4. Project Description

4.1 Project Information

4.1.1 Project Title

Eldorado-Lugo-Mohave Series Capacitor Project

4.1.2 Lead Agency Name and Address

California Public Utilities Commission
Energy Division
300 Capitol Mall, 4th Floor, Room 4-21
Sacramento, CA 95814

4.1.3 Lead Agency Contact Person and Phone Number

Billie Blanchard, Project Manager
Energy Division
(916) 823-4799 or billie.blanchard@cpuc.ca.gov

4.1.4 Project Location

The Proposed Project would be in San Bernardino County, CA and Clark County, NV and include activities on private, state, and federal lands. Figure 4-1. Proposed Project Regional Overview Map shows the overall project area and Figure 4-2. Project Overview illustrates the location of project activities along the entire length of the Proposed Project. **(Note: All figures and attachments referenced in Section 4 are included at the end of the section.)**

4.1.5 Project Sponsor's Name and Address

Southern California Edison Company
2244 Walnut Grove Avenue
Post Office Box 800
Rosemead, CA 91770

4.1.6 General Plan Designation

A large portion of the land crossed by the Proposed Project is under federal jurisdiction and does not have a general plan designation. County and city general plan designations in areas not under federal jurisdiction are as follows:

- San Bernardino County, CA: Agricultural and Resource Management; Special Purpose; Residential and Rural Living
- City of Hesperia, CA: Utilities Corridor
- Clark County, NV: Major Development Projects; Open Lands; Public Facility; Residential Suburban; Road ROW, Residential Agriculture.
- City of Boulder City, NV: Open Lands

4.1.7 Zoning

Land under federal jurisdiction does not have zoning designations. County and City zoning designations in areas crossed by the Proposed Project are as follows:

- San Bernardino County, CA: Agricultural and Resource Management; Special Purpose; Residential
- City of Hesperia, CA: Utilities Corridor
- Clark County, NV: Special Districts; Manufacturing Districts; Residential Districts
- City of Boulder City, NV: Government Open Space/Boulder City Conservation Easement

4.1.8 Description of Project

The overall extent of the Proposed Project is illustrated in Figure 4-1, Proposed Project Regional Overview Map. The primary Proposed Project components are shown in more detail in Figure 4-2, Proposed Project Overview Map Series, which consists of 12 map sheets. As indicated by notations in Figure 4-2, sites where extensive construction would occur are shown separately in individual figures. The Proposed Project would:

- Construct 2 new 500 kV mid-line series capacitors (i.e., the proposed Newberry Springs Series Capacitor and Ludlow Series Capacitor) and associated equipment.
- Provide 2 communication paths between the series capacitor sites:
  - Install approximately 2 miles of overhead and 500 feet of underground telecommunications facilities as one path to connect the proposed series capacitors to SCE's existing communication system.
  - Install approximately 2 miles of underground telecommunications facilities as a second communication path to connect the series capacitors to SCE's existing communication system.
- Provide station light and power to the proposed series capacitors by extending and/or rerouting existing lines to create approximately 2 miles of overhead and 700 feet of underground 12 kV distribution circuits. (The new distribution poles would support overhead telecommunication facilities as well as the electric distribution lines.)
- Construct 3 new fiber optic repeater facilities (Barstow, Kelbaker, and Lanfair) within the Lugo-Mohave ROW.
- Install distribution lines for light and power at the 3 proposed fiber optic repeater sites.
- Install underground telecommunications facilities from existing transmission structures to the Barstow, Kelbaker, and Lanfair fiber optic repeater sites.
- Address 16 potential overhead clearance discrepancies at 14 locations by:
  - Relocating, replacing, or modifying existing transmission, subtransmission, and distribution facilities at approximately 12 locations along the Eldorado-Lugo, Eldorado-Mohave, and Lugo-Mohave 500 kV Transmission Lines to address 14 of the overhead clearance discrepancies. Tower modifications would include raising 9 towers approximately 18.5 feet by inserting new lattice-steel sections in tower bodies.
  - Performing minor grading at 2 locations along the Lugo-Mohave 500 kV Transmission Line to address 2 of the overhead clearance discrepancies.

- Install approximately 235 miles of optical ground wire (OPGW) (approximately 59 miles on the Eldorado-Mohave Transmission Line and approximately 173 miles on the Lugo-Mohave Transmission Line, including approximately 3 miles of underground telecommunications facilities in the vicinity of the Mohave Substation).
- Modify and strengthen the ground wire peak of existing suspension towers where OPGW splices would occur (some of these towers would also require minor modifications to the steel in the tower body).
- Install approximately 2,000 feet of underground telecommunications facilities within the existing Lugo, Mohave, and Eldorado Substations.
- Within Lugo Substation, perform modifications on the existing series capacitors and install new terminating equipment and remove 2 existing tubular steel poles (TSPs) and install 2 new TSPs on the Eldorado-Lugo and Lugo-Mohave 500 kV Transmission Lines.
- Within the Eldorado Substation, perform modifications on the existing series capacitors and upgrade the terminal equipment on the Eldorado-Lugo 500 kV Transmission Line.
- Within the Mohave Substation, replace existing series capacitors on the Lugo-Mohave 500 kV Transmission Line and install new terminal equipment on the Eldorado-Mohave and Lugo-Mohave 500 kV Transmission Lines.
- Within LADWP's McCullough Substation, replace 5 existing 500 kV 50 kA circuit breakers with 5 new 500 kV 63 kA circuit breakers.
- Install (if necessary) cathodic protection on approximately 60 miles of SoCalGas's natural gas pipelines parallel to SCE's Lugo-Mohave 500 kV Transmission Line.

This project description is based on planning-level assumptions described in SCE's PEA and on responses to data requests from CPUC to SCE seeking clarification or additional information. Exact details would be determined following completion of final engineering; identification of field conditions; availability of labor, material, and equipment; and compliance with applicable environmental and permitting requirements. To estimate surface area disturbance under the Proposed Project, the project description relies on conservative ground disturbance assumptions based on preliminary engineering. The actual surface area disturbance is expected to be reduced from this initial estimate following completion of final engineering.

4.1.9 Surrounding Land Uses and Setting

Nearly all of the Proposed Project activities would occur in rural to remote locations primarily with recreation or open-space uses. A large portion of the land traversed by the project is administered by the BLM or the NPS. Figure 4-2. identifies land jurisdictions and shows the setting for the Proposed Project.

4.1.10 Permits and Approvals Required.

The CPUC has exclusive authority to approve or deny SCE's application for a CPCN; however, various permits and approvals from other agencies may need to be obtained by SCE for the project to be executed. Table 4-1 summarizes the permits from other federal, State, and local agencies that may be needed for the project.

Table 4-1. Permits and Approvals that May Be Required for the Project

Permit/Approval	Agency	Purpose/Jurisdiction
Federal		
ROW Grant	BLM	500 kV Transmission Lines and access roads. Construction on BLM-administered lands.
Special Use Permit	NPS	500 kV Transmission Lines and access roads
Special Use Permit	NPS	Construction on NPS-administered lands
Record of Decision	BLM	Considers Federal actions on the project approval.
Notice to Proceed	BLM	Final BLM approval to proceed with construction
Section 7 Consultation	United States Fish and Wildlife Service (USFWS)	Federal listed, threatened, and endangered species
Section 106 Consultation, National Historic Preservation Act	BLM	Cultural resources listed or eligible for listing on the National Register of Historic Places
Clean Water Act Section 404 Permit (CA and NV) – Nationwide	United States Army Corps of Engineers (USACE)	Construction impacting waters of the United States including wetlands
Permit	United States Bureau of Reclamation (BOR)	500 kV Transmission Lines and access roads
7460(1) Permit and Notice Proposed Construction or Alteration	Federal Aviation Administration (FAA)	Erection of tall structures or the use of tall construction equipment in the vicinity of an airport
Field Work Authorization (Arch)	BLM	Ability to conduct surveys
Field Work Authorization (Paleo)	BLM	Ability to conduct surveys
Archaeological Resources Protection Act (ARPA) Permit	NPS	Permit for Archaeological Investigations within the Mojave National Preserve
SF-299 Commercial Vehicle Permit	NPS	To allow non-SCE vehicles to travel within the 500 kV transmission line corridors located within the Mojave National Preserve to conduct surveys or field verification for existing infrastructure
Permit/Agreement/ Consent Type (TBD)	Western Area Power Administration (WAPA)	SCE 500 kV transmission line crossing WAPA 230 kV transmission line in Nevada
State		
CPCN	CPUC	State lead agency to approve project
Notice to Proceed	CPUC	Final CPUC approval to proceed with construction
Declaratory Order or Advisory Opinion	Nevada Public Utilities Commission (PUCN)	Nevada UEPA Permit to Construct not required
2081 Incidental Take Permit	California Department of Fish and Wildlife (CDFW)	State listed threatened or endangered species

Table 4-1. Permits and Approvals that May Be Required for the Project

Permit/Approval	Agency	Purpose/Jurisdiction
401 Certification – CA	State Water Resources Control Board	Certifies that activities subject to a federal permit meet state water quality standards
401 Certification – NV	Nevada Division of Environmental Protection (NDEP)	Certifies that activities subject to a federal permit meet state water quality standards
Temporary work in waterways permit – NV	NDEP	Regulates work in waterways
1602 Streambed Alteration Agreement	CDFW	Activity that may modify a river, stream, or lake
NPDES Construction General Permit for Discharges of Storm Water	State Water Resources Control Board	Construction activities that disturb more than one acre of soil
NPDES Construction General Permit for Discharges of Storm Water	NDEP	Construction activities that disturb more than one acre of soil
Oversize Load/Special Load Permit	Caltrans	Movement of vehicle/loads exceeding statutory limitations on the size, weight, and loading of vehicles
Encroachment Permit	Caltrans	Activities related to the placement of encroachments within, under, or over the State highway ROWs
Permit Type (TBD)	California State Lands Commission	Activities related to the placement of encroachments and landing zones within, under, or over the State of California School Lands
Encroachment Permit	CA and NV Cities or Counties, NVDOT	OH/UG crossings over or under travelways during OPGW stringing and work areas
NDOW Special Purpose Permit/Wildlife Authorization	NV Department of Wildlife	State listed threatened or endangered species
Operational Permit (CA and NV Fire Codes)	CA and NV	Operation of 500-gallon or greater propane tanks
Local		
Dust Control Permit	Clark County DAQ, NV	A dust control plan will need to be submitted to County
Generator Permit	MDAQMD	Use of temporary and permanent generators exceeding 50 horsepower
Landscaping Permit	Cities or Counties	County/City approval of landscaping plan
Tree Removal Permit	Cities or Counties	Tree trimming or removal for line clearance requirements
San Bernardino County Fire Protection District, Hazardous Materials Division Permit	San Bernardino County	Facility inspections and management of a facility's Hazardous Materials Business Plan program
Fire Permit – CA	Cities or Counties	If batteries are over 70 kilowatt, fire permit may be needed
Hazardous Materials Permits	CA and NV Counties	Hazardous materials inventory for materials used for construction (e.g. batteries, SF6 gas)
Grading Permit	San Bernardino and Clark Counties	Project work that includes earthwork

Table 4-1. Permits and Approvals that May Be Required for the Project

Permit/Approval	Agency	Purpose/Jurisdiction
Building Permit (e.g., Fence)	San Bernardino and Clark Counties	Construction activity subject to the county building code requirements. Desert Tortoise fencing design also needs to be approved by the BLM, CDFW, and USFWS
Building Permit (e.g., MEER)	San Bernardino and Clark Counties	Construction activity subject to the city or county building code requirements.
Temporary Entry Permit or Temporary Construction Easement (e.g., Material and Storage Yards, Landing Zones, Access Roads)	Counties or Private Property Owners	Approval to use project work areas
Demolition Permit	CA and NV Cities or Counties	Demolition of existing platforms and equipment at substations
Encroachment Permit (e.g., Traffic Control Plan, lane closure)	NV Cities or Counties	Activities related to the placement of encroachments within, under, or over the State highway ROWs
Other		
License, Easement, or Agreement (RR Permits)	BNSF and UPRR	Overhead crossings over railways during OPGW stringing

4.1.11 California Native American Tribal Consultation

Pursuant to Public Resources Code Section 21080.3.1, upon determining that an IS would be prepared for the Proposed Project, the CPUC initiated a plan to conduct consultation with California Native American Tribes traditionally and culturally affiliated with the project area. Tribes who had formally requested to be contacted by CPUC regarding projects in their geographic area of interest as well as other tribes identified by the Native American Heritage Commission (NAHC) as having a potential affiliation with the project area were contacted to determine their interest in consulting with the CPUC regarding the project. A total of 23 tribes were contacted. Of these, 4 tribes requested consultation – the San Manuel Band of Mission Indians, the Morongo Band of Mission Indians, the Twenty-Nine Palms Band of Mission Indians, and the Fort Mojave Tribe. Consultations were held with each tribe to explain the Proposed Project, including the nature and location of its associated activities, and to learn from the tribes regarding their concerns about tribal cultural resources potentially affected by the Proposed Project. Methods to ensure tribal cultural resources would be adequately protected were also addressed in consultation with the tribes. The analyses and mitigation measures in Sections 5.5 Cultural Resources, and 5.18 Tribal Cultural Resources, reflect input from these consultations.

As part of the consultation process, site visits were made to various cultural resource locations identified by the individual consulting tribes as locations of interest to them. Tribal representatives and representatives from BLM, NPS, SCE, and CPUC participated. The site visits took place over four days with tribal representatives attending as follows:

- On April 16, 2019, representatives from the Morongo Band of Mission Indians and the Twenty-Nine Palms Band of Mission Indians participated.
- On April 17, 2019, representatives from the San Manuel Band of Mission Indians and the Morongo Band of Mission Indians participated.
- On June 25 & 26, 2019, representatives of the Fort Mojave Tribe participated.

During the site visits, the parties discussed the location and nature of project activities and how to protect identified cultural resources near planned activities. Subsequent to their site visits, the CPUC provided draft mitigation measures to the individual tribes for comment. The draft measures were based on information available in cultural resource reports, discussions with tribal representatives, and comments provided during the site visits. Tribal comments on the draft measures were considered during development of final mitigation measures. A Cultural Resources Management (CRMP) is required to guide cultural resource management and protection procedures. The CPUC has agreed to provide the four consulting tribes a copy of the draft CRMP when it is prepared for their review and comment. Two of the tribes also requested that tribal monitors be engaged during construction. This request has been incorporated into impact mitigation requirements.

4.2 Project Capacity and Objectives

4.2.1 Project Capacity

The Proposed Project would not increase the nominal voltage of the three 500 kV transmission lines. With installation of the new series capacitors and additional work at the substations, the Proposed Project would provide for an operating capacity or entitlement increase from:

- 1,645 megavolt-ampere (MVA)[1] to 2,858 MVA on the Eldorado-Lugo 500 kV Transmission Line,
- 2,078 MVA to 2,858 MVA on the Lugo-Mohave 500 kV Transmission Line, and
- 1,580[2] MVA to 2,598 MVA on the Eldorado-Mohave 500 kV Transmission Line.

4.2.2 Project Objectives

The Proposed Project is being proposed to meet the following objectives:

- Meet the target in-service date of June 2021 in an effort to support the requirements as outlined and required by the California Renewables Portfolio Standard (RPS)[3] including 33% by 2020 and the increased requirement of 60% by 2030 Ensure compliance with California Public Utilities Commission (CPUC) General Order (G.O.) 95 and the National Electrical Safety Code (NESC).
- Continue to provide safe and reliable electrical service.

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1 MVA is a unit of measurement that refers to the rated capacity of electrical equipment such as transmission lines, transformers, etc., to carry or transport alternating current (AC). MW refers to the power delivered by the transmission system.

2 1,580 MVA (MW) refers to the total capacity entitlement allocated between SCE, the Los Angeles Department of Water and Power (LADWP) and Nevada Energy (NVE). The capacity entitlement refers to the MW ownership that each of these utilities, as co-owners of the Eldorado-Mohave transmission line, currently have over the transmission of power across this transmission line. Under existing agreements SCE, LADWP & NVE each have a capacity entitlement of 530, 716 & 334 MWs respectively. The rated capacity of the transmission line will remain as 2,598 MVA before and after the project. As a result of the project, the capacity entitlement of SCE will increase from 530 MW to 1,548 MW.

3 The California RPS requires investor-owned utilities, electric service providers, and community choice aggregators to procure a minimum quantity of electricity products from eligible renewable energy resources so that the total kilowatt-hours of those products sold to their retail end-use customers achieve a designated percentage for a given year. Currently, the RPS requires 60% procurement by 2030. Additional information regarding the RPS can be found on the CPUC's website: http://www.cpuc.ca.gov/RPS_Homepage/.

- Maintain system reliability within the Los Angeles Basin as well as the entire CAISO grid, which is defined as the Electrical Needs Area (ENA).
- Increase power flow through the existing Eldorado-Lugo, Eldorado-Mohave[4], and Lugo-Mohave 500 kV Transmission Lines for the purpose of increasing the amount of power delivered from California, Nevada, and Arizona to the ENA[5] through the SCE system in an effort to meet requirements associated with the California RPS[6].
- Reduce SCE's current flow into the LADWP transmission system for the purpose of mitigating power flow overloads under abnormal system conditions.
- Ensure compliance with all applicable reliability planning criteria required by the North American Electric Reliability Corporation, Western Electricity Coordinating Council, and California Independent System Operator (CAISO).
- Integrate planned generation resources in order for those facilities to become fully deliverable.[7]
- Meet the requirements of existing Interconnection Agreements that require the Proposed Project to achieve FCDS for generation facilities.
- Meet Proposed Project needs while minimizing environmental impacts.
- Design and construct the Proposed Project in conformance with SCE's approved engineering, design, and construction standards for substation, transmission, subtransmission, and distribution system projects.

4.3 Project Location

General Location. SCE's proposed Eldorado-Lugo-Mohave Series Capacitor Project would be located in southeastern California and southern Nevada. The Proposed Project would involve work along three existing SCE 500 kV transmission lines:

- Lugo-Mohave Transmission Line – connecting Lugo Substation in San Bernardino County, California and Mohave Substation in Laughlin, Clark County, Nevada;
- Eldorado-Mohave Transmission Line – connecting Eldorado Substation in the City of Boulder City, Nevada and the Mohave Substation; and
- Eldorado-Lugo Transmission Line – connecting Eldorado Substation and Lugo Substation.

The Proposed Project crosses San Bernardino and Clark counties, including the unincorporated communities of Lucerne Valley in California and Searchlight and Laughlin in Nevada. In San Bernardino

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4 *See* Footnote 3

5 While SCE's original Application to the CPUC defined the Electrical Needs Area (ENA) to include just the Los Angeles Basin, the Proposed Project benefits a larger regional area as well, as is depicted in SCE's Proponent's Environmental Assessment at Figure 1-2 Electrical Needs Area which can be found at http://www.cpuc.ca.gov/environment/info/aspen/elm/pea/vol1_ch1-ch3.pdf.

6 The Proposed Project provides for the delivery of additional renewable generation into southern California by increasing the operating transmission line capacities from:
- 1,645 megavolt-ampere (MVA) to 2,858 MVA on the Eldorado-Lugo 500 kV Transmission Line and
- 2,078 MVA to 2,858 MVA on the Lugo-Mohave 500 kV Transmission Line

7 A generating facility is referred to as being "fully deliverable" once it has achieved Full Capacity Deliverability Status (FCDS).

County, portions of the Proposed Project would also cross the incorporated City of Hesperia. The Proposed Project also would cross lands under the jurisdiction of the BLM, the NPS, the U.S. Bureau of Reclamation (BOR), and the Department of Defense, as well as land managed by the California State Lands Commission.

Figure 4-2, Proposed Project Overview Map Series, provides a series of 12 sheets depicting the location of Proposed Project components and land ownership. In the text below, information in parentheses [e.g., (See Figure 4-2, Sheet 3)] refers to individual sheets in Figure 4-2 that show where an activity would occur.

General Land Use. A majority of the land area crossed by and in the vicinity of the Proposed Project is under federal jurisdiction, including the BLM, NPS, the BOR, and Department of Defense. The Proposed Project area is generally characterized by undeveloped and open land, utilities and infrastructure, and some low-density residential land uses.

Most of the Proposed Project is in San Bernardino County, California. The area north of Lugo Substation is mostly residential development on private land. The remaining portions of San Bernardino County (i.e., in the vicinity of the Eldorado-Lugo and Lugo-Mohave 500 kV Transmission Lines) are mostly undeveloped open lands, with some low-density residential and agricultural uses. However, for approximately 55 miles of its length, the Lugo-Mohave transmission line parallels an existing Southern California Gas (SoCalGas) gas pipeline, as well as approximately 6 miles of a second pipeline. The pipeline locations are shown on Figure 4-2, Sheets 4, 5, and 6. Large portions of unincorporated San Bernardino County between Hesperia and the California border traversed by the Proposed Project are under federal jurisdiction and are managed by the BLM or the NPS.

Portions of the Proposed Project are within the City of Hesperia, California, which is bordered to the north by the City of Victorville, to the northeast by the Town of Apple Valley, to the west, east and south by unincorporated areas of San Bernardino County and to the southeast by San Bernardino National Forest. The City of Hesperia contains a mix of residential, agricultural, industrial, and commercial uses. The area surrounding the Lugo-Mohave 500 kV Transmission Line is mostly undeveloped, with residential uses and public facilities to the north. (See Figure 4-2, Sheet 1.)

The eastern portion of the Proposed Project is located in undeveloped, open lands in southern Clark County, Nevada. The Eldorado-Mohave 500 kV Transmission Line and a portion of the Lugo-Mohave 500 kV Transmission Lines traverse Clark County through mostly BLM-managed land and the unincorporated communities of Searchlight and Laughlin.

The City of Boulder City, Nevada, is surrounded by unincorporated Clark County and, to the northwest, by the City of Henderson, Nevada. The Eldorado Substation, McCullough Substation, and a portion of the Eldorado-Mohave 500 kV Transmission Line are located in the southern half of the City of Boulder City, in Eldorado Valley. Land uses in this area are dedicated to energy resources and open space. The northern portion of the City of Boulder City includes residential, commercial, and open space land uses.

Property Description. The majority of the Proposed Project would be constructed within existing SCE Rights-of-Way (ROWs), existing public ROWs where SCE has existing franchise agreements, or ROWs on federal lands that SCE is in the process of renewing. SCE's previous ROW Grant for lands currently and formerly under BLM administration has expired. The utility would need to renew the ROW Grant for lands under BLM jurisdiction and obtain a Special Use Permit from NPS on lands formerly under BLM jurisdiction but now administered by the NPS as the Mojave National Preserve. The BLM Grant would include permission to both construct and operate the Proposed Project. The BLM Grant for the Lugo-Mohave Transmission Line would be for a 160-foot wide ROW. The BLM Grant for the Eldorado-Lugo Transmission Line would be for a 180-foot wide ROW. In addition, a small area of additional BLM ROW would be required at the Newberry Springs mid-line capacitor site to accommodate the facility footprint and new

ROW would be required for a distribution and telecommunication link between the Newberry Springs and Ludlow capacitor facilities. On the Mojave National Preserve, an NPS Special Use Permit would be needed for the ROW and a separate Special Use Permit would be required for construction. For the Special Use Permit for the ROW the widths would be the same as on BLM-administered land: 160 feet on the Lugo-Mohave Transmission Line and 180 feet on the Eldorado-Lugo Transmission Line.[8] In addition, SCE would require an additional 20-foot ROW width adjacent to the 160-foot Lugo-Mohave Transmission Line ROW within the Mojave National Preserve at the Kelbaker and Lanfair repeater sites to accommodate distribution lines between the nearby roads and the repeater sites. Applications for the ROW Grant and Special Use Permits have been submitted by SCE to the BLM and the NPS, respectively.

The 2 proposed series capacitor sites and the 3 proposed fiber optic repeater sites may require slight increases in the amount of ROW from what is currently authorized in order to accommodate installation of these facilities. The amount of land required will be determined at the time of final engineering and Proposed Project approval. A more detailed discussion of ROW requirements is provided in Section 4.6, Right-of-Way Requirements.

4.4 Project Components – Overview

The Proposed Project would support the integration of renewable energy that would be used to help serve retail end-use customers throughout the ENA.

Project Components. The Proposed Project components and activities include:

- Construction of 2 new 500 kilovolt (kV) mid-line series capacitors – the proposed Newberry Springs Series Capacitor and Ludlow Series Capacitor. A series capacitor is used to improve the efficiency of power delivery and voltage stability on a transmission line. The proposed series capacitors would increase the megawatt (MW) capacity of the two transmission lines, which would remain at 500 kV. The series capacitor sites are about 1.25 miles apart and are located under the existing Eldorado-Lugo and Lugo-Mohave 500 kV Transmission Lines, respectively. The sites are approximately 0.6 miles north of Interstate 40 (I-40) and 18 miles east of Newberry Springs. For most of their route between Lugo Substation and I-40, the two transmission lines are parallel; near I-40, they separate. (See Figure 4-2, Sheet 4; Figure 4-3, Ludlow Mid-line Series Capacitor Detail; and Figure 4-4, Newberry Springs Series Capacitor Detail.)
- Installation of electric distribution and telecommunication facilities at and in the vicinity of the proposed series capacitor sites to provide light, power, and communications at these facilities. (See Figure 4-2, Sheet 4; and Figure 4-5, Ludlow-Newberry Springs Distribution/Telecom Detail.)
- Correction of 16 overhead clearance discrepancies[9] that currently exist along the Eldorado-Lugo, Eldorado-Mohave, and Lugo-Mohave 500 kV Transmission Lines. The clearance discrepancies would

[8] In the Mojave National Preserve, the only work on the Eldorado-Lugo 500 kV Transmission Line under the Proposed Project would be the raising of one tower adjacent to the Union Pacific Railroad line that demarks a portion of the western boundary of the Preserve. However, the Special Use Permit would be for the entire Eldorado-Lugo transmission line, as the original BLM ROW Grant has expired.

[9] SCE has defined "discrepancies" as potential clearance problems between an energized conductor and its surroundings, such as the structure supporting the conductor, another energized conductor on the same structure, a different line, or the ground. SCE has identified approximately 16 discrepancies along the Eldorado-Lugo, Eldorado-Mohave, and Lugo-Mohave 500 kV Transmission Lines where minor grading or relocation, replacement, or modification of transmission, subtransmission, or distribution facilities are needed to address California Public

require the relocation, replacement, or modification of some existing transmission, subtransmission, and distribution facilities, including minor grading. (See Figure 4-2, Sheets 1–4, 8, and 12.)

- Installation of telecommunications facilities, including:
  - Installation of overhead and underground fiber optic cable between the proposed Newberry Springs Series Capacitor and Ludlow Series Capacitor, which are 1.25 miles apart. (See Figure 4-5, Ludlow-Newberry Springs Distribution/Telecom Detail.)
  - Installation of 3 fiber optic repeater facilities in San Bernardino County within the Lugo-Mohave 500 kV Transmission Line ROW, along with local distribution lines, to provide light and power to the sites. Two of the sites would be in the Mojave National Preserve. (See Figure 4-6, Barstow Repeater Detail; Figure 4-7, Kelbaker Repeater Detail; and Figure 4-8, Lanfair Repeater Detail.)
  - Removal of an existing overhead ground wire (OHGW), modification of selected existing towers to support OPGW, and installation of approximately 235 miles of overhead OPGW (see Figure 4-2), including approximately 3 miles of underground fiber optic on SCE's existing Eldorado-Mohave and Lugo-Mohave 500 kV Transmission Lines. (See Figure 4-2; Figure 4-5, Ludlow-Newberry Springs Distribution/Telecom Detail; and Figure 4-9, Underground Telecom Line Detail.)
- Modifications within the existing SCE Lugo, Mohave, Eldorado Substations and LADWP McCullough Substation. (See Figure 4-10, Lugo Substation Detail; Figure 4-11, Mohave Substation Detail; and Figure 4-12, Eldorado Substation Detail.) These modifications include:
  - Installation of fiber optic cable within the 3 existing SCE substations.
  - Upgrading the existing series capacitor banks at the 3 SCE substations.
  - Installation of new terminal equipment at the 3 SCE substations.
  - Replacement of the existing series capacitor bank at Mohave Substation.
  - Removal of 2 existing tubular steel poles (TSPs) and installation of 2 new TSPs at Lugo Substation.
  - Removal of 5 existing 50 kA circuit breakers and installation of 5 new 63 kA circuit breakers at LADWP's McCullough Substation located just north of Eldorado Substation.
- If required as the result of engineering studies, installation of protective measures along existing natural gas pipelines paralleling a portion of the Lugo-Mohave Transmission Line. The pipeline locations are shown on Figure 4.2, Sheets 4, 5, and 6.

Component Locations. The Proposed Project's components and activities would occur at multiple locations along the Eldorado-Lugo, Lugo-Mohave, and Eldorado-Mohave Transmission Lines.

- The 2 mid-line series capacitor sites are each approximately 0.7 miles north of Interstate 40 in unincorporated San Bernardino County, California. The sites are approximately 1.3 miles apart. The proposed Newberry Springs Series Capacitor site is on the south side of the BNSF Railway approximately 1,200 feet northeast of the existing Pisgah Substation, within the Eldorado-Lugo 500 kV Transmission Line ROW. The proposed Ludlow Series Capacitor site is approximately 1.4 miles east of Pisgah Substation, within the existing Lugo-Mohave 500 kV Transmission Line ROW. Distribution facilities would be installed between the two sites to provide light and power to the mid-line series capacitor facilities; overhead and underground telecommunications lines would be installed between the facilities as well.

Utilities Commission (CPUC) General Order (G.O.) 95 and National Electrical Safety Code (NESC) overhead clearance requirements. Discrepancy locations are shown in Figure 4-2, Proposed Project Overview Map Series.

- The 16 identified clearance discrepancies are along the Eldorado-Lugo, Eldorado-Mohave, and Lugo-Mohave 500 kV Transmission Lines at 14 separate locations. To address these 16 discrepancies, transmission, subtransmission, and/or distribution facilities would be relocated, replaced, or modified at 12 locations to address 14 of the potential overhead clearance discrepancies. At two other locations, minor grading would correct two overhead clearance discrepancies. Figure 4-2 shows the location of each potential discrepancy work area and Attachment 4-A: Discrepancy Work Areas provides descriptions of the proposed work.
- The 3 Fiber Optic Repeater facility sites — Barstow, Kelbaker, and Lanfair — are dispersed within the Lugo-Mohave ROW. The Barstow Repeater site is in the ROW approximately 2,000 feet east of Barstow Road (Highway 247) and 900 feet north of Haynes Road in rural San Bernardino County. The Kelbaker Repeater site is in the transmission ROW approximately 700 feet east of Kelbaker Road in the Mojave National Preserve. The Lanfair Repeater site is in the transmission line ROW approximately 1,700 feet east of Lanfair Road, also in Mojave National Preserve. Distribution facilities also would be installed to provide light and power to the 3 proposed fiber optic repeaters. At the Barstow site, an underground distribution line would be installed for an adjacent overhead line. At the Kelbaker site, approximately eight wood poles would be installed between an existing overhead line on Kelbaker Road and the repeater site. At the Lanfair site, approximately 16 wood poles would be installed between an existing overhead distribution line along Lanfair Road and the repeater site.
- Approximately 232 miles of OPGW would be installed atop SCE's existing Eldorado-Mohave and Lugo-Mohave 500 kV Transmission Lines. Currently, 2 parallel OHGWs are strung between the tops of the transmission towers, above the 500 kV conductors. The OHGW shields high-voltage conductors from lightning strikes and provides for distributed grounding of towers for safe powerline operation. Under the Proposed Project, one of the two existing OHGW would be removed and replaced with OPGW, which has a fiber optic cable core surrounded by strands of steel and aluminum wire. From Lugo Substation to Mohave Substation, approximately 173 miles of OPGW would be installed on the Lugo-Mohave 500 kV Transmission Line and approximately 3 miles of underground fiber optic cable would be installed within existing SCE ROWs and public ROW where SCE is in franchise. OPGW also would be installed on approximately 59 miles of the Eldorado-Mohave 500 kV Transmission Line, from Mohave Substation to Eldorado Substation, including approximately 700 feet of underground fiber optic cable within Eldorado Substation.
- The Proposed Project would require minor internal modifications (e.g., circuit breaker replacement) within SCE's existing Lugo, Eldorado, and Mohave substations and LADWP's McCullough substation to accommodate the proposed system changes.
- Depending on final engineering studies, additional protective measures may be required to be installed along a portion of the SoCalGas natural gas transmission pipeline near a portion of the Lugo-Mohave Transmission Line.

4.5 Project Components by System

Detailed location information on project components and potential disturbance areas is provided in a 351-sheet map set submitted by SCE as Appendix E to its Proponent's Environmental Assessment (PEA) that accompanies its Application. Subsequent to submitting Appendix E, SCE has eliminated some proposed helicopter landing zones and yard sites and adjusted the boundaries of other yards. The maps show all towers on the Lugo-Mohave and Eldorado-Mohave transmission lines; towers on the Eldorado-Lugo transmission line are shown from Lugo Substation to a point just north of the Newberry Springs Capacitor site. Because of its size, this appendix (PEA Vol. 5 Appendix E: Detailed Route Map) is not reproduced as part of the IS/MND, but it can be viewed online at http://www.cpuc.ca.gov/environment/info/aspen/elm/toc-pea.htm. It is divided into two files because of its size.

4.5.1 Line-Related Work

The following subsections describe the transmission line, subtransmission line, distribution line, and telecommunications line work associated with the Proposed Project.

4.5.1.1 500 kV Transmission Line System

Two separate sets of actions are planned with regard to 500 kV Transmission Line facilities. Modifications and/or upgrades would occur to the existing Eldorado-Lugo, Eldorado-Mohave, and Lugo-Mohave 500 kV Transmission Lines to address 16 overhead clearance discrepancies at 14 locations. Modifications would also be required on the Lugo-Mohave and Eldorado-Mohave Transmission Lines to accommodate OPGW installation and connect the 3 repeater facilities that would be located along the Lugo-Mohave line. Project components are shown in Figure 4-2, Proposed Project Overview Map Series; individual figures for key project locations are as referenced in Figure 4-2.

Clearance Discrepancies. The proposed activities on the 3 transmission lines to address clearance discrepancies are identified below and described in Table 4.A-1 Discrepancy Work Areas in Attachment 4-A. The Lugo-Mohave and Eldorado-Lugo 500 kV Transmission Lines are adjacent to each other for approximately 65 miles between Lugo Substation and a point just west of I-40, at which point they diverge.

- On the Eldorado-Lugo 500 kV Transmission Line:
  - Raise Tower M14-T4 a minimum of 18.5 feet to address two discrepancies on either side of the tower (Figure 4-2, Sheet 1).
  - Reframe and lower two structures on the Cottonwood-Savage 115 kV Subtransmission Line and lower the 12 kV distribution line between Towers M20-T2 and M20-T3 by a minimum of 5 feet (this also addresses a discrepancy on the adjacent Lugo-Mohave 500 kV Transmission Line) (Figure 4-2, Sheet 1).
  - Raise Tower M33-T1 by a minimum of 5 feet (Figure 4-2, Sheet 2).
  - Modify conductor sag between Towers M58-T1 and M58-T2 (Figure 4-2, Sheet 3).
  - Raise Tower M63-T3 by a minimum of 15 feet (Figure 4-2, Sheet 3).
  - Raise Tower M64-T2 by a minimum of 5 feet (Figure 4-2, Sheet 3).
  - Raise Towers M97-T1 and M97-T2 by a minimum of 18.5 feet (Figure 4-2, Sheet 12).
- On the Lugo-Mohave 500 kV Transmission Line:
  - Remove a minimum of 3.5 feet of concrete below the conductor between Towers M4-T2 and M4-T3 (Figure 4-2, Sheet 1).
  - Reframe and lower the distribution line between Towers M8-T1 and M8-T2 by a minimum of 5 feet (Figure 4-2, Sheet 1).
  - Raise Tower M22-T4 by a minimum of -15 feet (Figure 4-2, Sheets 1 and 2).
  - Grade/remove a minimum of 2 feet of berm between Towers M29-T3 and M30-T1 (Figure 4-2, Sheet 2).
  - Raise Tower M68-T1 by a minimum of 8.5 feet (Figure 4-2, Sheet 4).

  - Modify conductor sag between Towers M89-T1 and M89-T2 (Figure 4-2, Sheet 4).
- On the Eldorado-Mohave 500 kV Transmission Line
  - Raise Tower M4-T1 by a minimum of 18.5 feet and add lattice steel tower (LST) and foundation modifications as required (Figure 4-2, Sheet 8).

OPGW-Related Modifications. In addition to addressing clearance discrepancies, the Proposed Project would install approximately 232 miles of OPGW on the Eldorado-Mohave and Lugo-Mohave 500 kV Transmission Lines. The OPGW would replace one of two existing overhead ground wires. This work would require modification to approximately 60 LSTs. These are towers where fiber optic splices would be required. Attachment 4-B: Table 4.B-1 Tower Modifications Associated with Optical Ground Wire Installation (at the end of this chapter) indicates which towers require ground wire peak (GWP) modification, body modification, and/or bent steel repair. Of the 60 towers requiring ground wire peak modification, 27 also require body modification and 4 require bent steel repair.

4.5.1.2 115 kV Subtransmission Line System

To address a clearance discrepancy, the Proposed Project would modify 2 wood poles on the existing Cottonwood-Savage 115 kV Subtransmission Line located on Desert View Road east of Canyon View Road (Figure 4-2, Sheet 1).

4.5.1.3 Distribution Line System

To provide electrical service for lighting and operations at the proposed series capacitor sites and repeater sites, distribution lines would be installed between existing distribution circuits and the proposed facilities. In addition, the cross-arm on one existing distribution pole would be lowered to address a clearance discrepancy with the overhead transmission line. The Proposed Project would include the following 12 kV and 16 kV distribution line elements:

- Extend or reroute approximately 2 miles of overhead and approximately 700 feet of underground 12 kV distribution circuits to provide electrical power to the proposed Newberry Springs Series Capacitor and Ludlow Series Capacitor (Figure 4-2, Sheet 4; and Figure 4-5) and electrical power to the three proposed fiber optic repeater sites. The Barstow Repeater would be served by a 12 kV circuit; the Kelbaker and Lanfair Repeaters would be served by 16 kV circuits (Figure 4-2, Sheets 2, 5, and 7; and Figures 4-6, 4-7, and 4-8).
- Address clearance discrepancies at two locations by changes to distribution circuits crossing under existing 500 kV transmission lines:
  - Lower the cross arms by approximately 5 feet on 2 existing 12 kV distribution pole to address the clearance discrepancy between Towers M8-T1 and M8-T2 on the Lugo-Mohave 500 kV Transmission Line at Deep Creek Road southeast of Hesperia, CA (Figure 4-2, Sheet 1).
  - Lower a 12 kV distribution line by approximately 5 feet by installing approximately two new distribution poles and removing one distribution pole near Towers M20-T3 and M20-T4 on the Eldorado-Lugo and Lugo-Mohave 500 kV Transmission Lines, respectively, on Desert View Road west of Lucerne Valley (Figure 4-2, Sheet 1).

