor. The amount of conductor and length and number of ground rods required will be calculated based on fault current and soil characteristics.

6.3.5 Fencing and Lighting

Security fencing will be installed around the entire perimeter of each terminal, substation, and the series compensation station to protect sensitive equipment and prevent accidental contact with energized conductors. A 7-foot-tall fence will be constructed of chain link with steel posts. One foot of barbed wire or similar material will be installed on top of the chain link yielding a total fence height of 8 feet. Locked gates will be installed at appropriate locations for authorized vehicle and personnel access. The perimeter fence will be a permanent feature to protect the public from accessing the facility.

VR-8

Safety and security lighting at the terminals, substations, and the series compensation station will be provided inside the fence for safety and security, and for uncommon instances of emergency, nighttime repair work. Dusk-to-dawn safety and security lighting will be used at the terminals and 500 kV AC substations. TransWest will install only the minimum down-shield lighting at outdoor Project facilities to reduce light pollution and nighttime glare.

6.3.6 Foundation Installation

Foundations for supporting structures and large buildings are of two types: spread footings or drilled piers. Spread footings are placed by excavating the foundation area, placing forms and reinforced-steel and anchor bolts, and pouring concrete into the forms. After the foundation has been poured, the forms will be removed, and the surface of the foundation finished. Drilled pier foundations are placed in a hole made by a track- or truck-mounted auger. Reinforced-steel and anchor bolts are placed into the hole using a track- or truck-mounted crane. The portion of the foundation above ground will be formed. The portion below ground uses the undisturbed earth of the augured hole as the form. After the foundation has been poured, the forms will be removed, the excavation will be backfilled, and the surface of the foundation finished.

Foundations for circuit breakers, transformers, and small prefabricated buildings will be slab-on-grade type. These foundations are placed by excavating the foundation area; placing forms, reinforced steel, and anchor bolts (if required); and placing concrete into the forms. After the foundations have been poured, the forms are removed, and the surface of the foundation finished. Where necessary, provisions have been made in the design of the foundations to mitigate potential problems because of frost. Reinforced steel and anchor bolts will be transported to each site by truck, either as a prefabricated cage or in loose pieces which will then be fabricated into cages on the site. Concrete will be hauled to the site in concrete trucks.

Concrete truck wash out locations will generally be located outside of public land. Unused concrete materials will be removed and properly disposed of at an appropriate waste facility. Unused excavated material (surplus, non-topsoil soil and/or rock) will be managed on-site in accordance with Appendix Q, Reclamation Plan, or disposed of offsite in accordance with Appendix Y, Waste Management Plan.

Structures and equipment will be attached to the foundations by means of threaded anchor bolts embedded in the concrete. Some equipment, such as transformers and reactors, may not require anchor bolts.

6.3.7 Oil Containment

As indicated in Appendix S, Spill Prevention and Response Plan, some types of electrical equipment (e.g., transformers) and some types of reactors and circuit breakers are filled with an insulating liquid. Where these types of equipment are used, containment structures are required to prevent equipment-insulating liquids from reaching the ground or waterbodies in the event of a rupture or leak. These structures take many forms depending on site requirements, environmental conditions, and regulatory restrictions. The simplest type of containment is a pit, of a calculated capacity, located under the equipment that has an impervious liner. The pit is filled with rock to grade level. In case of a leak or rupture, the liquid captured in the containment pit is pumped into tanks or barrels and transported to a disposal facility. If required, more elaborate containment systems can be installed. This may take the form of an on-site or offsite storage tank and/or insulating oil-water separator equipment, depending on site requirements.

6.3.8 Structure and Equipment Installation

Supporting steel structures are erected on concrete foundations. These are set with a track- or truck-mounted crane and are attached to the foundation anchor bolts by means of a steel base plate. These structures will be used to support the energized conductors and certain types of equipment. This equipment will be lifted onto the structure by means of a truck-mounted crane and bolted to the structures; electrical connections are then made. Some equipment, such as transformers, reactors, and circuit breakers, will be mounted directly to the foundations without supporting structures. These will be set in place by means of a truck-mounted crane. Some of this equipment requires assembly and testing on the pad. Electrical connections to the equipment will then be made.

6.3.9 Equipment Housing, Control, Storage, and Ancillary Building Construction

The TWE Project will require several buildings at each terminal, substation, and at the series compensation station. Depending on size and function, these buildings will be either prefabricated or constructed on-site as concrete block or metal-clad steel frame buildings.

The following provides a brief description and approximate dimensions of the building types typically required for the DC System terminal, which include both AC/DC Converter Stations, and adjacent AC substations and the AC System substations.

Alternating Current/Direct Current Converter Station

HVDC Converter Valve Hall: This is a large building that contains the high-voltage electronics involved in the AC to DC conversion process (referred to as valves), the valve cooling circulation system (pipes required to circulate the cooling medium), clean air exchange, and other supporting environmental conditions required for operation of the converter system. The valves are typically suspended from the ceiling of the building, which requires large clearance distances to the ground and surrounding structures because of the high voltages that are generated within the building during the conversion process. The building will be approximately 60 to 80 feet in height and the footprint will be approximately 200 × 80 feet. There will be two buildings of this size: one housing the valve equipment for the positive DC pole and the other housing the equipment for the negative DC pole.

HVDC Auxiliary Support Building: This building is typically placed between the two valve halls, or very near the valve halls. This building contains the pumps and heat exchange system for cooling of the valves. The building is typically 100 feet wide, 100 feet long, and approximately 20 feet high.

Main Operations Building: This building houses operations and general office and support functions. It is approximately 150 × 150 feet square and is typically a two-story building with a complete basement. The HVDC control room and supporting control systems are housed in a main operations building. Telecommunications equipment, HVDC controls equipment, and the operational control room are typically located in separate, secure spaces to assure safety and to restrict access to all levels of automation and telecommunication. Facilities that support operations, administrative staff, and maintenance dispatch are also located within this building. Control spaces will be equipped with a full range of uninterrupted power supply power protection, fire safety operations, and dispatcher coordination centers. This facility will also include the SCADA control and monitoring systems for the Project's entire AC substation, and transmission systems, as necessary, up to the points of interconnection with the regional grid.

Security Control Office Building: This building will be an approximately 30 × 30-foot, single-story building with a full basement to facilitate life safety and other equipment, including domicile facilities for security personnel on extended shift work.

Diesel Generator Building: This building will be an approximately 100 × 30-foot, single-story building. This building contains diesel generators and support equipment necessary to operate the facility if the primary power source is lost.

DC Switchyard Building: This building is typically a single-story building of approximately 30 × 60 feet. One or more control buildings may be required at each terminal to house control devices, battery banks for primary control power, and remote monitoring equipment. The size and construction of the building will depend on DC switchyard requirements. Typically, the control building will be constructed of concrete block, pre-engineered metal-sheathed, or composite-surfaced materials. Once the control house is erected, protection and control equipment will be mounted and wired inside.

Hazardous Chemical and Dry Storage Building: This building will store chemicals (in bulk) and other items outside and apart from the other buildings in the terminal complex. This building will be approximately 30 × 30 feet. This building will be supplied with the code-required containment, life, and fire safety systems.

Dry Indoor Storage Building: This building will be developed based on the requirements of the HVDC Construction Contractor and is estimated to be an approximately 100 × 150-foot, single-story, high bay building.

Alternating Current Substation

The following provides a brief description and approximate dimension of the building types typically required for the terminals, substations, and the series compensation station.

The **AC Switchyard Control House** is typically a single-story structure of approximately 50 × 80 feet. One or more control buildings may be required at each switchyard, substation, or at the series compensation station to house protective relays, control devices, battery banks for primary control power, and remote monitoring equipment. The size and construction of the building will depend on individual substation requirements. Typically, the control building will be constructed of concrete block, pre-engineered metal-sheathed, or composite-surfaced materials. Once the control house is erected, protection and control equipment will be mounted and wired inside.

6.3.10 Conductor Installation

The two main types of high-voltage conductors used in terminals and substations are tubular aluminum for rigid bus sections and/or stranded aluminum conductor for strain bus sections and connections to equipment. Rigid bus sections will be a minimum of 4 inches in diameter and will be supported on porcelain or polymer insulators on steel supports. The bus sections will be welded together and attached to special fittings for connection to equipment. Stranded aluminum conductors will be used as flexible connectors between the rigid bus sections and the station equipment.

6.3.11 Conduit and Control Cable Installation

Low-voltage connections are required for most terminal and substation equipment to protect relaying and control circuits. These circuits allow for metering, protective functions, and control (both remote and local) of the power system. Connections will be made from the control building to the equipment through multi-conductor control cables installed in conduits and/or a pre-cast concrete cable trench system.

6.4 Ground Electrode Construction

Construction of the two ground electrode facilities for the DC System, located near the Wyoming and Utah Terminals, will be initiated with a survey and staking to layout the location of the access road; deep earth electrode wells; control building; and low-voltage underground electrical, control, and monitoring cables connecting the wells to the control building. The Construction Contractor(s) will perform site development work, including grubbing and grading, and construction of an all-weather, gravel access road. Grubbing, grading, and contouring of the entire site is not required. Removal of vegetation will be required for the access road; control building site; well sites; alignments of the underground electrical, control, and monitoring cables; and on-site material storage yard/staging area.

Once the vegetation is cleared, the control building site will be graded essentially flat, with enough slope to provide for runoff of precipitation. After grading, the control building site will be treated with a soil sterilizer to prevent vegetation growth and minimize future maintenance. Next, a layer of gravel or crushed rock will be applied to the finished surface of the control building site. Except for the access roads, no additional grading will be required. Clearing and grading material will be disposed of in compliance with local ordinances. Material from offsite will be obtained at existing borrow or commercial sites and will be trucked to the ground electrode site using existing roads and the ground electrode site access road.

Security fencing will be installed around the perimeter of the control building site. This 7-foot-tall fence will be constructed of chain link with steel posts. One foot of barbed wire or similar material will be installed on top of the chain link yielding a total fence height of 8 feet. A locked gate will be installed for authorized vehicle and personnel access.

Foundations for the prefabricated building will be slab-on-grade type. These foundations are placed by excavating the foundation area; placing forms, reinforced steel, and anchor bolts; and placing concrete into the forms. After the foundations have been poured, the forms are removed, and the surface of the foundation finished. Where necessary, provisions will be made in the design of the foundations to mitigate potential problems because of frost.

Reinforced steel and anchor bolts will be transported to each site by truck and will then be fabricated into cages on the site. Concrete will be hauled to the site in concrete trucks. Unused excavated material (surplus non-topsoil soil and/or rock) will be managed on-site in accordance with Appendix Q, Reclamation Plan, or disposed of offsite in accordance with Appendix Y, Waste Management Plan. The prefabricated building will be transported to the site by truck and attached to the foundations by means of threaded anchor bolts embedded in the concrete.

Each ground electrode site will require drilling approximately 60 deep earth wells. Each electrode well will be a 12- to 18-inch-diameter bore drilled to a depth of 200 to 700 feet (based on site-specific design details). Well drilling will require small amounts of water, which will be procured from commercial or municipal sources. Groundwater will not be removed; although, small amounts of water, mud, and other excavated material will be brought to the surface as part of the drilling process. Excess water, mud, drilling fluids, and spoils will be contained adjacent to the drill rig and, when completed, will be disposed of per landowner and agency requirements.

Once drilling is completed, a wire will be grouted into the well, the well capped, and a small area excavated around the well head for the installation of the utility access vault. A pre-cast concrete utility access vault will be installed. This utility access vault provides access to the well in addition to preventing public access to the well connections or electrode components.

Several underground cables will be installed in trenches connecting each well to the control building. These cables provide a low-voltage electrical connection from the control building to each well and perform control and monitoring functions. Cables will be direct buried, and the trench will be backfilled and compacted with excavated material. Once backfilling is complete, the trenched area will be contoured to match existing slopes and grades.

A communication system used for monitoring and control of the ground electrode facility will be installed. This communication link will require installation of either a buried or overhead fiber optic cable and equipment, or fixed radio communication equipment and antenna.

Connection to a local electric distribution circuit will be required to provide power to the site. An emergency generator with a liquid propane gas fuel tank will be installed adjacent to the control building inside the fenced area.

6.5 Communication System Construction

The fiber optic network will require regeneration sites at periodic distances along the transmission line, as reflected in the final design. The communication system facilities will be constructed concurrently with the transmission line.

Construction will be initiated with a survey and staking to layout the location and extent of the regeneration site. The Construction Contractor(s) will perform site development work including grubbing, grading, and construction of an all-weather, gravel access road.

Clearing of vegetation will be required for the entire regeneration site, including approximately 8 to 10 feet outside the fence. Once vegetation is cleared, the entire regeneration site will be graded essentially flat, with enough slope to provide for runoff of precipitation. After grading, the entire site will be treated with a soil sterilizer to prevent vegetation growth and minimize future maintenance. Next, a layer of gravel or crushed rock will be applied to the finished surface of the regeneration site. Excess material will be disposed of in compliance with Appendix Y, Waste Management Plan. If needed, additional material will be obtained at existing borrow or commercial sites and will be trucked to the regeneration site using existing roads and the regeneration site access road.

Security fencing will be installed around the entire perimeter of each regeneration station. This 7-foot-tall fence will be constructed of chain link with steel posts. One foot of barbed wire or similar material will be installed on top of the chain link yielding a total fence height of 8 feet. A locked gate will be installed for authorized vehicle and personnel access.

Foundations for the prefabricated building(s) will be slab-on-grade type. These foundations are placed by excavating the foundation area; placing forms, reinforced steel, and anchor bolts; and placing concrete into the forms. After the foundations have been poured, the forms are removed, and the surface of the foundation finished. Where necessary, provisions have been made in the design of the foundations to mitigate potential problems because of frost.

Reinforced steel and anchor bolts will be transported to each site by truck which will then be fabricated into cages on the site. Concrete will be hauled to the site in concrete trucks. Unused excavated material (surplus non-topsoil soil and/or rock) will be managed on-site in accordance with Appendix Q, Reclamation Plan, or disposed of offsite in accordance with Appendix Y, Waste Management Plan. Prefabricated building(s) will be transported to the site by truck and attached to the foundations by means of threaded anchor bolts embedded in the concrete.

The fiber optic cable will be connected from the splice box located near the bottom of the nearest transmission structure to the control building at the regeneration site via two diverse paths, either overhead or underground. The overhead path may require one, two, or three short, distribution-type poles located on the transmission ROW. An underground path will require trenching and burial of an underground fiber optic cable. Trenching will occur on the transmission ROW.

Connection to a local electric distribution circuit will be required to provide power to the site.
An emergency generator, with a liquid propane gas fuel tank, will be installed at the site, inside the fenced area.

A short structure (less than 30 feet tall) with a UHF/VHF radio antenna will be installed to provide communication support for transmission line patrol and maintenance operations and allow emergency operations independent of commercial common carrier (i.e., cellular telephone).

6.6 Post-Construction Communication, Cleanup, and Reclamation

Construction of the terminals, ground electrode systems, series compensation station, and transmission line will generate a variety of solid wastes, including concrete, hardware, and wood debris. The solid wastes generated during construction will be recycled or hauled away for disposal in accordance with Appendix Y, Waste Management Plan. Excavation along the ROW and at terminals and substations will generate excavated material that could potentially be used as fill. If unused excavated material (i.e., surplus non-topsoil soil and/or rock) resulting from Project activities remains, it will be managed on-site in accordance with Appendix Q, Reclamation Plan, or disposed of offsite in accordance with Appendix Y, Waste Management Plan. Solid waste will include packing material, such as crates, pallets, and paper wrapping used to protect equipment during shipping. It is assumed a 12-yard dumpster will be filled once a week with waste material for the duration of each terminal or substation operation. Detailed waste handling practices are provided in Appendix Y, Waste Management Plan.

Cleanup and reclamation will consist of the actions listed below.

- Removing packing crate reels, shipping material, and debris, and disposing of them at approved landfills or recycling facilities
- Backfilling holes and ruts in access roads, installing water bars, and doing final grading
- Dressing work sites and structure sites to remove ruts

- Reclamation of temporary work areas and roads not required for operation in accordance with Appendix Q, Reclamation Plan
- Repairing fences and gates to their original condition or better
- Grounding fences
- Contacting property owners and processing claims for settlement

ROW-20

Within 90 calendar days of construction completion, TransWest will provide the AO with geographic information system data for the ROW and TWE Project facilities that are compatible with BLM systems and compliant with geospatial standards. Within 120 calendar days of completion of construction, TransWest will provide the AO with as-built drawings and a certification of construction verifying that the facility has been constructed in accordance with the design, plans, specifications, and applicable laws and regulations.

6.7 Special Construction Practices

6.7.1 Blasting

As previously described, foundations for tubular steel poles and self-supporting steel lattice structures will normally be installed using drilled shafts or piers. Foundations for guyed steel lattice structures will typically be small pre-cast or cast-in-place concrete pedestals. If hard rock is encountered in the planned drilling depth, blasting may be required to loosen or fracture the rock to reach the required depth to install the structure foundations. Blasting will occur in accordance with Appendix C, General Blasting Plan, and site-specific blasting plans tiered to Appendix C, General Blasting Plan, will be required prior to each blast. The Construction Contractor(s) will be required to provide data to support the adequacy of the plans for the safety of structures and slopes and to validate that an adequate foundation is obtained. When necessary, blasting will take place between sunrise and sunset.

6.7.2 Helicopter Construction

Helicopter construction techniques may be used for the erection of structures, stringing of conductor and shield wire, and other Project construction activities. The use of helicopters for structure erection is based on site- and region-specific considerations, including access to structure locations, sensitive resources, permitting restrictions, construction schedule, weight of structural components, time of year, elevation, availability of heavy lift helicopters, and/or construction economics.