4.5.1.4 Telecommunications System

Telecommunications infrastructure would be installed to connect the Proposed Project to SCE's telecommunications system and would support Supervisory Control and Data Acquisition (SCADA), protective relaying, and data transmission, and provide telephone services for the Proposed Project and associated facilities. The Proposed Project would include the following telecommunications lines and facilities:

- Install approximately 2 miles of overhead and approximately 500 feet of underground fiber optic cable to connect the proposed Newberry Springs Series Capacitor and Ludlow Series Capacitor (the overhead fiber optic cable would share the same poles with overhead distribution lines) (Figure 4-2, Sheet 4; and Figure 4-5).
- Install approximately 2 miles of underground telecommunications facilities in the same ROW as the overhead fiber optic cable as an additional connection of the proposed Newberry Springs Series Capacitor and Ludlow Series Capacitor to SCE's existing system.
- Install fiber optic cable within the existing Lugo, Mohave, and Eldorado Substations (Figures 4-10, 4-11, and 4-12).
- Install approximately 3 miles of underground fiber optic cable from Mohave Substation to existing tower M173-T2 on the Lugo-Mohave 500 kV Transmission Line (Figure 4-2, Sheet 8; and Figures 4-9 and 4-11).
- Install 3 fiber optic repeater facilities in the existing Lugo-Mohave 500 kV Transmission Line ROW. Two of these facilities would be within chain-link-fenced areas measuring approximately 70 feet by 35 feet, and one facility would be within a fenced area measuring approximately 101 feet by 57 feet. Access to Kelbaker and Lanfair repeater sites would be by way of approximately 80 -foot long new access road. (Figure 4-2, Sheets 2, 5, and 7; and Figures 4-6, 4-7, and 4-8) The repeater facilities would consist of:
  - Pre-fabricated building
  - Communication manhole
  - Distribution manhole
  - Emergency generator
  - Aboveground propane fuel tank surrounded by a block wall
  - Underground telecommunications facilities
  - Access road from existing transmission line access road to repeater site (at Kelbaker and Lanfair only)

A typical site plan for a fiber optic repeater facility is shown in Figure 4-13, Typical Site Plan for the Fiber Optic Repeater Sites, and a typical elevation is shown in Figure 4-14, Typical Elevation for the Fiber Optic Repeater Sites.

4.5.2 Poles/Towers

4.5.2.1 500 kV Transmission Poles/Towers

The Proposed Project would raise 9 existing 500 kV towers along the Eldorado-Lugo, Lugo-Mohave, and Eldorado-Mohave 500 kV Transmission Lines to address overhead clearance discrepancies. Approximately 60 existing 500 kV towers along the Eldorado-Mohave and Lugo-Mohave 500 kV Transmission Lines would be modified to facilitate the installation of OPGW. In addition, 2 existing TSPs would be removed and 2 new TSPs installed within Lugo Substation.

The approximate dimensions of the proposed structure types are shown in Figure 4-15, Typical Single-Circuit 500 kV Dead-End Tower; Figure 4-16, Typical Single-Circuit 500 kV Suspension Tower; and Figure 4-17, Typical Tubular Steel Pole. These are summarized in Table 4-2, Typical Transmission Structure Dimensions.

Table 4-2. Typical Transmission Structure Dimensions

Type of Structure	Proposed Number of Structures	Height Above Ground (feet)	Foundation or Pole Diameter (feet)	Auger Hole Depth (feet)	Auger Diameter (feet)
500 kV LST (Raised)	9	110 to 160	N/A	N/A	N/A
500 kV LST (Tower body and peak modifications)	60	N/A	N/A	N/A	N/A
500 kV TSP (New)	2	150 to 195	10 to 12	30 to 50	12 to 15

Note: "N/A" = Not Applicable.

To address potential conflicts with birds, transmission and distribution facilities would be designed consistent with the *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006* (Avian Power Line Interaction Committee [APLIC], 2006) where feasible. Transmission and distribution facilities would also be evaluated for installation of potential collision reduction devices in accordance with *Reducing Avian Collisions with Power Lines: The State of Art in 2012* (APLIC, 2012).

Approximately 9 existing LSTs would be raised for the Proposed Project to address discrepancies. This would be achieved by installing extensions in the tower body. Figure 4-18, Use of a Body Extension to Raise a Tower, illustrates the appearance of an LST before and after a tower body extension is installed. The LSTs to be modified would have a 30-foot by 30-foot to 60-foot by 60-foot disturbance area and would extend 110 feet to 160 feet above ground. If the weight from the additional steel requires LST foundation modification, the modifications would include installing three 5.5-inch-diameter micropiles on each of the four existing concrete piers that would extend underground approximately 20 feet (depending on a geotechnical analysis), with a 5-foot-diameter, 4-foot-deep concrete cap that would encapsulate the three new micropiles and the existing pier foundation. The raised LSTs would be bolted to the new cap.

Approximately 60 existing LSTs would have their bodies and/or peaks modified to accommodate the installation of OPGW. The LSTs are steel structures with a dulled galvanized finish. Figure 4-19, Use of Ground Wire Peak and Body Modifications to Support OPGW Installation, illustrates the modifications that would occur, strengthening the body and the peak of the tower with added steel members as shown. These modifications reinforce these specific towers to better handle the weight/load of the OPGW. Following the LST modifications, one of the two existing ground wires would be removed and a new OPGW fiber optic cable would be installed on approximately 855 existing LSTs on the Eldorado-Mohave and Lugo-Mohave 500 kV Transmission Lines. The existing structures range in height from 80 to 250 feet.

At Lugo Substation, two TSPs would be removed and two new TSPs would be installed. The new TSPs would be 10 feet to 12 feet in diameter at the base and extend 150 feet to 195 feet above ground. The TSPs would be attached to concrete foundations that would be 10 to 12 feet in diameter and would extend underground 30 feet to 50 feet with up to approximately 3 feet of concrete visible above ground. Each TSP would use approximately 100 to 225 cubic yards of concrete. The TSPs would be all-steel structures and would have a dulled galvanized finish.

SCE has identified 6 locations between Lugo Substation and I-40 where transmission line spans (i.e., catenaries) would exceed 200 feet above ground level (AGL). These spans may require installation of marker balls for aviation safety. Two spans are in uninhabited hilly terrain approximately 1.3 and 6.6 miles east of the Mojave River. Two spans are at Highway 18 just west of Joshua Road. The final two spans are approximately 15 miles northeast of Lucerne Valley, 1.3 miles east of Camp Rock Road along Powerline Road.

Prior to construction, SCE would file Federal Aviation Administration (FAA) notifications (Form 7460-1: Notice of Proposed Construction or Alteration) for Proposed Project structures meeting FAA notification requirements. This applies to any construction or alteration this is more than 200 feet AGL. SCE would consult with the FAA and implement recommendations, to the extent feasible. SCE submitted Form 7460-1 to the FAA for these towers and spans, providing location, elevation, and height-about-ground information. FAA conducted an aeronautical study and determined that the catenary wires and towers do not exceed FAA obstruction standards and would not be a hazard to air navigation. As a result, marking and lighting are not necessary

Typical FAA recommendations to utilities and others include, but are not limited to, installation of marker balls on spans between structures, and/or installation of lighting on structures and under some circumstances would involve minor modifications to the structure to accommodate additional weight of the marker balls. Generally, marking or lighting is recommended by the FAA for those spans or structures that exceed 200 feet AGL; however, marking or lighting may be recommended for spans and structures that are less than 200 feet AGL, but located within close proximity to an airport or other high-density aviation environment. The specific requirements for the installation of marker balls or lights are specified in FAA Advisory Circular AC 70/7460-1L. In situations where marker balls are installed, SCE complies with FAA installation recommendations, as follows:

Marker Ball Specifications

- **Size and Color:** The markers used on extensive catenary wires across canyons, lakes, rivers, etc., are not less than 36 inches in diameter. Smaller 20-inch spheres are permitted on less extensive power lines or on power lines below 50 feet above the ground and within 1,500 feet of an airport runway end. Each marker is to be a solid color, such as aviation orange, white, or yellow.
- **Spacing:** Markers are spaced equally along the wire at intervals of approximately 200 feet or a fraction thereof. Intervals between markers should be less in critical areas near runway ends (i.e., 30 to 50 feet). They are displayed on the highest wire or by another means at the same height as the highest wire. Where there is more than one wire at the highest point, the markers may be installed alternately along each wire if the distance between adjacent markers meets the spacing standard. This method allows the weight and wind loading factors to be distributed.
- **Pattern:** An alternating color scheme provides the most conspicuity against all backgrounds. Mark overhead wires by alternating solid colored markers of aviation orange, white, and yellow. Normally, an orange sphere is placed at each end of a line and the spacing is adjusted (not to exceed 200 feet) to accommodate the rest of the markers.

When lighting is required, SCE complies with FAA installation requirements, as follows:

Lighting Specifications

- **Structures 150 feet or less:** Structures 150 feet or less have two steady burning red lights on the top of the structure. The lights are illuminated only during darkness.
- **Structures over 150 feet:** Taller structures that exceed 150 feet have a flashing red beacon on the top of the structure and two steady burning red lights at mid-height. They are illuminated only during darkness.

4.5.2.2 Subtransmission Poles/Towers

The subtransmission segment of the Proposed Project would reframe two existing wooden subtransmission poles to address a clearance discrepancy with the overhead 500 kV lines. The wood poles extend 70 to 80 feet above the ground. The poles are 2 to 3 feet in diameter at ground level and taper to the top of the pole. This discrepancy location is west of Lucerne Valley, on Desert View Road between Canyon View Road and Joshua Road. The approximate dimensions of the existing structures are shown in Figure 4-20, Typical Subtransmission Structures, and are summarized in Table 4-3, Typical Subtransmission Structure Dimensions.

Table 4-3. Typical Subtransmission Structure Dimensions

Pole Type	Proposed Number of Existing Structures to be Modified	Approximate Height Above Ground (feet)	Approximate Pole Base Diameter (feet)	Approximate Auger Hole Depth (feet)	Approximate Auger Diameter (feet)
Wood Pole (Modified)	2	70 to 80	2 to 3	N/A	N/A

4.5.2.3 Distribution Poles

Approximately 100 distribution poles would be installed at various locations as part of the Proposed Project. Two existing distribution poles would be modified to address a clearance discrepancy and two new distribution poles would be installed to address a clearance discrepancy at a separate location. New distribution circuits on poles would extend from nearby existing distribution circuits to the two proposed series capacitor facilities and two of the optic fiber repeater facilities. The Barstow Repeater would be served by an underground circuit.

The distribution routes would use a combination of existing wood poles and new wood poles. As shown in Table 4-4, Typical Distribution Structure Dimensions, the wood poles would be 10 to 14 inches in diameter at the base and would extend 40 to 55 feet above the ground. As part of the Proposed Project, down guys may be required for certain structures, based on final engineering.

Table 4-4. Typical Distribution Structure Dimensions

Type of Structure	Approximate Number of Structures	Approximate Height Above Ground (feet)	Approximate Pole Diameter (Inches)	Approximate Auger Hole Depth (feet)	Approximate Auger Diameter (feet)
Wood Pole (New)	100	40 to 55	10 to 14	5 to 10	1.5 to 2
Wood Pole (Existing/ Modified)	3	40 to 55	10 to 14	N/A	N/A
Wood Pole (Removed)	1	40 to 55	10 to 14	N/A	N/A

4.5.3 Conductor/Cable

The following subsections describe the above ground and below ground installation of the transmission, subtransmission, telecommunications, and distribution lines.

4.5.3.1 Above Ground Installation

Transmission

The Proposed Project involves existing 500 kV transmission lines located primarily on LSTs. The existing 500 kV transmission lines support a non-specular two-bundled 2,156 kcmil[10] 84/19 stranded "BLUEBIRD" aluminum conductor steel-reinforced (ACSR) conductor. To correct potential clearance discrepancies at three locations, one location on the Eldorado-Lugo 500 kV Transmission Line and two locations on the Lugo-Mohave 500 kV Transmission Line, the length of the existing conductor between towers would be adjusted. This would involve transferring a portion of the conductor length in the span with the clearance discrepancy to an adjacent span. The approximate required distance from the ground to the lowest conductor would be 33 feet (non-pedestrian) and 28 feet (pedestrian only/not accessible to regular vehicles). The approximate required horizontal separation/distance between conductors would be 30 feet.

The Proposed Project also includes replacement of one of the two existing OHGW with one OPGW, which would be installed on existing structures on the Eldorado-Mohave and Lugo-Mohave 500 kV Transmission Lines to provide protection and to support telecommunications. The approximately 0.75-inch-diameter OPGW would be installed at the top of the existing structures, which range in height from 80 to 250 feet. The average span length (distance) between overhead structures is 350 to 1,850 feet. The OPGW would be installed above the conductor, with a radial clearance of at least 12.5 feet, as required by CPUC G.O. 95. To support OPGW installation, tower modifications would be required.

Subtransmission

To address clearance discrepancies, the Proposed Project would include lowering one existing 115 kV subtransmission line adjacent to Desert View Road by reconfiguring the cross arms on two existing wood poles to reduce the height of the conductor (see Figure 4-2, Sheet 1). This subtransmission line supports a non-specular 336.4 kcmil ACSR conductor. The lowest conductor would be 48 to 54 feet above the ground. The Proposed Project would use the existing conductors and would be designed to meet the CPUC G.O. 95 minimum ground-to-conductor clearance requirements**.**

Distribution

The distribution lines for the capacitor and repeater facilities would be installed on existing and new wood poles, with limited lengths of underground conduit. The lowest overhead conductor would be 30 to 47 feet above the ground. The average span length (distance) between overhead structures is estimated to be 150 feet to 200 feet.

Telecommunications

Fiber optic cables would be installed both overhead and underground. The overhead cable height would be between 20 and 25 feet above the ground and would be a 0.579-diameter all-dielectric self-supporting (ADSS) fiber optic cable. The average span length between overhead structures would be 150 feet to 200 feet. Overhead fiber optic cables would be co-located on poles carrying distribution lines.

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[10] A kcmil (1,000 circular mils [cmils]) is a quantity of measure for the size of a conductor; kcmil wire size is the equivalent cross-sectional area in thousands of cmils. A cmil is the area of a circle with a diameter of 0.001 inch.

4.5.3.2 Below Ground Installation

Distribution

The Proposed Project would include the installation of approximately 0.2 miles of underground distribution cables in new duct banks.[11] At a minimum, the duct banks would measure approximately 2 feet wide by 4 feet deep and would each consist of approximately two 5-inch conduits, conduit spacers, and concrete.

Telecommunications

The Proposed Project includes the installation of approximately 4.3 miles of underground telecommunications cable in new underground duct banks. The newly installed duct banks would measure approximately 2 feet wide and 3 feet deep and would typically consist of two 5-inch conduits, conduit spacers, and concrete, with a minimum of 30 inches of cover. A 1.25-inch inner-duct would be placed inside the underground 5-inch conduit. The fiber cable would be placed within the inner-duct. In addition to the new duct banks, approximately 0.7 miles of existing underground conduit would be used. The Proposed Project would use new and existing vaults measuring approximately 5 feet wide by 5 feet long by 6 feet deep.

The dimensions of the duct banks and distribution vaults are provided in Table 4-5, Underground Structure Dimensions, and are depicted in Figure 4-21, Typical Telecommunications Duct Bank (Note: the duct bank may have one or two PVC conduits). Figure 4-22, Typical Manhole, shows a typical manhole used for access to underground telecommunications facilities.

Table 4-5. Underground Structure Dimensions

Type of Structure	Approximate Number of Locations	Approximate Width (feet)	Approximate Length (feet)	Approximate Depth (feet)
Distribution Duct Bank	5	2	1,000	4
Telecommunications Vault (New Manholes)	41	5	5	6
Telecommunications Duct Bank	8	2	22,700	3

4.5.4 Mid-Line Series Capacitors

The Proposed Project includes the construction of two new 500 kV mid-line series capacitors — the proposed Newberry Springs Series Capacitor and Ludlow Series Capacitor — largely within the Eldorado-Lugo and Lugo-Mohave 500 kV Transmission Line ROWs, respectively (see Figures 4-3 and 4-4). Each mid-line series capacitor pad would be approximately 225 feet wide by 324 feet long and would occupy approximately 1.67 acres within an approximately 3.2-acre graded site (for the Newberry Springs Series Capacitor) or 2.5-acre graded site (for Ludlow Series Capacitor). Each mid-line series capacitor would include the following components:

[11] Duct banks are groups of conduits designed to protect and consolidate cabling to and from one structure to another. In a duct bank, telecommunications and electrical cables are laid out within PVC conduits that are bundled together. These groupings of conduit are then typically protected by concrete casings and buried underground.

- A 500-kV capacitor bank with platforms, support insulators, foundations, conduits or trenches, cables, conductors, and bus and/or cable interconnections
- A Mechanical Electrical Equipment Room (MEER) with alternating current/direct current (AC/DC) panels, Control & Protection panels, batteries, batteries chargers, telecommunications racks, security racks, heating, ventilating, air conditioning (HVAC) equipment, communication room to house communication equipment, and emergency lighting
- Two transmission interface structures and bus supports[12]
- External site lighting system
- Distribution station light and power system
- External bypass switch with required support insulators, foundations, conduits or trenches, conductors, conductors support insulators, and grounding connections
- Two motor-operated isolating disconnect switches with ground attachments, required support insulators, foundations, conduits or trenches, conductors, conductors support insulators, and grounding connections
- Up to two new internal bypass switches with required foundations, conduits or trenches, cables, conductors, bus-work, and grounding connections
- Security cameras with support structures and foundations
- Conductor between the two transmission interface structures inside the series capacitor facilities with two-bundled 2,156 kcmil 84/19 stranded “BLUEBIRD” ACSR per phase; insulator assemblies and mounting hardware (existing conductor may be used from existing towers to the new transmission interface structures)
- Insulator assemblies and mounting hardware on both sides of conductor spans
- Two overhead ground wires to connect existing and proposed towers at the proposed series capacitor facilities with 7 No. 6 Alumoweld wire
- Chain-link fence and gates around the series capacitor bank and chain-link fence and gates with appropriate top guard (e.g., castle spikes, barbed wire, and/or razor wire) along the perimeter of the facility
- Propane emergency generator outside MEER structure and a minimum of 1,800-gallon propane fuel tank with a block wall on at least three sides
- Ground grid system
- Permanently installed portable restroom on site
- Placing asphalt within series capacitor platform area for weed control

The mid-line series capacitor components are described in the subsections that follow. Figure 4-23, Typical Mid-Line Series Capacitor Layout, shows the dimensions of the proposed Newberry Springs Series Capacitor and Ludlow Series Capacitor, as well as the placement and orientation of the major components that would be included in the facilities. Figure 4-24, Typical Mid-Line Series Capacitor Profile, provides a profile view of the proposed mid-line series capacitors.

[12] SCE is evaluating the use of transmission interface structures.

4.5.4.1 Mechanical and Electrical Equipment Room

A Mechanical and Electrical Equipment Room (MEER) typically is constructed with metal framing, structural steel, or concrete masonry units, and concrete. The MEER would be a one-story building. SCE anticipates that the MEER would have a dark-colored roof and earth-tone-colored sidewalls and that the roofline, wall joints, and doorway would have a contrasting trim. The facilities would be on BLM lands and would conform to BLM requirements. Control cable trenches would be installed in the yard to connect the MEER to the 500 kV equipment's control cabinets.

4.5.4.2 Access

Two new, approximately 24-foot-wide,[13] 190-foot-long access roads would be constructed for the proposed Newberry Springs Series Capacitor. The existing access road at the Ludlow Series Capacitor site would be rerouted around the capacitor facility with approximately 650 feet of existing road removed and a new, approximately 24-foot-wide, 840-foot-long access road installed. Two new, approximately 14-foot-wide crushed rock interior driveways would be constructed within the two proposed capacitor sites. An approximate 125-foot by 175-foot asphalt pad would be installed at each facility within the perimeter fencing. There are no new, permanent parking spaces associated with the Proposed Project.

4.5.4.3 Grading and Drainage Description

At the beginning of construction, the proposed Newberry Springs and Ludlow Series Capacitor sites would be cleared of brush, vegetation, rocks, and other deleterious materials. Sites may be over-excavated to remove any unsuitable base materials. If suitable, over-excavated materials may be used to backfill the site; otherwise, they would be disposed of offsite. The site would be graded and compacted to achieve the desired pad elevation. Construction of the proposed Newberry Springs Series Capacitor and Ludlow Series Capacitor would require approximately 4.1 and 4.3 acres for site development (construction work areas), respectively. Mowers, excavators, front-end loaders, dump trucks, rock crushers, and/or bulldozers would be used during clearing, grubbing, vegetation removal, and grading activities. A summary of the anticipated grading quantities for the proposed Newberry Springs and Ludlow Series Capacitors is provided in Table 4-6, Mid-Line Series Capacitor Cut and Fill Grading Summary.

Table 4-6. Mid-Line Series Capacitor Cut and Fill Grading Summary

Element	Material	Approximate Surface Area (square feet)	Approximate Volume (cubic yards)
Site Grading, Cut[1]	Dirt	90,830	5,220
Site Grading, Fill[1]	Dirt	62,320	10,060
Over-excavation[2]	Dirt	253,150	25,700
Site Grading, Net[1]	Dirt	253,150	4,910 (import)
External Roads, Spoils, Net[3]	Dirt	16,240	0
Equipment Foundations, Spoils, Cut	Dirt	12,540	1,080
Cable Trench, Spoils, Cut	Dirt	N/A	N/A
Drainage Structure, Spoils, Cut	Dirt	N/A	N/A

1 - The approximate area and volume include material needed for the retention basin.
2 - The approximate area and volume include 12 inches of over-excavation in areas of cut.
3 - The approximate area and volume include material needed for the ditch and berm that would be constructed as part of the access roads

13 Access roads longer than 100 feet would have 24-inch shoulders.

A drainage berm would be constructed to divert storm water around the sites. Drainage devices would be required to convey storm water runoff to an approved discharge location. A retention/detention basin would be provided in order to mitigate increase in runoff as a result of site development. The permanent cut and fill slopes for the proposed Newberry Springs and Ludlow Series Capacitor sites and the permanent cut and fill for the access roads would be stabilized during construction by using best management practices (BMPs) that would be described in the Proposed Project's Storm Water Pollution Prevention Plans (SWPPPs) required prior to construction.

4.5.4.4 Lighting

Lighting at the proposed Newberry Springs Series Capacitor and Ludlow Series Capacitor would consist of light-emitting diode lights located in areas of the yard where Operation and Maintenance (O&M) activities may take place during evening hours for emergency/scheduled work. Maintenance lights would be controlled by a manual switch that would normally be turned off when lighting is not required. The maintenance lights would be directed downward to reduce glare outside the facility.

4.5.4.5 Perimeter

Each Series Capacitor site would be enclosed on all sides by a chain-link fence. Barbed wire would be affixed to the top of the fence and desert tortoise (*Gopherus agassizii*) exclusion fencing would be affixed at the bottom. Chain-link gates would be provided for vehicle and pedestrian access.

4.5.5 Modification to Existing Substations

The Proposed Project would require modifications at SCEs Lugo, Mohave, and Eldorado Substations and LADWP's McCullough Substation. The substations are shown in Figures 4-10, 4-11, and 4-12.

Lugo Substation

Lugo Substation modifications include the following:

- Reconfiguring two existing 500 kV positions:
  - Removing the Eldorado 500 kV Transmission Line from the dead-end connection at the switch rack and retaining all equipment for a breaker-and-a-half position
  - Removing the Mohave 500 kV Transmission Line from the dead-end connection at the switch rack; demolishing the east circuit breaker and associated line disconnect switches; and configuring switch rack for a double-bus, double-breaker position
- Relocating the Eldorado and Mohave 500 kV Transmission Lines to two new positions equipped for 4,000 amps with 4,000-amp circuit breakers and 4,000-amp vertical break disconnect switches
- Removing two existing 500 kV TSP structures and foundations to an approximate depth of 3 feet and installing two new 500 kV TSP structures to support the relocation of the Eldorado and Mohave 500 kV Transmission Lines to their new positions
- Extending the existing 500 kV switch rack by four positions
- Installing four OHGWs to connect to the extended switch racks and TSPs with 7 No. 6 Alumoweld wire
- Conductoring the line positions with new two-bundled 2,156 kcmil 84/19 stranded "BLUEBIRD" ACSR per phase
- Installing new foundations, steel structures, grounding, and conduits for the new equipment

- Removing power line carrier protection equipment on the Eldorado 500 kV Transmission Line and Mohave 500 kV Transmission Line and installing new protective relays with digital communication in the existing MEER for line and series capacitor protection
- Removing the obsolete equipment for the series capacitor
- Upgrading existing 500 kV Eldorado and Mohave series capacitor banks to 3,300-amp, including required conductors, buses, and/or cable interconnections
- Updating the substation database at the Regional Control Center Energy Management System
- Installing a new Remote Terminal Unit (RTU) or adding a card to the existing RTU as required
- Installing additional telecommunications equipment — including channel equipment, light wave equipment, and fiber tie cables between buildings and existing MEER where required — to provide two communication paths
- Installing communications and related equipment in the Administration Building and relocating the existing Human Machine Interface from the MEER to the Administration Building
- Routing new fiber optic cable from the MEER to the Administration Building in existing underground conduit and installing new underground conduit, if needed
- Relocating an existing spare transformer bank pad

Mohave Substation

Mohave Substation modifications include the following:

- Equipping two existing 500 kV positions:
  - One 4,000-amp Lugo 500 kV Transmission Line position equipment with 4,000-amp circuit breakers and 4,000-amp disconnect switches
  - One 3,000-amp Eldorado 500 kV Transmission Line position with 4,000-amp circuit breakers and 4,000-amp disconnect switches
- Reconductoring the line position with new two-bundled 2,156 kcmil 84/19 stranded “BLUEBIRD” ACSR
- Removing and salvaging the existing 500 kV operating bus disconnect switches at two line positions
- Removing power line carrier protection equipment for the existing Lugo 500 kV Transmission Line and existing Eldorado 500 kV Transmission Line
- Installing new protective relays with digital communication and series capacitor protection on the Lugo 500 kV Transmission Line
- Install new protective relays with digital communication on the Eldorado 500 kV Transmission Line
- Replacing existing series capacitor yard lighting with LED lighting
- Installing a new 3,300-amp series capacitor bank on the Lugo 500 kV Transmission Line with required platforms, support insulators, foundations, conduits or trenches, cables, conductors, and buses and/or cable interconnections
- Installing new internal bypass switches

- Incorporating internal and external bypass switches, isolating disconnect switches, and ground switches into interlock logic, including conduits and terminating control and power wiring to terminal blocks in switches and Control & Protection panels in the series capacitor MEER
- Providing control and power, wiring, testing and commissioning to 500 kV external bypass switch and motor-operated isolating disconnect switches with ground attachments, including conduits from the Lugo series capacitors' MEERs to interface with SCE conduits for these switches located within the substation
- Removing an existing shed and installing a new MEER for series capacitor with series capacitor Control & Protection panels, Human-Machine Interfaces, digital fault recorder, AC/DC panels, telecommunications racks, batteries, battery chargers, HVAC equipment, emergency lighting, distribution station light and power system and security panels
- Installing conduits and trenches as required
- Modifying fencing for series capacitors
- Installing task lighting, tool outlets, and equipment power test outlet (100 amp) within the series capacitor's fenced area
- Installing and/or modifying grounding grid within the series capacitor fence, as well as equipment and personnel ground connections for all equipment
- Removing the existing foundation, platform, and equipment for the series capacitor
- Replacing the conductor between dead-end structures in the area of the series capacitor bank with new two-bundled 2,156 kcmil 84/19 stranded "BLUEBIRD" ACSR
- Relocating isolating disconnect switches as needed to accommodate the new 500 kV series capacitor
- Installing auxiliary switches for grounding attachments on the isolating disconnect switches
- Installing new foundations, structures, and grounding for the new equipment
- Providing new conduits and cables from the isolating disconnect switches to the new series capacitor MEER
- Installing relays for local breaker failure backup for new circuit breakers
- Adding motor-operating mechanisms to existing isolating disconnect switches
- Installing additional telecommunications equipment — including channel equipment, light wave equipment, and fiber tie cables between buildings and existing MEER where required — to provide two diverse communication paths
- Placing asphalt at series capacitor location for weed control
- Grading and cut and fill (Table 4-7, Mohave Substation Cut and Fill Grading Summary, provides a summary of the ground surface improvements at Mohave Substation.)

Table 4-7. Mohave Substation Cut and Fill Grading Summary

Element	Material	Approximate Surface Area (square feet)	Approximate Volume (cubic yards)
Site Grading, Cut[1]	Dirt	37,380	610
Site Grading, Fill[1]	Dirt	11,830	670

Table 4-7. Mohave Substation Cut and Fill Grading Summary

Element	Material	Approximate Surface Area (square feet)	Approximate Volume (cubic yards)
Over-excavation[2]	Dirt	38,200	1,420
Site Grading, Net[1]	Dirt	49,210	60 (Imported Fill)
External Roads, Spoils, Net	Dirt	N/A	N/A
Equipment Foundations, Spoils, Cut	Dirt	3,700	300
Cable Trench, Spoils, Cut	Dirt	N/A	N/A
Drainage Structure, Spoils, Cut	Dirt	N/A	N/A

1 - The approximate area and volume include material needed for the retention basin.
2 - The approximate area and volume include 12 inches of over-excavation in areas of cut (pad

The permanent cut and fill slopes for the retention/detention basin would be stabilized during construction using BMPs described in the Proposed Project's SWPPPs, which would be prepared and approved prior to construction.

Eldorado Substation

Eldorado Substation modifications include the following:

- Upgrading the Lugo 500 kV Transmission Line position equipment to 4,000 amps:
  - Replacing 3,000-amp circuit breakers with 4,000-amp circuit breakers
  - Replacing 3,000-amp disconnect switches with 4,000-amp disconnect switches
- Removing the obsolete equipment for the series capacitor
- Upgrading existing 500 kV Lugo series capacitor bank to 3,300-amp including required conductors, buses, and/or cable interconnections
- Adding motor-operating mechanisms to existing isolating disconnect switches
- Incorporating internal and external bypass switches, isolating disconnect switches, and ground switches into interlock logic, including conduits and terminating control and power wiring to terminal blocks in switches and Control & Protection panels in the series capacitor MEER
- Providing control and power, wiring, testing, and commissioning to 500 kV external bypass switch and motor-operated isolating disconnect switches with ground attachments, including conduits from the Lugo series capacitor's MEER to interface with SCE conduits for these switches located within the substation
- Reconductoring the line positions with new two-bundled 2,156 kcmil 84/19 stranded "BLUEBIRD" ACSR
- Removing power line carrier protection equipment on the Lugo 500 kV Transmission Line and the Mohave 500 kV Transmission line
- Install new protection relays with digital communication for the Mohave 500 kV Transmission Line
- Installing new protective relays with digital communication for line and series capacitor protection
- Installing transient recovery voltage capacitors
- Installing new foundations, steel structures, grounding, and conduits for the new equipment
- Replacing all cables from switchyard equipment to the existing MEER

- Installing additional telecommunications equipment — including channel equipment, light wave equipment, and fiber tie cables between buildings and existing MEER where required — to provide two diverse communication paths
- Placing asphalt at series capacitor location for weed control

McCullough Substation (LADWP)

- Replacing existing 4,000 amp 50kA circuit breakers with new 4,000 amp 63kA circuit breakers

4.5.6 Cathodic Protection of Natural Gas Transmission Pipelines

A SoCalGas natural gas transmission pipeline parallels approximately 55 miles of SCE's Lugo-Mohave 500 kV Transmission Line, from near Essex Road in the Mojave National Preserve to the proposed Newberry Springs and Ludlow series capacitor facility sites near Pisgah Substation (see Figure 4.2, Sheets 4, 5 and 6). Approximately 6 miles of a second SoCalGas pipeline also is located near the transmission line, from east of Ludlow to Pisgah Substation (See Figure 4-2, Sheets 4, 5 and 6). At their closest, the transmission line and pipelines are approximately 150 feet apart. Based on their proximity to and the planned increased power flow on the transmission line, these pipelines may require additional protective measures in areas where they are near the transmission line. Such protection, if needed, may include cathodic protection and grounding.

4.6 Right-of-Way Requirements

The Proposed Project would be built primarily within existing SCE fee-owned ROW, easements, or public ROW where SCE has existing franchise agreements. The BLM ROW grants and NPS Special Use Permit applicable to the existing 500 kV transmission lines have expired or will be expiring and need to be renewed or reissued prior to project construction.

The BLM Grant for the Lugo-Mohave Transmission Line would be for a 160-foot wide ROW. The BLM Grant for the Eldorado-Lugo Transmission Line would be for a 180-foot wide ROW. In addition, a small area of additional BLM ROW would be required at the Newberry Springs mid-line capacitor site to accommodate the facility footprint and new ROW would be required for a distribution and telecommunication link between the Newberry Springs and Ludlow capacitor facilities. Depending on final engineering design, the distribution/telecommunication ROW may be in an existing SoCalGas ROW on BLM land or a separate ROW on BLM land.

An NPS Special Use Permit would be needed for ROW on the Mojave National Preserve and a separate Special Use Permit would be required for construction. For the Special Use Permit addressing ROW needs, the ROW widths would be the same as on BLM-administered land: 160 feet on the Lugo-Mohave transmission line and 180 feet on the Eldorado-Lugo transmission line.[14] In addition, the Proposed Project would require an additional 20-foot ROW width adjacent to the 160-foot ROW within the Mojave National Preserve near the Kelbaker and Lanfair repeater sites to accommodate distribution lines from nearby Kelbaker and Lanfair Roads to the respective repeater sites. Depending on final design, the distribution/telecommunication ROW may be in an existing SoCalGas ROW on NPS land or a separate ROW on NPS land.

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[14] In the Mojave National Preserve, the only work under the proposed project on the existing Eldorado-Lugo line would be the raising of one tower adjacent to the Union Pacific Railroad line that demarks a portion of the western boundary of the Preserve. However, the Special Use Permit would be for the entire Eldorado-Lugo transmission line, as the original BLM ROW Grant has expired.

Easement widths are based on facility types, final design, and type of right to be acquired. Upgrading easements may include adding land rights, adding width to existing easements, and improving or clarifying access or maintenance rights. Certain land rights may need to be acquired and/or amended as follows:

Substations and Mid-Line Series Capacitors: Substation access would continue to be provided directly from Escondido Avenue (for Lugo Substation), Edison Way (for Mohave Substation), and Eldorado Valley Drive (for Eldorado Substation). The proposed design requires a minimum of 0.09 acres of additional property to be granted by the BLM to construct the proposed Newberry Springs Series Capacitor, and a minimum of 0.69 acres of additional private property to be acquired to construct the proposed Ludlow Series Capacitor.

Access: Access to the Proposed Project components would be provided from existing public roads and existing access roads. New access roads would be constructed for the proposed Newberry Springs Series Capacitor and Ludlow Series Capacitor. Upon final engineering and project approval, new or amended access road rights for the proposed mid-line series capacitors may be required. Section 4.7.1.3, Access Roads and/or Spur Roads, provides more detail on access roads.

Transmission: SCE would install the proposed transmission facilities within the existing SCE fee-owned ROW, easements, BLM ROW Grants, NPS Special Use Permits, or public ROW where SCE has existing franchise agreements.

Distribution: Locations where SCE would install the proposed distribution facilities include the existing SCE fee-owned ROW, easements, BLM ROW Grants, or public ROW where SCE has existing franchise agreements. A new NPS Special Use Permit would be needed between existing distribution lines on Kelbaker Road and Lanfair Road and the Kelbaker and Lanfair Fiber Optic Repeaters, respectively.

A new 1.3 miles of ROW would be needed for new distribution and telecommunication lines between the Newberry Springs Series Capacitor and the Ludlow Series Capacitor sites. This would involve approximately 0.9 miles of BLM land and 0.4 miles of private land. The Barstow Repeater would be served by a new underground line in the existing ROW.

Telecommunications: Telecommunications lines would be co-located on overhead and underground structures within existing SCE ROWs, ROW grants (or renewed grants), or public ROW where SCE has existing franchise agreements. An underground telecommunication duct bank and an overhead telecommunication line (on the same wood poles as a new distribution line) would be installed in 1.3 miles of new ROW between the mid-line series capacitor sites. In addition, approximately 1,400 feet of underground telecommunication duct bank will be installed southwesterly of the Ludlow Series Capacitor, requiring the acquisition of additional underground rights on private property. The Kelbaker and Lanfair Fiber Optic Repeaters and associated underground fiber optic lines and overhead distribution lines would need to be included in an NPS Special Use Permit.

Construction Support: Based on final engineering and construction requirements, temporary land rights (e.g., temporary construction easements, permits, leases, and licenses) may be required for access roads, laydown areas, pulling sites, helicopter staging yards, and staging and work areas for any approved Proposed Project component.

4.7 Construction

4.7.1 For All Project Components

4.7.1.1 Staging Yards

Construction of the Proposed Project would require temporary staging yards. Staging yards would be temporary uses and, during project execution, would serve as a reporting location for workers and for vehicle and equipment parking and material storage. A yard may have construction trailers for supervisory and clerical personnel and may be lit for staging and security. Normal maintenance and refueling of construction equipment would be conducted at these yards; refueling and storage of fuels would be in accordance with the SWPPPs.

SCE anticipates using one or more of the possible locations listed in Table 4-8, Potential Staging Yard Locations, as the staging yard(s) for the Proposed Project. Not all potential yards identified are expected to be used. The locations ultimately used will depend on decisions by SCE and/or its contractors as to construction methods, material storage needs, and preferences. The yards locations identified range in size from 1 acre to 21 acres. Preparation of a staging yard would include temporary perimeter chain-link fencing, if fencing is not already in place. Depending on existing ground conditions at the site, grubbing and/or grading could be needed to provide a level and compact surface for the application of gravel or crushed rock. Yards not within remote or industrial locations and visible to the public within 0.5 miles would have temporary screening fencing (mesh or slats) that visually shield activities from offsite viewers. Following completion of construction for the Proposed Project, any land disturbed at a staging yard would be returned to pre-construction conditions or, if requested by the landowner, left in its modified condition.

Table 4-8. Potential Staging Yard Locations

Yard Name	Location	Condition	Approx. Area (acres)[1]	Proposed Project Component
Arrowhead Lake Road	Hesperia	Previously Disturbed	5.3	Transmission
Bear Valley	Lucerne Valley Joshua Rd at Hwy 18	Partially Disturbed	4.2	Transmission
Barstow Road	Lucerne Valley Between Barstow Rd & Fern Dr.	Undisturbed	10.1	Transmission
Coolwater	Daggett Santa Fe St at Sunray Ln	Previously Disturbed	21.0	Transmission
Ludlow	Ludlow North of I-40 at Ludlow exit	Previously Disturbed	1.7	Transmission
Goffs Yard	San Bernardino County Goffs Rd near Lanfair Rd	Previously Disturbed	5.9	Transmission
Goffs Yard – Alt	San Bernardino County Goffs Rd near Lanfair Rd	Previously Disturbed	2.5	Transmission
Mohave Substation	Mohave Substation	Previously Disturbed	7.5	Transmission/OPGW, Substation, Capacitor
Eldorado Substation	Eldorado Substation	Previously Disturbed	8.5	Transmission/ Substation
Eldorado Substation 2	Eldorado Substation	Previously Disturbed	5.5	Substation/Capacitor
South Eldorado Substation	Eldorado Substation	Previously Disturbed	4.2	Substation/ Capacitor

Table 4-8. Potential Staging Yard Locations

Yard Name	Location	Condition	Approx. Area (acres)[1]	Proposed Project Component
Mohave Substation 2	Mohave Substation	Previously Disturbed	1.0	Substation
Lugo Substation II	Lugo Substation	Previously Disturbed	3.3	Capacitor
Lugo Substation III	Lugo Substation	Previously Disturbed	1.0	Substation
Lugo Substation IV	Lugo Substation	Previously Disturbed	12.4	Substation
Newberry Springs Series Capacitor	Newberry Springs Adjacent – southwest side of site	Partially Disturbed	6.2	Capacitor
Ludlow Series Capacitor	Ludlow Adjacent – south side of site	Partially Disturbed	4.9	Capacitor

1 - Locations and acreages for staging yards within the existing SCE substation footprints are subject to change.

The need for temporary power at staging yards would be determined based on the type of equipment/ facilities at the yards. If existing distribution lines are available, a temporary service and meter may be used to provide electrical power at one or more of the yards. If it is determined that temporary power is not available, then a portable generator may be used intermittently for electrical power at one or more of the yards.