Helicopter erection of structures is a viable option for locations without prohibitions or restrictions on helicopter use. As such, “fly yards” have been incorporated into Project planning. In areas without prohibitions or restrictions on helicopter use, the decision to employ helicopter construction techniques will be ultimately be made by the Construction Contractor(s). Helicopter erection will be used in areas with extremely difficult access, in areas with ground access restrictions, or in areas where it is required by mitigation measures.

The use of helicopters for pulling shield wire and conductor lead lines is the normal and expected construction technique for wire-stringing and helicopters will be used for this purpose on the TWE Project.

Helicopters may be used during Project construction to deliver construction personnel, equipment, and materials to structure sites, and to place structures and install hardware. Helicopters may also be used to support the administration and management of the TWE Project by TransWest. Except in areas with restrictions on constructing or maintaining access roads, the use of helicopter construction methods will not change the length of the access road system required for operating the TWE Project because vehicle access to each structure site will still be required, regardless of the construction method used.

When helicopter construction methods are used, the structure assembly activities will be based at a fly yard. Fly yards will be approximately 7 acres and will typically be sited at about 5-mile intervals in the section of the line using helicopter erection. Optimum helicopter methods of erection will be used. Bundles of steel members and associated hardware for up to 15 to 20 structures (including insulators, hardware, blocking, stringing sheaves, etc.) will be transported to the appropriate fly yard by truck and stored. The steel bundles will be opened and laid out by component section and then built into assemblies of convenient size and weight according to the helicopter's lifting capabilities. The leg extensions will typically be transported to the structure location, assembled, and erected in place (with smaller equipment) in preparation for flying the completed structure sections to each location. After a planned quantity of structures is completely assembled, the helicopter and support force will be mobilized and, in a few days, will set the planned structures in the appropriate section. A follow-up crew will then tighten the bolts in the joints.

Prior to installation, each structure will be assembled in multiple sections at the fly yard. Structure sections or components will be assembled by weight, based on the lifting capacity of the helicopter in use. The lift capacity of helicopters is dependent on the elevation of the fly yard, the structure site, and the intervening terrain. The heavy lift helicopters that could be used to erect the complete structures or sections of a structure will be able to lift a maximum of 15,000 to 20,000 pounds per flight, depending on elevation.

After assembly at the fly yard, the complete structure or structure section will be attached by cables from the helicopter to the top of the structure section and airlifted to the structure location. Upon arrival at the structure location, the section will be placed directly onto the foundation or on top of the previous structure section. Guide brackets attached on top of each section will assist in aligning the stacked sections. Once aligned correctly, line crews will climb the structures to bolt the sections together permanently.

A helicopter may be used to move personnel and equipment (e.g., pulling lines and assembling structures). Helicopters will set down in areas previously identified to receive temporary disturbance such as fly yards and staging areas. Personnel may be dropped at pulling and tensioning sites or other work areas previously described. FAA regulations will be followed when using helicopters. Notification will be made to coordinate the air space with other helicopters or aircraft in the area (e.g., seeding operations, fire support, and Military Operation Areas).

Each fuel truck used to fuel helicopters will be equipped with automatic shutoff valves and will carry spill kits. In addition to the required preventive spill measures, a water truck may be required to spray the site to reduce dust. The Construction Contractor(s) will be required to clean up materials released on the ROW. Accidental spills will be handled according to the guidelines presented in Appendix S, Spill Prevention and Response Plan.

6.7.3 Water Crossings

Access roads are designed and will be constructed to minimize disruption of natural drainage patterns and wetlands and waterbodies including rivers, streams, ephemeral streams, ponds, lakes, reservoirs, wetlands, springs, and playas. Structure sites, new access roads, and other disturbed areas will be located away from waterbodies, wherever practicable. A detailed Access Road Siting and Management Plan is provided in Appendix A.

6.7.4 Undercrossing Trenches

The TWE Project 500 kV AC transmission line will cross under existing 500 kV transmission lines at seven locations. At four of these crossings, a trench will be excavated beneath the transmission line to maintain enough electrical clearance to the existing wires above and to the ground surface below (TransWest 2022a, 2022b). Each excavated area is expected to be 200 to 750 feet long, up to 90 feet wide at the bottom, and as much as 220 feet wide at the top. The depth of cut will vary from 0 to as much as 30 feet along the trench length. Side slopes of approximately 3H:1V are anticipated in most locations, though side slopes as steep as 2H:1V may be utilized for short distances to ensure all disturbance stays within the ROW. Small berms, approximately 1-foot-high, may be installed along the uphill edges of the trench to prevent stormwater surface flow from entering the trench. Alternately, approximately 1-foot-deep ditches may be utilized to channel stormwater surface flow away from the excavations. No significant amount of ponding is anticipated.

6.7.5 Disturbance to Cryptobiotic Soil Crust

SOIL-2

TransWest has minimized the need to disturb areas identified as containing biological soil crusts. Locations that will be disturbed include locations in Cedar City FO and Caliente FO. TransWest will demarcate the areas as a sensitive resource as noted in Appendix I, Flagging, Fencing, and Signage Plan. In addition, TransWest will utilize drive-and-crush methods and will limit equipment only to that necessary to complete specific tasks (e.g., cranes, pulling/tensioning trucks) within these areas to avoid clearing of these soils as an additional minimization measure.

6.8 Direct Current System Construction Schedule, Workforce, and Equipment

The construction schedule for the DC System will incorporate timing restrictions for special-status plant and wildlife species, as determined by the land management and regulatory agencies in their respective decision documents and as reflected in Appendix Z, Record of Decision Requirements Index. Conceptual construction schedules are described in Section 6.8.1, Construction Schedule. Estimated workforce and equipment needs are described in Sections 6.8.2, Construction Workforce, and 6.8.3, Construction Equipment, respectively.

6.8.1 Construction Schedule

The total construction timeframe for the DC System is anticipated to be approximately 3 years; line construction will be concurrent with construction of terminals and the ground electrode systems.

A conceptual schedule for the DC System is shown in Figure 22. Figures 23a and 23b provide a schedule for the Wyoming Terminal and Utah Terminal. Figure 24 presents a construction schedule for the ground electrode systems.

The transmission line schedules have a staggered start, providing time for setups, material and equipment logistics, and coordination between the various construction disciplines. The total elapsed time of the combined transmission line schedule is approximately 118 weeks. These construction schedules take anticipated conditions into consideration; however, winter weather, delays in equipment manufacturing and/or delivery, seasonal restrictions required for permitting, and/or unexpected mitigation could interrupt the schedule, inserting delays of weeks to several months or more.

Construction of the transmission line is anticipated to begin at various locations along the line at different times of the year to accommodate weather, terrain, and/or biological resource constraints that may prohibit construction during certain times of the year.

Transmission line construction activities on any section of the route may last up to 1 year or more, although the total duration of active construction will be much shorter, in the range of a few months. For any section of the route, transmission line construction will be characterized by short periods (ranging from 1 day to 1–2 weeks) of relatively intense activity interspersed by periods with no activity.

The construction of the Wyoming and Utah Terminals is planned to start approximately 3 to 6 months after the start of the construction of the transmission line and run concurrently. The total elapsed time is scheduled for approximately 2.5 years. The construction of the AC/DC converter station may take place in two stages where the second stage is several years later. If this is the case, the construction of the second stage AC/DC converter station would take place within the terminal yards built during the first stage. These construction schedules take anticipated conditions into consideration; however, winter weather at the Wyoming Terminal or Utah Terminal could interrupt the schedule, inserting delays of weeks to several months or more. Constructing the ground electrode facilities will take approximately 1 year. Construction activities for the ground electrode facilities are planned to start 18 months after the start of construction of the transmission line.

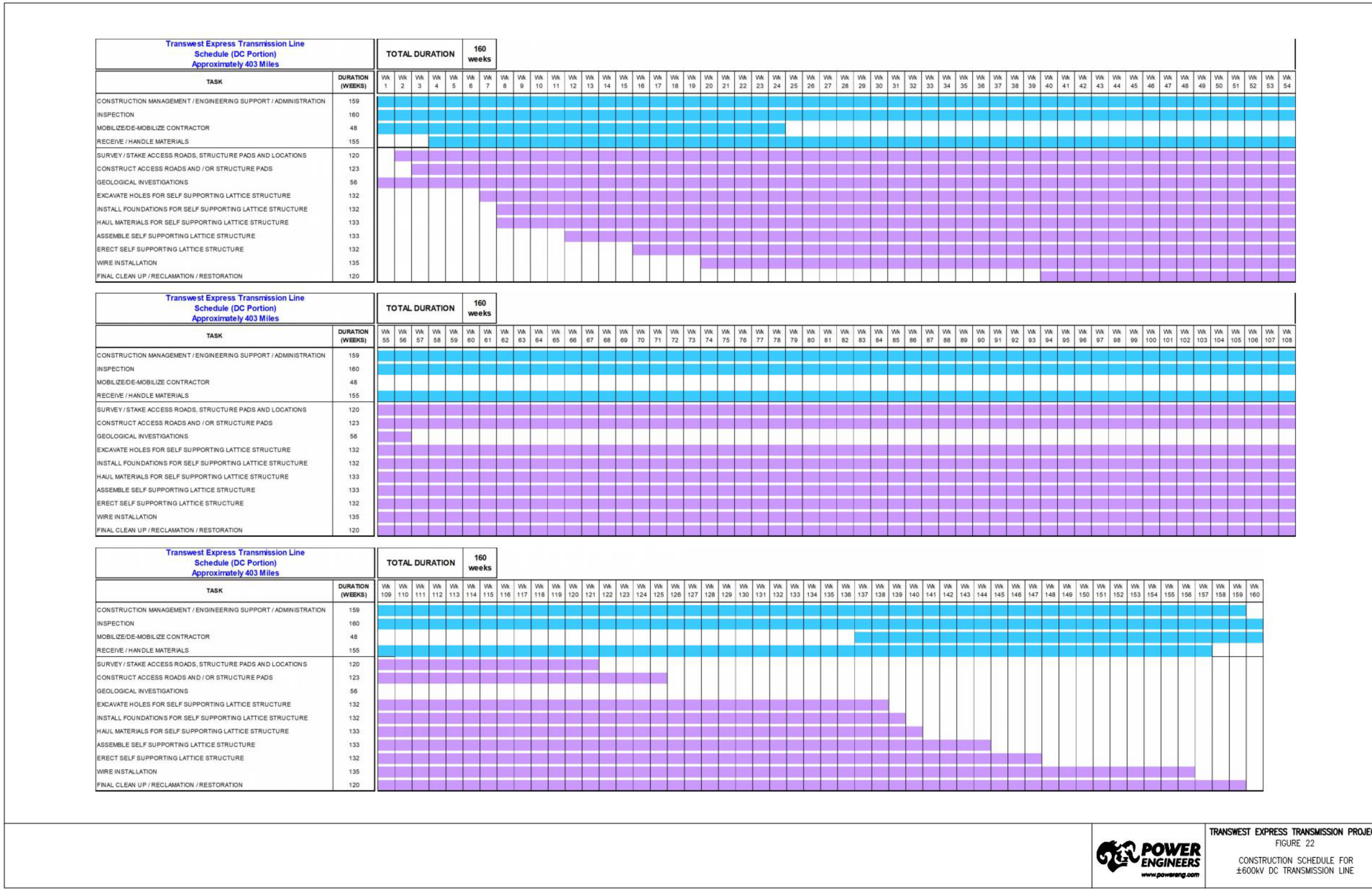

FIGURE 22 CONSTRUCTION SCHEDULE FOR ±600 KV DC TRANSMISSION LINE

WYOMING TERMINAL

TOTAL DURATION: 111 week

TASK	DURATION (WEEKS)
AC/DC CONVERTER STATION	
SITE GRADING	13
BELOW-GRADE WORK (FOUNDATIONS, CONDUIT, GROUNDING)	32
BUILDING CONSTRUCTION	35
EQUIPMENT INSTALLATION	39
EQUIPMENT TESTING	21
OPERATIONAL	9
500 kV AC SUBSTATION	
SITE GRADING	26
BELOW-GRADE WORK (FOUNDATIONS, CONDUIT, GROUNDING)	30
BUILDING CONSTRUCTION	34
EQUIPMENT INSTALLATION	30
EQUIPMENT TESTING	17
OPERATIONAL	7
230 kV AC SUBSTATION	
SITE GRADING	13
BELOW-GRADE WORK (FOUNDATIONS, CONDUIT, GROUNDING)	17
BUILDING CONSTRUCTION	17
EQUIPMENT INSTALLATION	13
EQUIPMENT TESTING	9
OPERATIONAL	4

UTAH TERMINAL

TOTAL DURATION: 111 week

TASK	DURATION (WEEKS)
AC/DC CONVERTER STATION	
SITE GRADING	13
BELOW-GRADE WORK (FOUNDATIONS, CONDUIT, GROUNDING)	32
BUILDING CONSTRUCTION	35
EQUIPMENT INSTALLATION	39
EQUIPMENT TESTING	21
OPERATIONAL	9
500/345 kV AC SUBSTATION	
SITE GRADING	22
BELOW-GRADE WORK (FOUNDATIONS, CONDUIT, GROUNDING)	22
BUILDING CONSTRUCTION	26
EQUIPMENT INSTALLATION	22
EQUIPMENT TESTING	13
OPERATIONAL	6

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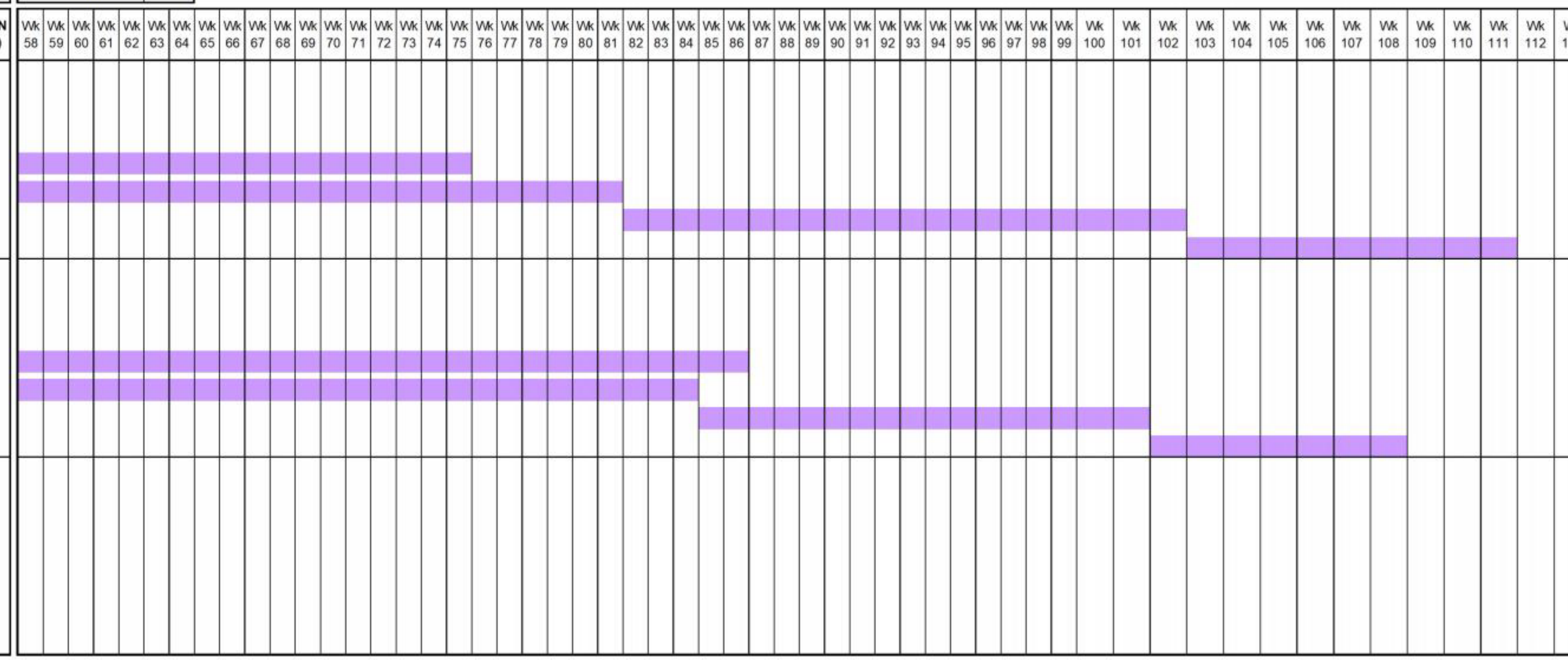
TRANSWEST EXPRESS TRANSMISSION PROJECT
FIGURE 23a
CONSTRUCTION SCHEDULE FOR WYOMING & UTAH TERMINALS SHEET 1

FIGURE 23A CONSTRUCTION SCHEDULE FOR WYOMING AND UTAH TERMINALS, SHEET 1

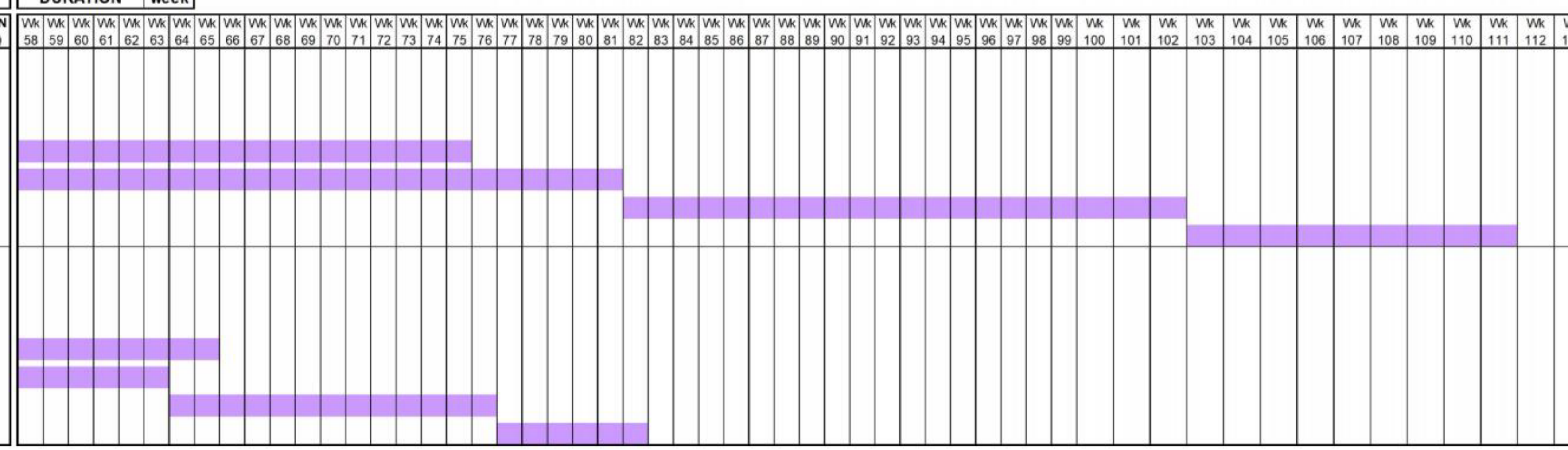
WYOMING TERMINAL — TOTAL DURATION: 111 week

TASK	DURATION (WEEKS)
AC/DC CONVERTER STATION	
SITE GRADING	13
BELOW-GRADE WORK (FOUNDATIONS, CONDUIT, GROUNDING)	32
BUILDING CONSTRUCTION	35
EQUIPMENT INSTALLATION	39
EQUIPMENT TESTING	21
OPERATIONAL	9
500 kV AC SUBSTATION	
SITE GRADING	26
BELOW-GRADE WORK (FOUNDATIONS, CONDUIT, GROUNDING)	30
BUILDING CONSTRUCTION	34
EQUIPMENT INSTALLATION	30
EQUIPMENT TESTING	17
OPERATIONAL	7
230 kV AC SUBSTATION	
SITE GRADING	13
BELOW-GRADE WORK (FOUNDATIONS, CONDUIT, GROUNDING)	17
BUILDING CONSTRUCTION	17
EQUIPMENT INSTALLATION	13
EQUIPMENT TESTING	9
OPERATIONAL	4



UTAH TERMINAL — TOTAL DURATION: 111 week

TASK	DURATION (WEEKS)
AC/DC CONVERTER STATION	
SITE GRADING	13
BELOW-GRADE WORK (FOUNDATIONS, CONDUIT, GROUNDING)	32
BUILDING CONSTRUCTION	35
EQUIPMENT INSTALLATION	39
EQUIPMENT TESTING	21
OPERATIONAL	9
500/345 kV AC SUBSTATION	
SITE GRADING	22
BELOW-GRADE WORK (FOUNDATIONS, CONDUIT, GROUNDING)	22
BUILDING CONSTRUCTION	26
EQUIPMENT INSTALLATION	22
EQUIPMENT TESTING	13
OPERATIONAL	6



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TRANSWEST EXPRESS TRANSMISSION PROJECT
FIGURE 23b
CONSTRUCTION SCHEDULE FOR WYOMING & UTAH TERMINALS SHEET 2

FIGURE 23B CONSTRUCTION SCHEDULE FOR WYOMING AND UTAH TERMINALS, SHEET 2

CONSTRUCTION SCHEDULE FOR ONE GROUND ELECTRODE LOCATION

TASK	DURATION (WEEKS)	Wk 1 – Wk 38
SITE GRADING	3	Wk 1 – Wk 3
DRILLING 60 WELLS	8	Wk 5 – Wk 12
EXCAVATE CABLE TRENCHES	6	Wk 5 – Wk 10
BUILD CONCRETE CABLE TRENCHES	10	Wk 7 – Wk 16
INSTALL ELECTRODE ELEMENTS	8	Wk 6 – Wk 13
INSTALL LV CABLES, SWITCHES	4	Wk 21 – Wk 24
INSTALL TEMPERATURE & CURRENT TRANSDUCERS, WIRING	2	Wk 23 – Wk 24
BUILD CONTROL / COMMUNICATION BUILDING & FENCED AREA	8	Wk 5 – Wk 12
INSTALL SITE COMMUNICATIONS EQUIPMENT, SCADA	4	Wk 26 – Wk 29
ELECTRODE COMMISSIONING*	8	Wk 31 – Wk 38

*PERFORMED AFTER CONVERTER STATIONS ARE FUNCTIONAL

CONSTRUCTION SCHEDULE FOR LOW VOLTAGE TRANSMISSION LINE (10 MILES ASSUMED)

TASK	DURATION (WEEKS)	Wk 1 – Wk 38
SURVEY / STAKE ACCESS ROADS & STRUCTURE PADS	3	Wk 1 – Wk 3
CONSTRUCT ACCESS ROADS AND / OR STRUCTURE PADS	4	Wk 3 – Wk 6
FOUNDATION EXCAVATION	3	Wk 6 – Wk 8
HAUL STRUCTURES	3	Wk 8 – Wk 10
INSTALL STRUCTURES	4	Wk 9 – Wk 12
INSTALL WIRES	2	Wk 12 – Wk 13
FINAL CLEAN UP / RECLAMATION / RESTORATION	4	Wk 14 – Wk 17

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TRANSWEST EXPRESS TRANSMISSION PROJECT
FIGURE 24
CONSTRUCTION SCHEDULE FOR GROUND ELECTRODE FACILITIES

FIGURE 24 CONSTRUCTION SCHEDULE FOR GROUND ELECTRODE FACILITIES

6.8.2 Construction Workforce

The TWE Project will be constructed by contract personnel, with TransWest responsible for Project management, Project administration, and inspection. The construction workforce will consist of laborers, craftsmen, supervisory personnel, support personnel, and construction management personnel who will perform the construction tasks. Contract personnel will be encouraged to purchase materials, equipment, and supplies from vendors in the local area where construction activities occur. In this way, local economies can benefit from the sales and use taxes that materials, equipment, and supply purchases generate. For materials, equipment, and supplies that must be purchased from outside of the local economy, contract personnel will be encouraged to have these items delivered to the counties in which the items will be used. Timely reporting of taxable purchases will also be encouraged so that local economies receive the economic benefit.

Estimated construction workforce requirements by major activity are summarized in Tables 13 and 14. Table 13 identifies the estimated personnel and equipment that is required for the DC System. The total estimated number of construction personnel for construction of the entire transmission line is 630 people. Table 14 identifies the estimated personnel and equipment required for each of the two terminals and each of the two ground electrode systems. The total estimated number of construction personnel for construction of both terminals and both ground electrode systems is 360 people; therefore, the total estimated workforce for the complete DC System is approximately 990 people.

Construction will usually occur between 7:00 a.m. and 7:00 p.m., Monday through Saturday. Additional hours may be necessary to make up schedule deficiencies or to complete critical construction activities. Additional work hours may include Sundays or extended daylight hours during the summer. Night work is not anticipated for this Project.

Temporary work camps are not expected to be necessary for the construction of the TWE Project. The variables listed below will be considered in determining if work camps will be required.

- The total distance between living facilities for construction workers and designated work areas. A one-way travel time of 2 hours may be considered as a limit in determining if temporary work camps are necessary.
- Workers' union wage agreement regarding the driving time one-way (to worksite) or round trip (to/from worksite). If the agreement allows for driving time, then the camp consideration may not be required.
- The ability of existing communities to provide housing for workers or to make improvements to meet the workers' accommodation demands.
- Socioeconomic impacts on communities along the route with or without the work camps.
- Economic feasibility of permitting a work camp.
- Service life of the work camps and the reclamation requirements after tear down.

The TWE Project does not appear to have areas that are more than 50 miles (on paved roads) from the ROW to existing communities or towns. The average travel distance to the Project is approximately 15 miles. The populations of these towns indicate their capability to handle the housing and/or accommodation demands of the construction workers. During typical transmission line construction, the entire workforce and support personnel usually do not all work in one area at the same time. One or more activities are completed in one location, and the associated crews move to a new location before all the other activities become fully operational in that area.

TABLE 13 ESTIMATED PERSONNEL AND EQUIPMENT FOR TRANSMISSION LINE CONSTRUCTION FOR EACH PHASE OF THE DC SYSTEM

Activity	People	Quantity	Type of Equipment	Track or Rubber Tires
Survey crew	6	2	Pickup trucks	Rubber
		2	ATVs	Rubber
Geologic/ Geotechnical investigations	6	2	Pickup trucks, 4-wheel drive	Rubber
		1	ATV	Rubber
		2	Drill trucks (2-ton)	Either
Road construction crew	6	2	Dozers (D-8 Cat or equivalent)	Track
		1	Motor grader	Rubber
		1	Pickup truck	Rubber
		2	Carry-alls	Rubber
		1	Water truck (for construction and maintenance)	Rubber
		1	Dump truck	Rubber
		1	Front end loader	Either
		1	Diesel tractor with lowboy	Rubber
Foundation installation crew	26	4	Hole diggers	Either
		2	Dozers	Either
		2	Trucks (2-ton)	Rubber
		2	Trucks, flatbed, with boom (5-ton)	Rubber
		4	Concrete trucks	Rubber
		2	Dump trucks	Rubber
		2	Diesel tractors (equipment hauling)	Rubber
		3	Pickup trucks	Rubber
		1	Mechanic's truck	Rubber
		1	Water truck	Rubber
		1	Carry-all	Rubber
		2	Cranes, all-terrain (35-ton)	Either
		1	Front end loader	Either
		1	Backhoe, with bucket	Rubber
		1	Wagon drill	Either
		3	Equipment-tool trailers	Rubber
Anchor installation	20	2	Pickup trucks	Rubber
		4	Carry-alls	Rubber
		1	Truck, flatbed (2-ton)	Rubber
		2	Trucks, flatbed, with boom (5-ton)	Rubber
		1	Dump truck	Rubber
		1	Water truck	Rubber
		2	Concrete trucks	Rubber
		1	Mechanic's truck	Rubber
		2	Diesel tractors, w/lowboy	Rubber
		2	Dozers	Track
		1	Loader, front end	Either
		3	Backhoes, with bucket	Either
		3	Wagon drills	Either
		3	Cranes, all-terrain (35-ton)	Either

Activity	People	Quantity	Type of Equipment	Track or Rubber Tires
Structure steel haul crew	8	1	Equipment-tool trailer	Rubber
		2	Diesel tractors (steel hauling)	Rubber
		1	Pickup truck	Rubber
		1	Truck, flatbed (2-ton)	Rubber
		1	Carry-all	Rubber
		5	Cranes, all-terrain (35-ton)	Either
		3	Forklifts	Rubber
Structure assembly crews (8–9 crews)	72	2	Pickup trucks	Rubber
		10	Carry-alls	Rubber
		5	Cranes, all-terrain (35-ton)	Either
		1	Water truck	Rubber
		5	Air compressors	Rubber
		2	Trucks (2-ton)	Rubber
		1	Mechanic’s truck	Rubber
		2	Tool-equipment trailers	Rubber
Structure erection crews (1–2 crews)	20	2	Cranes (120–300-ton)	Either
		2	Trucks (2-ton)	Rubber
		2	Pickup trucks	Rubber
		5	Carry-alls	Rubber
		1	Mechanic’s truck	Rubber
		2	Air compressors	Rubber
		1	Tool-equipment trailer	Rubber
Wire installation crew	36	6	Wire reel trailers	Rubber
		4	Haul trailers	Rubber
		4	Diesel tractors	Rubber
		4	Cranes (two 20-ton, two 30-ton)	Either
		5	Trucks, flatbed, with bucket (5-ton)	Rubber
		4	Pickup trucks	Rubber
		2	Splicing trucks	Rubber
		2	3-drum pullers (1 medium, 1 heavy)	Rubber
		2	Single drum pullers (large)	Rubber
		1	Backhoe, w/bucket	Rubber
		1	Water truck	Rubber
		2	Trucks, flatbed (2-ton)	Rubber
		4	Double bull-wheel tensioner (2 light and 2 heavy)	Rubber
		2	Sagging equipment (D-8 Cat)	Track
		6	Carry-alls	Rubber
		2	Static wire reel trailers	Rubber
		3	Tool-equipment trailers	Rubber
		2	Mechanic’s trucks	Rubber
Clean-up crew	4	1	Truck, flatbed, with bucket (5-ton)	Rubber
		1	Pickup truck	Rubber
		1	Carry-all	Rubber

Activity	People	Quantity	Type of Equipment	Track or Rubber Tires
Road rehabilitation crew (ROW reclamation)	6	1	Dozer (D-8 Cat or equivalent)	Track
		1	Front end loader with bucket	Either
		1	Backhoe, w/bucket	Either
		1	Diesel tractor, with lowboy	Rubber
		1	Seeding/harrowing equipment, with tractor	Either
		1	Motor grader	Rubber
		1	Pickup truck	Rubber
		1	Dump truck	Rubber
		1	Carry-all	Rubber

Note: The estimated maximum number of personnel required for all transmission line tasks, including maintenance, management, and quality control personnel equals 210 for each of three separate work groups required to complete the work, for a total of 630 personnel.

TABLE 14 ESTIMATED PERSONNEL AND EQUIPMENT FOR EACH TERMINAL AND GROUND ELECTRODE FACILITY

Activity	People	Quantity	Type of Equipment	Track or Rubber Tires
Survey crew	4	2	Pickup trucks	Rubber
Site management crew	10–12	4	Office trailers	Rubber
		4	Pickups	Rubber
		4	Generators	Rubber
Site development—civil work crew	30–35	4	Scrapers	Rubber
		2	Dozers (ripper)	Track
		2	Motor graders	Rubber
		2	Roller compactors	Rubber
		2	Excavators	Either
		4	Dump trucks	Rubber
		3	Water trucks	Rubber
		1	Mechanic’s truck	Rubber
		1	Fuel truck	Rubber
		2	Pickup trucks	Rubber
		6	Carry-alls	Rubber
Fence installation crew	10–20	1	Pickup truck	Rubber
		1	Boom truck	Rubber
		2	Carry-alls	Rubber
		1	Backhoe	Either
		1	Concrete truck	Rubber
		1	Reel stand truck	Rubber
		2	Bobcats	Either
Equipment footings installation crew	24–30	2	Hole diggers	Either
		2	Boom trucks	Rubber
		1	Excavator	Either
		3	Concrete trucks	Rubber
		1	Dump truck	Rubber
		1	Roller compactor	Rubber
		2	Plate compactors	NA
		1	Backhoe	Either
		2	Bobcats	Either
		1	Mechanic’s truck	Rubber
		1	Fuel truck	Rubber
		1	Water truck	Rubber
		2	Pickup trucks	Rubber
		4	Carry-alls	Rubber

Activity	People	Quantity	Type of Equipment	Track or Rubber Tires
Cable trench, conduits, and station grounding crew	12–16	2	Trenchers	Either
		2	Dozers (ripper)	Track
		2	Roller compactors	Rubber
		2	Plate compactors	NA
		2	Excavators	Either
		1	Boom truck	Rubber
		3	Pickup trucks	Rubber
		2	Flatbed trucks	Rubber
		4	Carry-alls	Rubber
		1	Air compressor	Rubber
		1	Backhoe	Either
		1	Mechanic's truck	Rubber
		1	Fuel truck	Rubber
		1	Dump truck	Rubber
		1	Reel stand truck	Rubber
Steel structure and bus installation crew, converter valve hall, ancillary buildings construction crew, equipment assembly and erection crew	16–24	2	Cranes, rough terrain	Either
		2	High-capacity cranes	Either
		4	Boom trucks	Either
		6	Manlifts	Either
		4	Welder trucks	Rubber
		2	Carry-alls	Rubber
		3	Pickup trucks	Rubber
		2	Flatbed trucks	Rubber
		1	Mechanic's truck	Rubber
		4	Vans	Rubber
		2	Flatbed trucks	Rubber
Control building and wiring crew	20–24	2	Boom trucks	Rubber
		4	Manlifts	Either
		3	Wire pullers-small	Rubber
		2	Reel stand trucks/trailers	Rubber
		4	Vans	Rubber
		4	Pickup trucks	Rubber
		2	Carry-alls	Rubber
		1	Splicing van	Rubber
		2	Concrete trucks	Rubber
		1	Bobcat	Either
		1	Trencher	Either
		2	Plate compactors	NA

Activity	People	Quantity	Type of Equipment	Track or Rubber Tires
Ground electrode construction crew	12–18	2	Pickup trucks	Rubber
		1	Fuel truck	Rubber
		1	Water truck	Rubber
		2	Trenchers	Either
		2	Drill rigs	Either
		1	Boom truck	Rubber
		2	Flatbed trucks	Rubber
		1	Bobcat	Either
		1	Backhoe	Rubber
		1	Mechanic's truck	Rubber
		1	Concrete trucks	Rubber
		1	Air compressor	Rubber

Note: This table reflects estimated personnel requirements, which may reach as high as 180 for construction of each terminal, substation, and the ground electrode facility, including maintenance, management, and quality control personnel.

6.8.3 Construction Equipment

GEN-10

Equipment required for construction of the DC transmission lines, terminals, and two ground electrode system facilities will include that listed in Tables 13 and 14. TransWest will store stationary construction equipment as far as practicable from nearby residences.

6.9 Alternating Current System Construction Schedule, Workforce, and Equipment

The construction schedule for the AC System will incorporate timing restrictions for special-status plant and wildlife species, as determined by the land management and regulatory agencies in their respective decision documents and as reflected in Appendix Z, Record of Decision Requirements Index. In addition, TransWest, being given adequate notice of timing, will plan construction activities to occur outside of specially permitted event areas or times, or work with organizers to ensure adequate access and use. Conceptual construction schedules are described in Section 6.9.1, Construction Schedule. Estimated workforce and equipment needs are described in Sections 6.9.2, Construction Workforce, and 6.9.3, Construction Equipment, respectively.