Materials commonly stored at yards used for substation construction would include, but not be limited to, portable sanitation facilities; electrical equipment such as circuit breakers, disconnect switches, lightning arresters, transformers, and vacuum switches; steel beams; rebar; foundation cages; conduit; insulators; conductor and cable reels; pull boxes; and line hardware.

Materials commonly stored at yards used for transmission, subtransmission, and/or telecommunications construction would include, but not be limited to, construction trailers; construction equipment; portable sanitation facilities; steel bundles; steel/wood poles; conductor reels; OHGW or overhead OPGW reels; marker balls, hardware; insulators; cross arms; signage; consumables (e.g., fuel); waste materials for salvaging, recycling, or disposal; and BMP materials (e.g., straw wattles, gravel, and silt fences).

Staging yards may also serve as assembly points for crews, from where they would be transported to work sites.

The majority of materials associated with the construction would be delivered by truck to designated staging yards for subsequent distribution to work areas. Some materials may be delivered directly to the temporary transmission and subtransmission construction areas, which are described in Section 4.7.1.2, Work Areas.

4.7.1.2 Work Areas

Work areas are temporary construction-related locations at or near sites where work is to occur. They serve as laydown areas for materials and are locations where crews and equipment are positioned and employed to undertake construction tasks. Table 4-9, Typical Laydown/Work Area Dimensions, identifies the approximate land disturbance for these work area dimensions by type of area.

The laydown/work areas provided in Table 4-9 would first be graded and/or cleared of vegetation as needed to provide a reasonably level and vegetation-free surface for construction activities. Sites would be graded such that runoff would run toward the direction of the natural drainage. In addition, drainage would be designed to prevent ponding and erosive water flows that could cause damage to structure footings. The graded area would be compacted to at least 90-percent relative density and would be capable of supporting heavy vehicular traffic.

Erection of or work on some structures may require establishing a temporary crane pad. The crane pad would occupy an area of approximately 50 feet by 50 feet and would be adjacent to each applicable structure within the laydown/work area. The pad may be cleared of vegetation and/or graded as necessary to provide a level surface for crane operation. The decision to use a separate crane pad would be determined during final engineering for the Proposed Project and the selection of the appropriate construction methods to be used by SCE or its contractor.

Table 4-9. Typical Laydown/Work Area Dimensions

Laydown/Work Area Feature	Preferred Size (L x W) (feet)
Guard Structures	50 x 150
LSTs (New)	220 x 220
LSTs (Modify)	150 x 150
Wood Poles (Subtransmission)	150 x 75
Wood Poles (Distribution)	40 x 60
OPGW Pulling, Tensioning, and Splicing Areas	100 x 150
Underground Duct Banks	Proposed Length x 30
Underground Vaults	35 x 35
Mid-Line Series Capacitor Sites	400 x 450
Fiber Optic Repeater Sites	100 x 60

Note: The dimensions listed in this table are approximate lengths preferred for construction efficiency; actual dimensions may vary depending on Proposed Project constraints. This table does not include work within existing substation properties.

Benching is a technique in which an earth-moving vehicle excavates a terraced access to structure sites located in extremely steep and rugged terrain. Benching may be required to provide access for footing construction, assembly, erection, and wire stringing activities during construction. Benching would also be used on an as-needed basis in areas to help ensure the safety of personnel during construction activities.

4.7.1.3 Access Roads and/or Spur Roads

The 500 kV ROWs are served by existing access and spur roads. SCE maintenance of the existing roads is scheduled as an operations and maintenance activity completed once a year in accordance with G.O. 165 requirements or on an as-needed basis (e.g., after weather events). There are no anticipated road modifications planned to facilitate construction of the ELM Project. However, if at the time of construction portions or sections of roads are found to be in disrepair, repair of those existing roads would be done to facilitate construction activities. This would be done as a normal maintenance activity and not as part of the Proposed Project. Maintenance activities would include, for example, using a motor grader to blade the roads or a backhoe to clear rocks or winter ruts. If any cultural resources are found throughout the project area during construction, the approved Cultural Resources Management Plan will be followed.

For construction of the Proposed Project, SCE would use a combination of existing unpaved through roads and spur roads along the project that are accessed from the existing network of paved and unpaved public and private roads in the region. Access to the transmission ROW for construction activities and future O&M activities associated with the Proposed Project would be accomplished using this road network.

While not anticipated, if needed, the existing access roads may be improved and new roads constructed to support the construction and O&M activities of the Proposed Project.

During construction of the Proposed Project, crews would use existing public roads and transmission access roads to the maximum extent feasible. Any new temporary access roads would be constructed to ensure safety during construction and O&M. Rehabilitation, road widening, and/or upgrades to existing access roads may also be required to facilitate construction access and to support O&M activities.

While SCE does not anticipate the need for new or reconstructed roads, this possibility may arise. Typical construction activities associated with the rehabilitation of existing unpaved access roads may include vegetation clearing; blade-grading; grubbing; mowing; and re-compacting to remove potholes, ruts, and other surface irregularities in order to provide a riding surface that can support heavy construction and maintenance equipment. Unpaved roads may also require additional upgrades to address specific issues, such as protection of existing underground utilities using soil cover, steel plates, etc.

Construction activities associated with any new access roads typically include activities similar to those described for the rehabilitation of existing unpaved roads. However, they may also include the following additional construction requirements, depending on the terrain:

- **Existing relatively flat terrain (grades up to 4 percent):** Construction activities are generally similar to rehabilitation activities on existing unpaved roads and may also require activities such as clearing and grubbing, in addition to constructing drainage improvements (e.g., wet crossings, water bars, and culverts). Detailed information on locations requiring drainage improvements would be provided during final engineering.
- **Existing rolling terrain (grades of 5 to 12 percent):** Construction activities generally include typical flat terrain activities and may also require cut and fill depths more than 2 feet, benched grading, drainage improvements (e.g., v-ditches, downdrains, and energy dissipaters), and slope stability improvements (e.g., geogrid reinforcement). The extent of slope stability improvements would be determined during final engineering, as would detailed information on locations requiring cut and fill, benched grading, and/or drainage improvements.
- **Existing mountainous terrain (grades over 12 percent):** Construction activities would include rolling terrain construction activities and would also likely require significant cut and fill depths, benched grading, drainage improvements, and slope stability improvements. Detailed information on locations requiring cut and fill, benched grading, and/or drainage improvements would be provided during final engineering.

Typical construction activities associated with temporary access vary and could include drive and crush management of vegetation, vegetation clearing, blade-grading, grubbing, mowing, and compacting. In addition, other slope stabilizing approaches that may be used include mechanical stabilization and drainage improvements (e.g., v-ditches, downdrains, and energy dissipaters). The extent of slope stability improvements would be determined during final engineering.

Generally, access roads would have a minimum drivable width of 14 feet with 2 feet of shoulder on each side, as determined by the existing terrain. Typically, the drivable road width would be widened and would generally range up to an additional 8 feet along curved sections of the access road, resulting in up to 22 feet of drivable surface for the access road. Access road gradients would be leveled so that sustained grades generally do not exceed 14 percent. Curves would typically have a minimum radius of curvature of 50 feet measured from the center line of the drivable road width. Specific site locations may require a wider drivable area to accommodate multi-point turns where 50-foot minimum radii cannot be achieved.

Access roads would typically have turnaround areas around the structure location. In some cases where a turnaround is not practical, an alternative configuration would be constructed to provide safe ingress/egress of vehicles to access the structure location. It is common to use access road turnaround areas for the dual purpose of structure access and as a construction pad for construction activities.

The Proposed Project access roads would generally follow the existing transmission lines. New access or spur roads would be constructed to support construction and O&M of the new mid-line series capacitors and supporting transmission structures at these two locations and at two of the three repeater sites.

4.7.1.4 Helicopter Access

Helicopters would be used primarily to support construction activities associated with OPGW installation. They may be used in areas where access is limited (e.g., no suitable access road, limited construction area for on-site structure assembly, and/or there are environmental constraints to accessing the Proposed Project area with standard construction vehicles and equipment) or where system outage constraints are a factor. The exact method of construction employed and the sequence with which construction tasks occur would depend on final engineering, contract award, conditions of permits, and Contractor preference.

Helicopter activities may include transportation of construction workers and delivery of equipment and materials to work sites, installation of hardware and marker balls (if applicable), and OPGW stringing operations. SCE would be consistent with Institute of Electrical and Electronic Engineers (IEEE) Standards 951-1996, *Guide to the Assembly and Erection of Metal Transmission Structures*, and 524-2003, *Guide to the Installation of Overhead Transmission Line Conductors* in the construction of the Proposed Project.

Helicopter operations, including refueling, and related support areas typically occur at staging yards, storage and maintenance sites, and ground locations (landing zones) in close proximity to OPGW pulling, tensioning, and splice sites, and/or within previously disturbed areas near construction sites. During emergencies, helicopters may land within SCE ROWs, which could include landing on access or spur roads. For reasons of safety and security, at night or during off days, helicopters and their associated support vehicles and equipment are anticipated to be based at local airports.

Helicopters typically used for OPGW stringing activities include light and medium duty helicopters. Potential bases for operation include Ludlow Airport, Laughlin/Bullhead International Airport, Kidwell Airport, and Searchlight Airport, which are all within approximately 2 miles of the Proposed Project area. Refueling may occur at these base locations, in addition to staging yard sites. With the exception of Hesperia Airport and Barstow-Daggett Airport, the Proposed Project is not located within an area included within an Airport Land Use Compatibility Plans (ALUCPs). The potential Coolwater yard is west of the Barstow-Daggett Airport. No additional public or private airports or airstrips were identified within 2 miles of the Proposed Project.

Flight paths would be determined immediately prior to construction by the helicopter contractor. Flight paths would be filed with the appropriate authorities as required. During construction, after leaving a base location or staging yard, helicopter flight paths would parallel in close proximity with the existing transmission line alignments. SCE would implement an operating plan for helicopter use, in accordance with Title 14, Part 77 of the Code of Federal Regulations (CFR) and in coordination with and to be approved by the FAA Flight Standards District Office.

Helicopter-supported construction activities may occur at any of the staging yards listed in Table 4-8, Potential Staging Yard Locations. Factors for selecting yards suitable for helicopter activity include yard size, anticipated support activities occurring at the yard, and optimization of flight time to work locations. Additionally, helicopter operation crews, as well as fueling and maintenance trucks, may be based in the staging yards. In addition to airport bases and the staging yards, helicopters may use any of the designated helicopter landing zones (HLZs) situated throughout the project area along the 500 kV transmission lines.

In emergency situations, when an HLZ or yard cannot be safely reached, they may land on any access or spur road.

4.7.1.5 Vegetation Clearance

The proposed Newberry Springs Series Capacitor and Ludlow Series Capacitor sites would require vegetation clearing (i.e., shrub and brush removal) within the respective 4.1- and 4.3-acre construction work areas for installation of the capacitor equipment. The three proposed repeater sites would also require vegetation clearing similar to the mid-line series capacitor sites. Minor site preparation and grading may be required to allow construction of the repeater sites. Limited vegetation clearing (e.g., shrub and brush removal) would also be required in the transmission ROWs to accommodate construction work areas and to reduce the potential for fire during construction activities.

4.7.1.6 Erosion and Sediment Control and Pollution Prevention during Construction

Storm Water Pollution Prevention Plan

Construction of the Proposed Project would disturb a surface area of 1 acre or more. Therefore, SCE would be required to obtain SWPPP coverage under the Statewide Construction General Permit for Storm Water Discharges (Order No. 2009-0009-DWQ, as amended by 2010-0014-DWQ and 2012-0006-DWQ) from the State Water Resources Control Board and the Nevada Division of Environmental Protection (NDEP) 2014 Construction General Permit (NVR100000). As part of the permitting requirements, SCE would prepare a Storm Water Pollution Prevention Plan (SWPPP) that includes project information, design features, monitoring and reporting procedures, and Best Management Practices (BMPs).

Commonly used SWPPP BMPs are storm water runoff quality control measures (i.e., boundary protection, erosion and sediment controls, etc.), good housekeeping, dewatering procedures, and concrete waste management. The SWPPPs would be based on final engineering design and would include all Proposed Project components.

Dust Control

During construction, fugitive dust from the construction sites would be limited by control measures set forth by the Mojave Desert Air Quality Management District and Clark County Department of Air Quality. These measures may include the use of water trucks and other dust control measures. Additional discussion regarding dust control activities is provided in Section 5.3, Air Quality

Hazardous Materials

Construction of the Proposed Project would require the use of hazardous materials, such as fuels, lubricants, and cleaning solvents. All hazardous materials would be stored, handled, and used in accordance with applicable regulations. Safety Data Sheets would be made available at the construction site for all workers. A project-specific Hazardous Materials Management Plan (HMMP) would be prepared and implemented throughout construction of the Proposed Project. The HMMP would include safety information regarding the transport, use, and disposal of hazardous materials in compliance with applicable laws, rules, and regulations.

If the aggregate volume of hazardous liquid materials (e.g., mineral oil) at any one project facility exceeds 1,320 gallons, a Spill Prevention, Control, and Countermeasure Plan would be provided per facility in accordance with 40 CFR, Parts 112.1 to 112.7.

Reusable, Recyclable, and Waste Material Management

Construction of the Proposed Project would generate various waste materials, including wood, metal, soil, vegetation, and sanitation waste (from portable toilets). Material from existing infrastructure that would be removed as part of the Proposed Project (e.g., conductor, steel, concrete, and debris) would be temporarily stored in one or more staging yards as the material awaits salvage, recycling, and/or disposal. Sanitation waste would be disposed of in accordance with applicable sanitation waste management practices and laws.

The existing wood poles removed for the Proposed Project would be returned to a staging yard and either reused by SCE, disposed of in a Class I hazardous waste landfill, and/or disposed of in the lined portion of a Regional Water Quality Control Board- (RWQCB-) certified municipal landfill.

Material excavated for the Proposed Project would be used as fill or backfill or disposed of off-site at an appropriately licensed waste facility. If contaminated material is encountered during excavation, work would stop at that location and SCE's Spill Response Coordinator would be called to the site to make an assessment and notify the proper authorities.

As required by BLM, excess excavated material on BLM land would be used in the ROW or would remain on site until it is sold. This excavated soil may also be made available for use by the BLM after proper testing or disposed of offsite at an appropriately licensed waste facility.

4.7.1.7 Cleanup and Post-Construction Restoration

SCE would clean up all areas that would be temporarily disturbed by construction of the Proposed Project (which may include the material staging yards, construction setup areas, stringing sites, and splicing sites) to as close to pre-construction conditions as feasible, or to the conditions agreed upon between the landowner and SCE following the completion of construction of the Proposed Project.

For restoration and/or revegetation within sensitive habitats, a habitat restoration and/or revegetation plan(s) would be developed by SCE with the appropriate resource agencies prior to construction for implementation after construction is complete.

4.7.2 Transmission Line Construction (Above Ground)

The following subsections describe the aboveground construction activities associated with modifications to the existing transmission, telecommunications, and distribution lines under the Proposed Project.

4.7.2.1 Pull and Tension Sites

Transmission Pull and Tension Sites

Pull and tension sites (also called stringing, wire pull, or wire setup sites) have been identified along the length of the transmission ROW. (See SCE 2018, Appendix E.) These would be used for equipment and materials needed for installing wire on the existing towers. Stringing activities for the Proposed Project would be primarily for OPGW installation. The existing OHGW installed at the peak of the lattice towers would be used to pull the new OPGW into position on the existing transmission structures. As the OPGW is pulled in, the replaced OHGW would be coiled around a drum at the puller. The coiled OHGW would be hauled away on a flat bed and recycled. Minor conductor work to modify the existing conductor would occur at the mid-line series capacitors sites in order to tie the 500-kV line into a new interconnect structure at each capacitor site. Excess wire length would be minimal and would be recycled.

The pull and tension sites associated with the Proposed Project would be temporary use areas and the land would be restored to its previous condition following completion of pulling and splicing activities. The locations require level areas to allow for setting up and maneuvering equipment. When possible, these sites would be located on existing roads and level areas to minimize the need for grading and restoration. Minor grading may be required at some sites to create level areas. Approximately 146 set-up locations are currently proposed along the ROWs. The final number and location of these sites will be determined upon final engineering. The approximate area needed for stringing set-ups associated with wire installation is variable and depends upon terrain. Table 4-9, Typical Laydown/Work Area Dimensions, provides the approximate size of pulling, tensioning, and splicing equipment set-up areas and laydown dimensions.

A "wire pull" is the length of any continuous wire installation process (either for OPGW or conductor) between two selected points along the line. Wire pull sites are selected based on a variety of factors, including availability of dead-end structures, wire size, geometry of the line as affected by points of inflection, terrain, and suitability of stringing and splicing equipment set-up locations. On relatively straight alignments in flat terrain, typical wire pull and splice locations occur every 9,500 to 22,000 feet but may be more closely spaced in rugged terrain. When the line route alignment contains multiple deflections or is situated in rugged terrain, the length of the wire pull is typically shorter. Generally, pulling locations and equipment set-ups would be in a direct line with the direction of the overhead conductors and situated at a distance equal to approximately three times the height of the adjacent tower structure.

Each OPGW or conductor stringing operation consists of a puller set-up positioned at one end of the wire pull and a tensioner set-up with a wire reel stand truck positioned at the other end of the wire pull. Pulling and wire tensioning locations may also be used for splicing and field snubbing of the OPGW or conductor. Temporary splices, if required, may be necessary because permanent splices that join the OPGW or conductor together cannot travel through the rollers. Splicing set-up locations are used to remove temporary pulling splices and to install permanent splices once the conductor is strung through the rollers located on each structure. Field snubs (i.e., anchoring and dead-end hardware) would be temporarily installed to sag OPGW or conductor wire to the correct tension at locations where stringing equipment cannot be positioned in back of a dead-end structure.

Distribution Pull and Tension Sites

Installation of distribution lines would also require pull and tension sites. These pull and tension sites would be approximately 50 feet by 50 feet. The Proposed Project would require approximately three distribution pull and tension sites on SCE property and within and adjacent to existing ROWs. These would be at the series capacitor sites and the fiber optic repeater sites in the Mojave National Preserve. Pull and tension sites require level areas to allow for maneuvering of the equipment. When possible, existing level areas and existing roads would be used to minimize the need for grading and cleanup. The average distance between distribution pull and tension sites would be 750 feet to 7,500 feet. Equipment used to pull the distribution line would be similar to the equipment described previously for the transmission lines. Within an approximately 40-foot by 60-foot work area, two splice trucks with pulling equipment would be required to complete the splicing. When existing distribution cable is replaced, flatbed trucks would be used to haul the cable offsite for disposal or recycling.

Telecommunications Pull and Tension Sites

Telecommunications pull and tension sites would be approximately 60 feet by 30 feet. The Proposed Project would require the use of approximately 33 telecommunications pull and tension sites on SCE property and within and adjacent to existing ROWs. The pull and tension sites require a level area to allow for maneuvering of the equipment. Where possible, existing, level areas and existing access roads would be used to minimize the need for grading and restoration. Equipment used to pull the telecommunication line would be similar to the equipment described previously for the transmission lines. Within an approximately 60-foot by 30-foot work area, two splice trucks with pulling equipment would be required to complete the splicing. When existing telecommunications cable is replaced, flatbed trucks would be used to haul the cable off site for disposal or recycling.

Temporary Structures

During construction, including installation of OPGW, temporary guard structures would be installed for safety to prevent wires being removed or installed from dropping to the ground at road and railroad crossings, aqueducts, and utility line crossings. These typically are H-frame pole structures placed on either side of the facility being protected to intercept any wires that might be dropped during stringing. The temporary guard structures are removed once the overhead work is completed. Hi-lift trucks with appropriate attachments can also serve this purpose, depending on site conditions. Guard structure locations are indicated on the PEA Appendix E map book (SCE 2018).

4.7.2.2 Pole/Tower Removal and Installation

At Lugo Substation, two existing 500 kV TSPs would be removed and two new 500 kV TSPs would be installed. Construction crews and equipment would arrive at the substation using public roads and existing access roads. Work areas would be within the substation property. Where applicable, any existing transmission lines would be transferred to the new structures prior to removal of existing structures. Any remaining facilities that are not reused by SCE would be removed and delivered to a facility for disposal, as described in the Reusable, Recyclable, and Waste Material Management section.

Section 4.7.8, Construction Equipment and Workforce describes the anticipated equipment and work-force required for the Proposed Project. To get to and from the sites, the crews would use one or more of the construction vehicles listed in Attachment 4-C: Construction Equipment and Workforce Estimates for each construction activity on any given day. The numbers of anticipated trips are discussed in Section 5.16, Transportation.

Pole/Tower Removal

The Proposed Project would involve removing structures, conductor, OHGW, and associated hardware. The proposed work is provided in the following sequence:

- Road work – Existing access roads would be used to reach structures, but some rehabilitation and grading may be necessary before removal activities would begin to establish temporary crane pads for structure removal, etc.
- Wire-pulling locations – Pull and tension sites would be located at varying distances along the existing transmission corridors and would include locations at dead-end structures and turning points.
- Conductor removal – SCE would remove existing conductors in a method similar to reversing the conductor installation process and the OHGW would be removed as part of the OPGW installation process. The existing OHGW would be used as a sock line to pull the new OPGW. The old conductor and OHGW would be transported to a staging yard or existing SCE facility where it would be prepared for recycling.
- Structure removal – Where TSPs would be removed in substations, the structures would be dismantled down to the foundations and the materials would be transported to a construction yard where they would be prepared for recycling. For each removal, a crane truck or rough terrain crane would be used

to support the structure during removal; an equipment pad of approximately 70 feet by 70 feet might be required to allow a removal crane to be set up at a distance of approximately 70 feet from the structure center line.

- Footing/foundation removal – Existing footings that are not needed would be removed to a depth of 1 to 3 feet below the adjacent ground surface. Holes would be filled with previously excavated soil and compacted, and the area would be smoothed to match the surrounding grade. If excavated soil is not available, new soil would be imported from an approved vendor or source. Removed footing materials would be transported to a staging yard or SCE facility where they would be prepared for disposal.

Pole/Tower Installation

Tubular Steel Pole Foundation Installation. Each of the two TSP to be installed would require a drilled, poured-in-place, concrete footing that would form the structure foundation. The hole would be drilled using truck- or track-mounted excavators. Excavated material would be used as described within Section 4.7.1.6, Erosion and Sediment Control and Pollution Prevention during Construction. Following excavation of the foundation footings, steel-reinforced cages would be set, positioning would be survey-verified, and concrete would then be poured. Foundations in soft or loose soil or those that extend below the groundwater level may be stabilized with drilling mud slurry. In this instance, mud slurry would be placed in the hole during the drilling process to prevent the sidewalls from sloughing. Concrete would then be pumped to the bottom of the hole, displacing the mud slurry. Depending on site conditions, the mud slurry brought to the surface would typically be collected in a pit adjacent to the foundation or vacuumed directly into a truck to be reused or discarded at an appropriate off-site disposal facility. TSP foundations typically require an excavated hole 12 feet to 15 feet in diameter at approximately 30 feet to 50 feet deep. TSPs would require approximately 140 to 350 cubic yards of concrete delivered to each structure location.

During construction, existing concrete supply facilities would be used where feasible. If needed during construction, a temporary concrete batch plant may be set up in an established material staging yard. Equipment would include a central mixer unit (drum type); three silos for injecting concrete additives, fly ash, and cement; a water tank; portable pumps; a pneumatic injector; and a loader for handling concrete additives not in the silos. Dust emissions would be controlled by watering the area and by sealing the silos and transferring the fine particulates pneumatically between the silos and the mixers.

Lattice Steel Tower Foundation Installation. Structure foundations for any new LST (if needed) would consist of four poured-in-place concrete footings. Actual footing diameters and depths for each of the structure foundations would depend on the soil conditions and topography at each site and would be determined during final engineering.

The foundation process begins with the drilling of holes using truck- or track-mounted excavators with various diameter augers to match the diameter requirements of the structure type. LSTs typically require an excavated hole measuring 6 to 10 feet in diameter and 25 to 45 feet deep. On average, each footing for an LST structure would extend approximately 1 to 4 feet AGL.

The excavated material would be distributed at each structure site, used to backfill excavations from the removal of nearby structures (if any), and/or used in the rehabilitation of existing access roads. Alternatively, the excavated soil may be disposed of at an off-site disposal facility in accordance with the applicable laws described in Section 4.7.1.6, Erosion and Sediment Control and Pollution Prevention During Construction.

Following excavation of the foundation footings, steel reinforced rebar cages would be set, survey positioning would be verified, and concrete and stub angles would then be placed. Steel reinforced rebar cages and stub angles may be assembled at staging yards and delivered to each structure location by flatbed truck or assembled at the job site. Depending upon the LST structure, soil conditions, and the topography at each site, LSTs would require 50 to 335 cubic yards of concrete delivered to each location.

Potential caving in of excavation walls may occur during the drilling of the LST foundations due to the presence of loose soils or groundwater levels. The use of water, fluid stabilizers, drilling mud, and/or casings would be made available to control ground caving and to stabilize the sidewalls from sloughing. If fluid stabilizers are used, mud slurry would be added in conjunction with the drilling. The concrete for the foundation is then pumped to the bottom of the hole, displacing the mud slurry. Mud slurry brought to the surface is typically collected in a pit adjacent to the foundation and/or vacuumed directly into a truck to be reused or discarded at an off-site disposal facility in accordance with all applicable laws.

Concrete samples would be drawn at the time of the pour and tested to ensure engineered strengths are achieved. A normally specified SCE concrete mix typically takes approximately 20 working days to cure to an engineered strength. This strength is verified by controlled testing of sampled concrete. Once this strength is achieved, crews would be permitted to commence erection of the structure.

Conventional construction techniques generally would be used as described previously for new foundation installation. Alternative foundation installation methods would be used where conventional methods are not practical. In certain cases, equipment and material may be deposited at structure sites using helicopters or by workers on foot, and crews may prepare the foundations using hand labor assisted by hydraulic or pneumatic equipment, or other methods.

As previously described, existing concrete supply facilities would be used where feasible and a temporary concrete batch plant may be set up in an established material staging yard. Prior to drilling for TSP foundations and LST footings, SCE or its contractor would contact Underground Service Alert to identify any existing underground utilities in the construction zone.

Lattice Steel Tower Installation. If new LSTs are needed they would be assembled within the construction areas at each tower site. Table 4-9, Typical Laydown/Work Area Dimensions, provides approximate laydown dimensions. Structure assembly begins with the hauling and stacking of steel bundles for tower work, per engineering drawing requirements, from a staging yard to each structure location. This activity requires use of several trucks with 40-foot trailers and a rough terrain forklift. After steel is delivered and stacked, crews would proceed with the assembly of leg extensions, body panels, boxed sections, and the cages/bridges. Assembled sections would be lifted into place with a crane and secured by a combined erection and torquing crew. When the steel work is completed, the construction crew may opt to install insulators and wire rollers (i.e., travelers).

When an LST requiring modification is located in terrain inaccessible by a crane, it is anticipated that a helicopter may be used. The use of helicopters for the modification of structures would be similar to methods detailed in IEEE 951-1996, *Guide to the Assembly and Erection of Metal Transmission Structures*, Section 9, Helicopter Methods of Construction. Section 4.7.1.4, Helicopter Access provides detailed information on helicopter usage.

Tubular Steel Pole Installation. TSPs typically consist of multiple sections. The pole sections would be placed in temporary laydown areas at each pole location. See Table 4-9, Typical Laydown/Work Area Dimensions, for approximate laydown dimensions. Depending on conditions at the time of construction, the top sections may come pre-configured, may be configured on the ground, or configured after pole installation with the necessary cross arms, insulators, and wire stringing hardware. A crane would then be used to set each steel pole base section on top of the previously prepared foundations. If existing terrain around the TSP location is not suitable to support crane activities, a temporary crane pad would be constructed within the laydown area. When the base section is secured, the subsequent section of the

TSP would be slipped together into place onto the base section. The pole sections may also be spot welded together for additional stability. Depending on the terrain and available equipment, the pole sections could also be pre-assembled into a complete structure prior to setting the poles.

Wood Pole Installation. Each wood pole would require a hole to be excavated using an auger, backhoe, or hand tools. Excavated material would be reused or disposed of, as described in Section 4.7.1.6, Erosion and Sediment Control and Pollution Prevention, during Construction. The wood poles would be placed in temporary laydown areas at each pole location. While on the ground, the wood poles may be configured (if not already preconfigured) with the necessary cross arms, insulators, and wire stringing hardware. The wood poles would then be installed in the holes, typically by a line truck with an attached boom, and the space around the poles would be backfilled.

Guys with a steel wire, known as a “down guy”, would be used as needed. The down guy would attach to an approximately 1-inch-diameter anchor at ground level and would attach to the opposite side of the wood pole from the tension forces applied by the attached conductors.

Lattice Steel Tower Modification. Modification of existing LSTs typically involves raising towers. There are two methods that could be used to raise towers — tower body extensions or vertical leg extensions. SCE would use the tower body extension method which would include some member reinforcing and/or adding some new tower members for the Proposed Project. The body extension method would involve installing an extension in the body of the tower using a crane or hydraulic tower lifting system to hoist a tower. A level area of approximately 50 feet by 50 feet may need to be graded adjacent to the tower if a crane pad would be necessary. The conductors may be unclipped and put into travelers on towers adjacent to the one being modified to allow for movement of the conductor. After the tower extension is installed, the conductors would be clipped back in. Conductors may be added and, if used, the hydraulic lifting system would be taken down from the tower that was raised.

In order to accommodate dead-end OPGW hardware assembly and the associated loads, some of the existing suspension structures being used for splicing locations would require minor bracing reinforcement to the body of the tower.

Wood Pole Modification. Each wood pole may be reconfigured with the necessary cross arms, insulators, conductor, and wire stringing hardware at a lower position.

Transmission, Subtransmission, and Distribution Land Disturbance. The land disturbance from above-ground construction of the transmission, subtransmission, and distribution lines is provided in Table 4-10, Transmission, Subtransmission, and Distribution Approximate Land Disturbance.

Table 4-10. Transmission, Subtransmission, and Distribution Approximate Land Disturbance

Proposed Project Feature	Approximate Number of Structures	Typical Work Area (L x W) (feet)	Approximate Area Disturbed during Construction (acres)	Approximate Area to be Restored (acres)	Approximate Area Permanently Disturbed (acres)
500 kV LST (Raised)	9	100 x 100	2.1	2.1	0.0
500 kV LST (Tower body and peak modifications)	60	100 x 100	13.6	13.6	0.0
500 kV TSP (New)	2	220 x 150	0.2	N/A	N/A*
115 kV Wood Pole (Existing to be Modified)	2	150 x 75	0.5	0.5	0.0
16 kV Wood Pole (New)	22	40 x 60	1.2	1.2	<0.01
12 kV Wood Pole (New)	78	40 x 60	4.3	4.3	<0.01

Table 4-10. Transmission, Subtransmission, and Distribution Approximate Land Disturbance

Proposed Project Feature	Approximate Number of Structures	Typical Work Area (L x W) (feet)	Approximate Area Disturbed during Construction (acres)	Approximate Area to be Restored (acres)	Approximate Area Permanently Disturbed (acres)
12 kV Wood Pole (Existing to be Modified)	3	40 x 40	0.1	0.1	0.0

*Note: New TSPs at Lugo Substation would be located within the previously disturbed substation footprint; therefore, no permanent disturbance would result.

4.7.2.3 Conductor/Cable Installation

500 kV Transmission Conductor. Wire stringing activities for conductors or OPGW would be in accordance with SCE common practices and similar to process methods detailed in the IEEE Standard 524-2003, *Guide to the Installation of Overhead Transmission Line Conductors*. To ensure the safety of workers and the public, safety devices (e.g., traveling grounds), guard structures, radio-equipped public safety roving vehicles, and linemen would be in place prior to the initiation of wire stringing activities. Advanced planning is required to determine circuit outages, pulling times, and safety protocols to ensure that the safe installation of wire is accomplished.

Wire stringing includes all activities associated with the installation of the primary conductors or OPGW onto transmission line structures. These activities include the installation of conductor, ground wire, insulators, stringing sheaves (rollers or travelers), vibration dampeners, weights, suspension, and hardware assemblies.

The following five steps describe typical wire stringing activities:

- **Step 1 – Planning:** Develop a wire stringing plan to determine the sequence of wire pulls and the set-up locations for the wire pull/tensioning/splicing equipment.
- **Step 2 – Sock Line Threading:** A helicopter would fly a lightweight sock line from structure to structure, which would be threaded through rollers in order to engage a camlock device that would secure the pulling sock in the roller. This threading process would continue between all structures through the rollers of a particular set of spans selected for a wire pull.
- **Step 3 – Pulling:** The sock line would be used to pull in the conductor pulling rope and/or cable. The pulling rope or cable would be attached to the conductor using a special swivel joint to prevent damage to the wire and to allow the wire to rotate freely to prevent complications from twisting as the conductor unwinds off the reel.
- **Step 4 – Splicing, Sagging, and Dead-Ending:** Once the conductor is pulled in, if necessary, all mid-span splicing would be performed. Once the splicing has been completed, the conductor would be sagged to the proper tension and dead-ended to structures.
- **Step 5 – Clipping-In:** After the conductor is dead-ended, the conductors would be secured to all tangent structures — a process called clipping in. Once this is complete, spacers would be attached between the bundled conductors of each phase to keep uniform separation between each conductor.

Optical Ground Wire. Stringing includes all activities associated with the installation of the OPGW onto the LSTs, as well as the installation of suspension and dead-end hardware assemblies. The dimensions of the area needed for the stringing setups associated with wire installation would vary depending on structure height and terrain but would not extend beyond the limits of the ROW and approved temporary construction work areas. Vegetation may be removed where necessary to safely access the site and position the stringing equipment. To the extent possible, pull and tension sites would be located on level ground to minimize the need for grading. The following four steps describe the OPGW stringing activities:

- **Step 1 – Setup:** Helicopters would be used to transport equipment and workers to each tower location to begin setting up for the pulling. On average, the helicopter would operate approximately 10 hours per day during stringing operations.
- **Step 2 – Pulling:** The existing OHGW being removed would be used to pull new OPGW cable into position at the tower peaks. The OPGW would be pulled through a single span or through multiple spans that would involve multiple tower structures.

  The pull site, located at one end of the OPGW pull, is where the pulling equipment would be located. The tension site would be located at the opposite end of the pulling site and would consist of several large pieces of equipment to support the wire stringing activities. Some of this equipment may include a rope machine; a tensioning machine, or "bull wheel" (used to provide tension on the OPGW as it is being pulled off the reel); several flatbed trailers with mounted reel stands; a rough terrain crane to remove/replace conductor reels off of the reel stands; and a sagging tractor or bulldozer.

  The puller and tensioner are operated together during the pulling phase to ensure that the OPGW is installed in a controlled manner.

  OPGW pull sites may occur every 9,500 to 20,000 feet on flat terrain and may be more closely spaced in rugged terrain. Wire pull locations would be selected, where possible, based on the geometry of the line as affected by changes in routing directions, changes in the terrain, and suitability of stringing and splicing equipment setups.
- **Step 3 – Splicing, Sagging, and Dead-Ending:** Once the OPGW is pulled through, OPGW splices may occur every 9,500 to 20,000 feet on flat terrain, or more closely in rugged terrain. Once the new OPGW has been installed, it would be pulled to a tighter tension that would be predetermined by engineering. This task would have the OPGW at a tension that is referred to as "initial sag." Once the OPGW has been sagged, this would allow the other crews to begin their work. The tower types in a pull would determine what task would be completed next. If there are dead-end-type structures, these would have to be completed prior to working on the tangent or clipping structures. This would vary from pull to pull. Both operations would use light-lift helicopters or boom trucks to move the workers, tools, and hardware assemblies to most of the structure sites.
- **Step 4 – Clipping-In:** After the OPGW is dead-ended, the OPGW would be attached to all tangent structures — a process called clipping-in.

Stringing would be conducted in accordance with SCE's specifications, which are similar to process methods detailed in IEEE Standard 524-2003, *Guide to the Installation of Overhead Transmission Line Conductors*. To protect the safety of workers and the public, safety devices (e.g., grounding, guard structures, and radio-equipped construction vehicles and equipment) would be in place prior to initiation of wire stringing activities.

Distribution Poles. Wooden distribution poles installed as part of the Proposed Project would support 12 kV or 16 kV distribution lines to provide power to new facilities. The distribution poles between the Newberry Springs and Ludlow capacitor sites also would support overhead All-Dielectric Self-Supporting (ADSS) fiber optic cable. Stringing of the distribution line and ADSS cable includes the installation of vibration dampeners, suspension, and dead-end hardware assemblies. Distribution line poles would be replaced or interset poles would be installed if the pole does not meet wind load or ground clearance requirements with the addition of fiber cable. An approximately 8-foot-deep hole would be drilled next to the existing pole and a new pole would be erected. The conductor would be transferred from the existing pole to the new pole and the old pole would be cut or removed.

Guard Structures. Guard structures are temporary facilities installed at transportation, flood control, and utility crossings during wire stringing/removal activities. Guard structures are designed to stop the movement of a wire should it momentarily drop below a conventional stringing height. SCE estimates that 95 guard structures may need to be constructed along the proposed OPGW installation route.

Typical guard structures are standard wood poles with cross members between them to catch wire should it descend below a certain height. Depending on the overall spacing of the wire being installed, two to four guard poles would be required on either side of a crossing. In some cases, the wood poles could be substituted for by specifically equipped boom trucks or, at highway crossings, temporary netting would be installed if required. The guard structures would be removed after the OPGW (or conductor) is secured on adjacent tower structures.

For road, railroad, and aqueduct crossings, SCE would work closely with the applicable jurisdiction to secure the necessary permits to string OPGW or conductor over the existing infrastructure.

4.7.3 Below Ground Construction Related to Transmission Line ROW

The following subsections describe the below ground construction activities associated with installing the distribution and telecommunications line components of the Proposed Project.

4.7.3.1 Trenching

Fiber Optic Installation

Approximately 2.9 miles of underground fiber optic line would be installed near Mohave Substation. New underground conduit and associated structures typically are installed with a backhoe. The trench would be excavated to approximately 24 inches wide and a minimum of 36 inches deep. Conduit would be placed in the trench and covered with approximately 30 inches of concrete slurry before it is backfilled and compacted. For manholes and pull boxes, a hole would be excavated to be approximately 10 feet deep, 8 feet long, and 8 feet wide. The manhole or pull box would be lowered into place and connected to the conduits, and the hole around the structure would be backfilled with concrete slurry and a minimum of 24 inches of native soil cover.

The fiber optic cable would be installed throughout the length of the underground conduit and structures through an inner-duct within the conduit, providing protection and identification for the cable. First, the inner-duct would be pulled in the conduit using a pull rope and pulling machine or a truck-mounted hydraulic capstan. Then, the fiber optic cable would be pulled inside the inner-duct using the same procedure.

Distribution Installation

The Proposed Project includes approximately 0.2 miles of underground distribution lines. An approximately 2-foot-wide by 4-foot-deep trench would be required to place the distribution conduit underground.

4.7.3.2 Trenchless Techniques: Horizontal Directional Drilling

Duct banks for underground distribution line and fiber optic line installation would be constructed using open-cut trenching techniques, unless alternate methods are required to cross existing underground facilities or sensitive resources. If trenchless techniques are required, SCE would use the horizontal directional drilling (HDD) technique.

HDD technology is an underground boring technique that uses hydraulically powered, horizontal drilling equipment. It involves drilling along a vertical arc beneath a feature that is to be avoided. HDD technology uses lubrication containing water and bentonite clay (i.e., drilling mud) to aid the drilling, coat the walls of the bore hole, and maintain the open hole. The HDD technology uses a hydraulically powered horizontal drilling rig supported by a drilling mud tank and a power unit for the hydraulic pumps and mud pumps. A variable-angle drilling unit would be adjusted to the proper design angle for the particular drill being used. A 6- to 8-inch-diameter drill would typically be used.