6.9.1 Construction Schedule

The total construction timeframe for the AC System is anticipated to be approximately 3 years, concurrent with the AC buildout at the Utah Terminal, AC series compensation station, TWE Crystal Substation, Nevada AC Substation, and 500 kV interconnections.

A conceptual schedule for the AC System is shown in Figure 25. Figure 26 presents a schedule for AC substation buildout.

The transmission line schedules show a staggered start, providing time for setups, material and equipment logistics, and coordination between the various construction disciplines. The total elapsed time of the combined transmission line schedule is approximately 118 weeks. These construction schedules take anticipated conditions into consideration; however, winter weather, delays in equipment manufacturing and/or delivery, seasonal restrictions required for permitting, and/or unexpected mitigation could interrupt the schedule, inserting delays of weeks to several months or more.

Construction of the transmission line is anticipated to start in various locations along the line at different times of the year to accommodate weather, terrain, or biological resource constraints that may prohibit construction during certain times of the year.

Transmission line construction activities on any section of the route may last up to 1 year or more, although the duration of active construction will be much shorter, in the range of a few months. For any section of the route, transmission line construction will be characterized by short periods (ranging from 1 day to 1–2 weeks) of relatively intense activity interspersed by periods with no activity.

The construction of the AC portion of the substation at the Utah Terminal, the series compensation station, and Nevada AC Substation is planned to start approximately 3 to 6 months after the start of the construction of the transmission line and run concurrently. The total elapsed time is scheduled for approximately 2 years. These construction schedules take anticipated conditions into consideration; however, winter weather at the Utah Terminal could interrupt the schedule, inserting delays of weeks to several months or more.

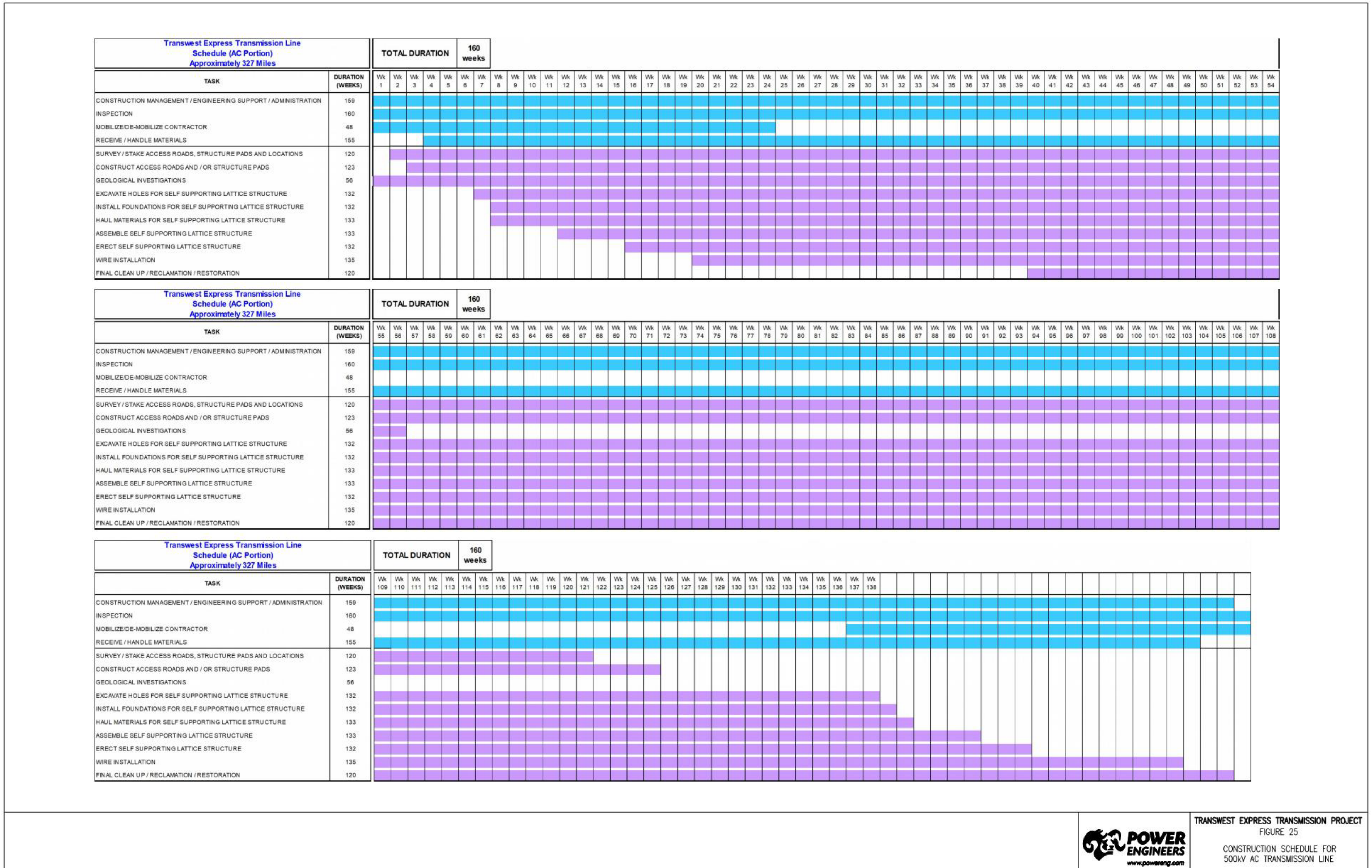
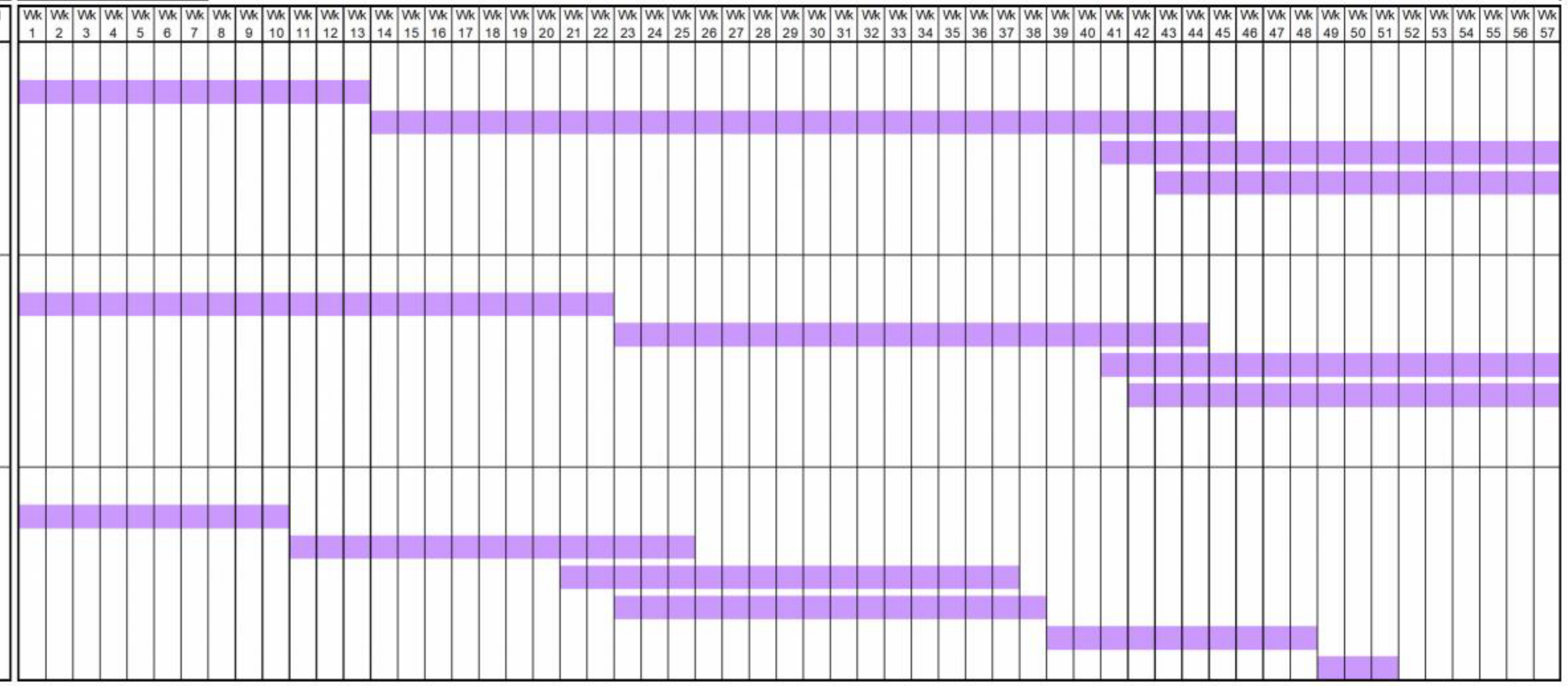
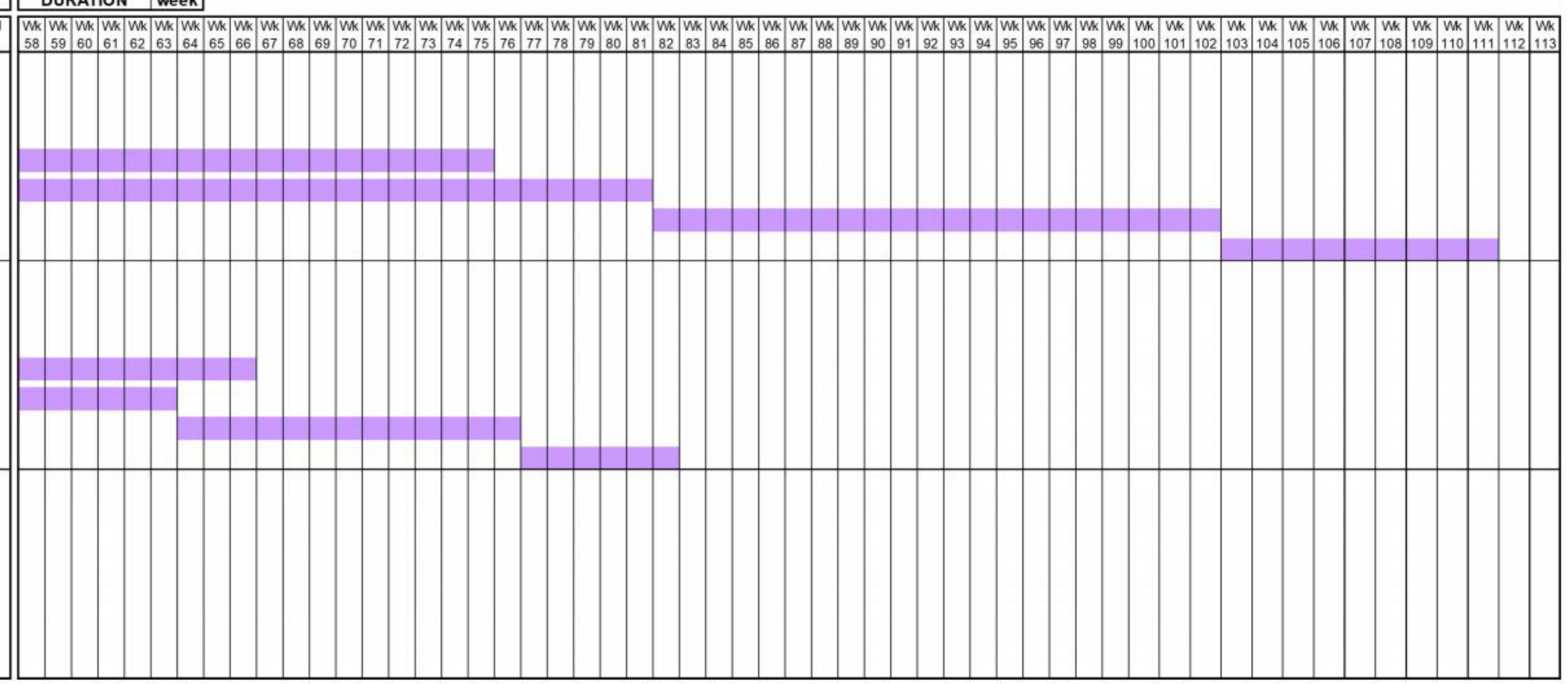


FIGURE 25 CONSTRUCTION SCHEDULE FOR 500 KV AC TRANSMISSION LINE

AC SUBSTATION BUILDOUT		TOTAL DURATION	111 week
TASK	DURATION (WEEKS)		
NEVADA AC SUBSTATION			
SITE GRADING	13		
BELOW-GRADE WORK (FOUNDATIONS, CONDUIT, GROUNDING)	32		
BUILDING CONSTRUCTION	35		
EQUIPMENT INSTALLATION	39		
EQUIPMENT TESTING	21		
OPERATIONAL	9		
AC SUBSTATION (EXTENSION OF UTAH TERMINAL)			
SITE GRADING	22		
BELOW-GRADE WORK (FOUNDATIONS, CONDUIT, GROUNDING)	22		
EQUIPMENT INSTALLATION	26		
CONTROL BUILDING INSTALLATION	22		
EQUIPMENT TESTING	13		
OPERATIONAL	7		
SERIES COMPENSATION STATION			
SITE GRADING	10		
BELOW-GRADE WORK (FOUNDATIONS, CONDUIT, GROUNDING)	15		
CONTROL HOUSE CONSTRUCTION	17		
EQUIPMENT INSTALLATION	16		
EQUIPMENT TESTING	10		
OPERATIONAL	3		



AC SUBSTATION BUILDOUT		TOTAL DURATION	111 week
TASK	DURATION (WEEKS)		
NEVADA AC SUBSTATION			
SITE GRADING	13		
BELOW-GRADE WORK (FOUNDATIONS, CONDUIT, GROUNDING)	32		
BUILDING CONSTRUCTION	35		
EQUIPMENT INSTALLATION	39		
EQUIPMENT TESTING	21		
OPERATIONAL	9		
AC SUBSTATION (EXTENSION OF UTAH TERMINAL)			
SITE GRADING	22		
BELOW-GRADE WORK (FOUNDATIONS, CONDUIT, GROUNDING)	22		
EQUIPMENT INSTALLATION	26		
CONTROL BUILDING INSTALLATION	22		
EQUIPMENT TESTING	13		
OPERATIONAL	7		
SERIES COMPENSATION STATION			
SITE GRADING	10		
BELOW-GRADE WORK (FOUNDATIONS, CONDUIT, GROUNDING)	15		
CONTROL HOUSE CONSTRUCTION	17		
EQUIPMENT INSTALLATION	16		
EQUIPMENT TESTING	10		
OPERATIONAL	3		



POWER ENGINEERS www.powereng.com

TRANSWEST EXPRESS TRANSMISSION PROJECT
FIGURE 26
CONSTRUCTION SCHEDULE FOR AC CONSTRUCTION SUBSTATION BUILDOUT

FIGURE 26 CONSTRUCTION SCHEDULE FOR AC SUBSTATION BUILDOUT

6.9.2 Construction Workforce

The TWE Project will be constructed by contract personnel, with TransWest responsible for Project management, Project administration, and inspection. The construction workforce will consist of laborers, craftsmen, supervisory personnel, support personnel, and construction management personnel who will perform the construction tasks. Estimated construction workforce requirements by major activity are summarized in Tables 15 and 16.

Table 15 identifies the estimated personnel and equipment that is required for the AC System. The total estimated number of construction personnel for construction of the entire transmission line is 630 people. Table 16 identifies the estimated personnel and equipment that is required for constructing the 500 kV series compensation station and Nevada AC Substation. The total estimated number of construction personnel for construction of these facilities is 360 people; therefore, the total estimated workforce for the complete AC System is approximately 990 people.

Construction will usually occur between 7:00 a.m. and 7:00 p.m., Monday through Saturday. Additional hours may be necessary to make up schedule deficiencies or to complete critical construction activities.

Temporary work camps are not expected to be necessary for the construction of the TWE Project. The variables listed below will be considered in determining if work camps will be required.

- The total distance between living facilities for construction workers and designated work areas. A one-way travel time of 2 hours may be considered as a limit in determining if temporary work camps are necessary.
- Workers' union wage agreement regarding the driving time one-way (to worksite) or round trip (to/from worksite). If the agreement allows for driving time, then the camp consideration may not be required.
- The ability of existing communities to provide housing for workers or to make improvements to meet the workers' accommodation demands.
- Socioeconomic impacts on communities along the route with or without the work camps.
- Economic feasibility of permitting a work camp.
- Service life of the work camps and the reclamation requirements after tear down.

The TWE Project does not appear to have areas that are more than 50 miles (on paved roads) from the ROW to existing communities or towns. The average travel distance to the Project is approximately 15 miles. The populations of these towns indicate their capability to handle the housing and/or accommodation demands of the construction workers. During typical transmission line construction, the entire workforce and support personnel usually do not all work in one area at the same time. One or more activities are completed in one location, and the associated crews move to a new location before all the other activities become fully operational in that area.

6.9.3 Construction Equipment

Equipment required for construction of the AC System will include that listed in Tables 14 and 15.

TABLE 15 ESTIMATED PERSONNEL AND EQUIPMENT FOR TRANSMISSION LINE CONSTRUCTION FOR EACH PHASE OF THE AC SYSTEM

Activity	People	Quantity	Type of Equipment	Track or Rubber Tires
Survey crew	6	2	Pickup trucks	Rubber
		2	ATVs	Rubber
Geologic/Geotechnical investigations	6	2	Pickup trucks, 4-wheel drive	Rubber
		1	ATV	Rubber
		2	Drill trucks (2-ton)	Either
Road construction crew	6	2	Dozers (D-8 Cat or equivalent)	Track
		1	Motor grader	Rubber
		1	Pickup truck	Rubber
		2	Carry-alls	Rubber
		1	Water truck (for construction and maintenance)	Rubber
		1	Dump truck	Rubber
		1	Front end loader	Either
		1	Diesel tractor with lowboy	Rubber
Foundation installation crew	26	4	Hole diggers	Either
		2	Dozers	Either
		2	Trucks (2-ton)	Rubber
		2	Trucks, flatbed, w/boom (5-ton)	Rubber
		4	Concrete trucks	Rubber
		2	Dump trucks	Rubber
		2	Diesel tractors (equipment hauling)	Rubber
		3	Pickup trucks	Rubber
		1	Mechanic's truck	Rubber
		1	Water truck	Rubber
		1	Carry-all	Rubber
		2	Cranes, all-terrain (35-ton)	Either
		1	Front end loader	Either
		1	Backhoe, with bucket	Rubber
		1	Wagon drill	Either
		3	Equipment-tool trailers	Rubber
Anchor installation	20	2	Pickup trucks	Rubber
		4	Carry-alls	Rubber
		1	Truck, flatbed (2-ton)	Rubber
		2	Trucks, flatbed, with boom (5-ton)	Rubber
		1	Dump truck	Rubber
		1	Water truck	Rubber
		2	Concrete trucks	Rubber
		1	Mechanic's truck	Rubber
		2	Diesel tractors, with lowboy	Rubber
		2	Dozers	Track
		1	Loader, front end	Either
		3	Backhoes, w/bucket	Either
		3	Wagon drills	Either
		3	Cranes, all-terrain (35-ton)	Either

Activity	People	Quantity	Type of Equipment	Track or Rubber Tires
Structure steel haul crew	8	1	Equipment-tool trailer	Rubber
		2	Diesel tractors (steel hauling)	Rubber
		1	Pickup truck	Rubber
		1	Truck, flatbed (2-ton)	Rubber
		1	Carry-all	Rubber
		5	Cranes, all-terrain (35-ton)	Either
		3	Forklifts	Rubber
Structure assembly crews (8–9 crews)	72	2	Pickup trucks	Rubber
		10	Carry-alls	Rubber
		5	Cranes, all-terrain (35-ton)	Either
		1	Water truck	Rubber
		5	Air compressors	Rubber
		2	Trucks (2-ton)	Rubber
		1	Mechanic's truck	Rubber
		2	Tool-equipment trailers	Rubber
Structure erection crews (1–2 crews)	20	2	Cranes (120–300-ton)	Either
		2	Trucks (2-ton)	Rubber
		2	Pickup trucks	Rubber
		5	Carry-alls	Rubber
		1	Mechanic's truck	Rubber
		2	Air compressors	Rubber
		1	Tool-equipment trailer	Rubber
Wire installation crew	36	6	Wire reel trailers	Rubber
		4	Haul trailers	Rubber
		4	Diesel tractors	Rubber
		4	Cranes (two 20-ton, two 30-ton)	Either
		5	Trucks, flatbed, with bucket (5-ton)	Rubber
		4	Pickup trucks	Rubber
		2	Splicing trucks	Rubber
		2	3-drum pullers (one medium, one heavy)	Rubber
		2	Single-drum pullers (large)	Rubber
		1	Backhoe, with bucket	Rubber
		1	Water truck	Rubber
		2	Trucks, flatbed (2-ton)	Rubber
		4	Double bull-wheel tensioners (two light and two heavy)	Rubber
		2	Sagging equipment (D-8 Cat)	Track
		6	Carry-alls	Rubber
		2	Static wire reel trailers	Rubber
		3	Tool-equipment trailers	Rubber
		2	Mechanic's trucks	Rubber
Clean-up crew	4	1	Truck, flatbed, with bucket (5-ton)	Rubber
		1	Pickup truck	Rubber
		1	Carry-all	Rubber

Activity	People	Quantity	Type of Equipment	Track or Rubber Tires
Road rehabilitation crew (ROW reclamation)	6	1	Dozer (D-8 Cat or equivalent)	Track
		1	Front end loader with bucket	Either
		1	Backhoe, with bucket	Either
		1	Diesel tractor, with lowboy	Rubber
		1	Seeding/harrowing equipment, with tractor	Either
		1	Motor grader	Rubber
		1	Pickup truck	Rubber
		1	Dump truck	Rubber
		1	Carry-all	Rubber

Note: The estimated maximum number of personnel required for all transmission line tasks including maintenance, management, and quality control personnel equals 210. For each of three separate work groups required to complete the work, for a total of 630 personnel.

TABLE 16 ESTIMATED PERSONNEL AND EQUIPMENT FOR THE 500 KV SERIES COMPENSATION STATION AND NEVADA AC SUBSTATION

Activity	People	Quantity	Type of Equipment	Track or Rubber Tire
Survey crew	4	2	Pickup trucks	Rubber
Site management crew	10–12	4	Office trailers	Rubber
		4	Pickups	Rubber
		4	Generators	Rubber
Site development—civil work crew	30–35	4	Scrapers	Rubber
		2	Dozers (ripper)	Track
		2	Motor graders	Rubber
		2	Roller compactors	Rubber
		2	Excavators	Either
		4	Dump trucks	Rubber
		3	Water trucks	Rubber
		1	Mechanic's truck	Rubber
		1	Fuel truck	Rubber
		2	Pickup trucks	Rubber
		6	Carry-alls	Rubber
Fence installation crew	10–20	1	Pickup truck	Rubber
		1	Boom truck	Rubber
		2	Carry-alls	Rubber
		1	Backhoe	Either
		1	Concrete truck	Rubber
		1	Reel stand truck	Rubber
		2	Bobcats	Either

Activity	People	Quantity	Type of Equipment	Track or Rubber Tire
Equipment footings installation crew	24–30	2	Hole diggers	Either
		2	Boom trucks	Rubber
		1	Excavator	Either
		3	Concrete trucks	Rubber
		1	Dump truck	Rubber
		1	Roller compactor	Rubber
		2	Plate compactors	NA
		1	Backhoe	Either
		2	Bobcats	Either
		1	Mechanic's truck	Rubber
		1	Fuel truck	Rubber
		1	Water truck	Rubber
		2	Pickup trucks	Rubber
		4	Carry-alls	Rubber
Cable trench, conduits, and station grounding crew	12–16	2	Trenchers	Either
		2	Dozers (ripper)	Track
		2	Roller compactors	Rubber
		2	Plate compactors	N/A
		2	Excavators	Either
		1	Boom truck	Rubber
		3	Pickup trucks	Rubber
		2	Flatbed trucks	Rubber
		4	Carry-alls	Rubber
		1	Air compressor	Rubber
		1	Backhoe	Either
		1	Mechanic's truck	Rubber
		1	Fuel truck	Rubber
		1	Dump truck	Rubber
		1	Reel stand truck	Rubber
Steel structure and bus installation crew, converter valve hall, ancillary buildings construction crew, equipment assembly and erection crew	16–24	2	Cranes, rough terrain	Either
		2	High-capacity cranes	Either
		4	Boom trucks	Either
		6	Manlifts	Either
		4	Welder trucks	Rubber
		2	Carry-alls	Rubber
		3	Pickup trucks	Rubber
		2	Flatbed trucks	Rubber
		1	Mechanic's truck	Rubber
		4	Vans	Rubber
		2	Flatbed trucks	Rubber

Activity	People	Quantity	Type of Equipment	Track or Rubber Tire
Control building and wiring crew	20–24	2	Boom trucks	Rubber
		4	Manlifts	Either
		3	Wire pullers, small	Rubber
		2	Reel stand trucks/trailers	Rubber
		4	Vans	Rubber
		4	Pickup trucks	Rubber
		2	Carry-alls	Rubber
		1	Splicing van	Rubber
		2	Concrete trucks	Rubber
		1	Bobcat	Either
		1	Trencher	Either
		2	Plate compactors	NA
Ground electrode construction crew	12–18	2	Pickup trucks	Rubber
		1	Fuel truck	Rubber
		1	Water truck	Rubber
		2	Trenchers	Either
		2	Drill rigs	Either
		1	Boom truck	Rubber
		2	Flatbed trucks	Rubber
		1	Bobcat	Either
		1	Backhoe	Rubber
		1	Mechanic's truck	Rubber
		1	Concrete truck	Rubber
		1	Air compressor	Rubber

Note: This table reflects estimated personnel requirements, which may reach as high as 180 for construction of each terminal, substation, and the ground electrode facility, including maintenance, management, and quality control personnel.

7.0 OPERATIONS AND MAINTENANCE

The TWE Project's transmission lines, terminals, substations, ground electrode facilities, communications system, and other ancillary facilities will comprise critical infrastructure of the Desert Southwest region transmission systems and the western United States electrical grid. Limiting the duration of unplanned outages and planning for the use of live-line maintenance techniques to minimize the requirement for and duration of outages is an important part of the design, construction, and O&M requirements for this Project.

Regular inspection of transmission lines, terminals, substations, ground electrode systems, and support systems is critical for the safe, efficient, and economical operation of the TWE Project. Regular ground and aerial inspections will be performed in accordance with TransWest's established policies and procedures for transmission line inspection and maintenance (WAPA 2007). The TWE Project's transmission lines, terminals, substations, ground electrode facilities, communications system, and other ancillary facilities will be inspected regularly for corrosion, equipment misalignment, loose fittings, vandalism, and other mechanical problems. The need for vegetation management on transmission line ROWs will also be determined during inspections. A detailed Operations and Maintenance Plan is included in Appendix O.

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8.0 LOCATION-SPECIFIC INFORMATION

This section describes location-specific ROD requirements for the TWE Project. Information presented in this section is supplemental to the details provided in the previous sections of this POD. This section describes location-specific ROD requirements for BLM-managed land in Colorado, Utah, and Nevada and USFS land in Utah. There are no location-specific requirements for Wyoming, therefore it is not addressed. The POD appendices follow the same organization as this POD and include location-specific ROD requirements, as applicable. A full list of ROD requirements is available in Appendix Z, Record of Decision Requirements Index. Appendix AA, Map Sets, includes maps depicting the locations where these requirements apply.

8.1 Colorado

8.1.1 Bureau of Land Management Little Snake Field Office

ROD-F-01

For approximately 11 miles in a greater sage-grouse Priority Area for Conservation and Priority Habitat Management Area where the TWE Project is not co-located with other transmission lines, TransWest will use tubular self-supporting structures (Map Exhibit 9). At the Yampa River and 100-year floodplain crossings, engineering considerations may dictate using other types of structures and exempt TransWest from this requirement.

8.2 Utah

8.2.1 Bureau of Land Management Vernal Field Office

Temporary work areas are required for the Project, including structure work areas, pulling/tensioning sites, mid span/OPGW splicing sites, guard structure sites, and fly yards. Detail designs showing the limits of grading were created for temporary work areas that significantly impact steep slope areas (>21% slopes) (see Appendix AA, Map Sets). Where the intersection of a temporary work area with steep slope areas is less than 0.1 acre, the impact was considered de minimis and a detail design was not created. In lieu of a detailed design, portions of some work areas were delineated as “No Grading Allowed” on the Project maps. See Appendix A, Access Road Siting and Management Plan, for details on access roads on steep slope areas.

8.2.2 Bureau of Land Management Fillmore Field Office

REC-9
ROD-F-04

For approximately 35.5 miles in designated recreation areas and locations with active sand dune complexes, TransWest will use self-supporting steel lattice structures instead of guyed lattice structures (Map Exhibit 10). This requirement helps to promote the safety of recreational users driving off-highway vehicles and those on ATVs. Of the 35.5 miles, 22.0 miles extend through portions of the Sheeprock/Tintic Off-Road Vehicle Area and the Little Sahara Recreational Area. The remaining 13.5 miles extend through portions of the Cricket Mountains ATV Trails (Map Exhibit 11).

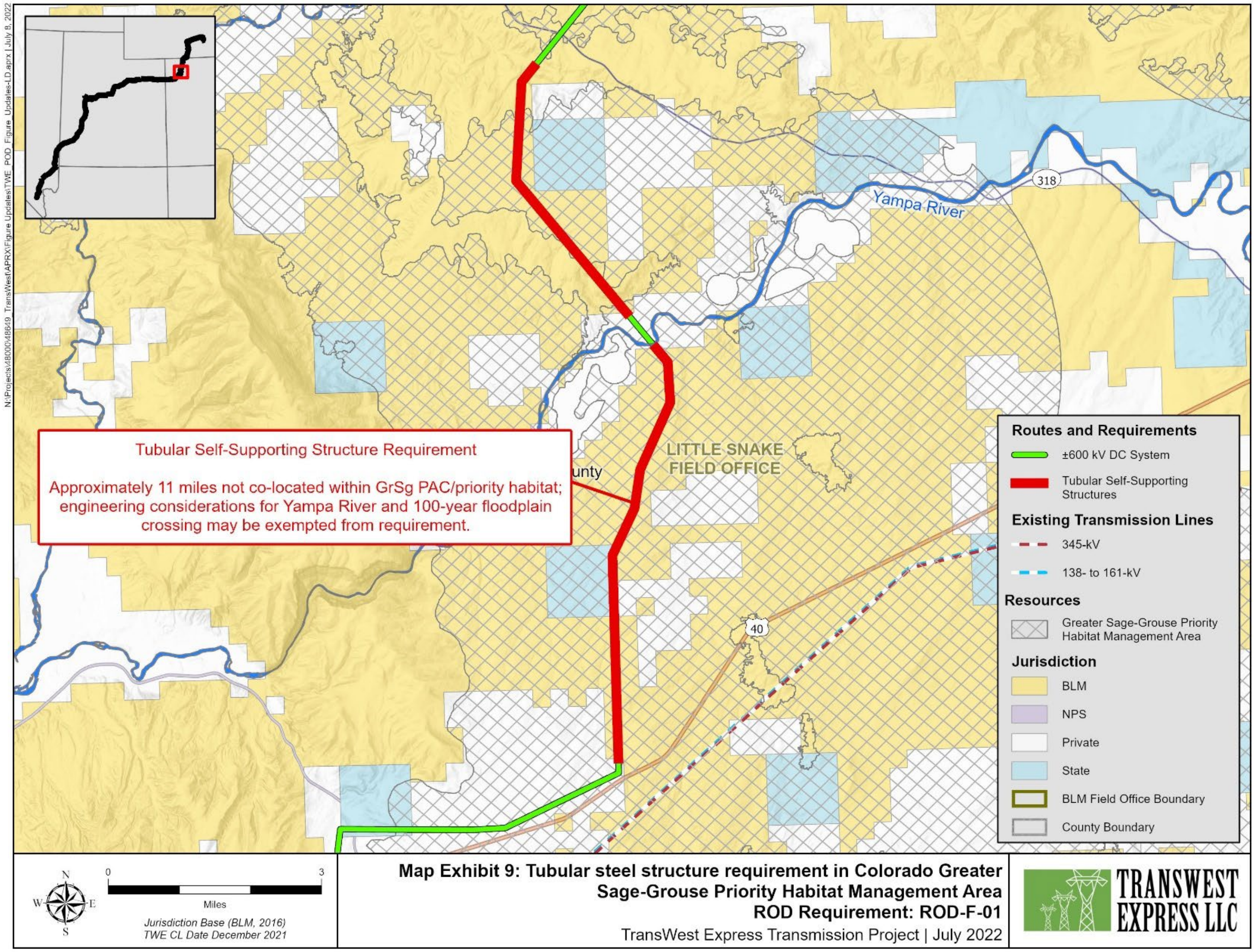
ROW-30

Outside of the above areas where there is a similarly high volume of recreational trail use, TransWest may use guyed lattice structures, but will equip the guy wires with sleeve markers for greater visibility to recreational users (see Map Exhibit 11). On land under the jurisdiction of the BLM Fillmore FO, guy wire sleeves will be installed at turns and at dead ends requiring guy wires along the ground electrode line.