The first step would be to drill a fluid-filled pilot bore. The first and smallest of the cutting heads would begin the pilot hole at the entry point. The first section of the drill stem has an articulating joint near the drill-cutting head that the HDD operator can control. Successive drill stem sections would be added as the drill head bores under the crossing. The drill head would be adjusted by the operator to follow a designed path under the crossing and ascend upward toward the exit point. Once the pilot hole is completed, a succession of larger cutting heads and reamers would be pulled and pushed through the bore hole until the hole is the appropriate size for the steel casing to be installed. Once the steel casing is in place, ducts would be installed within the steel casing, with spacers used to maintain the needed separation between the ducts. The remaining space in the casing outside the ducts would be backfilled with a slurry mix.

The underground cable to be pulled through the casing would be strung on cable supports down the ROW or within temporary extra workspace areas.

As part of the drilling design process, geotechnical surveys of subsurface conditions would be conducted to determine the underlying geologic strata along the bore path. Infrequently, the geologic strata above the bore may be weaker than anticipated and/or unconsolidated material. As the HDD passes under these locations, the high pressure of the drilling mud may fracture these strata, allowing drilling mud to rise to the surface. This situation is termed a “frac-out” and is usually resolved by reducing the mud system pressure or increasing the mud viscosity. If a frac-out occurs, the boring operation would be stopped immediately, and an established frac-out contingency plan (Horizontal Direction Drilling Fluid Management Plan) would be implemented to contain and remove the drilling mud.

4.7.3.3 Grading for Clearance Discrepancy Area

One potential clearance discrepancy area located between Towers M29-T3 and M30-T1 on the Lugo-Mohave 500 kV Transmission Line, would be graded to remove a minimum of 2 feet of berm in order to achieve a minimum transmission line clearance between the ground and the conductor in accordance with CPUC G.O. 95 and/or SCE’s standard practices. A conceptual grading scheme has been developed by SCE to determine any problem areas and to understand the type of limitations the site may have as the final design progresses. Schematic grading analysis includes analyzing drainage patterns and calculating rough estimates of cut and fill quantities. Typical grading activities associated with clearance discrepancies include vegetation clearing, blade-grading, grubbing, earthwork (e.g., cut and fill transitions), drainage improvements, and slope stability improvements (e.g., geogrid reinforcement). Less than 0.1 acres would be graded, approximately 30 cubic yards of material would be excavated, and approximately 1 cubic yard of material would be added. The excavated material would be spread on site or disposed of offsite at an SCE-approved facility.

In addition, one potential clearance discrepancy area, located between Towers M4-T2 and M4-T3 on the Lugo-Mohave 500 kV Transmission Line, would require removal of a minimum of 3.5 feet of berm/concrete at an abandoned concrete foundation to provide minimum transmission line clearance in accordance with CPUC G.O. 95 and/or SCE's standard practices.

4.7.4 Mid-Line Series Capacitor Construction

The following subsections describe the construction activities associated with installing the components of the proposed Newberry Springs Series Capacitor and Ludlow Series Capacitor.

4.7.4.1 Site Preparation and Grading

The sites would be prepared by clearing existing vegetation within the boundaries of the proposed series capacitor sites. Once vegetation clearance is completed, the sites would be graded in accordance with approved grading plans, and a temporary chain-link fence would be installed around the site perimeter.

4.7.4.2 Ground Surface and Below Ground Improvements

Table 4-11, Mid-Line Series Capacitor Ground Surface Improvement Materials, provides a summary of the ground surface improvements at the proposed mid-line series capacitor sites. Table 4-12, Mid-Line Series Capacitor Estimated Land Disturbance, provides a summary of the land disturbance estimates associated with the construction of the proposed Newberry Springs Series Capacitor and Ludlow Series Capacitor. Improvements would also include any required grounding system, foundations, conduits, and drainage. Following site preparation, below grade systems (such as conduits, grounding, and foundation) would be installed and any asphalt, rock, or aggregate put in place.

Table 4-11. Mid-Line Series Capacitor Ground Surface Improvement Materials

Element	Material	Approximate Area (acres)	Approximate Volume (cubic yards)
Access Road Surface Areas[1]	Dirt	0.4	0
Mid-Line Series Capacitor Paved Areas[2]	Asphalt	0.8	282
Internal Road Surface Areas[3]	Aggregate Base	1.1	1,700
Gravel Surfacing[4]	Crushed Rock	2.5	1,199

1 - The acreage includes additional width for ditch and berm.
2 - This item includes 2 inches over rough grade. However, enough crushed rock needs to be added to cover a design that does not include asphalt.
3 - The 12-inch aggregate base includes the 24-foot wide entrance roads just outside the yard.
4 - This item includes all areas within the mid-line series capacitor sites, except for the areas paved with asphalt.

Table 4-12. Mid-Line Series Capacitor Estimated Land Disturbance

Proposed Project Feature	Quantity	Approximate Area Disturbed during Construction (acres)[1]	Approximate Area to be Restored (acres)	Approximate Area Permanently Disturbed (acres)
Newberry Springs Series Capacitor	1	3.8	0.6	3.2
Ludlow Series Capacitor	1	4.0	1.5	2.5

1 - Land disturbance acreage during construction is greater than the acreage associated with the permanent facility as described in Section 4.5.4 Mid-Line Series Capacitors.

4.7.4.3 Above-Grade Construction

above-grade installation of capacitor facilities (e.g., buses, capacitor banks, disconnect switches, steel support structures, perimeter fence, and the MEER) would commence after the below-grade structures are in place.

4.7.4.4 Telecommunications Equipment Installation

Both the proposed Newberry Springs Series Capacitor and Ludlow Series Capacitor would include a MEER, as described in Section 4.5.4.1, Mechanical and Electrical Equipment Room. The MEER would have a separate communication room to house telecommunications equipment. Each communication room would be equipped with AC power, DC power system (including batteries and a battery charger), an overhead cable tray, redundant air conditioners, and diverse fiber entry conduits for connection to outside fiber optic cables. SCE would install fiber optic terminating shelves, fiber optic transport terminals, channel equipment, communications alarm/switch equipment, and data equipment in the communication room. The equipment would be transported to the site and installed by SCE technicians after the MEER structure is completed, but before the capacitors are placed in service.

4.7.5 Fiber Optic Repeater Construction

The following subsections describe the construction activities associated with installing the components of the Barstow, Kelbaker, and Lanfair Fiber Optic Repeaters.

4.7.5.1 Site Preparation and Grading

Existing vegetation within the boundaries of the Barstow, Kelbaker, and Lanfair Fiber Optic Repeater sites would be cleared. Once vegetation clearance is completed, a temporary chain-link fence would be installed around the site perimeter. Minor grading would be required inside the fence and for the access roads at each location. The maximum amount of grading at each repeater site is as follows:

- Barstow Fiber Optic Repeater site: 16 cubic yards
- Kelbaker Fiber Optic Repeater site: 30 cubic yards
- Lanfair Fiber Optic Repeater site: 24 cubic yards

4.7.5.2 Ground Surface Improvements

Table 4-13, Fiber Optic Repeater Ground Surface Improvement Materials, provides a summary of the ground surface improvements at the fiber optic repeater sites. Table 4-14, Fiber Optic Repeater Estimated Land Disturbance, provides a summary of the land disturbance estimates associated with the construction of the proposed fiber optic repeaters.

Table 4-13. Fiber Optic Repeater Ground Surface Improvement Materials

Element	Material	Approximate Area (acres)[1]	Approximate Volume (cubic yards)[2]
Access Road Surface Area	Dirt	0.1	85.0
Gravel Surfacing	Crushed Gravel	0.1	66.0

1 - The approximate area includes all three repeater sites.
2 - The approximate volume includes all three repeater sites

Table 4-14. Fiber Optic Repeater Estimated Land Disturbance

Fiber Optic Repeater	Quantity	Approximate Area Disturbed during Construction (acres)	Approximate Area to be Restored (acres)	Approximate Area Permanently Disturbed (acres)
Barstow	1	0.43	0.3	0.13
Kelbaker	1	1.0	0.9	0.1
Lanfair	1	1.5	1.5	0.1

4.7.5.3 Below-Grade Construction

After the site is prepared, below-grade facilities would be installed. Below-grade facilities include tele-communications and distribution conduits, duct banks, and vaults.

4.7.5.4 Above-Grade Construction

Above-grade installation for the fiber optic repeater facilities (e.g., communication building, emergency generator, and an above-grade 499-gallon propane fuel tank) would commence after the below-grade structures are in place. A typical communication building would either be a block wall-type building to be constructed on site or a prefabricated building delivered to the site. Prefabricated buildings are set on a concrete foundation using a crane. The typical building size is approximately 36 feet by 12 feet; the building consists of a generator room and an equipment room. The generator room houses an emergency backup generator and manual/automatic AC switch equipment. An 8-foot high chain link fence with barbed wire would be installed around the facility and would include an access gate.

4.7.6 Modifications at Other Facilities

As described in Section 4.5.5, Modifications to Existing Substations, minor internal modifications (e.g., circuit breaker replacement, etc.) would be necessary at SCE’s Lugo, Mohave, and Eldorado Substations and LADWP’s McCullough Substation.

4.7.7 Land Disturbance Summary

Land disturbance includes all areas affected by construction of the Proposed Project. Approximately 378.1 acres of land would be disturbed. Total permanent land disturbance for the Proposed Project would be approximately 7.0 acres. The balance of the land disturbed by project activities (371.1 acres) includes 125.5 acres of previously disturbed land and 245.6 acres of undisturbed land that would be restored after construction. The estimated amount of land disturbance for each Proposed Project component is summarized in Table 4-15, Proposed Project Estimated Land Disturbance.

Grading is proposed at eight locations. Two locations would involve grading to reduce the clearance discrepancies between existing land surface contours and the overhead Lugo-Mohave 500kV Transmission Line at towers M4-T2 to M4-T3 and M29-T3 to M30-T1. No new facilities will be constructed in these areas. The remaining six locations that would be graded would be for the installation of the new Newberry Springs and Ludlow mid-line series capacitors; a replacement series capacitor at Mohave Substation; and the Barstow, Kelbaker, and Lanfair fiber optic repeaters. The proposed graded areas are identified as permanent impacts. These areas are on relatively flat terrain and would require minimal additional area for grading beyond the pad edge. Included in the permanent disturbance are short access roads required between existing access roads and some of the facilities.

In addition to these areas proposed to be graded to accommodate new facilities or to address clearance discrepancies, some work areas and staging yards may involve driving over and crushing vegetation (drive and crush), vegetation clearing, grubbing, mowing, blade-grading, and/or re-compacting surfaces to remove potholes, ruts, and other surface irregularities in order to provide leveled working areas.

Trenching for underground telecommunication and distribution lines is anticipated to yield approximately 6,800 cubic yards of soil. The excavated soil will be used as backfill and compacted over the trenches. Excess soil would be used to improve adjacent access roads by smoothing and removing ruts. If excess material is not disposed of onsite, it would be transported to an SCE-approved facility. In the event contaminated soils are encounter, they would be stockpiled on plastic sheeting and covered to prevent contact with stormwater or becoming air borne. If the contamination is determined to be non-hazardous, the soil would be disposed of at an SCE-approved facility. If hazardous, it would be transported to an SCE-approved facility authorized to accept such material.

4.7.8 Construction Equipment and Workforce

The estimated construction equipment and workforce required for construction of the Proposed Project are summarized in Attachment 4-C: Construction Equipment and Workforce Estimates.

Construction would be performed by either SCE construction crews or contractors. If SCE construction crews are used, they typically would be based at SCE's local facilities (e.g., service centers and substations) or a temporary material staging yard set up for the Proposed Project. Contractor construction personnel would be managed by SCE construction management personnel and based out of the Contractor's existing yard or temporary material staging yards established for the Proposed Project. Based on activities being conducted, SCE anticipates a total of 15 to 346 (or an average of 159) construction personnel working on any given day. SCE anticipates that multiple crews would work concurrently when possible; however, the estimated deployment and number of crew members would vary depending on factors such as material and equipment availability, weather, and construction scheduling.

Table 4-15. Proposed Project Estimated Land Disturbance

Proposed Project Feature	Quantity	Total Approximate Area Disturbed during Construction (acres)	Temporary Disturbance: Approximate Area Previously Disturbed (acres)	Temporary Disturbance: Approximate Area to be Restored (acres)	Approximate Area Permanently Disturbed (acres)
Mid-Line Series Capacitors					
Newberry Springs Series Capacitor	1	3.8	0.0	0.6	3.2
Ludlow Series Capacitor	1	4.0	0.0	1.5	2.5
Total Estimate for Mid-Line Series Capacitors		7.7	0.0	2.1	5.6
Transmission					
Guard Structures	92	7.4	0.0	7.4	0.0
Pull and Tension Sites	198	58.3	0.0	58.1	0.2
Discrepancy Work Areas	14	3.6	3.5	0.1	0.0
OPGW/Tower Work	92	20.8	20.6	0.2	0.0
Total Estimated for Transmission		90.2	24.1	65.9	0.2
Subtransmission					
Discrepancy Work Area	1	1.7	0.0	1.7	0.0
Total Estimated for Subtransmission		1.7	0.0	1.7	0.0
Distribution					
Mid-Line Series Capacitor Work Areas (includes Joint Distribution/ Telecommunications Route between Capacitors)	4	21.2	0.0	21.2	0.0
Fiber Optic Repeater Work Areas	3	2.7	0.0	2.7	0.0
Total Estimated for Distribution		23.9	0.0	23.9	0.0
Telecommunications					
Fiber Optic Repeaters	3	0.2	0.0	0.0	0.2
Telecommunications Work Areas (Mohave Substation, Mid-Line Series Capacitors, Fiber Optic Repeaters, and Pull and Tension Sites)	38	32.0	0.9	31.1	0.0
Total Estimated for Telecommunications		32.2	0.9	31.1	0.2

Table 4-15. Proposed Project Estimated Land Disturbance

Proposed Project Feature	Quantity	Total Approximate Area Disturbed during Construction (acres)	Temporary Disturbance: Approximate Area Previously Disturbed (acres)	Temporary Disturbance: Approximate Area to be Restored (acres)	Approximate Area Permanently Disturbed (acres)
Substations					
Lugo Substation	1	22.9	22.9	0.0	0.0
Mohave Substation	1	21.5	21.5	0.0	0.0
Eldorado Substation	1	11.0	11.0	0.0	0.0
McCullough Substation	5	0.4	0.4	0.0	0.0
Total Estimated for Substations[1]		55.8	55.8	0.0	0.0
Staging Areas					
Staging Areas	17	98.3	34.4	63.9	0.0
Landing Zones	201	50.0	0.1	49.9	0.0
Parking Areas	4	15.5	9.8	5.6	0.0
Total Estimated for Staging Areas		163.8	44.3	119.4	0.0
Access Roads and/or Spur Roads					
Access Roads and/or Spur Roads	11	1.4	0.3	0.2	0.9
Footpaths	40	1.6	0.0	1.6	0.0
Total Area Estimated for Access Roads and/or Spur Roads and Footpaths		3.0	0.3	1.8	0.9
Total Estimated for Proposed Project		378.1	125.5	245.6	7.0

Notes:
Work areas at substations are previously disturbed, and do not contribute to the new, permanent disturbance acreage associated with the Proposed Project.
Work area acreages are based on preliminary planning and may be adjusted due to final engineering.
Disturbance areas have been rounded to the nearest tenth of an acre; therefore, they may not match the totals presented in Table 4-14, Fiber Optic Repeater Estimated Land Disturbance.
Portions of the permanently disturbed areas associated with access or spur roads are located within areas that have been previously disturbed.
The footprint of the staging yards overlaps with other work areas that will be used for the Proposed Project. This overlap was attributed to non-staging yard workspaces when calculating the total disturbance area. As a result, the disturbance associated with the staging yards in Table 4-15 is less than the total staging yard footprint reported in Table 4-8.

4.7.8.1 Equipment Description

Table 4-16, Construction Equipment Description, lists the equipment SCE expects to use during construction and a brief description of the use of that equipment.

Table 4-16. Construction Equipment Description

Equipment Type	Use Description
1-Ton Crew Cab	Transport and support construction personnel
¾-Ton Truck/Foreman's Truck	Transport and support construction personnel
Backhoe	Excavate and load materials
Bobcat	Excavate, move, and load materials
Bucket Truck	Lift and transport workers; and frame and string overhead cable lines
Bullwheel Puller	Install underground components
Compactor	Compact soil
Compressor Trailer	Provide compressed air for pneumatic tools
Concrete Mixer Truck	Deliver and mix concrete
Crane/Boom Truck	Lift and place materials
Digger Derrick	Dig holes, hoist, and set utility poles
Ditch Witch	Dig trenches
Dozer	Grade pads and access roads
Drill Rig	Drill subsurface holes
Dump Truck	Transport import/export material
Excavator	Excavate materials
Fiber Tensioner	Remove and install OPGW
Flatbed Truck	Deliver poles and hardware
Forklift	Lift and move materials
Foundation Auger	Drill foundation holes
Generator	Provide power to the work area
Grader	Grade substation site, pads, and access roads; ROW clearing; and restoration
V-Groove Puller	Remove and install OPGW
Helicopter	Install conductor/OPGW
Helicopter Support Truck	Install conductor/OPGW
Hydraulic Crane	Lift and place materials
Hydraulic Rewind Puller	Pull conductor/OPGW
LoDrill	Drill foundation holes
Low Bed Hauler	Transport equipment
Low Side End Dump	Transport import/export material
Manlift	Set steel and install equipment
Motor Grader	Grade terrain
Paving Machine	Lay asphalt
Reach Lift	Install equipment
Rock Crusher	Process and crush oversized rocks

Table 4-16. Construction Equipment Description

Equipment Type	Use Description
Scissor Lift	Provide access to elevated work areas
Scraper	Grade pads and access roads
Semi-Tractor Truck	Transport materials
Skid Steer Loader	Move materials
Skip Loader	Move or load materials
Static Truck/Tensioner	Provide tension during conductor/OPGW during installation
Splicing Lab/Truck	Splice conductor/OPGW
Storage Trailer	Storage
Test Truck (less than 1-ton truck)	Transport workers and test equipment to site
Tool Truck	Transport tools
Trencher	Dig trenches
Utility Cart	Support construction activities
Van (Cargo)	Transport telecommunications personnel and equipment
Water Buffalo	Transport/store water
Water Pull	Suppress dust and condition soil for compaction
Water Truck	Suppress dust and condition soil for compaction
Wire Truck/Trailer	Transport and hold conductor/OPGW during stringing operations

4.7.9 Construction Schedule

SCE anticipates that construction of the Proposed Project would take approximately 16 months, as shown in Table 4-17, Proposed Construction Schedule.[15] Construction would commence following approval by responsible agencies, final engineering, procurement activities, land rights acquisition, and receipt of all applicable permits.

Table 4-17. Proposed Construction Schedule

Proposed Project Activity	Approximate Duration (months)	Approximate Start Date
CPUC CPCN	N/A	February 2020
BLM Record of Decision	N/A	February 2020
Final Engineering	N/A	December 2019
ROW/Property Acquisition	N/A	February 2020
Acquisition of Required Permits	N/A	February 2020
Mid-Line Series Capacitor Construction	13	March 2020
Substation Modifications	10	March 2020
OPGW Construction	9	March 2020
500 kV Transmission (Discrepancy) Construction	6	March 2020

[15] The proposed construction schedule does not account for unforeseen Proposed Project delays, including but not limited to those due to inclement weather and/or stoppage necessary to protect biological resources (e.g., nesting birds).

Table 4-17. Proposed Construction Schedule

Proposed Project Activity	Approximate Duration (months)	Approximate Start Date
Telecommunications Construction	11	July 2020
Distribution Construction	5	October 2020
Proposed Project In-Service	N/A	June 2021
Cleanup	6	December 2021

4.8 Operation and Maintenance

Operation and maintenance (O&M) of the Proposed Project facilities require no new full-time staffing; the facilities would be operated and maintained by staff based at Lugo and/or Eldorado Substations. Ongoing O&M activities ensure reliable service, as well as the safety of utility workers and the general public, as mandated by the CPUC. SCE facilities are subject to Federal Energy Regulatory Commission (FERC) jurisdiction. SCE transmission facilities are under operational control of the CAISO.

4.8.1 Proposed Mid-Line Series Capacitors

The proposed Newberry Springs Series Capacitor and Ludlow Series Capacitor would require minimal O&M. Typical routine inspection and maintenance activities would include the following:

- Monthly inspections to check and record pressure gauge readings, operation counter readings, battery voltage and current readings, mimic display, and fence conditions (e.g., any damage to the fences).
- Annual inspection of platform structures, capacitor equipment, metal oxide varistors, damping reactors, instrument transformers, fiber optics, triggered air gaps/fast bypass devices, insulators, bus-work and fitting, protection and control systems, internal bypass switch(es), external bypass switch, and isolating disconnect switches with ground attachments.
- Periodic testing on instrument transformers, triggered air gaps/fast bypass devices, protection and control systems, and internal bypass switches; the frequency of the tests ranges from once per year to once every five years, depending on the types of equipment and types of tests.

Routine O&M activities would typically involve two to four operators, electricians, and testmen over a period of two to five days. A manlift is required for all activities on mid-line series capacitor platforms, which typically are 19 to 20 feet above the ground.

4.8.2 Existing Substations

The existing Mohave Substation is unstaffed; electrical equipment within the substation is remotely monitored and controlled from SCE's Eldorado Substation Switching Center. SCE maintains an Energy Management System that allows it to monitor and respond to alarms as the system status changes.

The existing Lugo and Eldorado Substations are both manned facilities that function as Switching Centers manned by System Operators acting under the direction of the Grid Control Center to operate the portion of the system under their respective substation jurisdiction. McCullough Substation is maintained by LADWP.

Substation personnel perform station inspections in both manned and unmanned substations when there is an indication of trouble or to perform routine maintenance. Routine circuit breaker and disconnect switching operations at remotely controlled stations would normally be performed by remote control on orders by the responsible switching center.

4.8.3 Transmission, Subtransmission, and Distribution Lines

The existing transmission, subtransmission, and distribution lines would continue to be maintained in a manner consistent with CPUC G.O. 95 and G.O. 128, as applicable, for circuits in California, and the NESC for circuits outside of California. Normal operation of the lines would be controlled remotely through SCE control systems and manually in the field as required. Consistent with CPUC G.O. 165, SCE inspects the transmission, subtransmission, and distribution overhead facilities a minimum of once per year via ground and/or aerial observation; however, inspections usually occur more frequently based on system reliability. Maintenance would occur as needed and could include activities such as repairing or replacing conductors, washing or replacing insulators, repairing or replacing other hardware components, repairing or replacing poles and towers, tree trimming, brush and weed control, and maintenance of access roads. Most regular O&M activities of overhead facilities are performed from existing access roads with no surface disturbance. Repairs done to existing facilities, such as repairing or replacing existing poles and towers, could occur in undisturbed areas. Existing conductors could require re-stringing to repair damage. Some pulling site locations could be in previously undisturbed areas, and at times, conductors could be passed through existing vegetation en route to their destination.

Routine access road maintenance is conducted on an annual and/or as-needed basis. Road maintenance includes maintaining a vegetation-free corridor to facilitate access and for fire prevention and blading to smooth over washouts, eroded areas, and washboard surfaces. Access road maintenance can include brushing (i.e., trimming or removal of shrubs) 2 to 5 feet beyond berms or road edges when necessary to keep vegetation from intruding into the roadway. Road maintenance also would include cleaning ditches, moving and establishing berms, clearing and making functional drain inlets to culverts, culvert repair, clearing and establishing water bars, and cleaning and repairing over-side drains. This maintenance also includes the repair, replacement, and installation of storm water diversion devices.

Insulators could require periodic washing with water to prevent the buildup of contaminants (e.g., dust, salts, droppings, smog, condensation) and reduce the possibility of electrical arcing, which can result in circuit outages and potential fire. Frequency of insulator washing is region specific and based on local conditions and the build-up of contaminants. Replacement of insulators, hardware, and other components is performed as needed to maintain circuit reliability.

Some tower or pole locations and/or laydown areas could be in previously undisturbed areas and could result in ground and/or vegetation disturbance, though attempts would be made to use previously disturbed areas to the greatest extent possible. Roads and trails are used for access to poles. In some cases, new access is created to remove and replace an existing tower or pole. Wood pole testing and treating is conducted to evaluate the condition of wood structures both above and below ground level. Intrusive inspections require the temporary removal of soil around the base of the pole, usually to a depth of 12 to 18 inches, to check for signs of deterioration. All soil removed for intrusive inspections would be reinstalled and compacted at completion of the testing.

Existing conductors could require re-stringing to repair damages. Some pulling site locations could be in previously undisturbed areas, and at times, conductors could be passed through existing vegetation en route to their destination.

Regular tree pruning must be performed to comply with existing State and federal laws, rules, and regulations and is crucial for maintaining reliable service, especially during severe weather or disasters.

Tree pruning standards for distances from overhead lines have been set by the CPUC (G.O. 95, Rule 35); California Public Resources Code Section 4293; California Code of Regulations Title 14, Article 4; and other government and regulatory agencies. SCE's standard approach to tree pruning is to remove at least the minimum required by law plus one year's growth, depending on the species.

In addition to maintaining vegetation-free access roads, helipads, and clearances around electrical lines, clearing of brush and weeds around poles and/or transmission tower pads may be required by applicable regulations on fee-owned ROWs, as necessary for fire protection. A 10-foot radial clearance around non-exempt poles (as defined by California Code of Regulations Title 14, Article 4) and a 25- to 50-foot radial clearance around non-exempt towers (as defined by California Code of Regulations Title 14, Article 4) are maintained in accordance with California Public Resources Code Section 4292.

In some cases, towers or poles do not have existing access roads and are accessed on foot, by helicopter, or by creating temporary access areas. O&M-related helicopter activities could include transportation of workers, delivery of equipment and materials to structure sites, structure placement, hardware installation, and OPGW stringing operations. Helicopter landing areas could occur where access by road is infeasible. SCE has identified potential landing zones across the project area. In addition, in the event of an emergency helicopters would be able to land within SCE ROWs, which could include landing on access or spur roads.

In addition to regular O&M activities, SCE conducts a wide variety of emergency repairs, such as those required to address damage from high winds, storms, fires, and other natural disasters, and accidents. Such repairs could include replacement of downed poles, transmission towers, or lines or re-stringing conductors. Emergency repairs could be needed at any time.

4.8.4 Telecommunications Facilities

The telecommunications equipment would be subject to maintenance and repair activities on an as-needed or emergency basis. Activities would include testing the equipment and replacing defective circuit boards, damaged radio antennas, or feedlines. Telecommunications equipment would also be subject to routine inspection and preventative maintenance, including filter change-outs or software and hardware upgrades. Most regular O&M activities for telecommunications equipment are performed at substation or communication sites and inside the equipment rooms. These are accessed from existing access roads with no surface disturbance. Helicopter transportation may be required to access remote communications sites for routine or emergency maintenance activities.

Telecommunications cables would be maintained on an as-needed or emergency basis. Maintenance activities would include patrolling, testing, repairing, and replacing damaged cable and hardware. Most regular maintenance activities of overhead facilities are performed from existing access roads with no surface disturbance. Repairs done to existing facilities, such as repairing or replacing existing cables and re-stringing cables, could occur in undisturbed areas. Access and habitat restoration may be required for routine or emergency maintenance activities, as mentioned previously in Section 4.8.3, Transmission, Subtransmission, and Distribution Lines.

4.8.4.1 Fiber Optic Repeater Sites

The fiber optic repeater sites would require the following site maintenance/inspection schedule:

- Generator – once per year
- Fuel tank – once per year; refuel as required by usage

- Site vegetation clearance – once per year, or as required
- Building inspection – once per year

4.9 Applicant-Proposed Measures and Standard Practices

As part of the Proposed Project, SCE has identified 19 applicant-proposed measures (APMs) that it would implement during construction and/or O&M of the Proposed Project to reduce or avoid impacts. SCE would conduct the design, construction, and O&M of the Proposed Project in accordance with the APMs. SCE's proposed APMs are listed in Table 4-18, Applicant-Proposed Measures. However, if analysis reveals that an APM may be insufficient, it may be superseded by a specific mitigation measure. Typically, when an APM is superseded by a mitigation measure it is because more detail on mitigation is required than is stated in the APM or to add requirements not found in the APM.

In addition to the APMs, SCE has identified its standard practices for environmental surveys, worker environmental awareness training, and traffic control that would apply to the ELM project. These are discussed following Table 4-18.

Environmental Surveys

SCE has conducted initial biological, cultural, and paleontological resource evaluations and would conduct further focused environmental surveys after approval of the Proposed Project, but prior to the start of construction. These surveys would identify and/or address any potential sensitive biological, cultural, and paleontological resources that may be affected by the Proposed Project. The information gathered from these surveys may be used to finalize the Proposed Project design in order to avoid sensitive resources or to minimize the potential impact to sensitive resources from Proposed Project-related activities. The results of these surveys would also help determine the extent to which environmental specialist construction monitors would be required.

Table 4-18. Applicant-Proposed Measures

APM	Description
APM-AIR-01: Fugitive Dust	During construction, fugitive dust would be controlled by implementing the following measures: ▪ Surfaces disturbed by construction activities would be covered or treated with a dust suppressant or water until the completion of activities at each site of disturbance. ▪ Inactive disturbed (e.g., excavated or graded areas) soil and soil piles would be sufficiently watered or sprayed with a soil stabilizer to create a surface crust or would be covered. ▪ Drop heights from excavators and loaders would be minimized to a distance of no more than 5 feet. Vehicles hauling soil and other loose material would be covered with tarps or maintain at least 6 inches of freeboard. ▪ Within Nevada, vehicle speeds on unpaved traffic and parking areas would be restricted to 15 miles per hour. In California, vehicle speeds on unpaved roadways would adhere to all posted speed limits. ▪ Within Nevada, unpaved non-public traffic and parking areas designated for utilization during Proposed Project construction would be effectively stabilized to control dust emissions (e.g., using water or chemical stabilizer/suppressant). In California, unpaved non-public traffic and parking areas designated for utilization during Proposed Project construction would be effectively stabilized to control dust emissions with a chemical stabilizer/suppressant.

Table 4-18. Applicant-Proposed Measures

APM	Description
APM-AIR-02: Tier 4 Engines	Off-road diesel construction equipment with a rating between 100 and 750 horsepower would be required to use engines compliant with the U.S. Environmental Protection Agency's final Tier 4 non-road engine standards. In the event that a Tier 4 engine is not available, the equipment would be equipped with a Tier 3 engine and documentation would be provided from a local rental company stating that the rental company does not currently have the required diesel-fueled, off-road construction equipment, or that the vehicle is specialized and is not available to rent. Similarly, if a Tier 3 engine is not available, that equipment would be equipped with a Tier 2 or 1 engine, and documentation of unavailability would be provided.
APM-AIR-03: Idling	Equipment would not be left idling in excess of five minutes, except when idling is required for the equipment to perform its task or has a California clean-idle- sticker.
APM-AIR-04: Equipment Maintenance	Diesel engines would be maintained in good working order and according to manufacturer's specifications to reduce emissions.
APM-AIR-05: Ridesharing	Workers would be encouraged to carpool to work sites, and/or utilize public transportation for employee commutes.
APM-BIO-01:	To the extent feasible, SCE would minimize temporary impacts and permanent loss to sensitive natural vegetation communities and special-status plants. Impacts would be minimized at construction sites by clearly demarcating work areas and flagging resources to be avoided. If unable to avoid impacts to sensitive natural vegetation communities and special-status plants, a revegetation plan would be prepared in coordination with the applicable agencies. The revegetation plan would describe, at a minimum, which vegetation restoration method (e.g., natural revegetation, planting, or reseeding with native seed stock in compliance with the Proposed Project's SWPPPs) would be implemented in the Proposed Project area. The revegetation plan would also include the plant species or habitats to be restored or revegetated, the replacement or restoration ratios (as appropriate), the restoration methods and techniques, and the monitoring periods and success criteria.
APM-BIO-02: Special-Status Plant Species Protection	Prior to construction and during the appropriate phenological (i.e., blooming) periods, a qualified biologist would flag the locations of any special-status plants present within a work area. These flagged areas would be avoided to the extent possible and monitored by a qualified biologist during construction activities. Where disturbance to these areas cannot be avoided, SCE would develop and implement a revegetation plan (APM-BIO-01). Weed species would be removed, where necessary, from areas to be revegetated to ensure successful revegetation to pre-construction conditions.
APM-BIO-03: Noxious and Invasive Weed Management Plan	Prior to construction, SCE would prepare a Noxious and Invasive Weed Management Plan (NIWMP) that is intended to minimize the spread of noxious and invasive weeds during construction. The NIWMP would include, but would not be limited to, ensuring that construction (earth-moving or ground-disturbing) vehicles arrive to work sites clean and weed-free prior to entering the ROW in cross-country areas, ensuring straw wattles used to contain storm water runoff are weed-free, and documenting the extent of noxious weeds within the construction areas prior to construction. Noxious weeds are defined as species rated as High on the California Invasive Plant Inventory Database, published by the California Invasive Plant Council. Construction within urban/developed areas and intensive agricultural areas would be exempt from the NIWMP requirements.
APM-BIO-04: Desert Tortoise Protection	The following list of measures is designed to avoid and minimize impacts to desert tortoise and would apply to all construction activities in areas with the potential to support the species: 1. Pre-activity Surveys: No more than seven days prior to the onset of ground-disturbing activities, an agency-approved biologist — with experience monitoring and handling desert tortoise — would conduct a pre-activity survey in all work areas within potential desert tortoise habitat, plus an approximately 300-foot buffer. All desert tortoise burrows within the pre-activity survey area (including desert tortoise pallets) would be prominently flagged at that time so that they may be avoided during work activities. Proposed actions would avoid disturbing desert tortoise burrows to the extent possible. However, burrows would be excavated if they would be impacted by construction activities. If a potential tortoise burrow must be excavated, the biologist would proceed according to the Desert Tortoise Council's Guidelines for Handling Desert Tortoise during Construction Projects.

Table 4-18. Applicant-Proposed Measures

APM	Description
	2. Monitoring: The approved tortoise biologist would be available on site to monitor any work areas for desert tortoise, as needed. The approved tortoise biologist would be responsible for performing surveys prior to Proposed Project activities in suitable desert tortoise habitat. The approved tortoise biologist would have the authority to halt all non-emergency actions (as soon as safely possible) that may result in harm to desert tortoise, and would assist in the overall implementation of APMs for the tortoise. 3. Desert Tortoise in Work Area: In the event that a desert tortoise is encountered in the work area, all work would cease and the approved biologist would be contacted. Work would not commence until the animal has voluntarily moved to a safe distance away from the work area. Desert tortoises may be moved by an agency-approved biologist if necessary to move them out of harm's way. Encounters with desert tortoise would be reported to an approved biologist. Encounters with desert tortoise would be documented and provided to the California Department of Fish and Wildlife (CDFW), BLM, and U.S. Fish and Wildlife Service (USFWS). In the event that a dead or injured desert tortoise is observed, the approved biologist would be responsible for notifying SCE's herpetologist and reporting the incident to the CDFW, BLM, and USFWS. 4. Under Vehicle Checks: Desert tortoises commonly seek shade during the hottest times of the day. Employees working within the geographic range of this species would be required to check under their equipment or vehicles before they are moved. If desert tortoises are encountered, the vehicle is not to be moved until the animals have voluntarily moved to a safe distance away from the parked vehicle. Desert tortoises may be moved by the approved biologist, if necessary, to move them out of harm's way. 5. Handling Desert Tortoise: Only an agency-approved biologist may move or handle desert tortoises. When a desert tortoise is moved, the approved biologist would be responsible for taking appropriate measures to ensure that the animal is not exposed to harmful temperature extremes. The approved biologist would follow the appropriate protocols outlined in the Desert Tortoise Council's *Guidelines for Handling Desert Tortoises During Construction Projects* when handling desert tortoises or excavating their burrows. 6. Excavation of Desert Tortoise Burrows: Should it prove necessary to excavate a desert tortoise from its burrow to move it out of harm's way, excavation would be done using hand tools, either by or under the direct supervision of an approved biologist. Excavation of desert tortoise burrows would occur no more than seven days before the onset of construction or O&M activities. All desert tortoises removed from burrows would be placed in an unoccupied burrow that is approximately the same size as the one from which it was removed. If an existing burrow is unavailable, the approved biologist would construct or direct the construction of a burrow of similar shape, size, depth, and orientation as the original burrow. To ensure their safety, desert tortoises moved during inactive periods would be monitored for at least two days after placement in the new burrows or until the end of the construction activity. If desert tortoises need to be moved at a time of day when ambient temperatures could harm them (i.e., at temperatures lower than 40 degrees Fahrenheit (°F) or higher than 90°F), they would be held overnight in a clean cardboard box. These desert tortoises would be kept in the care of the approved biologist under appropriate controlled temperatures and released the following day when temperatures are favorable. All cardboard boxes would be appropriately discarded after one use. 7. Disposal of Trash: Trash and food items would be contained in closed containers and removed daily to reduce attractiveness to opportunistic predators, such as common ravens (*Corvus corax*), coyotes (*Canis latrans*), and feral dogs (*Canis lupus familiaris*). 8. Pets Prohibited: Employees would not bring pets to the Proposed Project area. 9. Vehicle Travel: Motor vehicles would be limited to maintained roads and designated routes. If additional routes are needed, they would be surveyed by the approved biologist. 10. Raven Management: SCE would implement a Raven Management Plan (RMP) to minimize avian predation of desert tortoise for the Proposed Project. The purpose of the RMP is to utilize methods that deter raven depredation of juvenile desert tortoises, and other wildlife species. The RMP is not intended to eliminate or control raven populations, but would target offending ravens that have been found to prey upon desert tortoises. The RMP would incorporate an adaptive management strategy for immediate implementation following construction of the Proposed Project. The RMP would be evaluated after three years of implementation, or as needed, if avian predation becomes apparent.