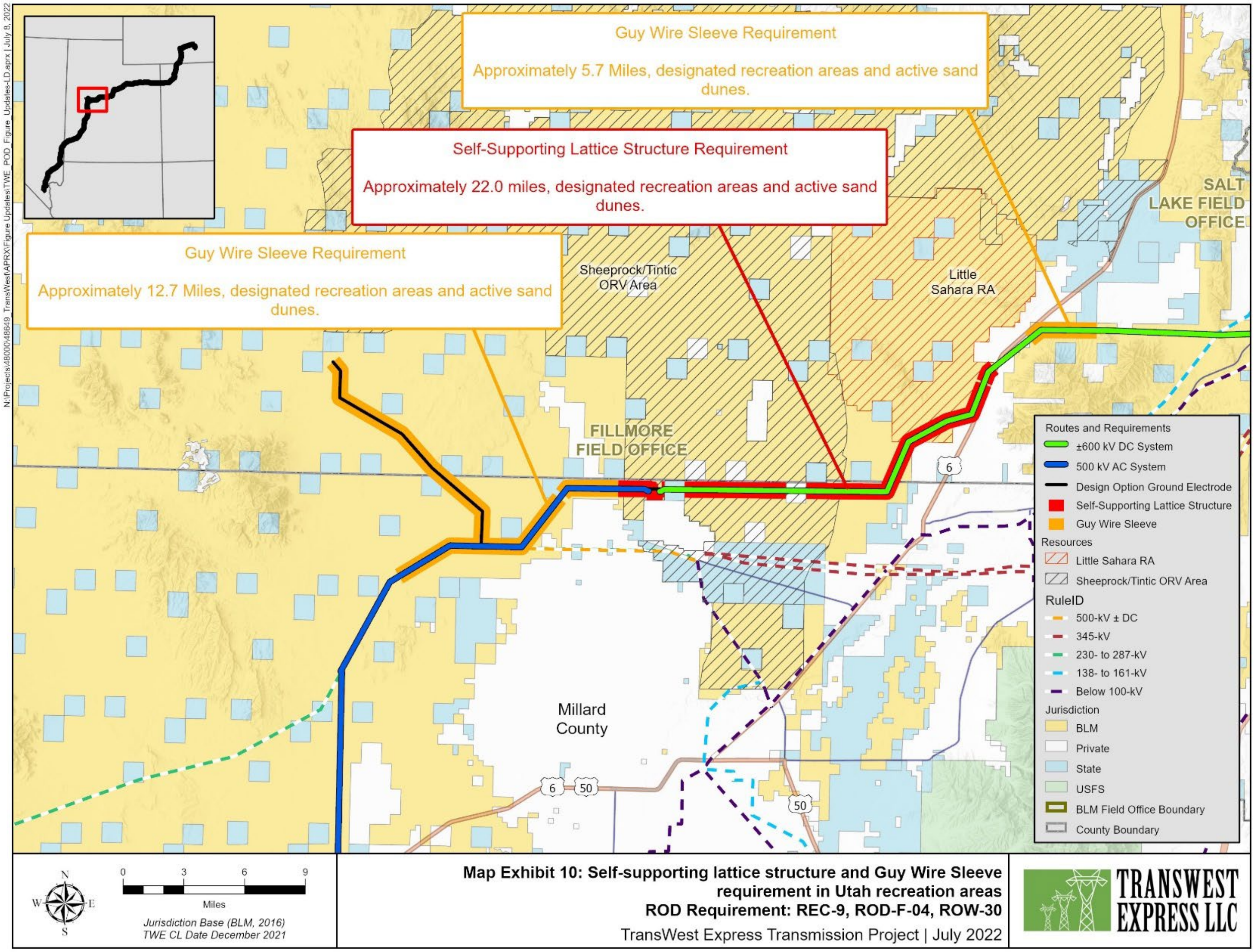
LU-5

Structures within the Sevier B Military Operating Area will be no more than 10 feet higher than existing structures (Map Exhibit 12). If structure lighting is required by the

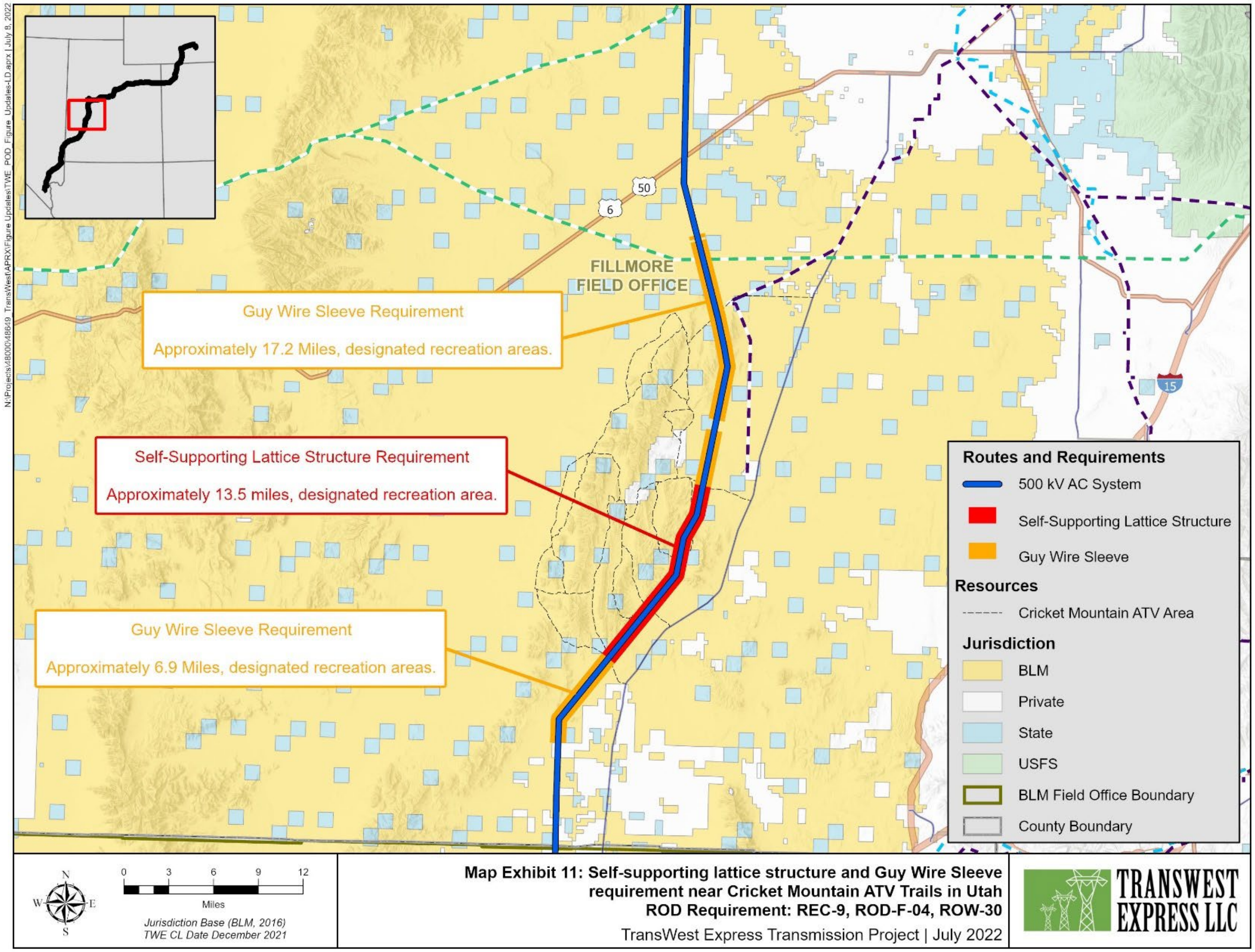
Department of Defense because of safety concerns, TransWest will coordinate with the University of Utah and U.S. Department of Defense to develop a structure lighting plan and structure lighting systems to reduce the impact to dark skies and, subsequently, operation of the University of Utah's Telescope Array Project to the extent practicable while still meeting Department of Defense safety requirements.



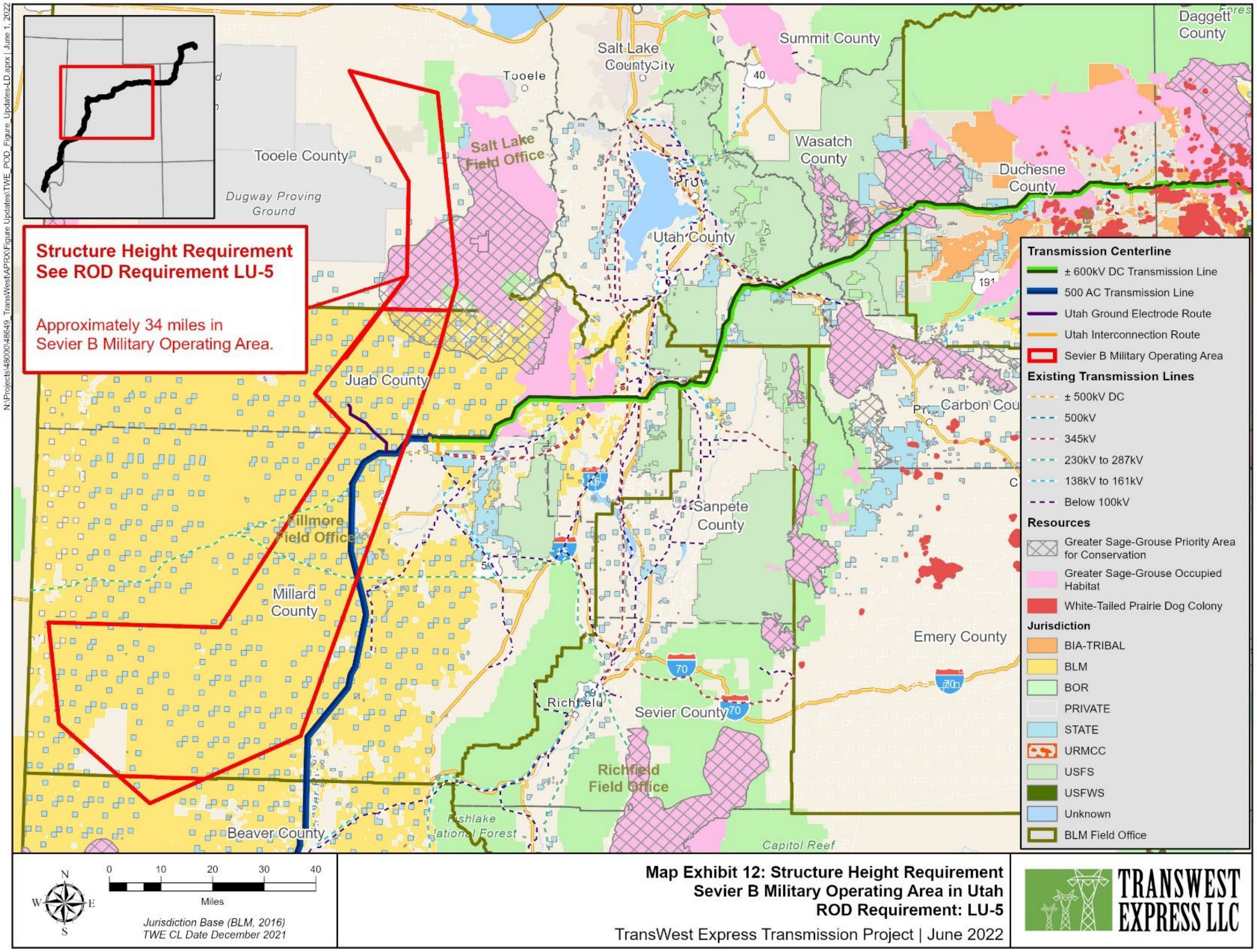
MAP EXHIBIT 9 TUBULAR STEEL STRUCTURE REQUIREMENT IN COLORADO GREATER SAGE-GROUSE PRIORITY HABITAT MANAGEMENT AREA



MAP EXHIBIT 10 SELF-SUPPORTING LATTICE STRUCTURE AND GUY WIRE SLEEVE REQUIREMENT IN UTAH RECREATION AREAS



MAP EXHIBIT 11 SELF-SUPPORTING LATTICE STRUCTURE AND GUY WIRE SLEEVE REQUIREMENT NEAR CRICKET MOUNTAIN ATV TRAILS IN UTAH



MAP EXHIBIT 12 STRUCTURE HEIGHT REQUIREMENT IN SEVIER B MILITARY OPERATING AREA IN UTAH

8.2.3 U.S. Forest Service

TransWest was granted a USFS Easement, issued June 26th, 2018 (USFS 2018), which provides for a 250-foot-wide ROW on USFS land for a renewable term of 30 years. TransWest will also utilize a temporary Special Use Permit, issued on May 16, 2019 (USFS 2019), for a shorter duration, that will cover areas outside of the Easement for purposes of construction (43 USC 1761 and 36 CFR 251).

The following discussions incorporate ROD requirements specific to USFS land occurring along the Project in Utah, including the Uinta-Wasatch-Cache, Manti-La Sal, and Dixie National Forests. These requirements replace the general requirements with similar identification numbers. No other USFS land is crossed by the TWE Project.

FS-LU-1

TransWest has developed this POD based on prior coordination with USFS on final structure placement, including aboveground components, access routes, and permanent disturbance areas, to promote optimal, compatible land use with valid existing land uses and rights. TransWest will continue to coordinate during the construction of the TWE Project and if this coordination results in alternative routing or impacts outside of the scope of the EIS analysis, a variance, additional analysis, and/or NEPA disclosure may be required.

FS-RANGE-1
FS-RANGE-3
FS-RANGE-6

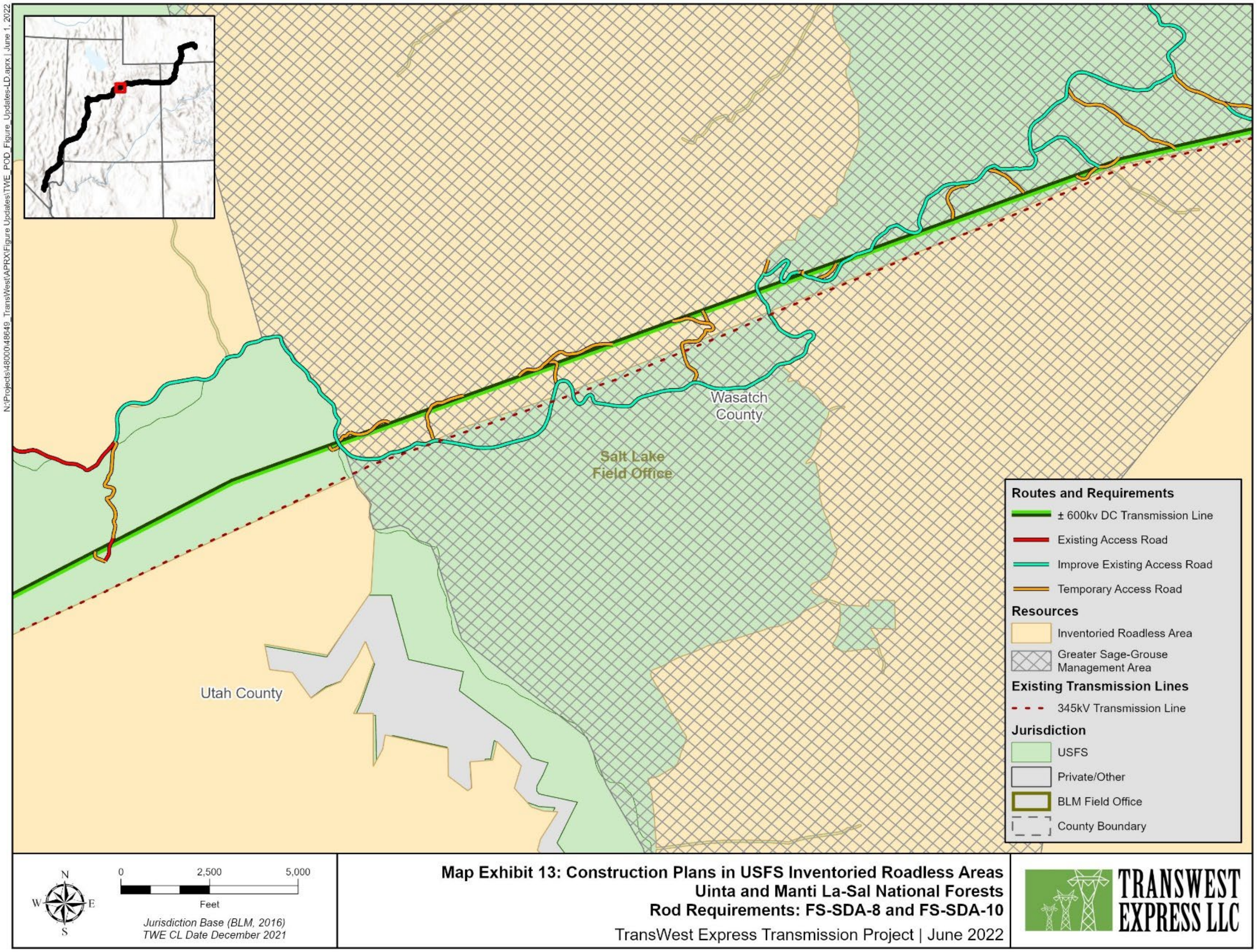
Prior to construction activities commencing, TransWest will coordinate with USFS to identify planned developments and operations for livestock grazing allotments and identify areas where Project activities might impact grazing allotments. TransWest will identify structure locations and ways to avoid grazing allotments, as feasible; identify vegetation management and reclamation methods; and identify areas where additional restoration and mitigation may be required. For activities that might impact grazing allotments, TransWest may rearrange grazing allotment fences, construct additional access roads for grazing allotments, or relocate Project facilities and access roads, as practicable. TransWest will report damage to livestock and livestock facilities as quickly as possible to USFS and affected livestock operators. If damage is caused by the construction or O&M of the Project, TransWest will be financially responsible for the replacement of the livestock and/or livestock facilities.

FS-RANGE-2
FS-RANGE-5

Prior to construction activities commencing, TransWest will also inventory active range improvement locations, including livestock water sources and systems. No Project facilities will be sited within 200 meters of range improvement locations. In locations where this distance requirement cannot be met, USFS and the permittee must concur to allow range improvements to be relocated. If Project activities disrupt water transport to water locations for livestock or wildlife, TransWest will provide an alternative water source until water transport can be continued. Alternative water sources may include an alternate pipeline or a temporary watering facility for livestock and wildlife.

FS-SDA-8
FS-SDA-10
FS-REC-7
FS-S-2

For Project construction activities in Inventoried Roadless Areas (IRAs) (Map Exhibit 13), TransWest will coordinate with USFS to provide construction schedules and meet with USFS before construction activities to review the schedules and plans and after construction activities to review results. TransWest also will not site ancillary facilities outside the transmission line ROW, including staging areas/fly yards, concrete batch plants, and material storage yards within 1 mile of developed recreation areas such as trails, trailheads, and campgrounds, except for the use of the Sheep Creek Dispersed Camping Area as an off-ROW staging area/fly yard, or any other sites approved by the AO. On USFS land, construction, excavation, and other soil disturbing activities will not be conducted on frozen or saturated soils.



MAP EXHIBIT 13 CONSTRUCTION PLANS IN USFS IRAS IN THE UINTA-WASATCH-CACHE AND MANTI-LA SAL NATIONAL FORESTS

TransWest will install only the minimum down-shield lighting at outdoor Project facilities to reduce light pollution and nighttime glare. Project construction activities are not anticipated to occur during the evening or nighttime hours.

FS-VR-8

As outlined in Appendix A, Access Road Siting and Management Plan, no new permanent roads will be added within USFS land. TransWest will employ mitigations such as roadless construction methods where required.

U.S. Forest Service Land Roadless Construction Methods

The standard construction methods described in this POD are the preferred methods for the TWE Project. Under specific conditions where access road construction is restricted or prohibited, such as in IRAs and Special Designation Areas, roadless construction methods will be used to eliminate the need for access roads and allow construction activities to take place with specialized techniques, vehicles, and equipment. The roadless construction methods described in this section apply only to USFS land and will be used to construct the TWE Project in IRAs and other restricted areas (see Map Exhibit 13).