Table 4-18. Applicant-Proposed Measures

APM	Description
	The following activities may be implemented as part of the RMP: (1) Common raven nest/power line monitoring, (2) Funding of offending raven control via contract with the U.S. Department of Agriculture, and (3) Alternative control strategies developed in coordination with USFWS (e.g. egg-oiling, laser deterrents, etc.). Mutual and timely cooperation between SCE and the BLM, USFWS, and CDFW is central to effective implementation of the RMP.
APM-BIO-05: Compensation for Impacts to Desert Tortoise Critical Habitat	Compensation for temporary and permanent impacts to desert tortoise habitat disturbance is proposed at the following ratios: ▪ A 5-to-1 ratio for impacts to desert tortoise critical habitat. ▪ A 1-to-1 ratio for impacts to desert tortoise habitat, excluding critical habitat. No compensatory mitigation is required for disturbed areas (i.e., totally denuded, mostly denuded with scattered shrub-like vegetation, active agricultural, residential, and urban) that provide no habitat value to the species. Although much of the desert tortoise habitat disturbance resulting from Proposed Project activities would be temporary, compensatory mitigation would be provided at a permanent ratio due to the slow recovery time of habitats in desert ecosystems. No mitigation would occur for impacts to developed land within the Proposed Project area.
APM-BIO-06: Nesting Birds	SCE would conduct pre-construction clearance surveys no more than seven days prior to construction to determine the location of nesting birds and territories, during the nesting bird season (typically February 1 to August 31, or earlier for species such as raptors). An avian biologist would establish a buffer area around active nest(s) and would monitor the effects of construction activities to prevent failure of the active nest. The buffer would be established based on construction activities, potential noise disturbance levels, and behavior of the species. Monitoring of construction activities that have the potential to affect active nest(s) would continue until the adjacent construction activities are completed or until the nest is no longer active.
APM-BIO-07: Western Burrowing Owl Protection	Pre-construction burrowing owl surveys would be conducted within suitable habitat in accordance with Appendix D of the Staff Report on Burrowing Owl Mitigation (CDFW 2012). Prior to construction activities SCE would prepare a survey report in accordance with the requirements of the staff report. If a breeding territory or nest is confirmed, the CDFW would be notified and SCE would avoid impacts to burrowing owl to the extent feasible. If unavoidable impacts to western burrowing owl are anticipated, SCE would implement mitigation methods as outlined in the staff report and in coordination with the CDFW.
APM-BIO-08: Compensation for Permanent Impacts to Jurisdictional Water Resources	All necessary authorizations must be obtained from the applicable jurisdictional agencies for impacts to aquatic resources. Permanent impacts to all jurisdictional water resources would be compensated for at a one-to-one ratio, or as agreed upon with the U.S. Army Corps of Engineers, State Water Resources Control Board, NDEP, and CDFW.
APM CUL-01: Environmentally Sensitive Areas	Where operationally feasible, all National Register of Historic Places- (NRHP-) and California Register of Historic Resources- (CRHR-) eligible resources would be protected from direct impacts by Proposed Project redesign (i.e., relocation of the line, ancillary facilities, or temporary facilities or work areas). Avoidance mechanisms would include fencing off areas such as Environmentally Sensitive Areas (ESAs) for the duration of the Proposed Project or as outlined in the Cultural Resources Management Plan (CRMP). If avoidance of NRHP- or CRHR-eligible resources is not feasible, SCE would prepare and submit a Historic Properties Treatment Plan (HPTP) to outline the treatment of cultural resources that cannot be avoided. The HPTP would be submitted to the appropriate agencies for review and approval. All treatment measures outlined in the HPTP would be implemented at least 30 days before the start of construction.
APM-CUL-02: Cultural Resources Survey	SCE would perform surveys prior to construction for any Proposed Project areas not yet surveyed (e.g., new or modified staging areas, pull sites, or other work areas). Resources discovered during the surveys would be subject to APM-CUL-03.
APM-CUL-03: CRMP	SCE would prepare and submit for approval a CRMP to guide all cultural resource management activities during Proposed Project construction. Management of cultural resources would follow the standards and guidelines established by the NPS for implementing Section 106 of the National Historic Preservation Act (“Archeology and Historic Preservation; Secretary of the Interior’s Standards and Guidelines,” 48 Federal

Table 4-18. Applicant-Proposed Measures

APM	Description
	Register 190 [29 September 1983], pp. 44716-44742). The CRMP would be submitted to the BLM for review and approval at least 30 days before the start of construction. The CRMP would define and map all known or assumed eligible NRHP and CRHR properties in or within 100 feet of the Proposed Project Area of Potential Effect and would identify the cultural values that contribute to their NRHP and CRHR eligibility. A cultural resources protection plan would be included that details how NRHP- and CRHR-eligible properties would be avoided and protected during construction. Measures would include, at a minimum, designation and marking of ESAs, archaeological monitoring, personnel training, and effectiveness reporting. The plan would detail the measures to be used; how, when, and where they would be implemented; and how protective measures and enforcement would be coordinated with construction personnel. The CRMP would also define any additional areas that are considered to be of high sensitivity for the discovery of buried NRHP- and CRHR-eligible cultural resources, including burials, cremations, or sacred features. The CRMP would detail provisions for monitoring construction in these high-sensitivity areas. It would also detail procedures for halting construction; making appropriate notifications to agencies, officials, and Native Americans; and assessing NRHP and CRHR eligibility in the event that unknown cultural resources are discovered during construction. For all unanticipated cultural resource discoveries, the CRMP would detail the methods, the consultation procedures, and the timelines for assessing NRHP and CRHR eligibility, formulating a mitigation plan, and implementing treatment. Mitigation and treatment plans for unanticipated discoveries would be reviewed by the appropriate Native Americans and approved by the BLM, and the Office of Historic Preservation (OHP) prior to implementation. The CRMP would include provisions for analysis of data in a regional context, reporting of results within one year of the completion of field studies, curation of artifacts (except from private land) and data (e.g., maps, field notes, archival materials, recordings, reports, photographs, and analysts' data) at a facility that is approved by the BLM, and dissemination of reports to local and State repositories, libraries, and interested professionals. The BLM would retain ownership of artifacts collected from BLM-managed lands. SCE would attempt to gain permission for artifacts from privately held land to be curated with the other project collections. The CRMP would specify that archaeologists and other discipline specialists conducting the studies must meet the Professional Qualifications Standards mandated by the OHP.
APM-CUL-04: Paleontological Resource Mitigation and Monitoring Plan	SCE would prepare and submit to the BLM for review and approval a Paleontological Resources Mitigation and Monitoring Plan (PRMMP) that is consistent with the following requirements: ▪ The PRMMP would be prepared by a qualified paleontologist, would be based on Society of Vertebrate Paleontology guidelines, and would meet all regulatory requirements. The qualified paleontologist would have a master's degree or a Doctor of Philosophy in paleontology, would have knowledge of the local paleontology, and would be familiar with paleontological procedures and techniques. ▪ The PRMMP would include a site-specific investigation to identify construction impact areas of moderate (Potential Fossil Yield Classification [PFYC] 3a) to very high (PFYC 5) sensitivity for encountering significant resources and the approximate depths where those resources are likely to be encountered for each Proposed Project component. ▪ The PRMMP would require the qualified paleontological monitor to monitor all construction-related ground disturbance in sediments determined to have a moderate (PFYC 3a) to very high (PFYC 5) sensitivity. ▪ The PRMMP would define monitoring procedures and methodology and would specify that sediments of undetermined sensitivity must be monitored on a part-time basis (as determined by the qualified paleontologist). Sediments with very low or low sensitivity would not require paleontological monitoring. The qualified paleontological monitor would have at least a Bachelor of Science degree in geology or paleontology, as well as demonstrated field experience in the collection and identification of fossil material. ▪ The PRMMP would state which resources would be avoided and which would be recovered for their data potential. Where possible, recovery is preferred over avoidance in order to mitigate the potential for looting of paleontological resources. The PRMMP would also detail methods of recovery, preparation and analysis of specimens, final curation of specimens at a federally accredited repository, data analysis, and reporting. ▪ The PRMMP would specify that all paleontological work undertaken by SCE on public lands managed by the BLM would be carried out by qualified, permitted paleontologists with the appropriate current paleontological resources use permit.

Table 4-18. Applicant-Proposed Measures

APM	Description
APM-NOI-01: Duration of Helicopter Use	Active helicopter operation at landing zones within 700 feet of occupied residences would be limited to 2 hours per day. Helicopter use may be extended if required to ensure that electrical service is maintained for customers or for safety reasons.
APM-NOI-02: Helicopter Use in Residential Areas	Helicopters would be required to maintain a height of at least 500 feet when passing over residential areas, except at temporary construction areas or when actively assisting with conductor stringing. All helicopters would be required to maintain a lateral distance of at least 500 feet from all schools.
APM-TCR-01: Tribal Monitoring	An archaeological monitor, and tribal monitor that is culturally affiliated with the project area, may be present for all ground-disturbing activities within or directly adjacent to previously identified TCR(s) and prehistoric resources as outlined in the CRMP. The archaeological and tribal monitors will consult the CRMP to determine when to increase or decrease the monitoring effort should the monitoring results indicate a change is warranted. Monitoring reports shall be prepared and submitted to the BLM and CPUC on a monthly basis.
APM-TCR-02: Tribal Engagement Plan	A tribal engagement plan shall be prepared, which will detail how Native American tribes will be engaged and informed throughout the proposed project. The tribal engagement plan will be included in the CRMP (APM CUL-1).

Biological resources in the vicinity of the Proposed Project are presented in detail in Section 5.4, Biological Resources. The following biological surveys would occur prior to construction:

- Nesting bird surveys
- Burrowing owl surveys
- Desert tortoise surveys

A clearance field survey would be conducted by a qualified botanist and wildlife biologist no more than 30 days prior to the start of construction in a particular area to identify potential plant and animal species that may be affected by construction activities. Clearance surveys would be limited to areas directly impacted by construction activities.

Cultural resources in the vicinity of the Proposed Project are presented in detail in Section 5.5, Cultural Resources.

Worker Environmental Awareness Training

Prior to construction, a Worker Environmental Awareness Program (WEAP) would be developed for agency approval. A presentation would be prepared by SCE and used to train all site personnel prior to the commencement of work. A record of all trained personnel would be kept. In addition to instruction on compliance with any additional APMs and Proposed Project mitigation measures, all construction personnel would also receive the following:

- A list of phone numbers of SCE environmental specialist personnel associated with the Proposed Project (e.g., archaeologist, biologist, environmental coordinator, and regional spill response coordinator)
- Instruction on the Mojave Desert Air Quality Management District and Clark County Department of Air Quality fugitive dust rules
- A description of applicable noise construction time and/or noise level limits
- A review of applicable local, State, and federal ordinances; laws and regulations pertaining to historic and paleontological preservation; a discussion of disciplinary and other actions that could be taken against persons violating historic and paleontological preservation laws and SCE policies; a review of

paleontology, archaeology, history, prehistory, and Native American cultures associated with historical and paleontological resources in the Proposed Project vicinity, inclusive of instruction on what typical cultural and paleontological resources look like; and instruction that if discovered during construction, work is to be suspended in the vicinity of any find, and the site foreman and SCE Project Archaeologist or environmental compliance coordinator are to be contacted for further direction

- Instruction on the roles of environmental monitors (i.e., biological, cultural, and paleontological), if present, and the appropriate treatment by on-site personnel of areas designated as Environmentally Sensitive Areas
- Instruction on the importance of maintaining the construction site inclusive of ensuring all food scraps, wrappers, food containers, cans, bottles, and other trash from the Proposed Project area would be deposited in closed trash containers; trash containers would be removed from the Proposed Project as required and would not be permitted to overfill
- Instruction on the individual responsibilities under the Clean Water Act, the Proposed Project SWPPPs, site-specific BMPs, and the location of Safety Data Sheets for the Proposed Project
- Instructions to notify the foreman and regional spill response coordinator in case of a hazardous materials spill or leak from equipment, or upon the discovery of soil or groundwater contamination
- Instructions to cover all holes/trenches at the end of each day
- A copy of the truck routes to be used for material delivery
- Instruction that non-compliance with any laws, rules, regulations, or mitigation measures could result in being barred from participating in any remaining construction activities associated with the Proposed Project

Traffic Control

Construction activities completed within public street ROWs would require the use of a traffic control service, and all lane closures would be conducted in accordance with applicable requirements. These traffic control measures would be consistent with those published in the *California Joint Utility Traffic Control Manual* (California Inter-Utility Coordinating Committee, 2010).

4.10 Electric and Magnetic Fields

The CPUC recognizes that there is public interest and concern regarding potential health effects that could result from exposure to electric and magnetic fields (EMF) from power lines; therefore, this subsection provides information regarding EMF associated with electric utility facilities and the potential effects of the Proposed Project related to public health and safety. Potential health effects from exposure to ***electric fields*** from power lines (produced by the existence of an electric charge, such as an electron, ion, or proton, in the volume of space or medium that surrounds it) are typically not of concern since electric fields are effectively shielded by materials such as trees, walls, etc. Therefore, the majority of the following information related to EMF focuses primarily on exposure to ***magnetic fields*** (invisible fields created by moving charges) from power lines.

Magnetic fields can be reduced either by cancellation or by increasing distance from the source. Cancellation is achieved in two ways. A transmission line circuit consists of three "phases" associated with three separate wires (conductors), usually on an overhead tower. The configuration of these three conductors can directly influence the strength of the magnetic field. When the configuration places the three conductors closer together, the interference or cancellation of the fields from each wire is enhanced, and the magnetic field is reduced. This technique has practical limitations because of the potential for short circuits if the wires are placed too close together. Close conductor spacing can also create worker safety concerns because there is a risk of workers contacting energized conductors during maintenance.

This environmental document does not consider magnetic fields in the context of CEQA and a determination of environmental impact. This is because (a) there is no agreement among scientists that EMF does create a potential health risk, and therefore, (b) there are no defined or adopted CEQA standards for defining health risk from EMF. As a result, EMF information is presented for the benefit of the public and decisionmakers.

After several decades of study regarding potential public health risks from exposure to power line EMF, research results remain inconclusive. Several national and international panels have conducted reviews of data from multiple studies and state that there is not sufficient evidence to conclude that EMF causes cancer. The International Agency for Research on Cancer (IARC), an agency of the World Health Organization (WHO), and the California Department of Health Services (DHS) both classify EMF as a possible carcinogen (WHO, 2001; DHS, 2002).

In addition, the 2007 WHO [Environmental Health Criteria (EHC) 238] report concluded that:

- Evidence for a link between Extremely Low Frequency (ELF, 50–60 Hz) magnetic fields and health risks is based on epidemiological studies demonstrating a consistent pattern of increased risk for childhood leukemia. However, "…virtually all of the laboratory evidence and the mechanistic evidence fail to support a relationship between low-level ELF magnetic fields and changes in biological function or disease status.… the evidence is not strong enough to be considered causal but sufficiently strong to remain a concern."
- "For other diseases, there is inadequate or no evidence of health effects at low exposure levels."

Currently, there are no applicable regulations related to EMF levels from power lines or substations. However, following a California Public Utilities Commission (CPUC) decision from 1993 (Decision [D.]93-11-013) that was reaffirmed by the CPUC on January 27, 2006 (D.06-01-042), the CPUC requires utilities to incorporate "low-cost" or "no-cost" measures to mitigate EMF from new or **upgraded electrical utility facilities** up to approximately 4 percent of total project cost. To comply with this requirement, SCE developed and included a Field Management Plan as part of the application for the Proposed Project to reduce magnetic field levels in the vicinity of the transmission lines and other Proposed Project components.

EMF in the Proposed Project Area

Magnetic field strength is a function of both the electric current carried by the wires, and the configuration and design of the three conductors that together form a single circuit of an electric transmission line. Magnetic field strengths for typical transmission power line loads at the edge of an *overhead* transmission system right-of-way generally range from 10 to 30 milligauss (mG) (NIEHS, 2002). Exposure to EMF occurs in the community from sources other than electric transmission lines. Research on ambient magnetic fields in homes indicates that levels below 0.6 mG could be found in half of the studied homes in the centers of rooms, and that the average levels in the homes away from electrical appliances was 0.9 mG. Immediately adjacent to appliances (within 12 inches), field values are much higher, for example: 4 to 8 mG near electric ovens and ranges, 20 mG for portable heaters, or 60 mG for vacuum cleaners (NIEHS, 2002). Outside of the home, the public also experiences EMF exposure from the electric distribution system that is located throughout all areas of the community.

Existing EMF levels along SCE's existing 500 kilovolt (kV) transmission and 115 kV subtransmission corridors vary with loading conditions, which vary with time of the day, season of the year, and operating conditions. The stated purpose of the series capacitors to be constructed as part of the Proposed Project is to increase the power flow over the existing transmission lines. Therefore, the magnetic field would increase in the project area.

Field Management Plan for the Proposed Project

This section discusses SCE's general practices regarding EMF and the specific EMF reduction measures proposed by SCE for the Proposed Project. SCE's Field Management Plan is included with the application as Appendix F. The amended application for a CPCN, including Appendix F, is available on line at http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M283/K484/283484103.PDF

SCE's Field Management Plan includes the reasons for adopting or not adopting each of the "no cost" and "low cost" design options available for components of the Proposed Project, see Appendix F of the application.

In its present form, SCE's Field Management Plan does not quantitatively or qualitatively address the increase in magnetic field that would occur all along the three segments of existing 500 kV transmission line due to the installation and use of the proposed series capacitors.

SCE's EMF Design Guidelines. In accordance with Section X(A) of CPUC General Order 131-D, Decision No. D.06-01-042, and SCE's EMF Design Guidelines prepared in accordance with the EMF Decision, SCE would implement certain "no cost" magnetic field reduction design options with the Proposed Project, identified in SCE's Field Management Plan.

SCE's guidelines (2006) call for implementation of measures to reduce magnetic fields based on the land uses surrounding each project, in the following priority:

- Schools, day care centers, hospitals
- Residential properties
- Commercial/industrial land uses
- Recreational sites
- Agricultural lands
- Undeveloped land

Common magnetic field reduction options SCE utilizes to comply with the CPUC EMF Policy include the following measures, any or all of which may be selected to reduce the magnetic field strength levels from the proposed transmission line:

- Increasing the distance from electrical facilities by:
  - Increasing pole (structure) height,
  - Increasing the width of right-of-way, and/or
  - Locating power lines closer to the centerline of the corridor.
- Reducing conductor (phase) spacing.
- Arranging conductors to reduce magnetic field.
- Converting single-phase circuits to split-phase circuits.

Proposed EMF Reduction Measures. The Field Management Plan SCE prepared for the Proposed Project (Provided in SCE's Application as Appendix F) includes the following "no cost" magnetic field reduction options:

- Proposed substation and mid-line capacitors work:
  - Install mid-line series capacitors in undeveloped areas.
  - Place substation series capacitors away from the substation property lines.
- Proposed 500 kV transmission line work:
  - Utilize taller structure heights in areas with potential overhead discrepancies.
  - Relocate underbuilt distribution circuits on 115 kV structures.
  - Increase conductor ground clearance.
- Proposed 115 kV subtransmission line work:
  - No Proposed Project components would occur near population.

Additional information regarding EMF and the Proposed Project can be found in Appendix F of SCE's Application (A.18-05-007). If the project or an alternative that is approved by the CPUC differs from the preliminary engineering represented in the application, then SCE would prepare and submit to the CPUC an Addendum to the Field Management Plan containing the precise EMF measures to be employed for the project.

4.11 References

SCE (Southern California Edison). 2018. Eldorado-Lugo-Mohave Series Capacitor Project: Proponent's Environmental Assessment (PEA). Volumes 1 through 8. April. http://www.cpuc.ca.gov/environment/info/aspen/elm/toc-pea.htm

SoCalGas (Southern California Gas). 2019a. Gas Transmission Pipeline Interactive Map – San Bernardino, Pipeline locations in San Bernardino County. http://socalgas.maps.arcgis.com/apps/webappviewer/index.html?id=faeed481312f4e5fb056f739ff169e02 Accessed May 6, 2019.

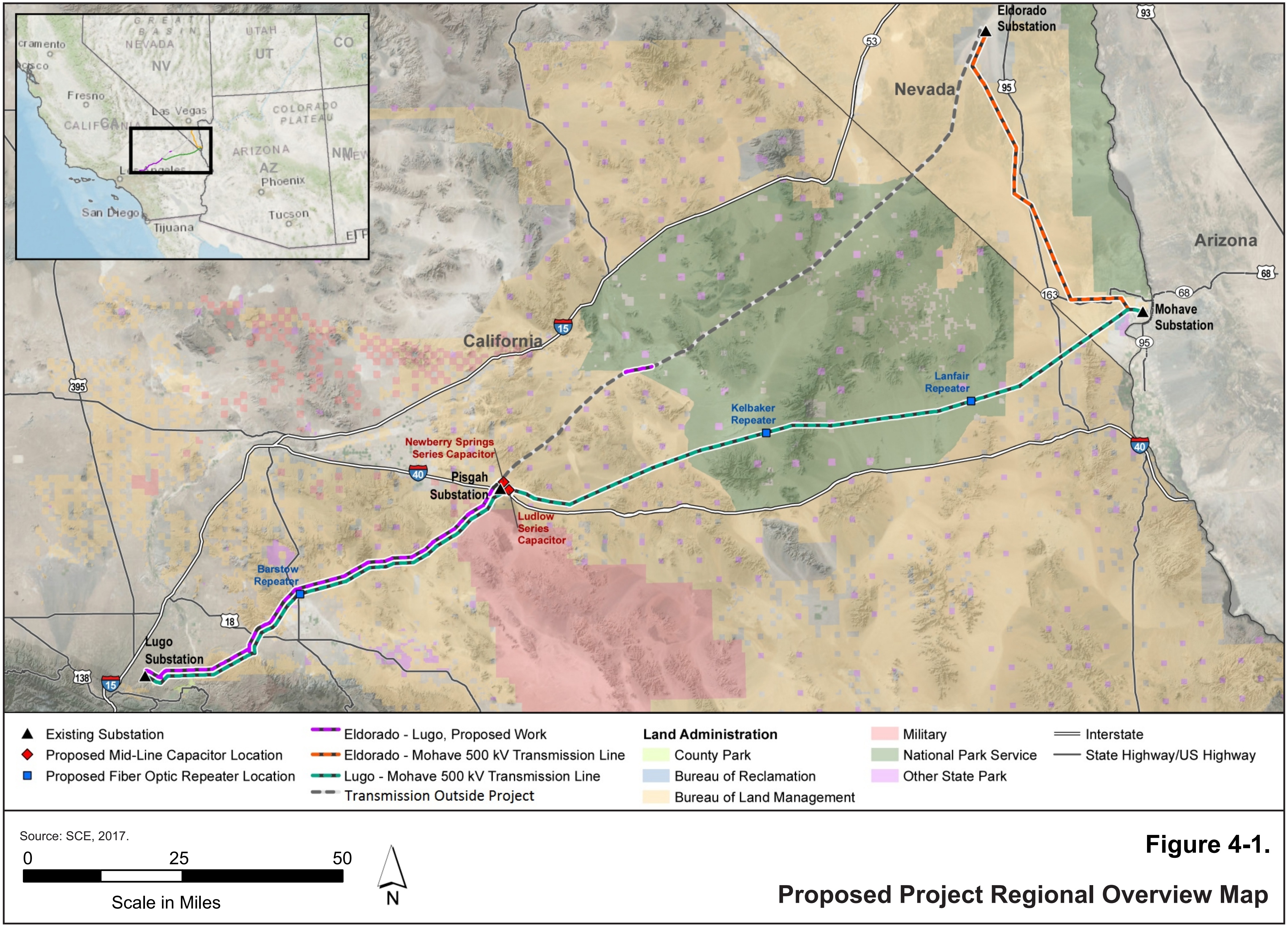
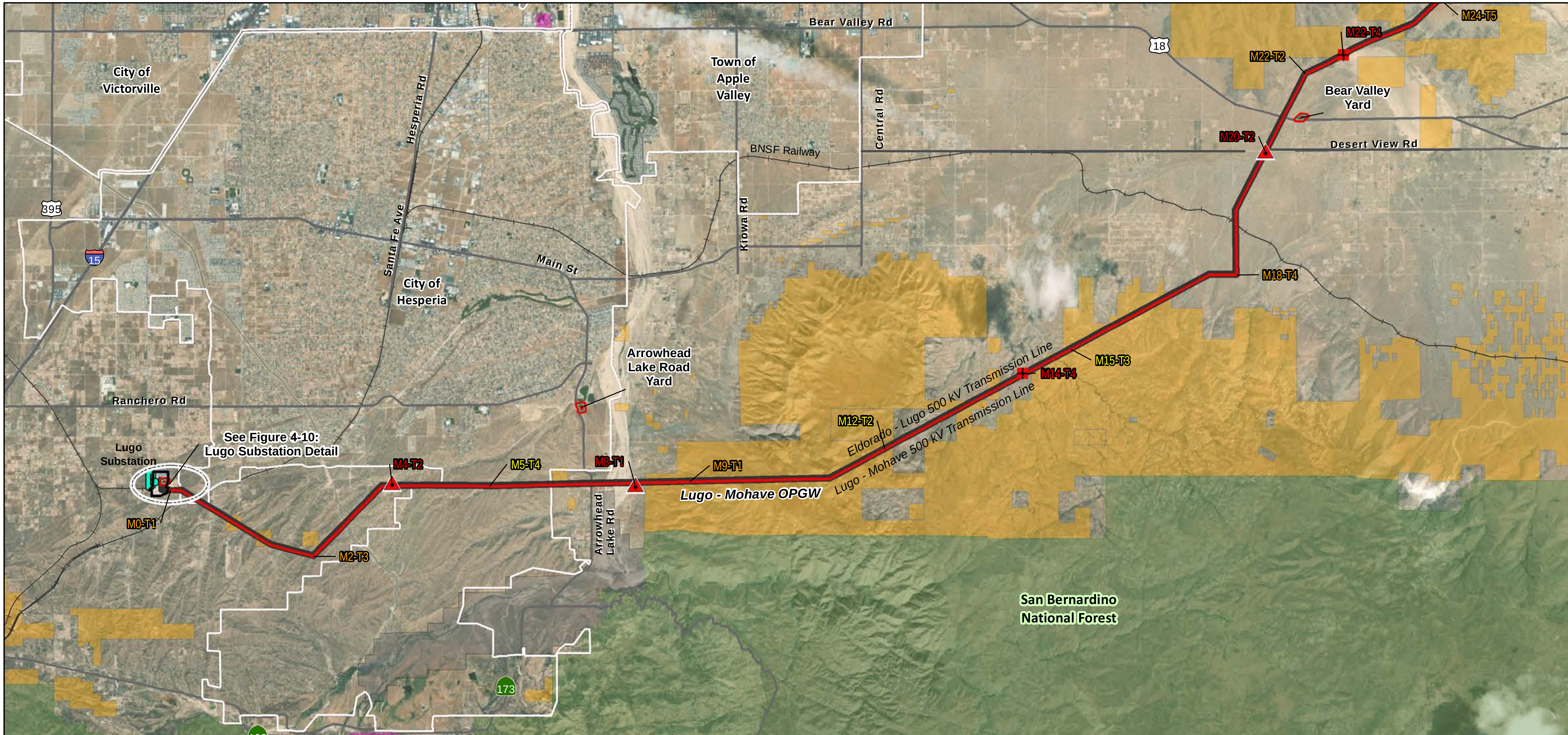


Figure 4-1.

Proposed Project Regional Overview Map



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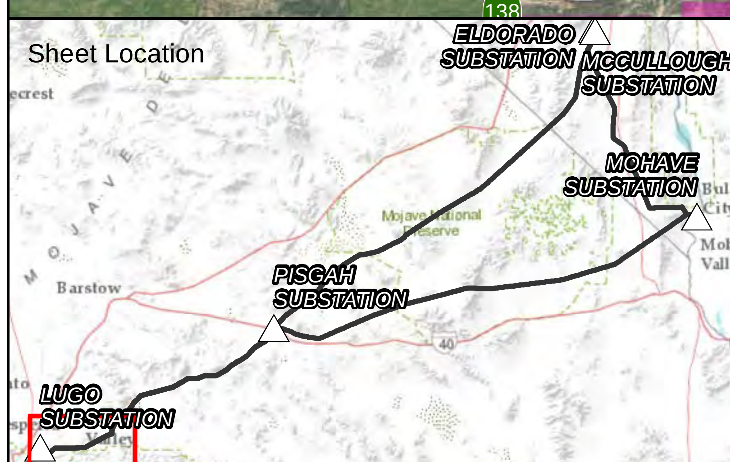

Existing Transmission Line
Existing Yard
Temporary Yard
New OPGW

Discrepancy Work

Raise Tower
Other

Jurisdiction

Bureau of Land Management
State Lands
Dept. of Defense
US Forest Service

Source: SCE, 2018

Figure 4-2.

Project Overview

Sheet 1

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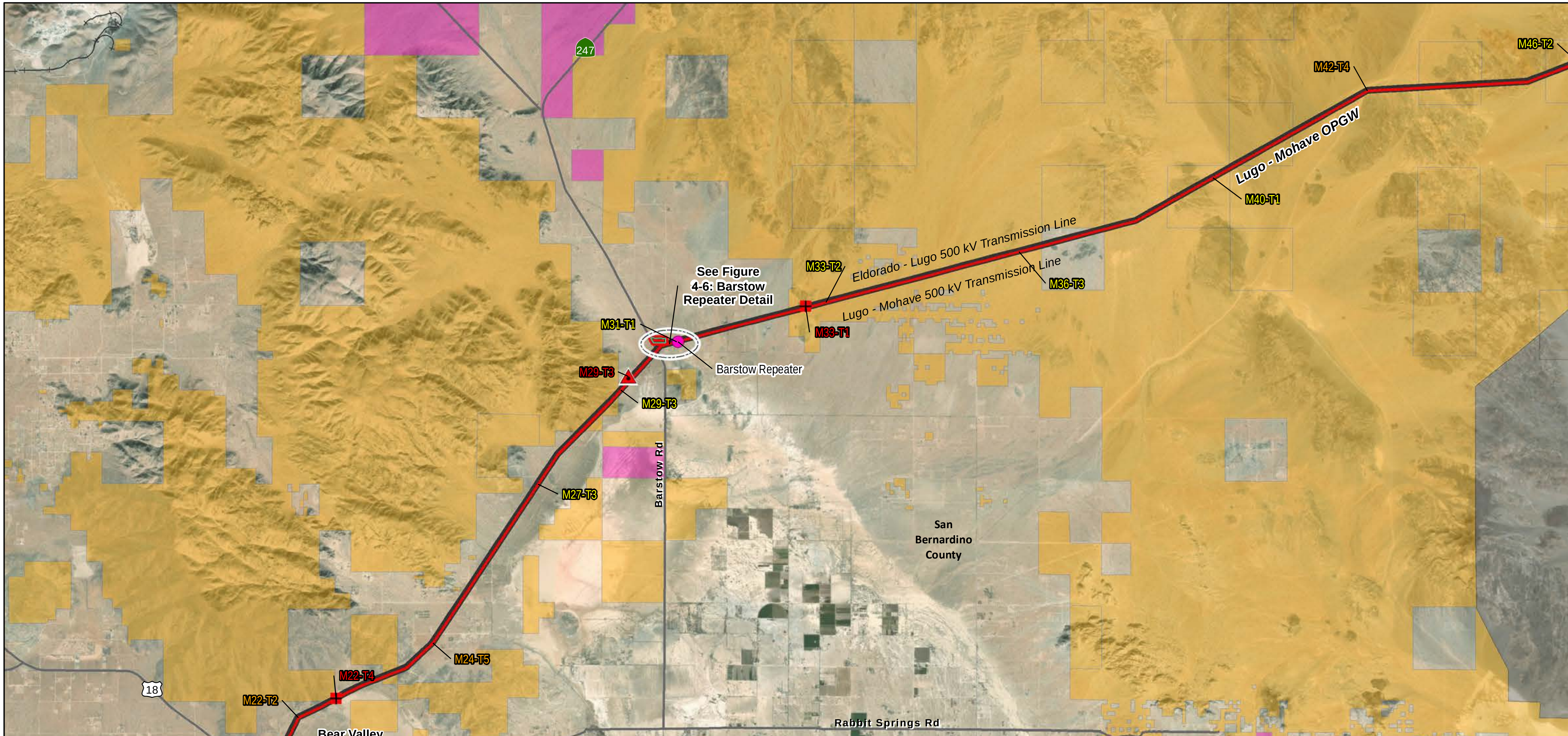
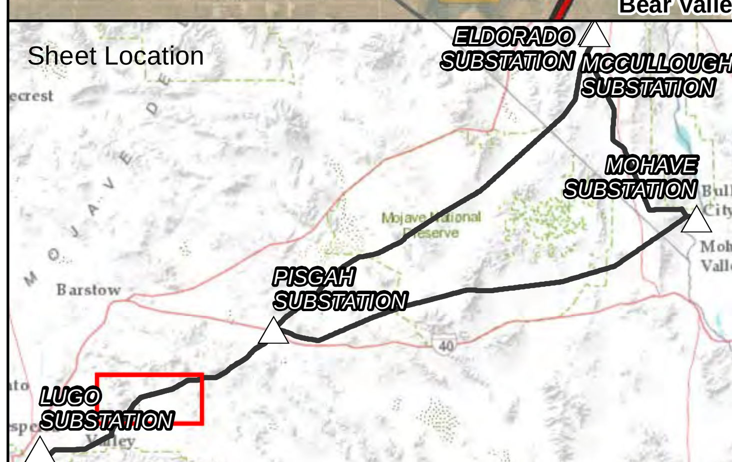
Scale in Miles





Existing Transmission Line
Temporary Yard
Repeater Site
New OPGW

Discrepancy Work
Raise Tower
Other

Jurisdiction
Bureau of Land Management
State Lands
Dept. of Defense

Source: SCE, 2018

Figure 4-2.

Project Overview

Sheet 2

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Scale in Miles

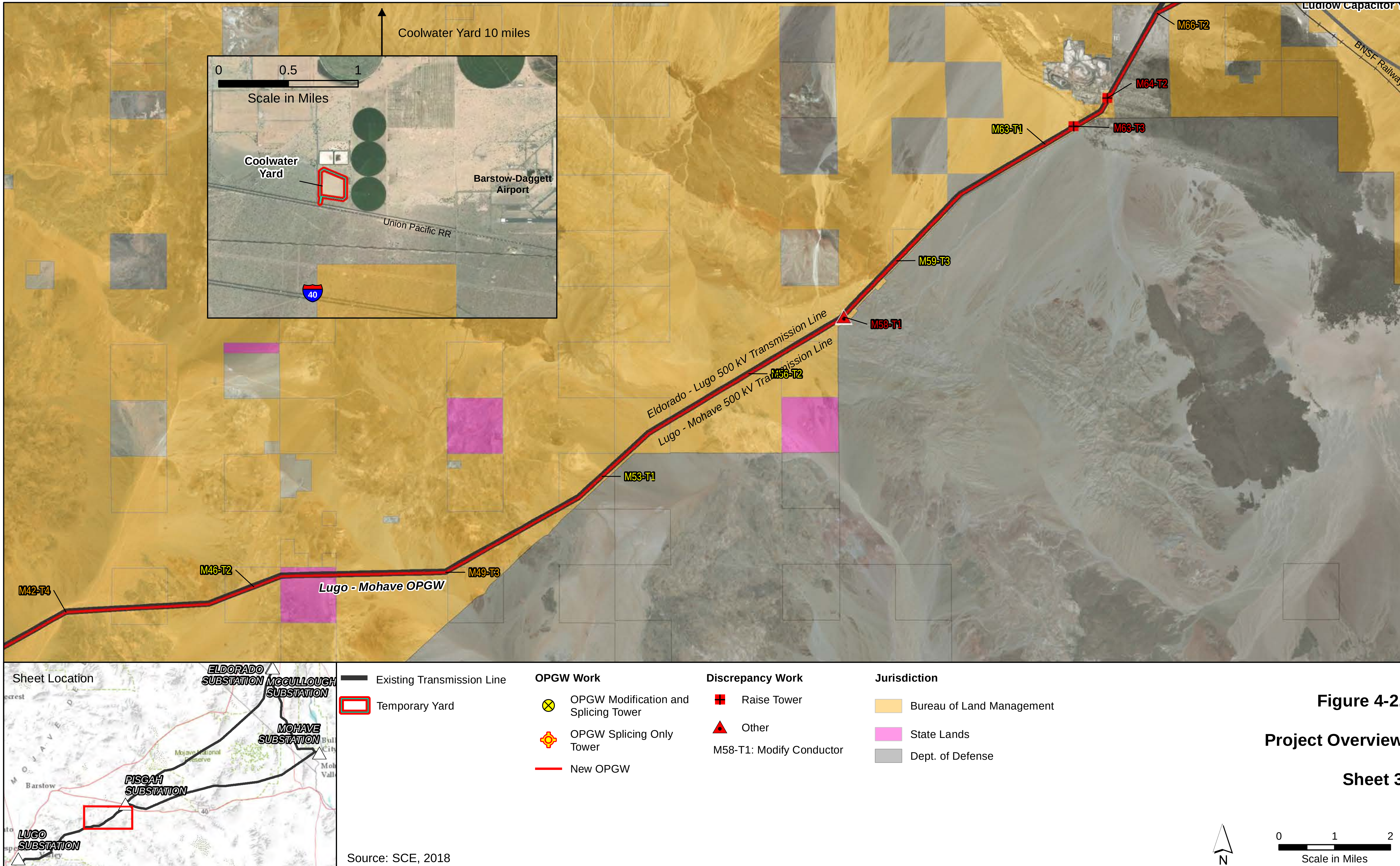


Figure 4-2.

Project Overview

Sheet 3

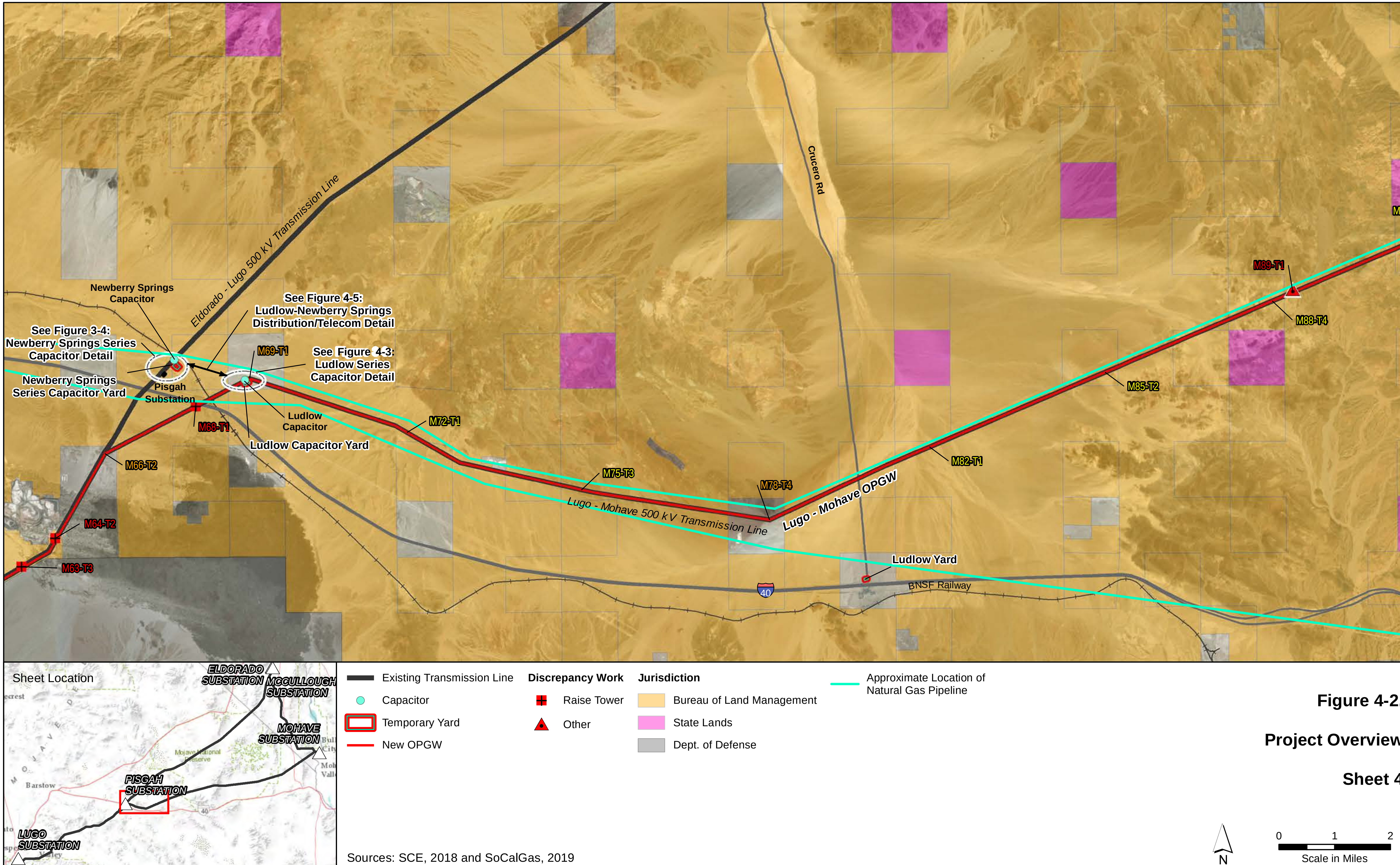
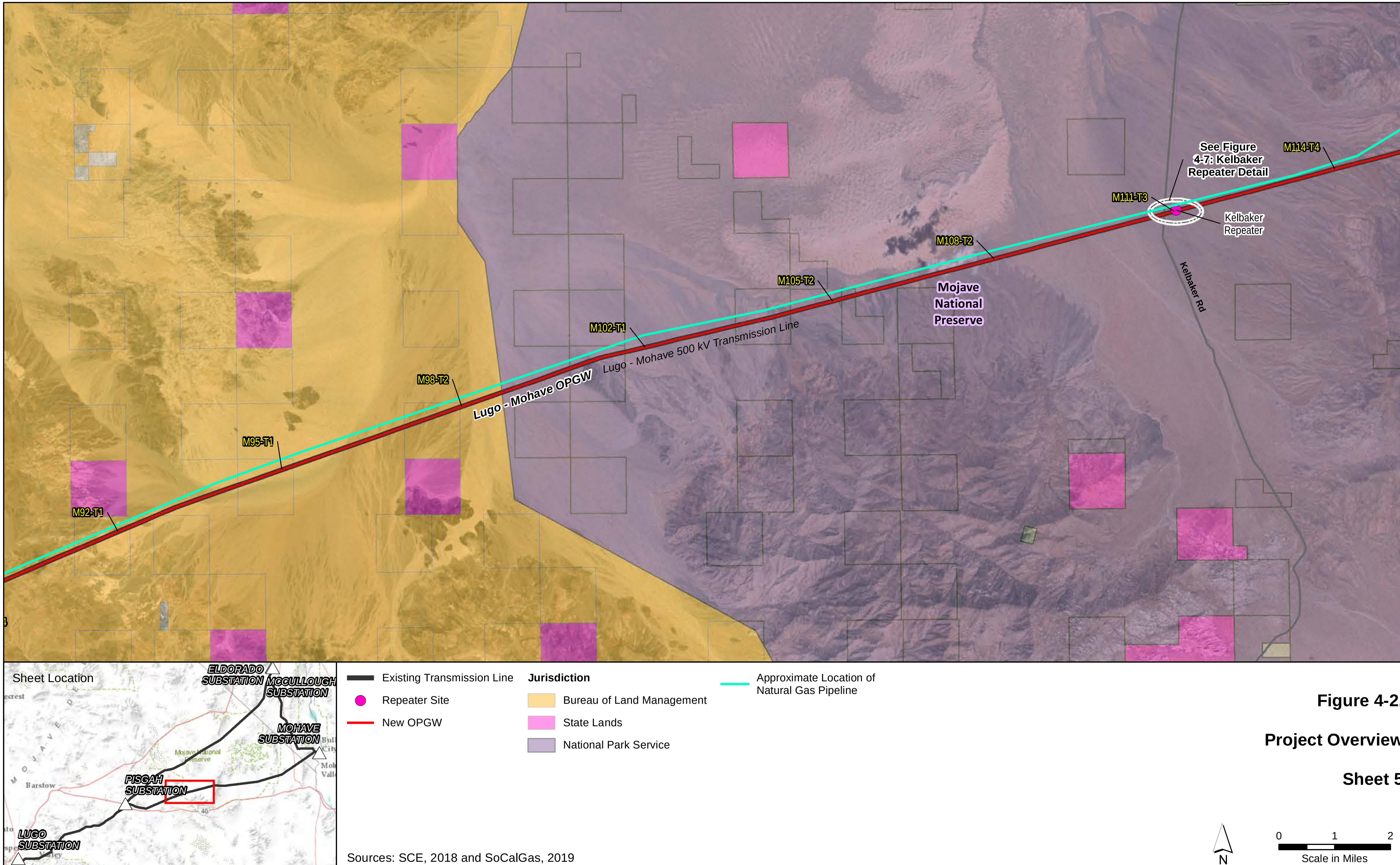


Figure 4-2.

Project Overview

Sheet 4

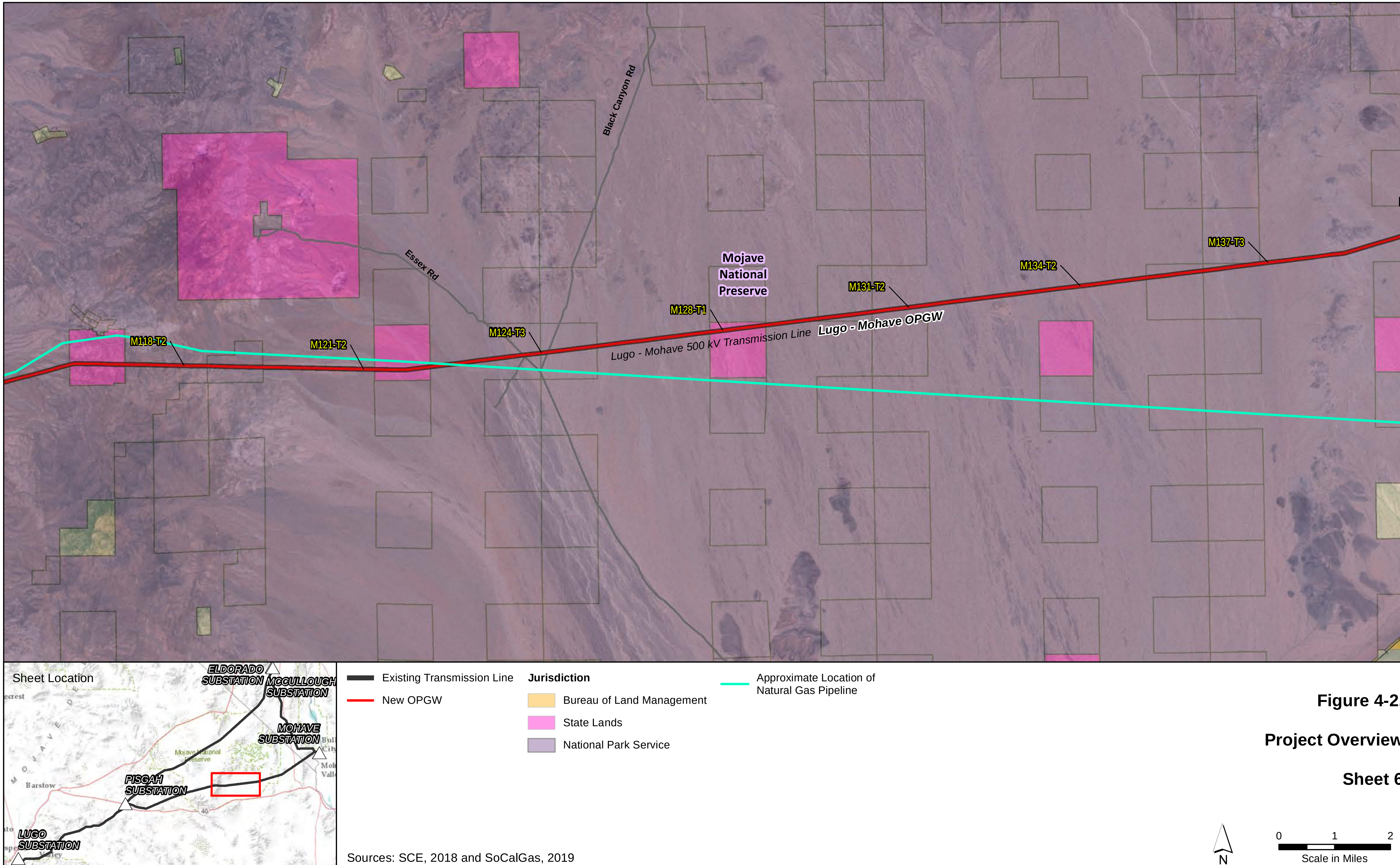


Sources: SCE, 2018 and SoCalGas, 2019

Figure 4-2.

Project Overview

Sheet 5

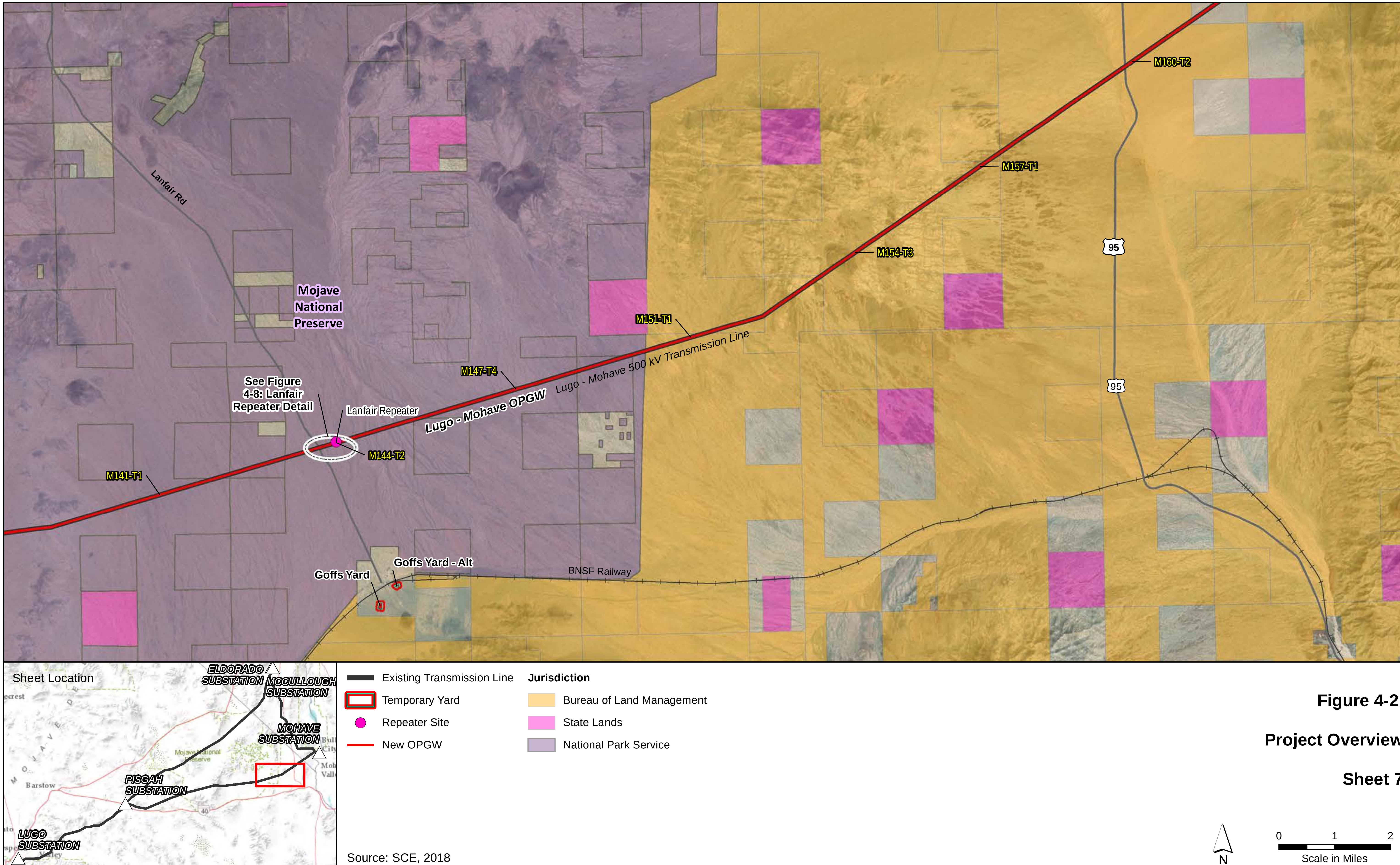


Sources: SCE, 2018 and SoCalGas, 2019

Figure 4-2.

Project Overview

Sheet 6

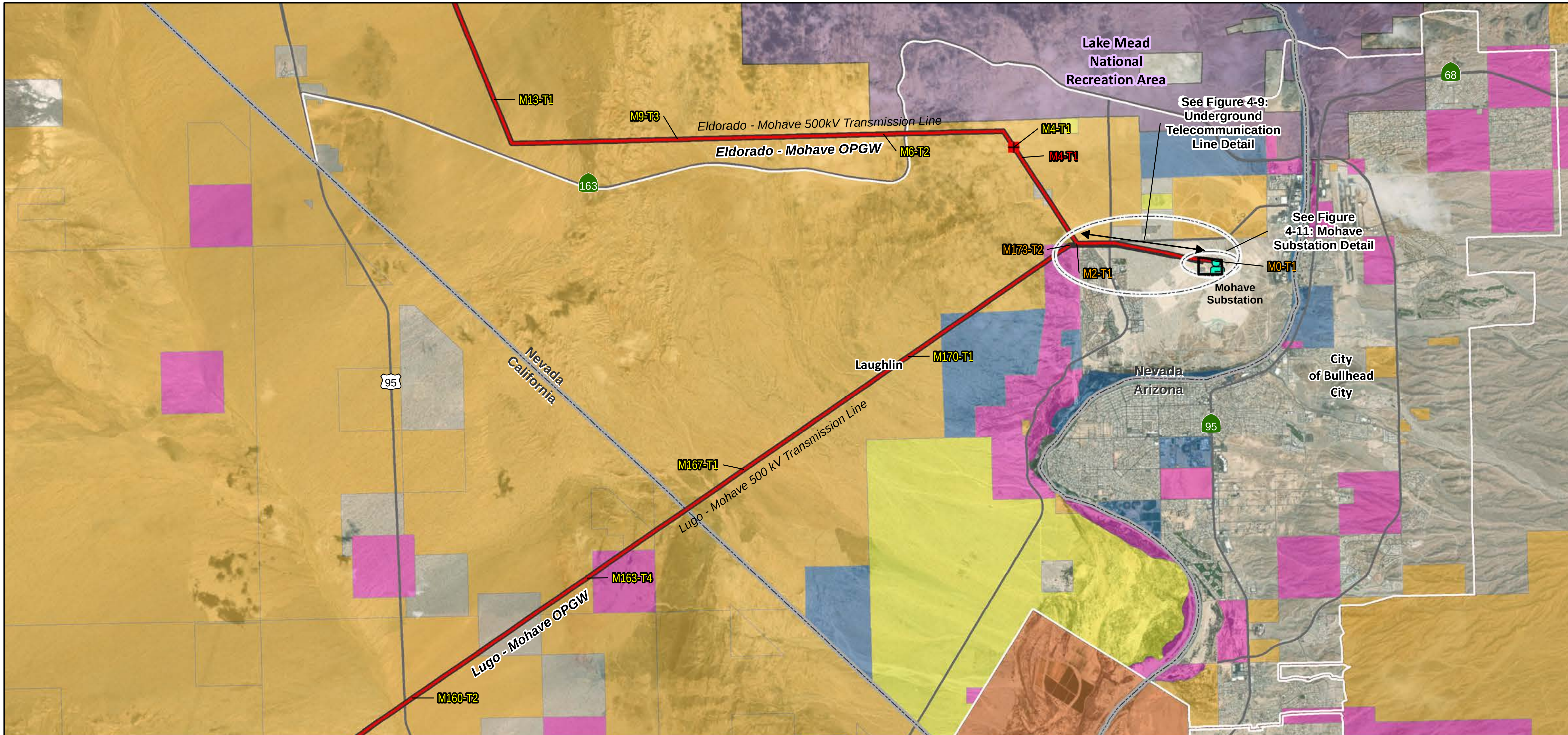


Source: SCE, 2018

Figure 4-2.

Project Overview

Sheet 7



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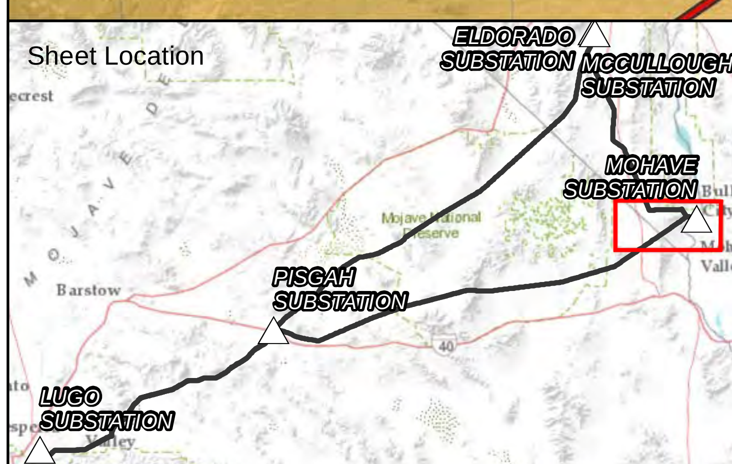


	Discrepancy Work	Jurisdiction
Existing Transmission Line	Raise Tower	Bureau of Indian Affairs
Existing Yard		Bureau of Land Management
New OPGW		Bureau of Reclamation
		State Lands
		County
		National Park Service

Source: SCE, 2018

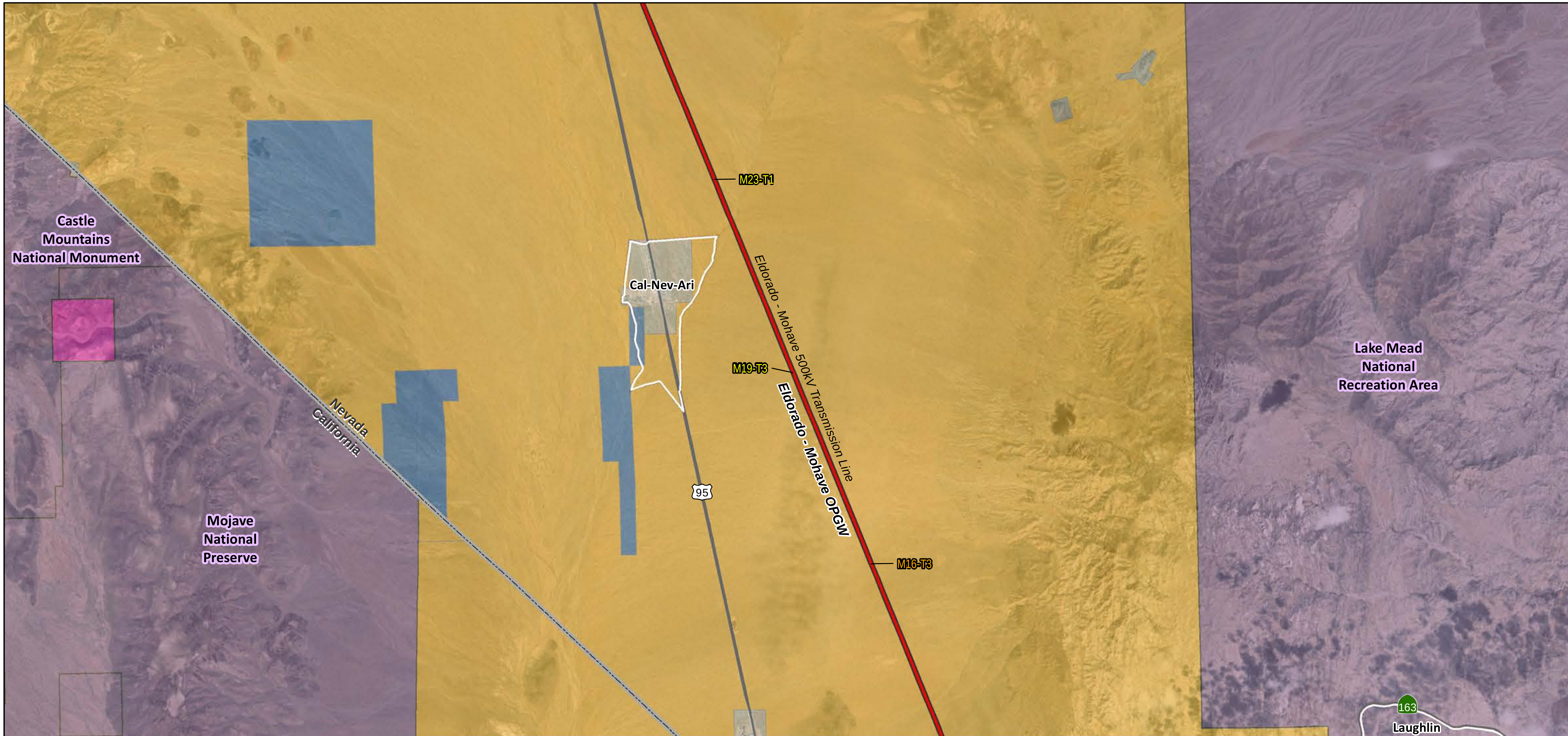
N

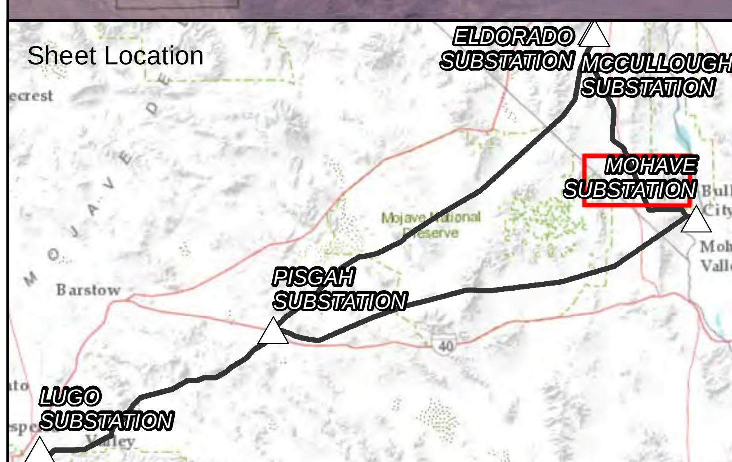
0 1 2
Scale in Miles

Figure 4-2.

Project Overview

Sheet 8





Existing Transmission Line

New OPGW

Jurisdiction

Bureau of Land Management

Bureau of Reclamation

State Lands

National Park Service

Source: SCE, 2018

Figure 4-2.

Project Overview

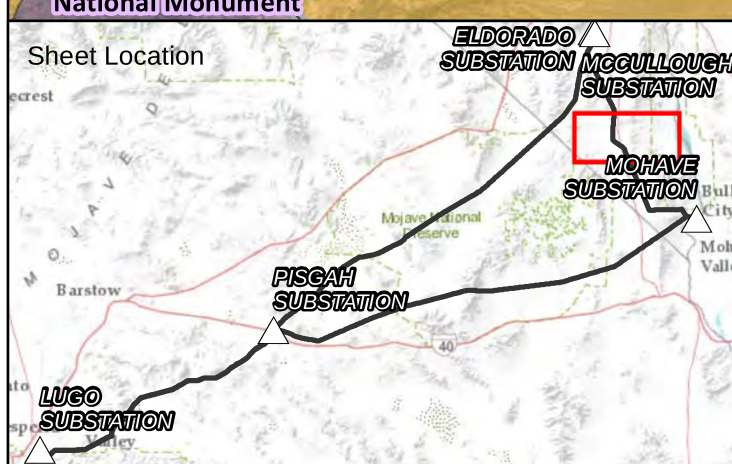
Sheet 9

N

0 1 2

Scale in Miles

Sheet Location



Existing Transmission Line

New OPGW

Jurisdiction

Bureau of Land Management

County

National Park Service

Source: SCE, 2018

Figure 4-2.

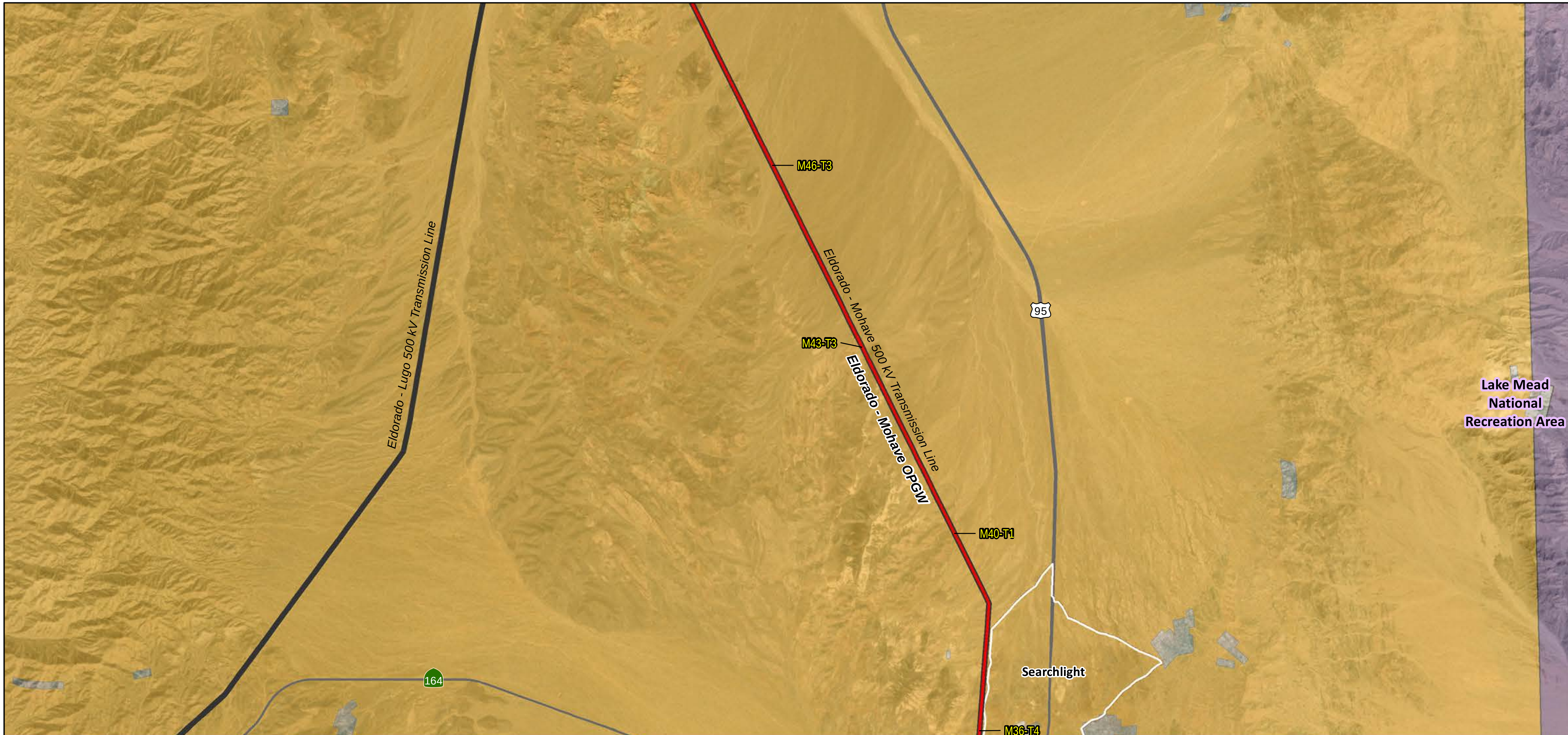
Project Overview

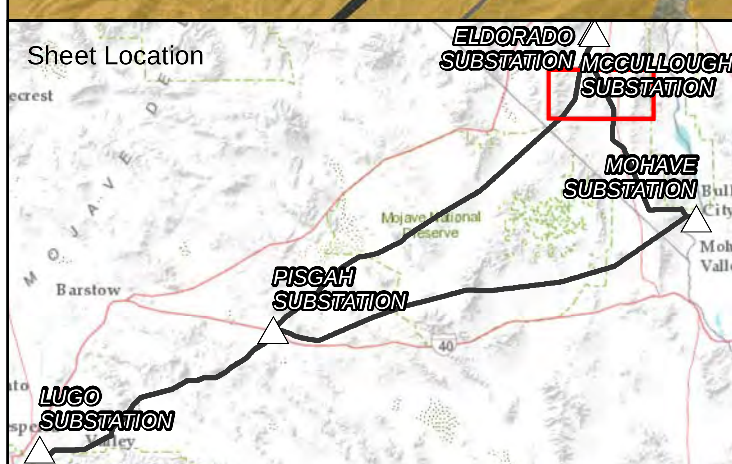
Sheet 10

N

0 1 2

Scale in Miles





Existing Transmission Line

New OPGW

Jurisdiction

Bureau of Land Management

National Park Service

Source: SCE, 2018

Figure 4-2.

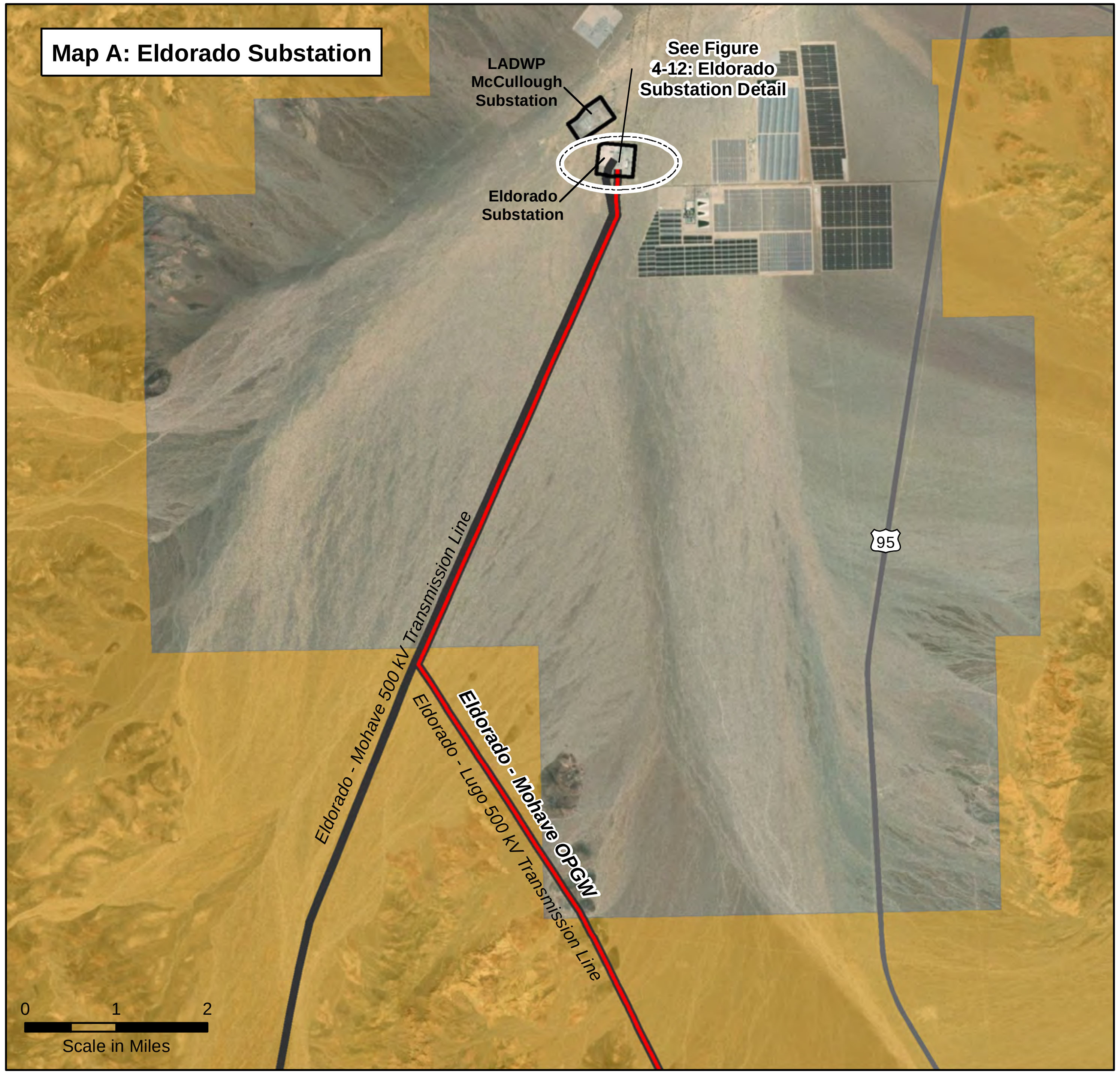
Project Overview

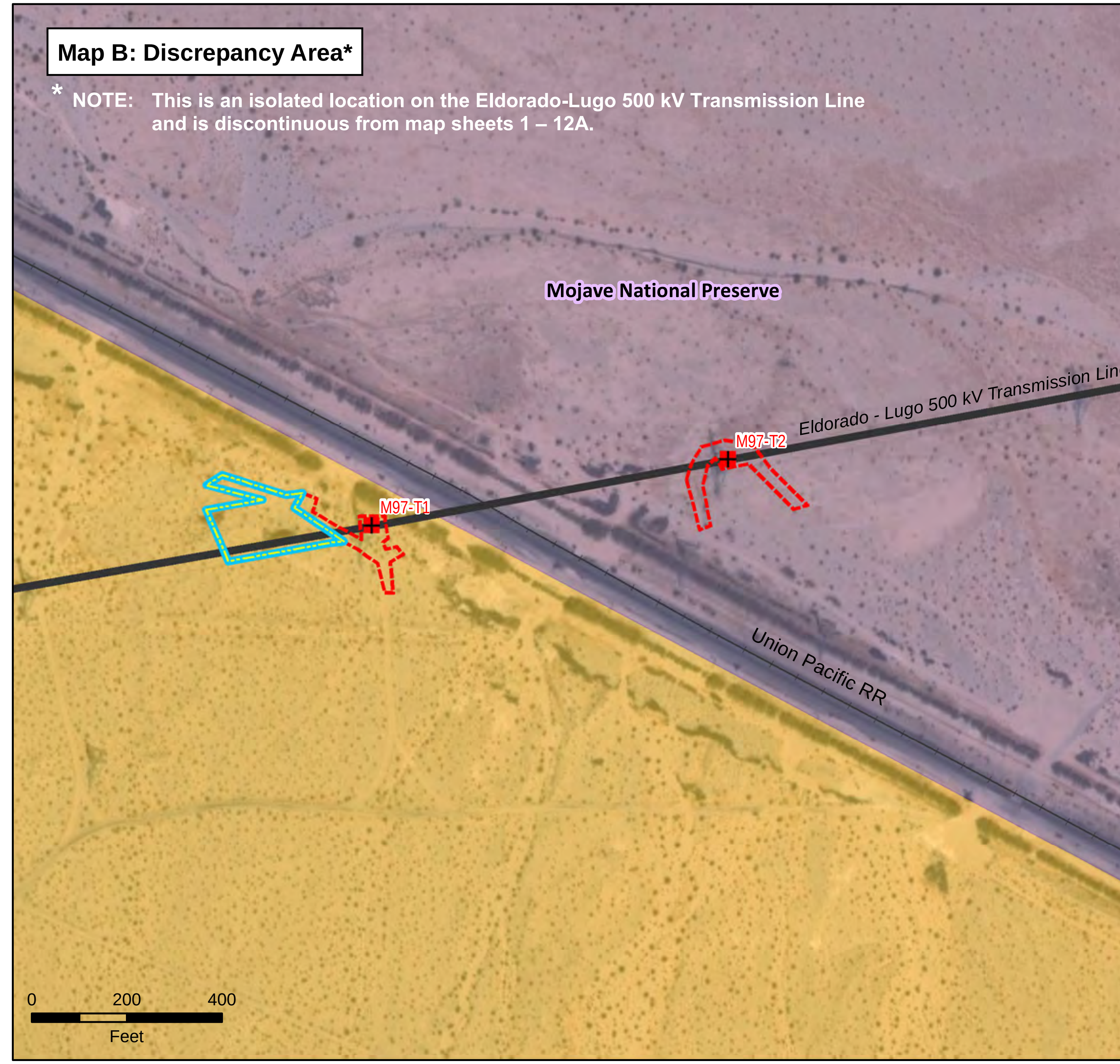
Sheet 11

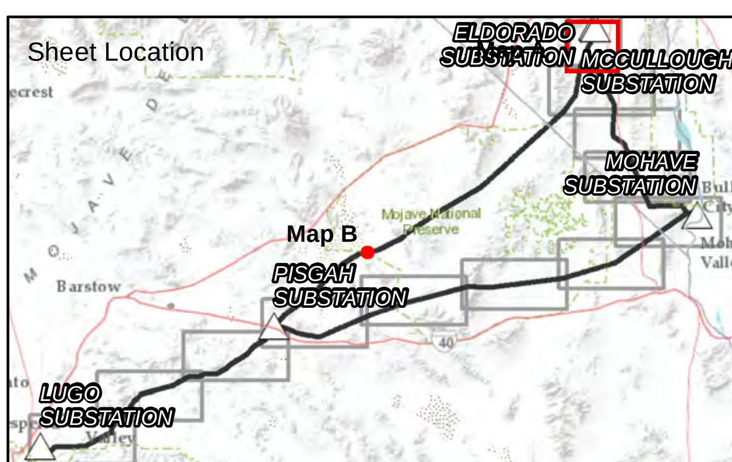
N

0 1 2

Scale in Miles







Existing Substation

Existing Transmission Line

Helicopter Landing Zone

Structure Work Area

OPGW Work

OPGW Modification and Splicing Tower

OPGW Splicing Only Tower

New OPGW

Discrepancy Work

Raise Tower

Jurisdiction

Bureau of Land Management

National Park Service

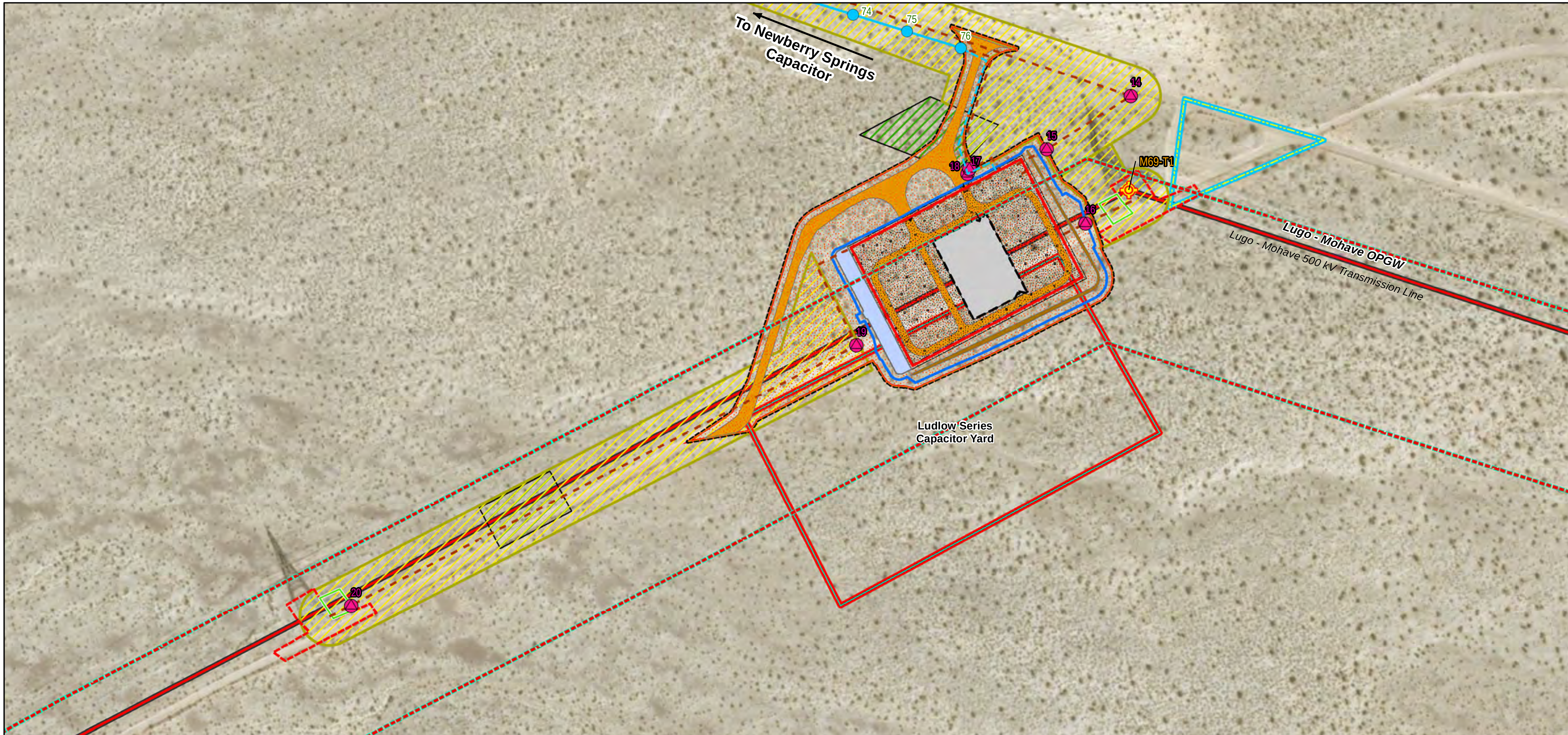
Sources: SCE, 2018

Figure 4-2.