TransWest is not proposing to build or maintain new temporary or permanent roads across IRAs. Roadless construction methods include the use of helicopter construction techniques supported by minimally impactful overland travel. A detailed description of helicopter construction techniques is provided in Section 6.7.2, Helicopter Construction. Helicopters will transport personnel, drilling equipment, structures, and other construction materials to and from the ROW and will be used for wire-stringing. Access to the ROW for transport of personnel, equipment, and material will be accomplished by overland travel using low-impact vehicles. These low-impact vehicles will only be used in suitable terrain to the extent that no visible road or pathway is created. No blade work will be performed to assist overland travel in the IRAs.

In a restricted area, the structure foundations could be constructed by several methods, depending on soil and terrain conditions. Examples of construction options for installing structure foundations include using pre-cast concrete support pedestals for the guyed steel lattice structures and micro-piles for the self-supporting lattice structure foundations. Both could be transported into the restricted area by helicopter or by overland travel using low-impact vehicles. Structure sections will be pre-assembled at approved construction fly yards, located outside of the restricted areas, and airlifted to structure site locations by helicopter for erection.

Following the completion of construction activities, temporary disturbances, including those associated with overland travel to access the ROW, will be reclaimed. The use of low-impact vehicles and equipment for overland access and ground-based site work will result in minimal disturbance in the temporary work areas. Disturbance that does occur will be re-contoured, the topsoil will be replaced, and the site will be revegetated consistent with USFS requirements and Appendix Q, Reclamation Plan. Revegetation will be monitored in accordance with USFS requirements and Appendix Q, Reclamation Plan. Once the roadless construction area is reclaimed, routine maintenance will take place via aircraft or low-impact vehicles, rubber-tired ATVs, or by non-motorized methods including on-foot or horseback, depending on terrain and vegetation, and in accordance with applicable requirements with appropriate mitigation measures applied. Unless otherwise approved, the transmission line ROW will only be accessed with motorized equipment for emergency repairs or to maintain NESC electrical line clearances. Long-term disturbances will include maintenance of a limited ROW width, in which active vegetation management will occur. Continued vegetation management and emergency repairs will be conducted as authorized by USFS and in accordance with the POD and USFS stipulations.

TransWest will work with USFS to control the use of the ROW and prevent unauthorized travel along the ROW by off-road vehicles. Access control measures will be determined in consultation with USFS and may include installing gates or other human-made physical barriers, creating natural barriers (e.g., large boulders or debris), and stockpiling trees cut for ROW clearing at barrier locations.

8.3 Nevada

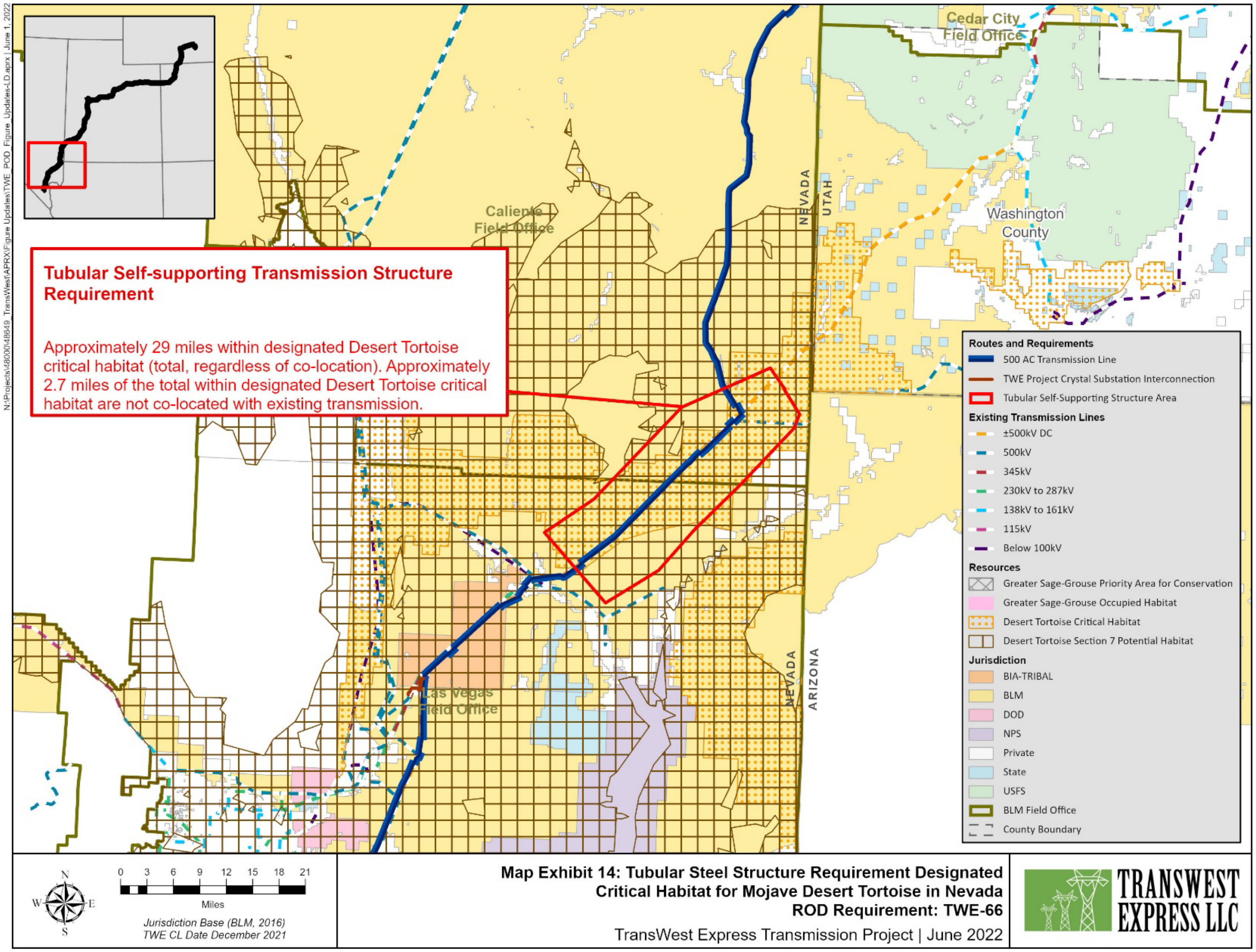
ROW-29

The placement of TransWest's transmission facilities will be consistent with the coordinated alignments map submitted by TransWest Express LLC, Great Basin Transmission LLC, and Silver State Energy Association on February 12, 2015, except as otherwise mutually agreed by those entities.

8.3.1 Bureau of Land Management Caliente and Las Vegas Field Offices

TWE-66
ROD-F-02

The TWE Project extends for approximately 29 miles in designated critical habitat for the Mojave Desert tortoise (*Gopherus agassizii*) (Map Exhibit 14). In accordance with ROD requirements, TransWest coordinated with BLM and USFWS to identify appropriate structure types to avoid and minimize impacts to Mojave Desert tortoise within critical habitat. In accordance with ROD requirements, TransWest's May 28, 2021, memorandum to BLM describes and analyzes transmission line structure types in Mojave Desert tortoise critical habitat and identifies the use of tubular guyed-V, 3-pole tubular steel dead-end, and self-supporting tubular steel H-frame structures to reduce nesting and perching opportunities for corvids and raptors consistent with, and as required by, the Nevada desert tortoise stipulation attached to the ROW Grant (BLM 2017).



MAP EXHIBIT 14 TUBULAR STEEL STRUCTURE REQUIREMENTS IN DESIGNATED CRITICAL HABITAT FOR MOJAVE DESERT TORTOISE IN NEVADA

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9.0 RECORD OF DECISION REQUIREMENTS

9.1 Introduction

This POD is based on the final design of the TWE Project, final mitigation measures, and the requirements, terms, and conditions of the RODs, ROW grants, special use authorizations, and other required permits that are collectively referred to as ROD requirements throughout the POD and its appendix plans (see Table 1). The development of this set of requirements has been iterative over time. The process began by drafting framework plans during the NEPA process and was based on preliminary engineering and design of the Agency Preferred Alternative, potential impacts disclosed in the Final EIS, applicant-committed environmental mitigation measures, and BMPs and mitigation measures. The ROD requirements have been, and will be, implemented at various milestones of the TWE Project, beginning with the NEPA process and continuing through the decommissioning phase.

A full list of ROD requirements is available in Appendix Z, Record of Decision Requirements Index, along with the disposition or approach TransWest is employing to fulfill them. Each of the requirements is listed by its unique identifying number which in some cases was assigned during the NEPA process, as with the applicant-committed measures (e.g., TWE-1), and some were given a new identifying number, as with the ROW grant stipulations (e.g., ROW-1). When applicable, Appendix Z, Record of Decision Requirements Index, identifies when requirements do not apply to the Project final design or have been addressed during the NEPA process or during previous stages of Project design. Appendix Z, Record of Decision Requirements Index, also denotes environmental requirements that necessitate oversight during construction, O&M, and/or decommissioning and which are further described in Appendix G, Environmental Compliance and Monitoring Plan. A list of ROD requirements addressed in this POD, excluding those addressed in the appendices, is provided in Table 17. Each appendix to this POD also contains a list of ROD requirements addressed within that appendix.

9.2 Implementation of Plan of Development and Record of Decision Requirements

MIT-1
MIT-2

This POD outlines the ROD requirements that must be followed during construction, O&M, and decommissioning of the TWE Project. This POD is intended to be used Project-wide except where otherwise noted as location-specific (e.g., BLM FO-specific, USFS land, etc.). This POD is intended to be used as a summary of Project environmental requirements and protection measures, and a description of the processes and procedures that will be used to address compliance, as appropriate.

BLM and USFS have jurisdiction over land under the administrative control of each respective agency. Each agency has required specific mitigation measures that would apply to land under their jurisdiction. In addition, TransWest has committed to mitigation (applicant-committed mitigation) that will apply Project-wide except where otherwise noted as location-specific (e.g., BLM FO-specific, USFS land, etc.). Collectively, such requirements are referred to as ROD requirements.

9.3 Overview of Record of Decision Requirements

To index the ROD requirements that apply to the TWE Project, TransWest has prepared Appendix Z, Record of Decision Requirements Index, containing a master table of ROD requirements identified in the agencies' decision documents. Appendix Z, Record of Decision Requirements Index, compiles the sets of requirements listed below.

- Applicant-Committed Environmental Mitigation Measures

- Additional mitigation measures for the TWE Project
- BLM FO and ROW Grant Stipulations for the TWE Project
- WWEC Final Programmatic EIS BMPs
- USFS National BMPs for water quality management
- ESA species conservation measures adopted in the ROD
- Requirements of the PA for cultural resources

The following sections outline what is included for each of the sets of requirements listed above. Further description of their incorporation into the POD and appendix plans is provided in Appendix Z, Record of Decision Requirements Index.

9.3.1 Applicant-Committed Environmental Mitigation Measures

The applicant-committed environmental mitigation measures for TransWest are being applied to reduce impacts to environmental resources as part of the TWE Project. Mitigation measures include general mitigation measures, which apply Project-wide; and selective mitigation measures, which will be implemented on a case-by-case basis to address specific environmental impacts or location-specific conditions.

9.3.2 Additional Mitigation Measures

Additional mitigation measures for the TWE Project are included in the list of ROD requirements that were developed by BLM through its NEPA analysis and that will be implemented by TransWest during construction, O&M, and decommissioning, as applicable. TransWest will apply the additional mitigation measures for the TWE Project regardless of land ownership or jurisdiction, where practicable. Requirements for federal land under the jurisdiction of an agency other than BLM, or non-federal land that differ or conflict with the additional mitigation measures for the TWE Project, will be replaced or will not apply if a landowner or agency requests different or conflicting actions (BLM 2016). For example, the USFS ROD (USFS 2017) has adopted a separate set of additional mitigation measures for the TWE Project to be applied on National Forest System land as outlined in Section 9.3.5, U.S. Forest Service National Best Management Practices for Water Quality Management. Appendix Z, Record of Decision Requirements Index, identifies and details instances where the application of the additional mitigation measures is not practicable, or where the landowner or agency has requested different or conflicting measures or actions on land it owns or manages, including the alternative mitigation measures to be used to protect the resource(s).

9.3.3 Bureau of Land Management Field Office and Right-of-Way Grant Stipulations

The BLM FO Resource Management Plan (RMP) requirements that are applicable to the final design on land managed by BLM will be implemented by TransWest during construction and O&M unless a waiver, exception, or modification is obtained. BLM requirements are a more complete description of applicant-committed environmental mitigation measures and if in conflict, the BLM requirement will control.

9.3.4 West-Wide Energy Corridor Final Programmatic Environmental Impact Statement Best Management Practices

WWEC requirements address Interagency Operating Procedures (IOPs) that TransWest will comply with where the TWE Project is located within a corridor designated under Section 368 of the Energy Policy Act (42 USC 15926[a]). The *Approved Resource Management Plan Amendments/Record of Decision (ROD) for Designation of Energy Corridors on Bureau of Land Management-Administered Land in the 11 Western States* (WWEC ROD) (BLM 2009:3) and the BLM ROD (BLM 2016) amended BLM's RMPs along the corridor routes to incorporate Section 368 corridors. As part of the WWEC ROD, BLM adopted IOPs which are listed in Appendix B of the WWEC ROD (BLM 2009). The WWEC ROD provides that the IOPs are mandatory within Section 368 corridors but acknowledges that not all IOPs are applicable to a given project: "those that apply to pipelines, for instance, are not appropriate to transmission lines" (BLM 2009: B-2). Moreover, in 2014, BLM issued policy guidance regarding the use of Section 368 corridors and addressed IOPs (BLM 2014). Consistent with the WWEC ROD, BLM directed that "[l]ine managers should ensure applicable IOPs are used for projects sited within EPA [Energy Policy Act] Section 368 corridors" (BLM 2009, 2014). The IOPs applicable to the TWE Project include those applied at the planning, construction, and operations stages. The IOPs applicable to the planning stage are listed for the sake of completeness; however, these IOPs have already been met by BLM and, where appropriate, TransWest. TransWest will comply with the construction and operation IOPs where the TWE Project is located within a Section 368 corridor. If and to the extent that TransWest's applicant-committed environmental mitigation measures conflict with the IOPs, TransWest will comply with the IOPs, in lieu of the applicant-committed measures, where the route is located within a Section 368 corridor.

9.3.5 U.S. Forest Service National Best Management Practices for Water Quality Management

These requirements include the USFS National BMPs for water quality management. These BMPs will be applied by TransWest on National Forest System land, where applicable, and as required in the USFS ROD for the TWE Project (USFS 2017).

9.3.6 Endangered Species Act Species Conservation Measures Adopted in the Record of Decision

TWE-31

These requirements are taken from the BO which was derived from the iterative Biological Assessment and BO process during the EIS (BLM 2016: Appendix C). These requirements describe the conservation measures for plants and wildlife within the TWE Project area that are listed as threatened or endangered under the ESA. In compliance with applicant-committed environmental mitigation measure, "Mitigation measures…developed during the consultation period with the BLM and the U.S. Fish and Wildlife Service under Section 7 of the ESA and adopted in the ROD will be adhered to." Many of these requirements are addressed in Appendix X, Wildlife and Plant Conservation Measures Plan, and Appendix B, Avian Protection Plan.

9.3.7 Requirements of the Programmatic Agreement for Cultural Resources

These requirements are taken from the PA (BLM 2016: Appendix E) and address detailed requirements for cultural resources to be considered for the TWE Project. These requirements include identifying the area of potential effects, survey requirements, determinations of effect, and coordination with federal agencies, tribes, and other stakeholders. The requirements will be applied to the TWE Project as required in the PA and are addressed in Appendix D, Cultural Resources Protection and Management Plan.

9.4 Record of Decision Requirements Addressed in Plan

Tables 17, 18, 19, and 20 list the ROD requirements discussed in this Plan. In this POD, location-specific requirements are addressed for Colorado, Utah, and Nevada. There are no location-specific requirements addressed in this Plan for Wyoming, so no corresponding requirements are listed. TransWest will comply with the WWEC IOPs where the TWE Project is located within a corridor designated under Section 368 of the Energy Policy Act.

Additional Project-wide and location-specific requirements addressed in Appendices A through AA are listed at the end of each appendix. A full list of ROD requirements is available in Appendix Z, Record of Decision Requirements Index.

TABLE 17 PROJECT-WIDE ROD REQUIREMENTS ADDRESSED IN PLAN*

Location	ROD Requirement	Description†
All Lands	AGRI-1	Coordinate with farm and ranch operators to identify problems with structure placement and determine structure locations to ensure implementation of design feature TWE-40. Locate structures along fence lines, field lines, or adjacent to roads. Use longer spans between structures to clear fields. Consider use of non-guyed free-standing transmission structures in agricultural areas.
All Lands	AGRI-2	Schedule construction activities to avoid planting and harvesting activities to the extent practicable and as agreed to with the landowner.
All Lands	AGRI-4	Minimize the use of guy wires in crops and hay lands to the extent possible. If guy wires have to be used in crop and hay lands, highly visible shield guards will cover the wires.
All Federal	FR-6	Where appropriate and feasible, micro-siting of the route would occur in recently burned areas.
WWEC corridors	GEN-6	When concurrent development projects are proposed and implemented within a corridor, the agency POCs shall coordinate among projects to ensure consistency with regard to all regulatory compliance and consultation requirements, and to avoid duplication of effort.
WWEC corridors	GEN-10	The Applicant shall locate all stationary construction equipment (i.e., compressors and generators) as far as practicable from nearby residences.
All Federal	LU-1	TransWest would develop an approved POD and coordinate with land owners, land managers, and agencies with jurisdictional authority on final structure placement, including all aboveground components, access roads, and permanent disturbance areas, to ensure optimal compatible land use with valid existing land uses and rights. If this coordination results in alternative routing or impacts outside of the scope of this EIS analysis, additional analysis and/or NEPA disclosure may be required.
WWEC corridors	MIT-1	All control and mitigation measures established for the Project in the POD and other required plans must be maintained and implemented by the Applicant throughout construction. Necessary adjustments may be made with the concurrence of the appropriate agency.
WWEC corridors	MIT-2	All control and mitigation measures established for the Project shall be maintained and implemented by the Applicant throughout the operation of the Project. Necessary adjustments may be made with the concurrence of the appropriate agency.
WWEC corridors	PHS-3	An electricity transmission project shall be planned by the Applicant to comply with FAA regulations, including lighting regulations, and to avoid potential safety issues associated with proximity to airports, military bases or training areas, or landing strips.