Project Overview

Sheet 12

N



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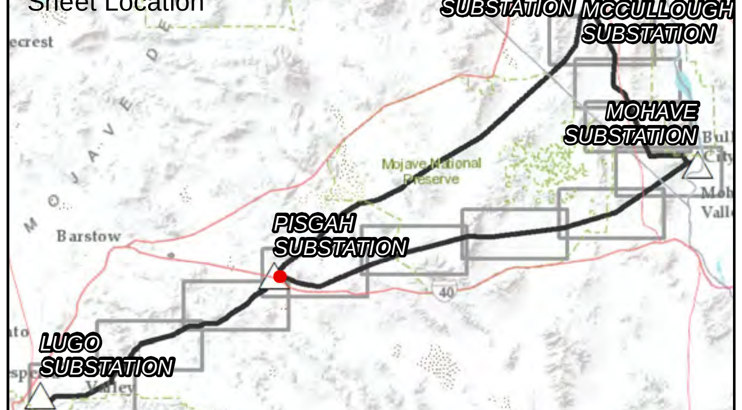


- Proposed Capacitor
- Existing Transmission Line
- Right-of-Way
- Temporary Yard

OPGW Work
- OPGW Splicing Location Only Tower
- New OPGW

Distribution
- New Distribution Pole
- New Overhead Line
- New Underground Line

Telecommunication
- New Manhole
- Underground Telecom Line

Civil Access Roads
- Permanent Access Road

Civil Disturbance
- Permanent Fence
- Permanent Grading Limit
- Permanent Gravel Surfacing
- Permanent Retention Basin
- Permanent Rip Rap
- Permanent Series Cap - Asphalt
- Temporary Ground Disturbance Area

Construction Areas
- Series Capacitor Work Area
- Equipment Setup Area
- OPGW Pull Site
- Helicopter Landing Zone
- Structure Work Area
- Potential Work Areas

Source: SCE, 2018

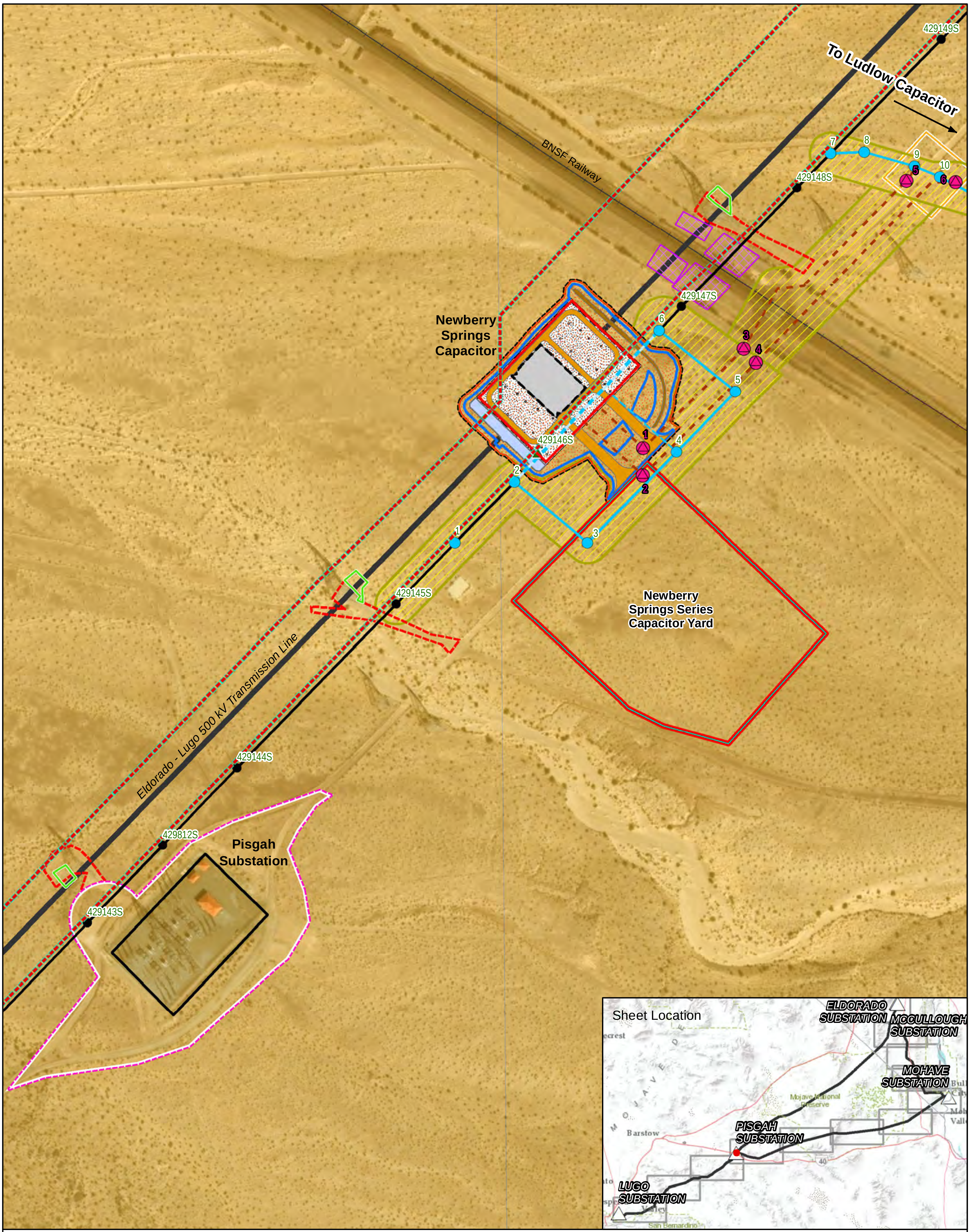
Figure 4-3

Ludlow Series Capacitor Detail

N

0 125 250

Scale in Feet



Existing Substation	Distribution	Civil Disturbance	Construction Areas
Proposed Capacitor	Existing Pole	Permanent Fence	Series Capacitor Work Area
Existing Transmission Lines	New Pole	Permanent Grading Limit	Equipment Setup Area
Right-of-Way	Remove Pole	Permanent Gravel Surfacing	Parking Area
Temporary Yard	Existing Overhead	Permanent Retention Basin	Guard Structure Site
Telecommunication	New Overhead	Permanent Rip Rap	Structure Work Area
New Manhole	New Underground	Permanent Series Cap - Asphalt	Potential Work Areas
Overhead Telecom Line	Remove Overhead	Temporary Ground Disturbance Area	Pulling/Tensioning/ Splicing
Underground Telecom Line		Permanent Access Road	**Jurisdiction**
			Bureau of Land Management

Source: SCE, 2018

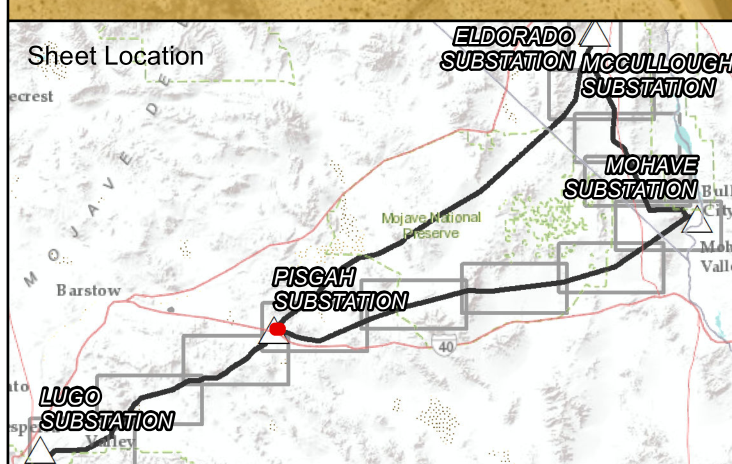
N

0 250 500

Scale in Feet

Figure 4-4.

Newberry Springs Series Capacitor Detail



Existing Transmission Line
Right-of-Way

Telecommunication

New Manhole
Underground Telecom Line

Distribution

Existing Pole
New Pole
Existing Overhead
New Overhead

Construction Areas

Equipment Setup Area
Structure Work Area
Potential Work Areas
Pulling/Tensioning/Splicing

Jurisdiction

Bureau of Land Management

Source: SCE, 2018

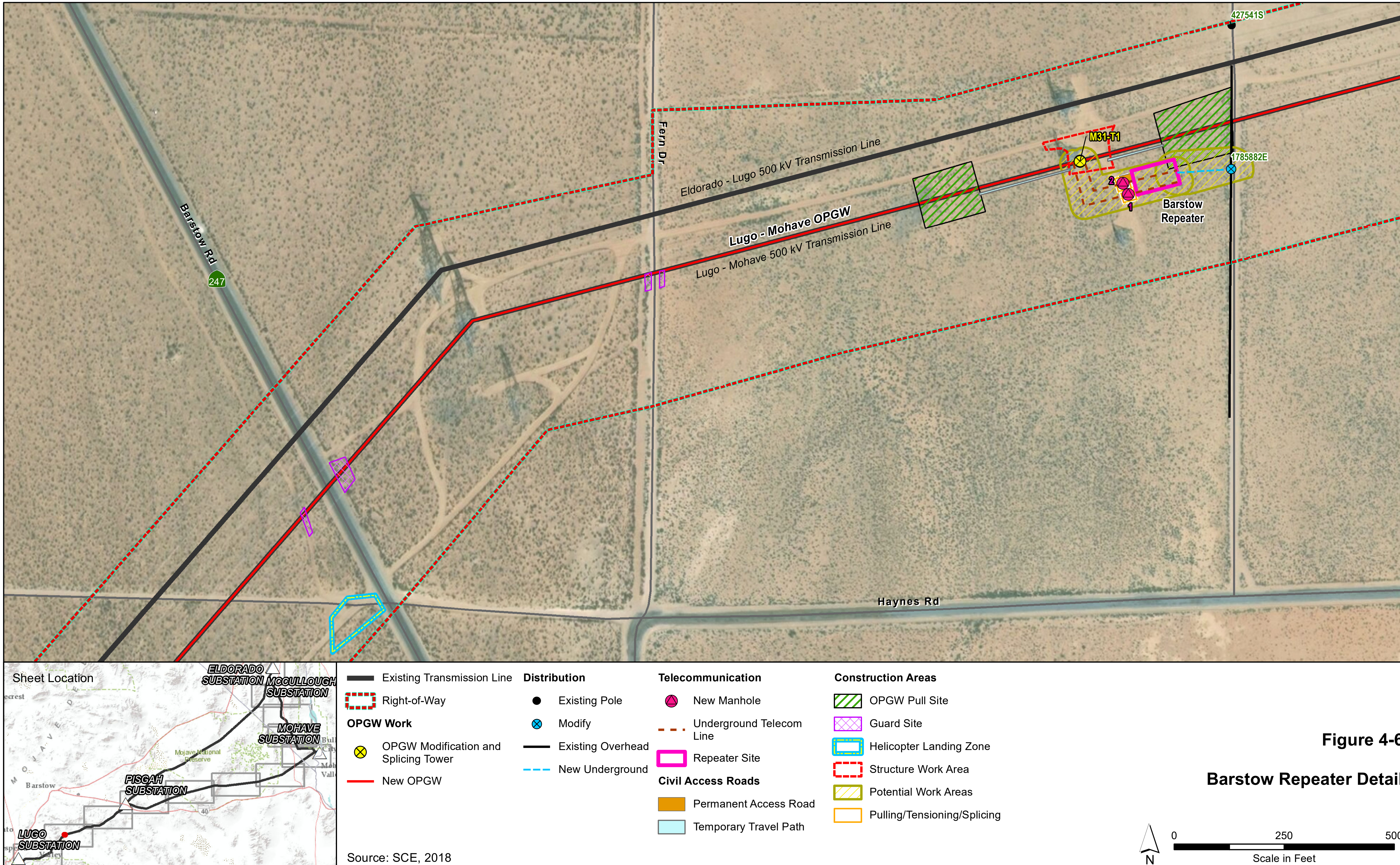
Figure 4-5

Ludlow-Newberry Springs Distribution/Telecom Detail

N

0 250 500

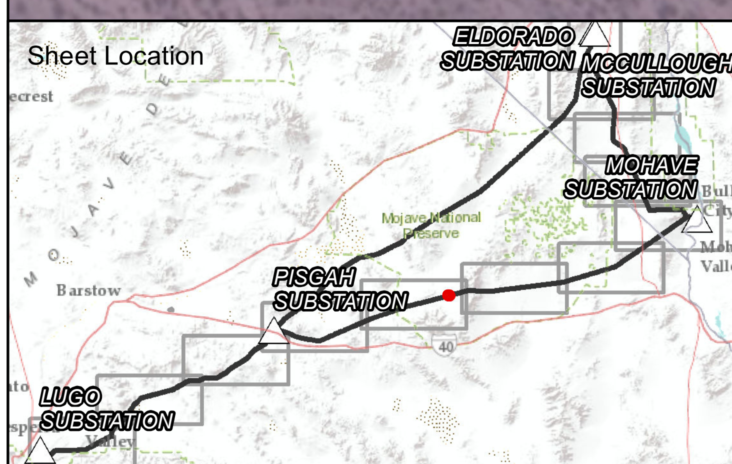
Scale in Feet



Source: SCE, 2018

Figure 4-6

Barstow Repeater Detail



Existing Transmission Line
Right-of-Way

OPGW Work

OPGW Modification and Splicing Tower
New OPGW

Telecommunication

New Manhole
Underground Telecom Line
Repeater Site

Distribution

Existing Pole
New Pole
Existing Overhead
New Overhead
New Underground

Civil Access Roads

Permanent Access Road

Construction Areas

OPGW Pull Site
Guard Structure Site
Helicopter Landing Zone
Structure Work Area
Potential Work Areas
Pulling/Tensioning/Splicing

Jurisdiction

National Park Service

Figure 4-7

Kelbaker Repeater Detail

Source: SCE, 2018

N

0 250 500
Scale in Feet

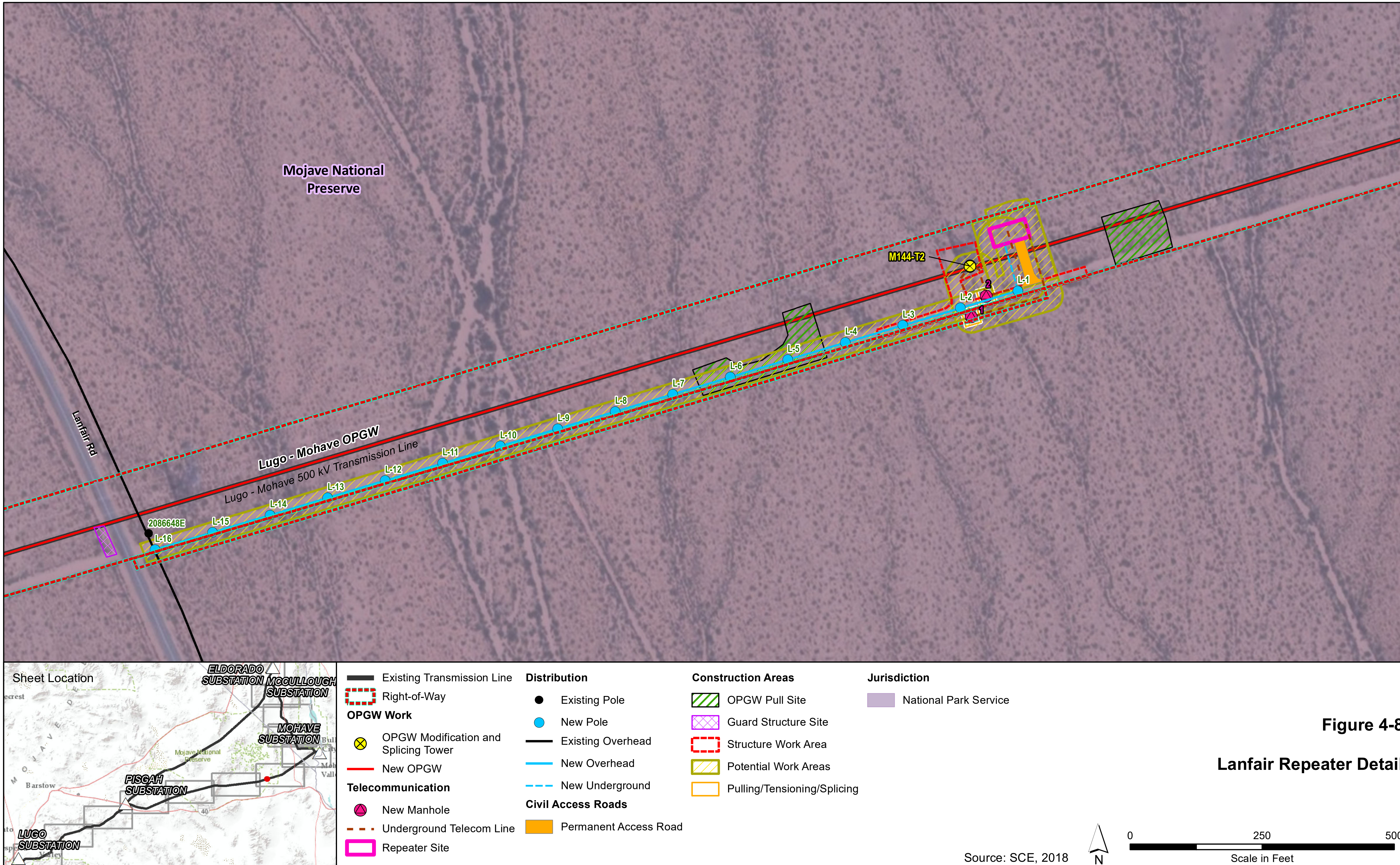


Figure 4-8

Lanfair Repeater Detail

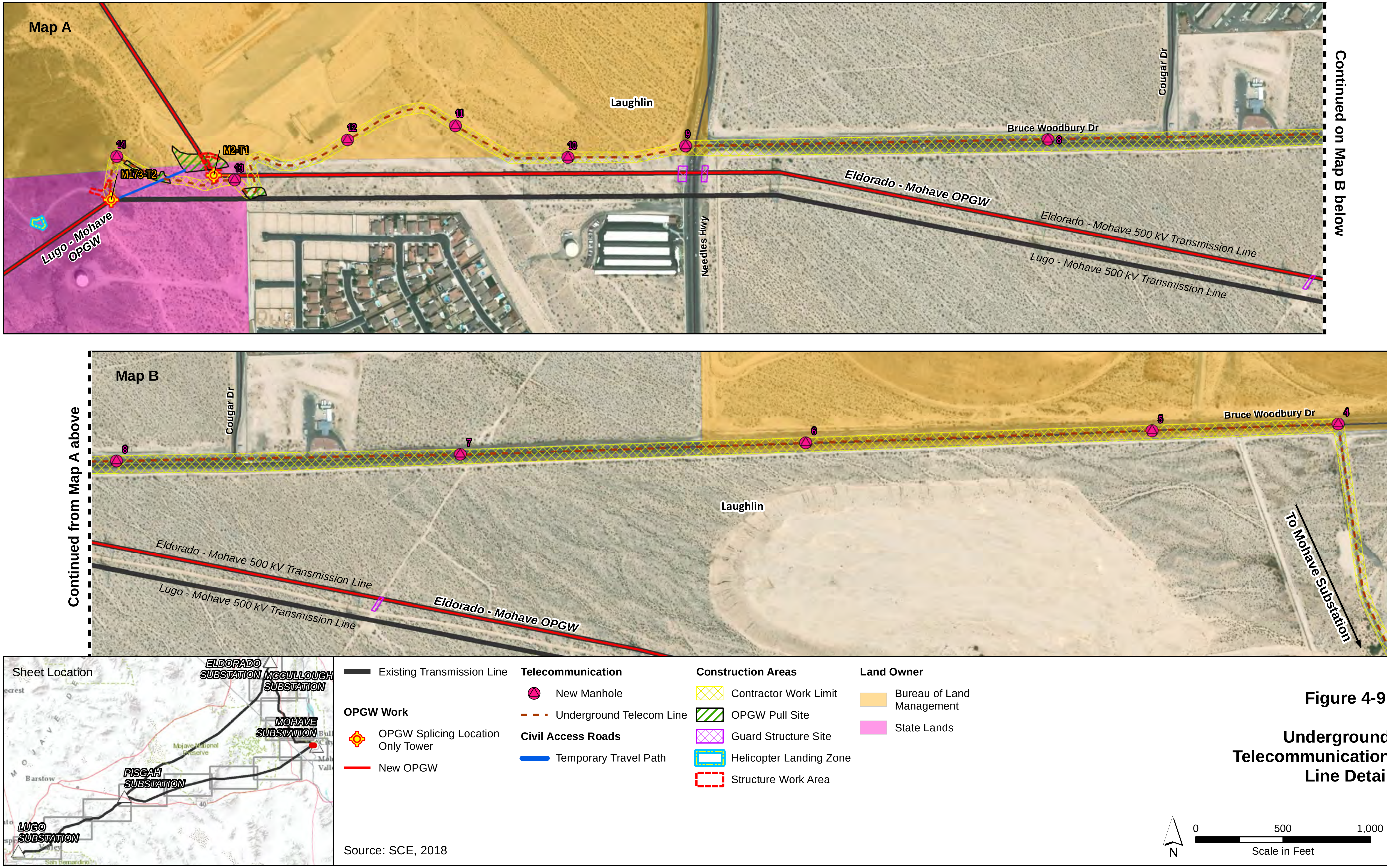
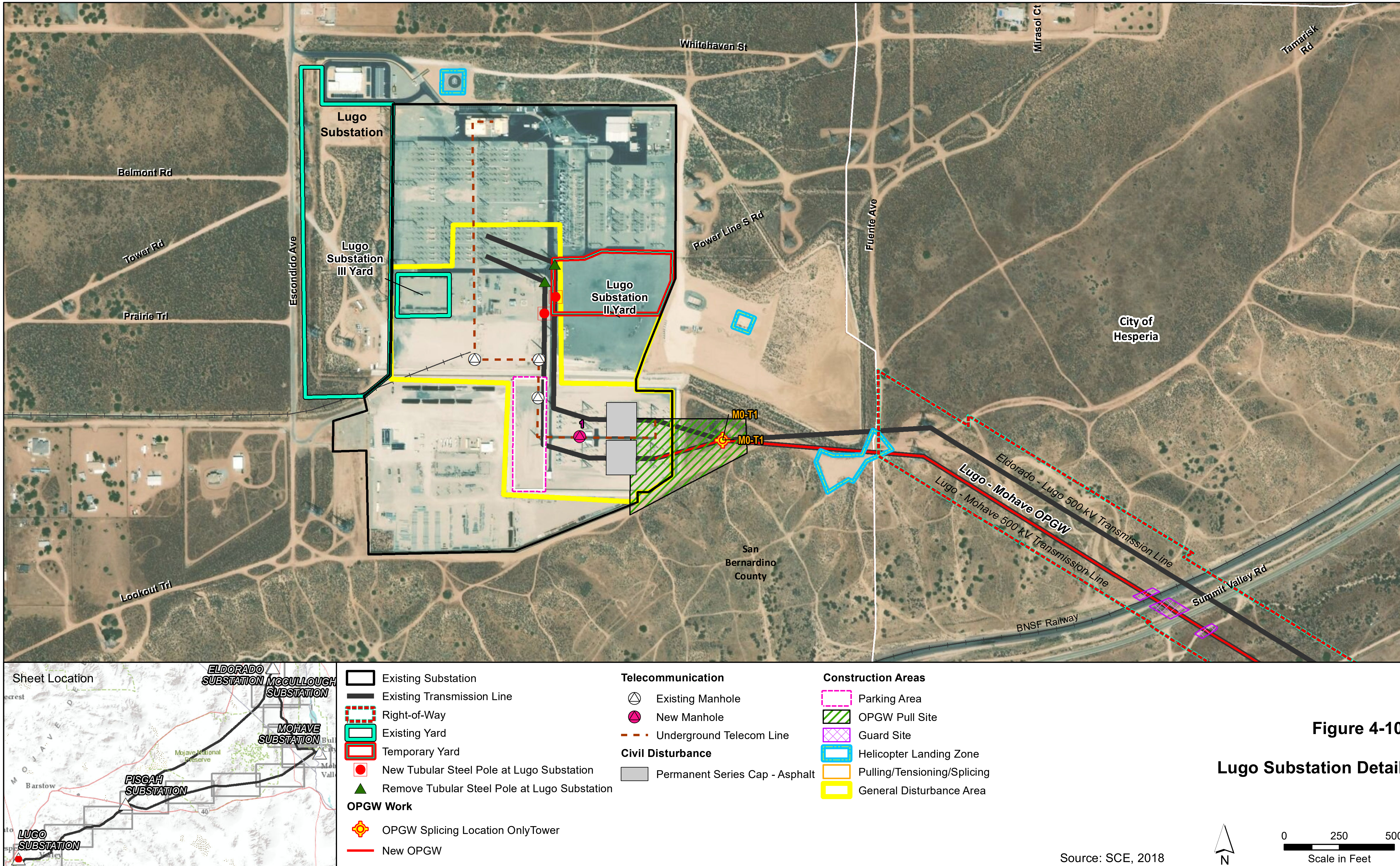


Figure 4-9.

Underground Telecommunication Line Detail



Existing Substation
Existing Transmission Line
Right-of-Way
Existing Yard
Temporary Yard
New Tubular Steel Pole at Lugo Substation
Remove Tubular Steel Pole at Lugo Substation

OPGW Work

OPGW Splicing Location OnlyTower
New OPGW

Telecommunication

Existing Manhole
New Manhole
Underground Telecom Line

Civil Disturbance

Permanent Series Cap - Asphalt

Construction Areas

Parking Area
OPGW Pull Site
Guard Site
Helicopter Landing Zone
Pulling/Tensioning/Splicing
General Disturbance Area

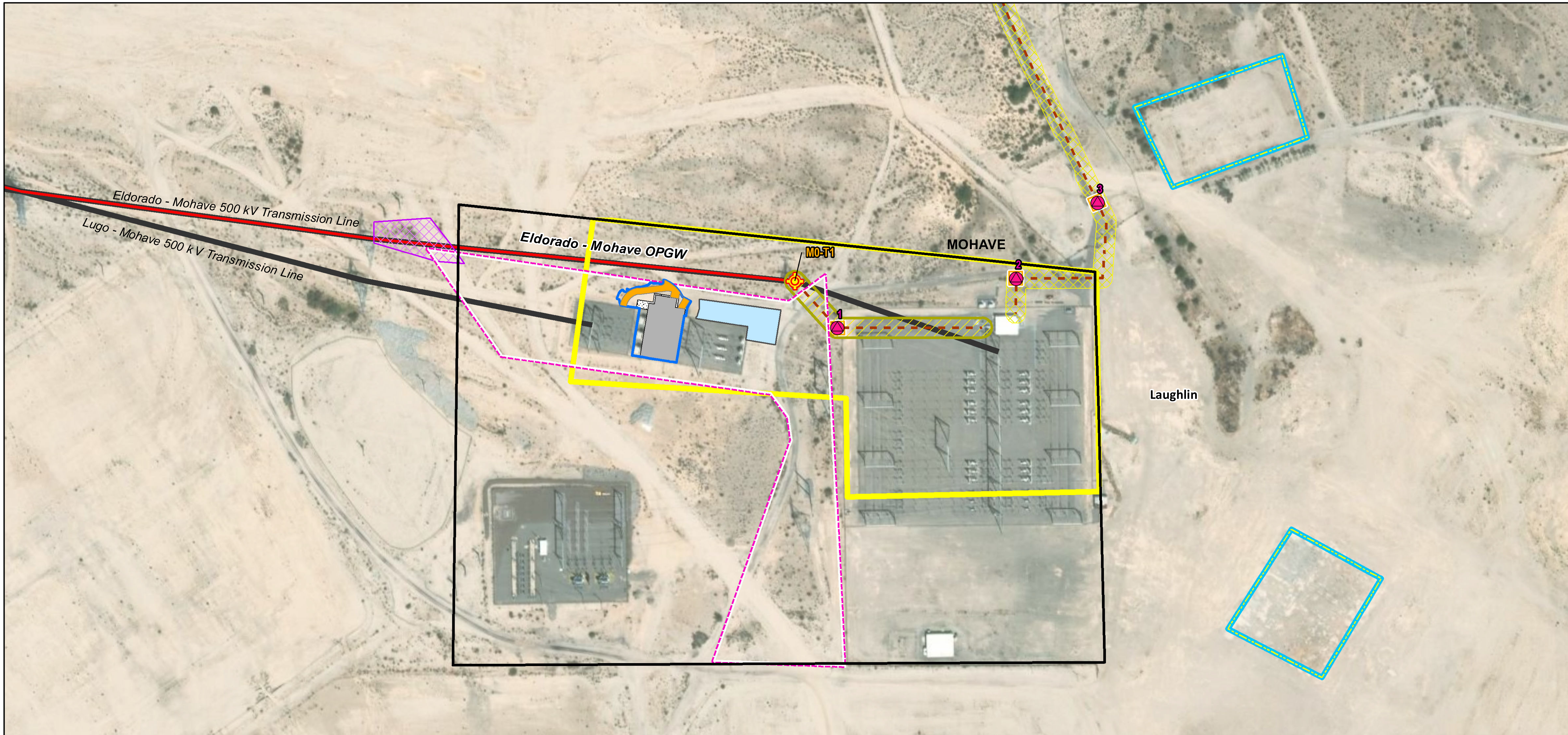
Figure 4-10

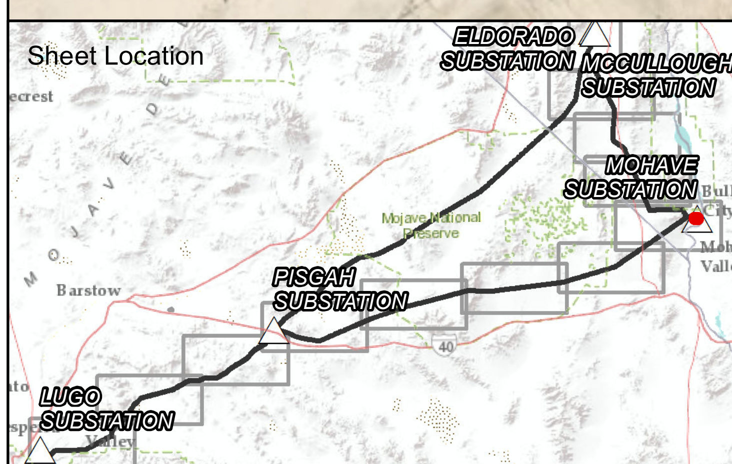
Lugo Substation Detail

Source: SCE, 2018

N

0 250 500
Scale in Feet





Existing Substation
Existing Transmission Line

OPGW Work

OPGW Splicing Location Only Tower
New OPGW

Telecommunication

New Manhole
Underground Line

Source: SCE, 2018

Civil Disturbance

Permanent Grading Limit
Permanent Gravel Surfacing
Permanent Retention Basin
Permanent Series Cap - Asphalt

Civil Access Roads

Permanent Access Road

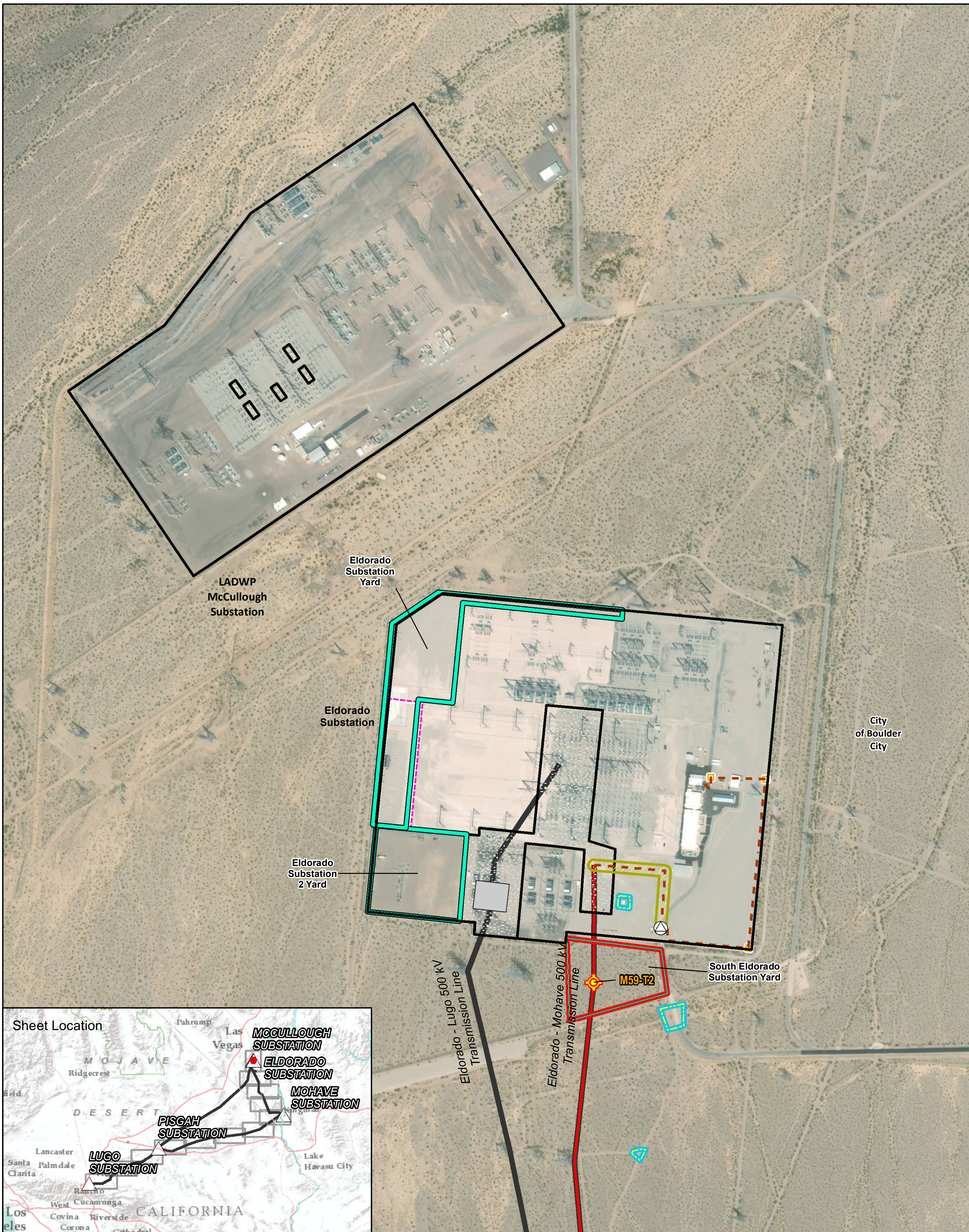
Construction Areas

Contractor Work Limit
Parking Area
Guard Structure Site
Helicopter Landing Zone
Potential Work Areas
Pulling/Tensioning/Splicing Site
General Disturbance Area

Figure 4-11

Mohave Substation Detail

N
0 250 500
Scale in Feet



Existing Substation

Existing Transmission Line

Existing Yard

Temporary Yard

OPGW Work

OPGW Splicing Location Only Tower

New OPGW

Telecommunication

Existing Manhole

Underground Line

Civil Disturbance

Permanent Series Cap - Asphalt

Construction Areas

Parking Area

Helicopter Landing Zone

Potential Work Areas

Pulling/Tensioning/Splicing

General Disturbance Area

Figure 4-12.

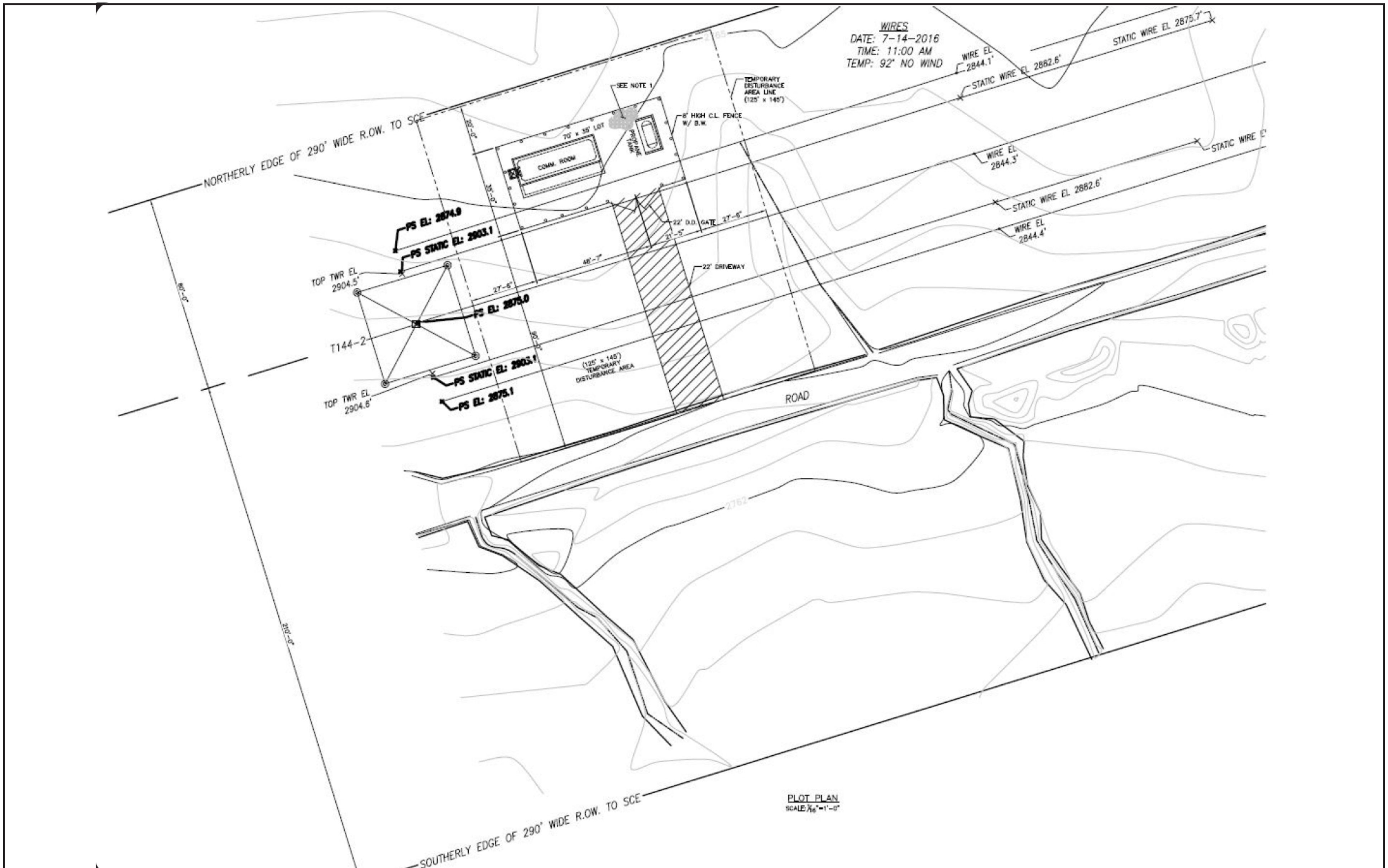
Eldorado Substation Detail

N

0 250 500

Scale in Feet

Sources: SCE, 2018

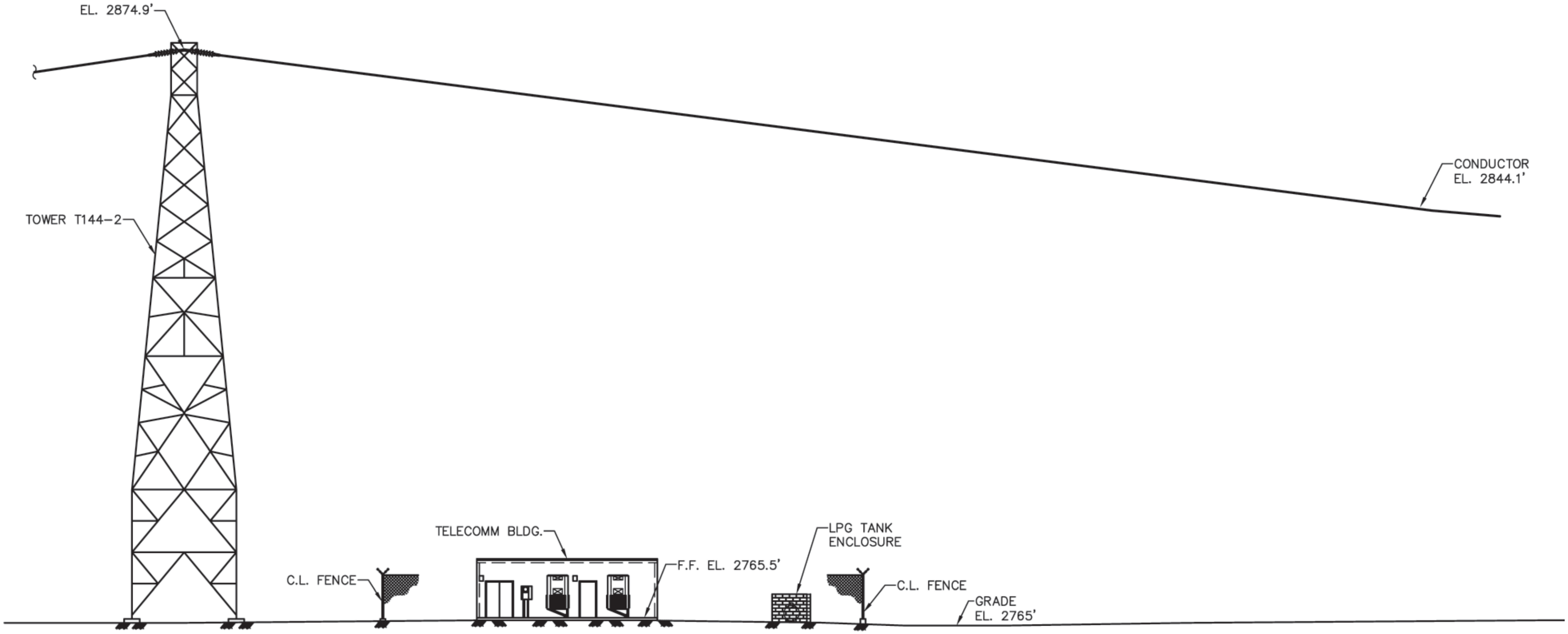


Source: SCE, 2017.