Location	ROD Requirement	Description[†]
BLM and USFS Only	RANGE-1	Prior to construction of each segment, access road, or ancillary facility crossing a BLM or USFS grazing allotment, TransWest shall coordinate with the associated BLM FO and USFS National Forest concerning planned development and operations activities that will occur and identify potential livestock management issues. Coordination will include identification of: - site-specific routing options, and surface disturbance locations. - site-specific mitigation for individual grazing allotments, such as micro-siting around areas of concern, and additional reclamation activities. - proposed application of vegetation management activities on individual grazing allotments. - identification of areas of low reclamation potential that may require additional restoration activities. - identification of areas where trespassing and increased access could require additional mitigation.
All Federal	RANGE-3	Damage to livestock and livestock facilities shall be reported as quickly as possible to BLM, USFS, and affected livestock operators. If damage is caused by the construction, operation, or maintenance of this project, TransWest will be financially responsible for the replacement of the livestock and/or livestock facilities.
BLM and USFS Only	RANGE-6	Prior to construction and placement of permanent facilities and access roads, TransWest shall coordinate with the associated BLM Field Office and USFS National Forest to identify areas where the placement of structures, facilities, and access roads would prevent access to either a portion or all of a livestock grazing allotment resulting in the livestock grazing allotment becoming unusable or decreasing the AUMs available to a point that requires the grazing permit to be modified. In these areas, corrective actions would then be identified including rearranging of grazing allotment fences, additional access roads to the grazing allotment, re-arrangement of Project facilities and access roads as feasible, etc.
All Federal	REC-7	Ancillary construction areas would not be located within 1 mile of developed recreation areas (trails, trailheads, campgrounds, etc.).
All Federal	REC-12	TransWest shall plan construction activities to occur outside of specially permitted event areas or times; or work with organizers to ensure adequate access and use. The feasibility of this mitigation measure would be dependent on TransWest being given adequate notice of permit timing.
All Federal	ROW-1	The Authorized Officer retains the right of access to the lands included within the ROW at any time and may enter any facility on the ROW in accordance with 43 CFR Part 2805.L5(a). The Holder shall pay monitoring fees in accordance with 43 CFR Part 2805.16 for the reasonable costs incurred in the inspection and monitoring of construction, operation, maintenance, and decommissioning of the ROW.
All Federal	ROW-3	The Holder shall perform all operations in a good and workmanlike manner so as to ensure protection of the environment and the health and safety of the public, consistent with the ROW stipulations and approved POD, so as to ensure protection of the environment and the health and safety of the public. The Authorized Officer may order an immediate temporary suspension of operations, orally or in writing, in accordance with 43 CFR Part 2807.16 to protect public health or safety or the environment if the Authorized Officer determines that the Holder has violated one or more of the terms, conditions, or stipulations of this instrument. An immediate temporary suspension order is effective until the Holder receives a written NTP from the Authorized Officer.
All Federal	ROW-5	This grant or permit may be assigned consistent with the regulations in 43 CFR Part 2800, but all assignments are subject to approval by the Authorized Officer. In addition, the qualifications of all assignees must comply with the requirements of the regulations in 43 CFR Part 2800. A partial assignment of this instrument shall not be approved if such action would hinder the Authorized Officer's management of the authorization or the associated public lands.
All Federal	ROW-7	A bond or multiple bonds acceptable to the Authorized Officer shall be furnished by the Holder prior to issuance of the NTP. There may be separate bonds for cultural resources mitigation, construction, reclamation, and decommissioning. The amount of the bond shall be determined by the Authorized Officer after review and approval of a reclamation cost estimate (RCE), prepared by a reclamation specialist, and furnished by the Holder. The RCE must be based on the details in the ROW grant, stipulation 7.
All Federal	ROW-9	The Holder shall designate a representative(s) who shall have the authority to act upon and to implement instructions from the Authorized Officer. The Holder's representative(s) shall be available for communication with the Authorized Officer within a reasonable time when construction or other surface-disturbing activities are underway.

Location	ROD Requirement	Description†
All Federal	ROW-14	Evidence of the public land survey system (PLSS) and related federal property boundaries will be identified and protected prior to commencement of any ground-disturbing activity. This will be accomplished by contacting BLM cadastral survey to coordinate data research, evidence examination and evaluation, and locating, referencing, or protecting monuments of the PLSS and related land boundary markers from destruction. In the event of obliteration or disturbance of the federal boundary evidence the Holder shall immediately report the incident, in writing, to the Authorized Officer. BLM cadastral survey will determine how the marker is to be restored. In rehabilitating or replacing the evidence, the Holder will be instructed to use the services of a Certified Federal Surveyor (CFEDS), procurement shall be per qualification-based selection, or reimburse the BLM for costs. All surveying activities will conform to the Manual of Surveying Instructions (Manual) and appropriate state laws and regulations. Local surveys will be reviewed by cadastral survey before being finalized or filed in the appropriate state or county office. The Holder shall pay for all survey, investigation, penalties, and administrative costs.
All Federal	ROW-20	Within 120 calendar days of completion of construction, the Holder shall submit to the Authorized Officer, as-built drawings and a certification of construction verifying that the facility has been constructed in accordance with the design, plans, specifications, and applicable laws and regulations. Within 90 calendar days of construction completion, the Holder shall provide the Authorized Officer with data in a format compatible with the 'BLM's ARC-INFO geographic information system to accurately locate and identify the ROW. Acceptable data standards are: corrected global positioning system files with sub-meter accuracy or better, in UTM NAD 83; zone 12. Data may be submitted in any of the following formats: ARCGIS interchange, shapefile or geodatabase format, CD ROM in compressed or uncompressed format. All data shall include metadata for each coverage, and conform to the content standards for Digital Geospatial Metadata Federal Geographic Data Committee standards.
All Federal	ROW-23	The Holder shall fund, in accordance with 43 CFR Part 2805.16, a third-party compliance and inspection program as deemed necessary by the Authorized Officer to ensure compliance with the terms, conditions, and stipulations of this ROW grant and applicable laws and regulations.
All Federal	ROW-24	Any change of condition or variance to the right-of-way or PODs must be authorized by a written Change of Condition or Variance approval by the Authorized Officer or his/her delegate prior to the initiation of any construction or other surface disturbing activities related to that change or variance. Each Change of Condition or Variance shall authorize construction or use only as therein expressly stated and only for the particular location and use therein described. All Changes of Condition and Variances are subject to such terms and conditions as deemed necessary by the Authorized Officer at the time of approval. Approved changes authorize construction or use only as therein expressly stated and only for the particular location, phase, area, or use described. The Authorized Officer may by written notice suspend or terminate in whole or in part any change of condition/variance which has been approved, when in the Authorized Officer's judgment, unforeseen conditions arise which result in the approved terms and conditions being inadequate to protect the public health and safety or to protect the environment.
All Federal	ROW-31	The Holder shall complete final engineering and siting that maximizes efficient use of available space within corridors with proximity to existing transmission given consideration. BLM will issue a NTP after reviewing and accepting the final engineering and siting.
All Federal	SDA-15	Series compensation stations shall not be sited in any special designation area.
All Lands	SOCIO-2	TransWest should encourage its contractors to purchase materials, equipment, and supplies locally, have non-locally purchased materials and supplies delivered to the counties in which the materials would be utilized, and complete all sales and use reports regarding taxable purchases in a timely manner so that proper attribution of sales and use tax revenues to the local jurisdictions can occur.
All Lands	SOCIO-4	If not required by existing regulations or included in the various operations plans to be developed (see Section 2.4 of Final EIS), TransWest should develop and implement a plan for on-going communications with local county and municipal governments to inform them of construction schedules and progress, specifically as they relate to the anticipated timing of activity across each spread, or other about other aspects of the TWE Project that could affect local communities and service providers.

Location	ROD Requirement	Description†
WWEC corridors	SOIL-2	The Applicant must not create excessive slopes during excavation. Areas of steep slopes, biological soil crusts, erodible soil, and stream channel crossings would often require site-specific and specialized construction techniques by the Applicant. These specialized construction techniques should be implemented by adequately trained and experienced employees.
WWEC corridors	SOIL-4	The Applicant shall obtain borrow (fill) material only from authorized sites. Existing sites should be used in preference to new sites.
All Lands	TWE-1	The TWE Project will be planned, constructed, operated, and decommissioned in accordance with the agencies' RODs, the BLM's ROW grant stipulations, USFS special use permit stipulations, and requirements of other permitting agencies.
All lands	TWE-16	Watering facilities (tanks, natural springs and/or developed springs, water lines, wells, etc.) will be repaired or replaced, if damaged or destroyed by construction activities, to their pre-disturbed condition as required by the landowner or land management agency.
All Lands	TWE-44	Non-specular conductors and shield/ground wires will be used to reduce potential visual impacts.
All Lands	TWE-45	Structures and/or shield/ground wire will be marked with high-visibility devices where required by governmental agencies (federal aviation administration [FAA]). Structure heights will be less than 200 feet, where feasible, to minimize the need for aircraft obstruction lighting.
All Lands	TWE-49	Transmission line materials will be designed to minimize corona. The proposed hardware and conductor will limit the audible noise, radio interference, and TV interference due to corona. Tension will be maintained on all insulator assemblies to assure positive contact between insulators, thereby avoiding sparking. Caution will be exercised during construction to avoid scratching or nicking the conductor surface that may provide points for corona to occur.
All Lands	TWE-55	The TWE Project will be designed to comply with FAA regulations, including lighting regulations, to avoid potential safety issues associated with proximity to airports, military bases or training areas, or landing strips.
All Federal	VR-8	Minimize lighting at terminals, substations, series compensation stations and construction facilities by installing dark-sky lighting to the extent permitted by Occupational Safety and Health Administration (OSHA) and down-shield lights to reduce night glare and light pollution.

* Appendices contain ROD requirements specific to the topic addressed in that appendix.

† References to 'Applicant' or 'Holder' have been preserved in the wording from the NEPA process and are synonymous with TransWest.

TABLE 18 COLORADO ROD REQUIREMENTS ADDRESSED IN PLAN*

Location	ROD Requirement	Description
Little Snake FO	ROD-F-01	Tubular self-supporting structures are required for an estimated 11 miles within a greater sage-grouse Priority Habitat Management Area (PHMA) in Colorado where there are no existing above-ground large transmission structures (Figure ROD F-1). Within the 11 miles of greater sage-grouse PHMA in Colorado, special engineering considerations may guide structure needs at the Yampa River crossing.

* Appendices contain ROD requirements specific to the topic addressed in that appendix.

TABLE 19 UTAH ROD REQUIREMENTS ADDRESSED IN PLAN*

Location	ROD Requirement	Description†
All Federal	LU-5	In the event that Project structures are more than 10 feet higher than existing structures in the Sevier B Military Operating Area, the Applicant would coordinate with University of Utah and DOD to develop structure lighting systems to reduce the impact to dark skies and, subsequently, operation of University of Utah's Telescope Array Project to the extent practicable while still meeting DOD safety requirements.
All Federal	ROW-29	The placement of Holder's transmission facilities shall be consistent with the coordinated alignments map submitted by TransWest Express LLC (Holder), Great Basin Transmission LLC, and Silver State Energy Association on February 12, 2015, except as otherwise mutually agreed by those entities.

Location	ROD Requirement	Description[†]
All Federal	ROW-30	The Holder shall apply acceptable guy wire sleeve marking on BLM land in open OHV use areas where there is a high volume of recreation before an NTP is issued. Finalization of locations within Field Offices will be included in the POD. Additionally, the structure requirements discussed in the ROD for specific OHV areas will be implemented. Please see the structure types discussion found in the decisions section of the ROD for a detailed description on structure type requirements to minimize impacts to wildlife and motorized recreation.
USFS Only—All NFs	FS-LU-1	TransWest will develop an approved POD and coordinate with the USFS on final structure placement, including all aboveground components, access routes, and permanent disturbance areas, to ensure optimal compatible land use with valid existing land uses and rights. If this coordination results in alternative routing or impacts outside of the scope of the EIS analysis, additional analysis and/or NEPA disclosure may be required.
USFS Only—All NFs	FS-RANGE-1	Prior to construction of each segment, temporary access route, or ancillary facility crossing a Forest Service grazing allotment, TransWest will coordinate with the USFS concerning planned development and operations activities that will occur and identify potential livestock management issues. Coordination will include: -the identification of site-specific routing options and surface disturbance locations; -site specific mitigation for individual grazing allotments, such as micro-siting around areas of concern, and additional reclamation activities; -proposed application of vegetation management activities on individual grazing allotments; -identification of areas of low reclamation potential that may require additional restoration activities; and -identification of areas where trespassing and increased public access could require additional mitigation.
USFS Only—All NFs	FS-RANGE-2	Prior to construction of transmission line segments, temporary access routes, or ancillary facilities, active range improvement locations will be inventoried. Based on the results of these inventories, no roads or ancillary facilities will be placed within 200 meters of range improvements such as livestock water sources/systems in order to avoid disturbance to livestock and wildlife. If avoidance is not feasible, range improvements may be relocated with concurrence from the permittee and the USFS.
USFS Only—All NFs	FS-RANGE-3	TransWest will report damage to livestock and livestock facilities as quickly as possible to the Forest Service and affected livestock operators. If damage is caused by the construction, operation, or maintenance of the Project, TransWest will be financially responsible for the replacement of the livestock and/or livestock facilities.
USFS Only—All NFs	FS-RANGE-5	If construction or operation activities disrupt the transport of water to water locations for livestock or wildlife, an alternative water source will be provided until the transport of water is resumed. Alternative water sources could include the hauling of water to watering locations, an alternate pipeline, or the establishment of a temporary watering facility for livestock and wildlife.
USFS Only—All NFs	FS-RANGE-6	Prior to construction of Project facilities and temporary access routes, TransWest will coordinate with the USFS to identify areas which could impact livestock grazing allotments. If the placement of structures, facilities, and access routes will prevent access to either a portion or all of a grazing allotment, the result could be the allotment becoming unusable or a need for the grazing permit to be modified due to decreased available AUMs. In these areas, corrective actions will then be identified. Options include rearranging grazing allotment fences, construction of additional access roads to the grazing allotment, and relocation of Project facilities and access roads, as feasible.
USFS Only—All NFs	FS-REC-7	Ancillary construction areas will not be located within 1 mile of developed RAS (trails, trailheads, campgrounds, etc.). Ancillary areas include staging areas/fly yards, material storage yards, and batch plant sites that are off the ROW.
USFS Only—All NFs	FS-SDA-8	Construction schedules for work within IRAs will be developed as part of the construction POD and in coordination with the USFS to minimize resource impacts.
USFS Only—All NFs	FS-SDA-10	At least one pre-construction coordination meeting will be conducted with the USFS-responsible official, USFS implementation project lead, and construction contractor to review IRA site-specific construction plans. One post-construction meeting will be conducted with these parties to review results.
USFS Only—All NFs	FS-S-2	On USFS land, construction, excavation, and other soil disturbing activities will not be conducted on frozen or saturated soils.

Location	ROD Requirement	Description[†]
USFS Land	FS-VR-8	TransWest will minimize lighting at Project facilities to the extent permitted by Occupational Safety and Health Administration (OSHA) and down-shield lights to reduce night glare and light pollution
Fillmore FO, Salt Lake FO	REC-9	In and immediately adjacent to designated off-road vehicle/all-terrain vehicle (ORV/ATV) use areas where there are active dunal complexes, TransWest will use non-guyed transmission structures. The specific areas for the agency preferred alternative where this measure will be applied are the Sheeprock/Tintic ORV area, the Cricket Mountains ATV trails, and the Little Sahara recreational areas for a total of approximately 35.5 miles (TWE 2015). TransWest will also use guy wire sleeve markers on BLM land in open ORV areas where there is a high volume of recreational use as agreed to with BLM before a notice to proceed is issued in these areas.
BLM Utah—All FOs	ROD-F-04	BLM requires self-supporting steel lattice structures in and adjacent to the following designated recreation areas in Utah: the Sheeprock/Tintic Off-Road Vehicle Area, the Cricket Mountains All-Terrain Vehicle Trails, and Little Sahara Recreation Area. The total mileage for these areas is approximately 35.5 miles. In addition, BLM requires the use of a BLM-reviewed and approved guy wire sleeve marking on BLM lands in open off-highway vehicle use areas where there is a high volume of recreation. Special marking requirements will be finalized in the NTP process for the areas shown in Figure ROD F-2.

* Appendices contain ROD requirements specific to the topic addressed in that appendix.

† References to ‘Applicant’ or ‘Holder’ have been preserved in the wording from the NEPA process and are synonymous with TransWest.

TABLE 20 NEVADA ROD REQUIREMENTS ADDRESSED IN PLAN*

Location	ROD Requirement	Description
Las Vegas FO	TWE-66	In designated critical habitat for desert tortoise in the BLM Las Vegas Field Office, TransWest will use self-supporting tubular steel poles where not co-located with other transmission lines. This measure applies to approximately 2.7 miles of the transmission line route (TWE 2015).
BLM Nevada	ROD-F-02	Tubular self-supporting structures are required for the approximately 2.9 miles of Critical Habitat for Mojave Desert tortoise in Nevada as described in the ROD POD. Additionally, tubular self-supporting structures are required for the remaining designated Critical Habitat for Mojave Desert tortoise as shown in Figure ROD F-3, subject to the Nevada NTP desert tortoise stipulation attached to the ROW grant.

* Appendices contain ROD requirements specific to the topic addressed in that appendix.

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