N

Figure 4-13.

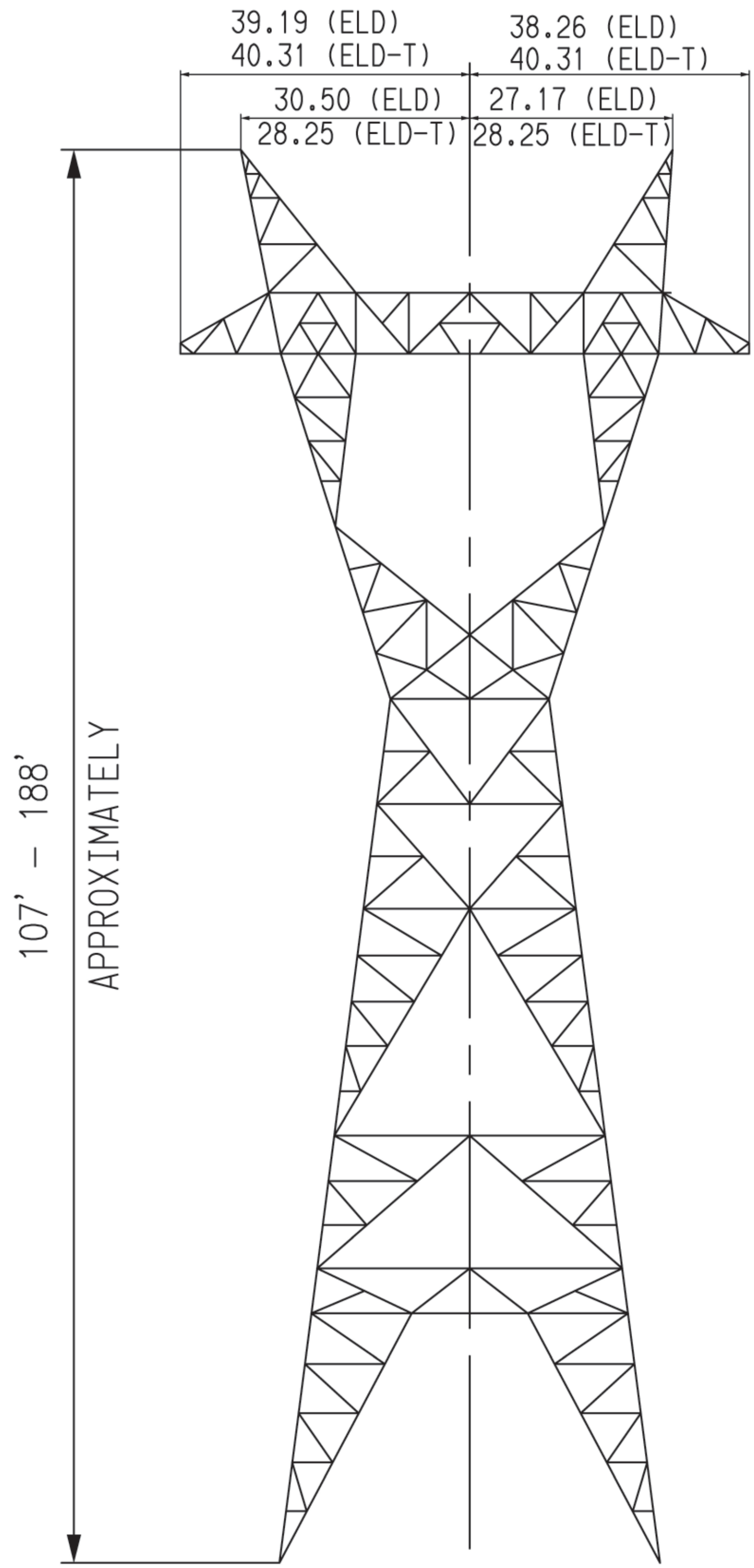
Typical Site Plan for the Fiber Optic Repeater Sites



Source: SCE, 2017.

Figure 4-14.

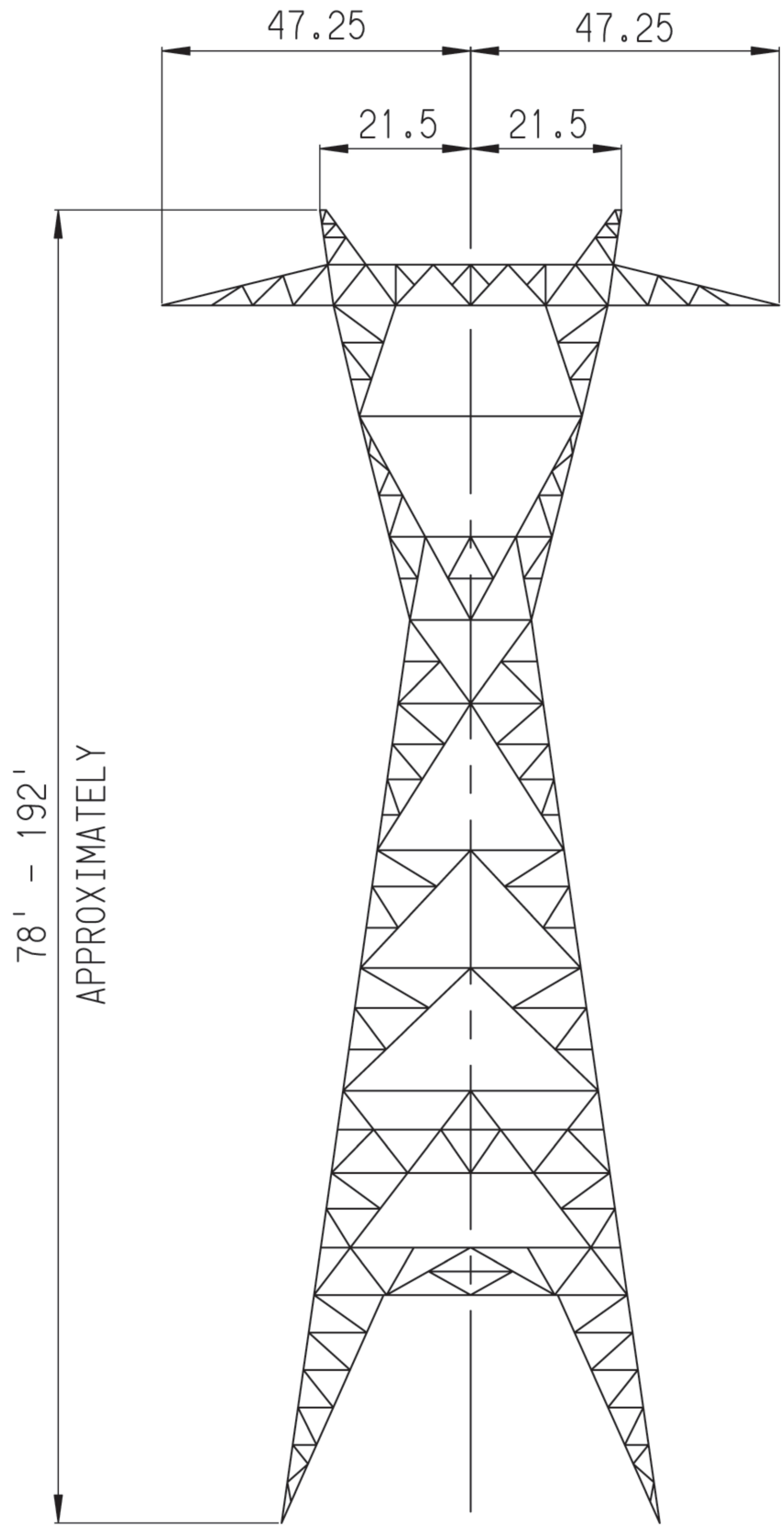
Typical Elevation for the Fiber Optic Repeater Sites



Source: SCE, 2017.

Figure 4-15.

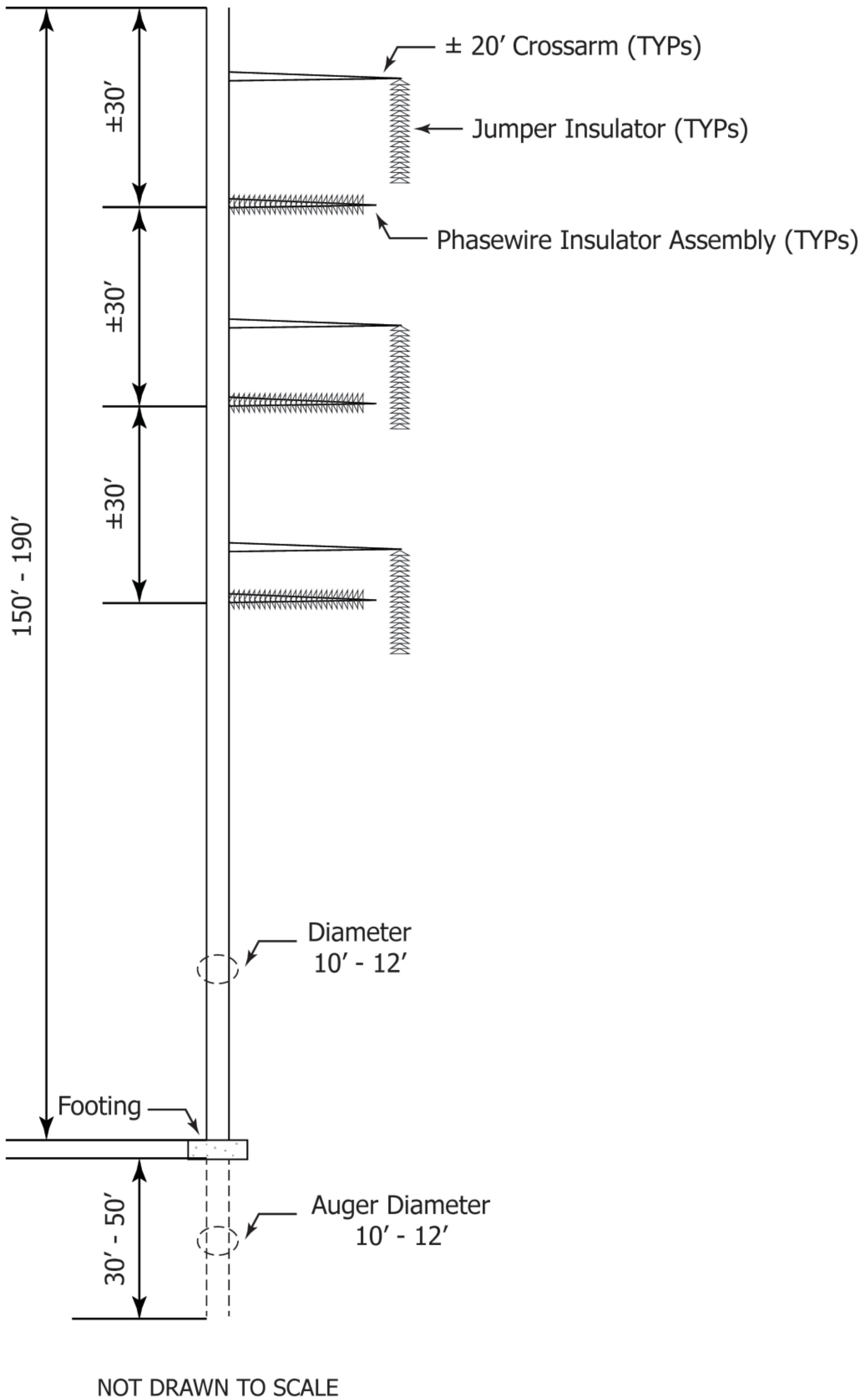
Typical Single-Circuit 500 kV Dead-End Tower



Source: SCE, 2017.

Figure 4-16.

Typical Single-Circuit 500 kV Suspension Tower



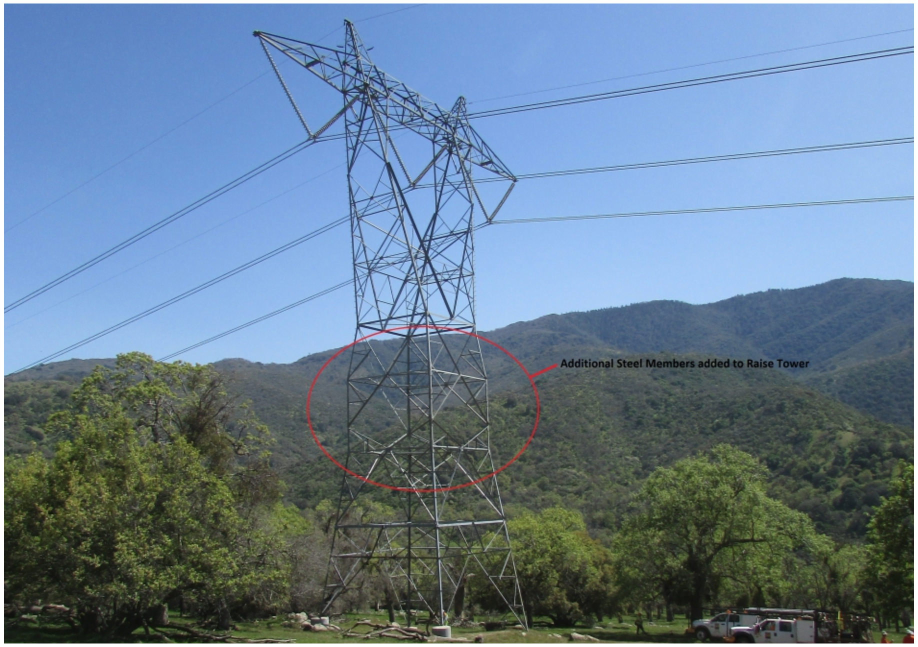
Source: SCE, 2017.

Figure 4-17.

Typical Tubular Steel Pole

BEFORE

AFTER

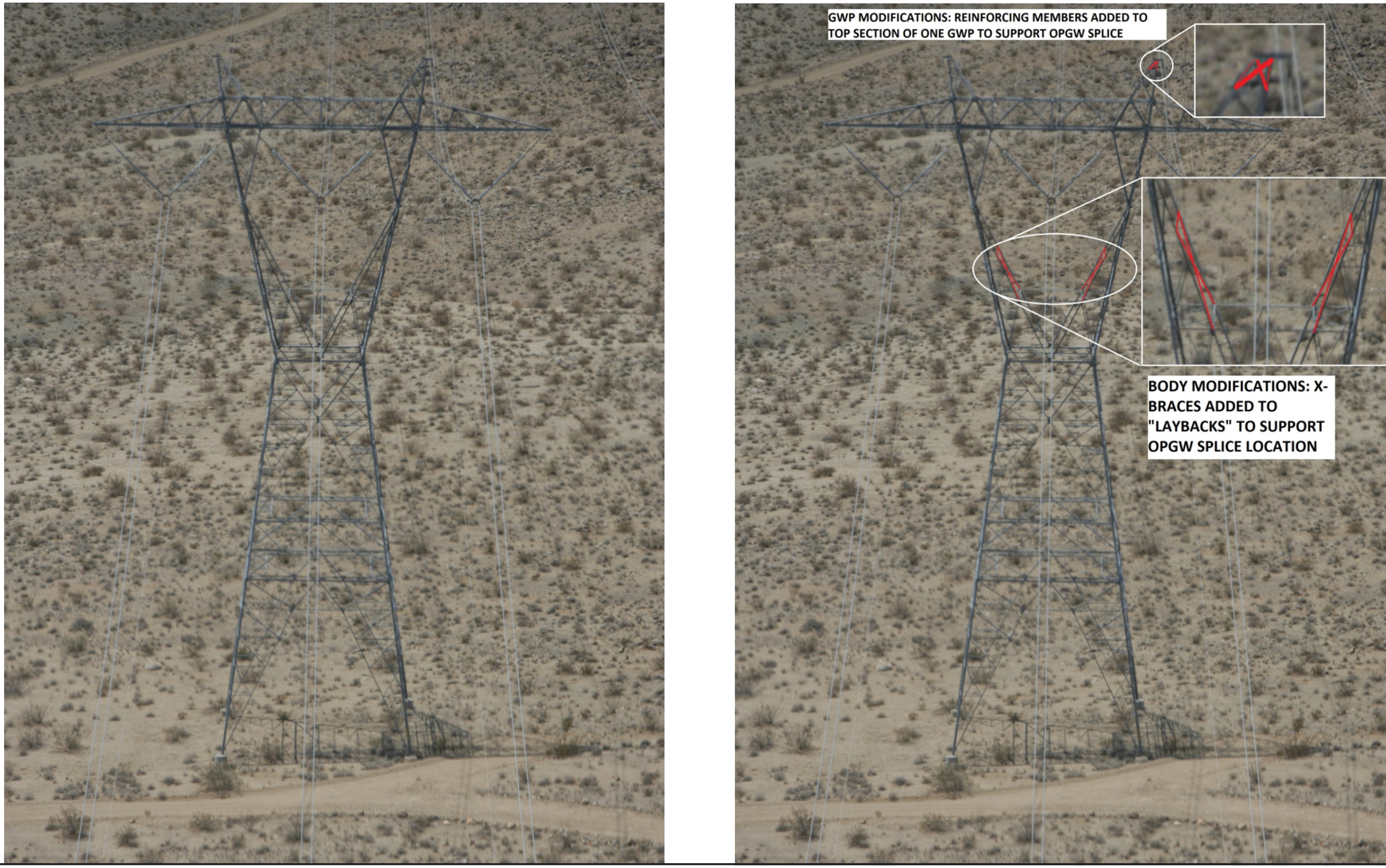


Source: SCE, 2018.

Figure 4-18.

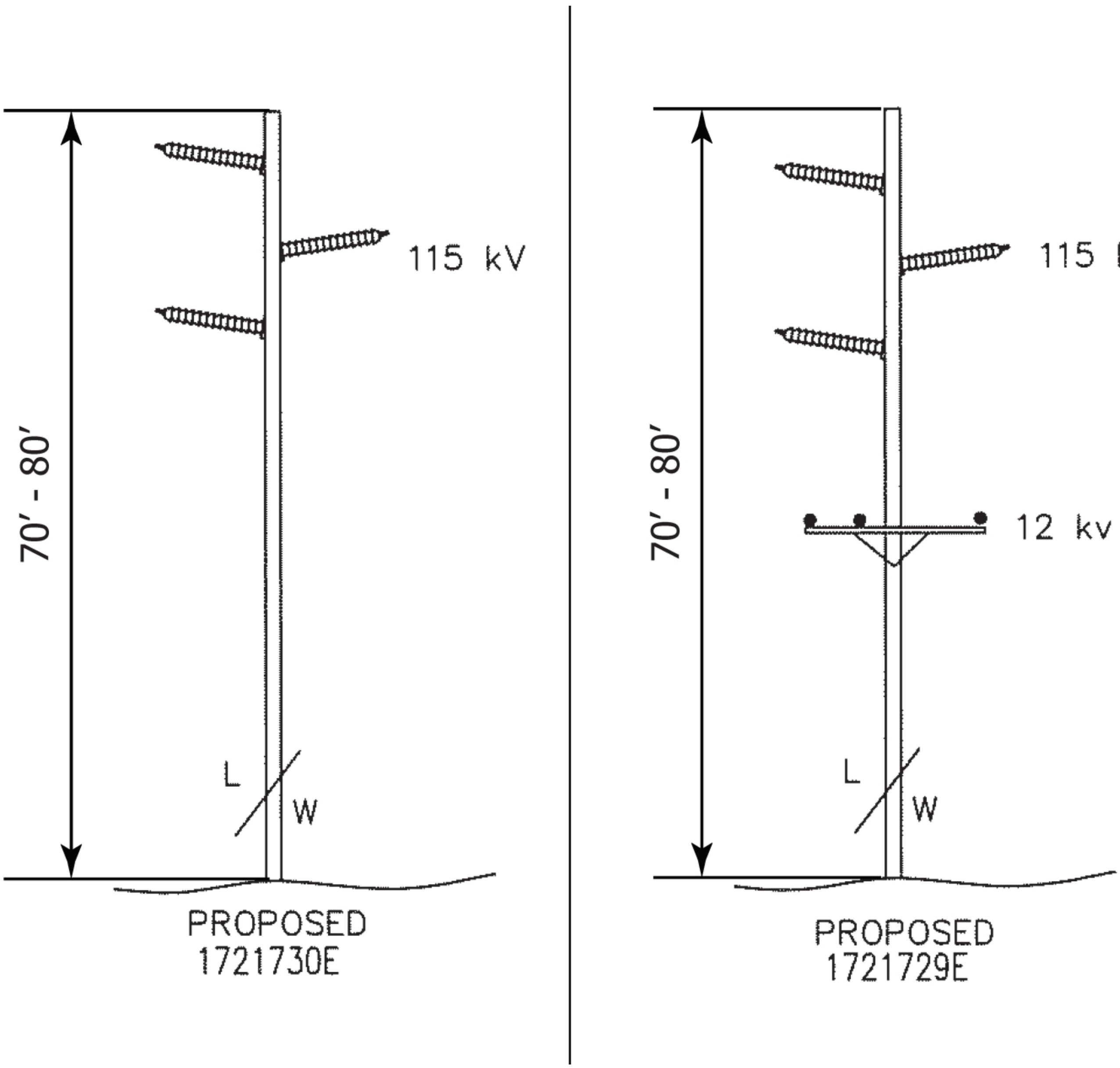
Use of a Body Extension to Raise a Tower

BEFORE **AFTER**



Source: SCE, 2018.

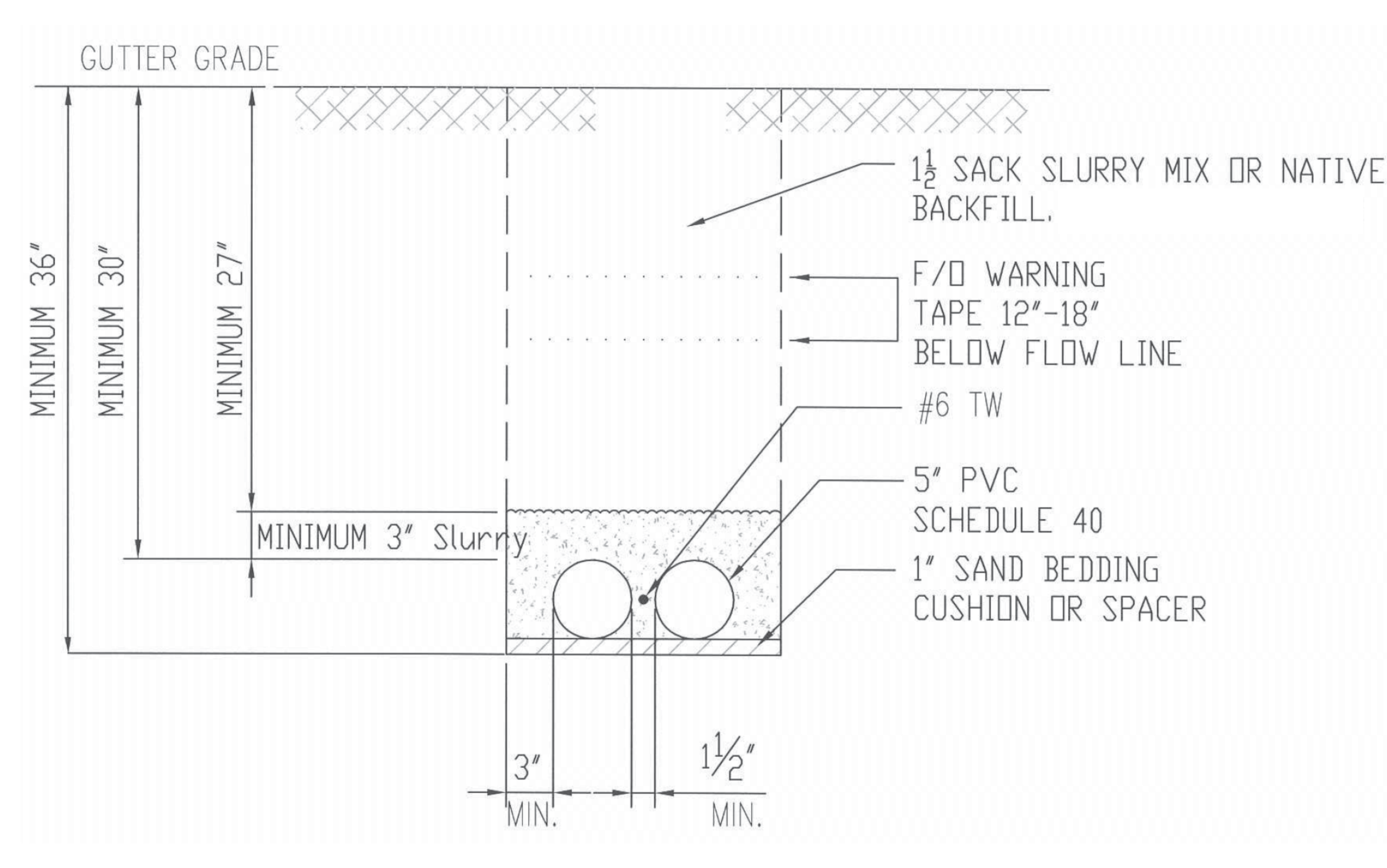
Figure 4-19.
Use of Ground Wire Peak (GWP) and Body Modifications to Support OPGW Installation



Source: SCE, 2017.

Figure 4-20.

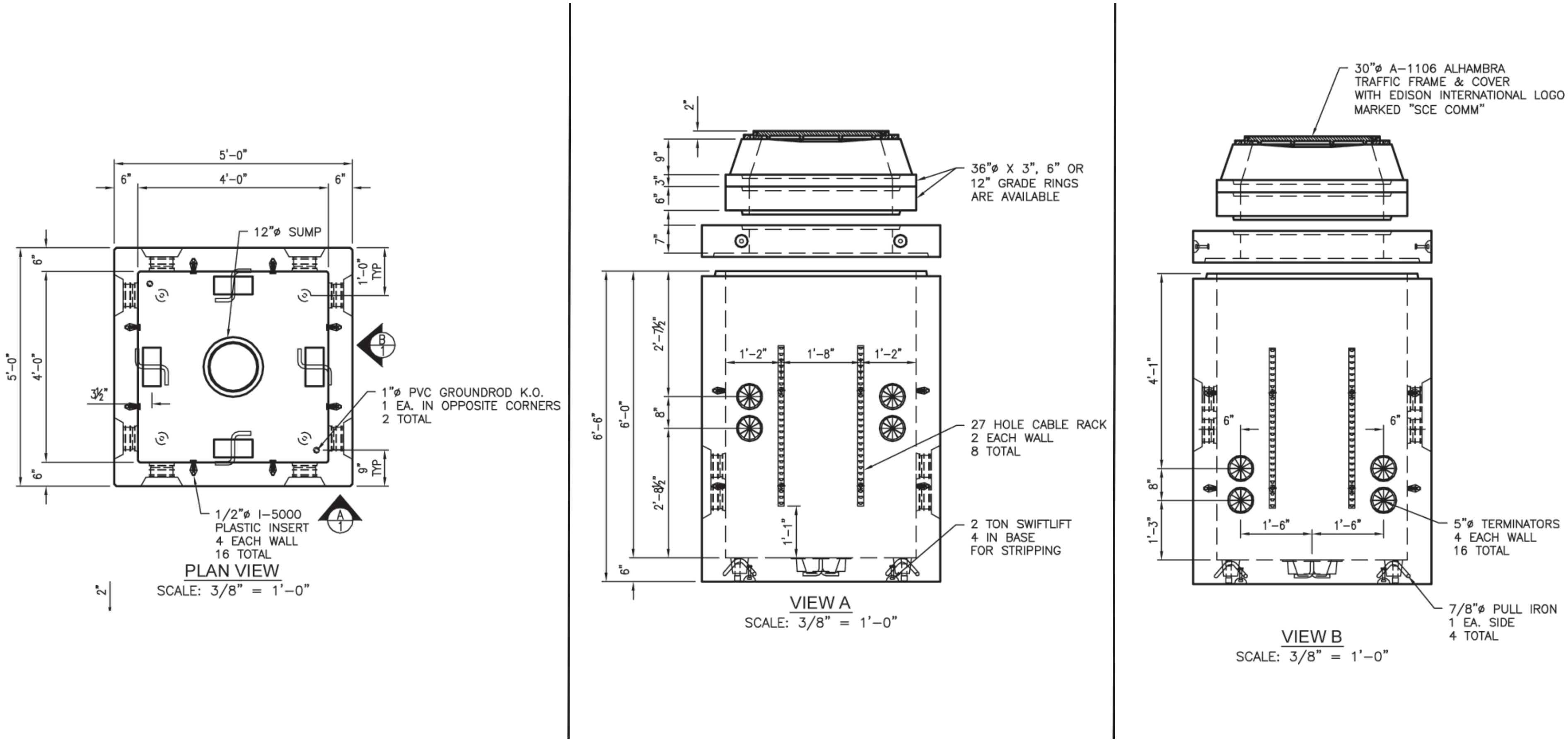
Typical Subtransmission Structures



Source: SCE, 2017.

Figure 4-21.

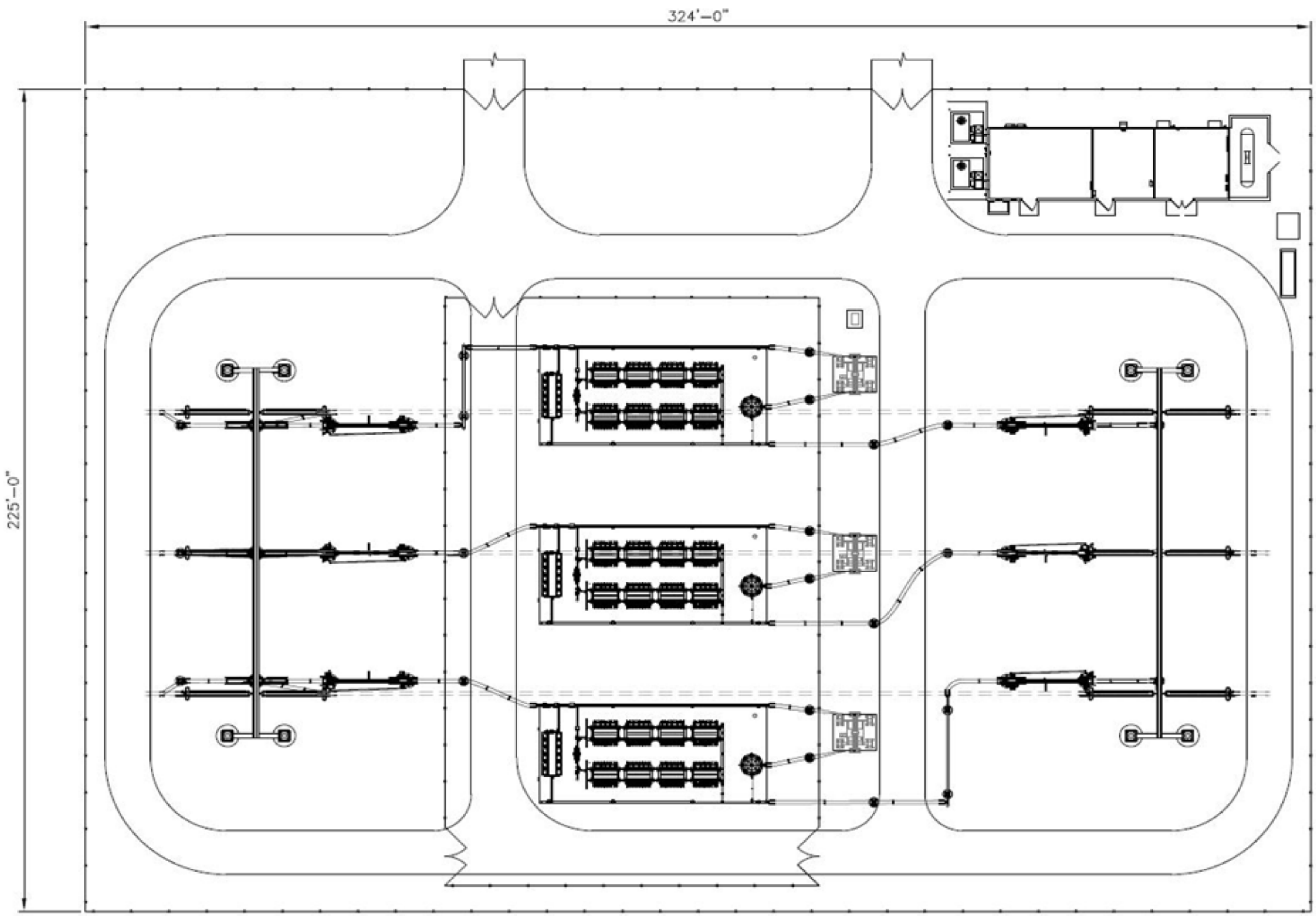
Typical Telecommunications Duct Bank



Source: SCE, 2017.

Figure 4-22.

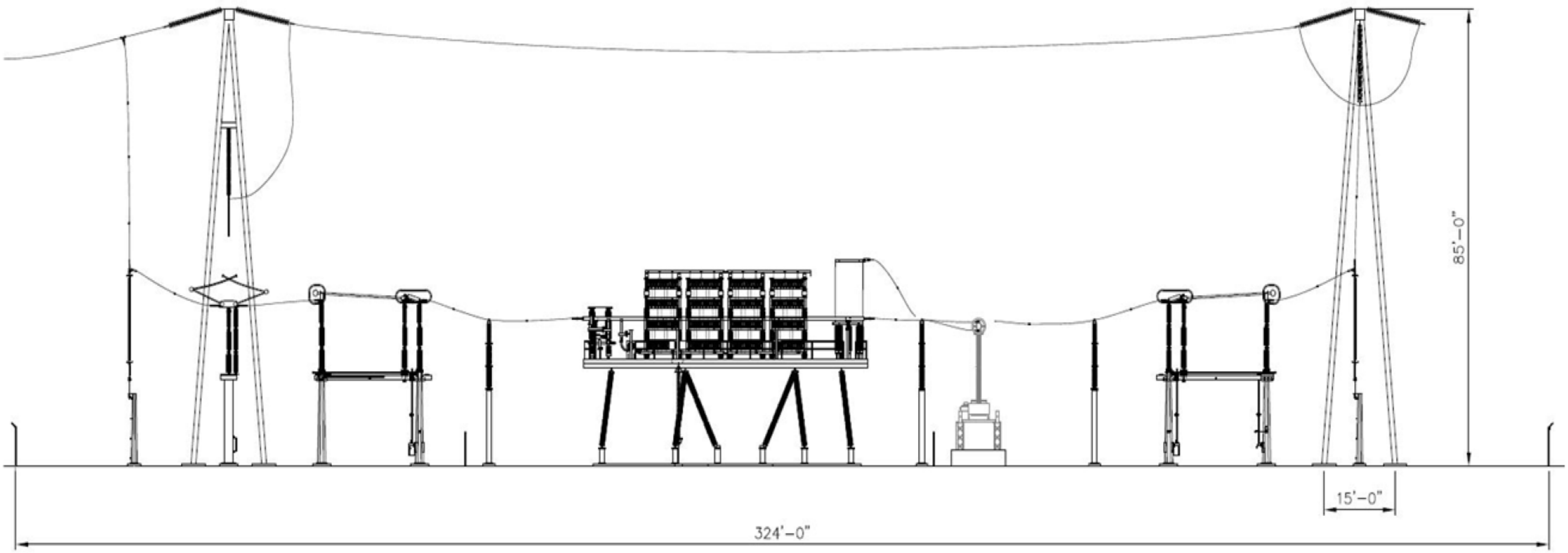
Typical Manhole



Source: SCE, 2017.

Figure 4-23.

Typical Mid-Line Series Capacitor Layout



Source: SCE, 2017.

Figure 4-24.

Typical Mid-Line Series Capacitor Profile

Attachment 4.A

Discrepancy Work Areas

Table 4.A-1. Discrepancy Work Areas

Number	Tower Number	Location	Encroachment Type	Activity
Eldorado-Lugo 500 kV Transmission Line				
1	Between Towers M14-T3 and M14-T4	San Bernardino County, California	Ground/rock	Raise Tower M14-T4 by a minimum of 18.5 feet
2	Between Towers M14-T4 and M15-T1	San Bernardino County, California	Ground	Raise Tower M14-T4 by a minimum of 18.5 feet
3	Between Towers M20-T2 and M20-T3	San Bernardino County, California	115 kV crossing wire	Reframe 115 kV subtransmission line — lower by a minimum of 5 feet and lower the 12 kV distribution structure[1]
4	Between Towers M33-T1 and M33-T2	San Bernardino County, California	Ground/rock	Raise Tower M33-T1 by a minimum of 5 feet
5	Between Towers M58-T1 and M58-T2	San Bernardino County, California	Ground	Modify conductor
6	Between Towers M63-T3 and M63-T4	San Bernardino County, California	Ground	Raise Tower M63-T3 by a minimum of 15 feet
7	Between Towers M64-T1 and M64-T2	San Bernardino County, California	Ground	Raise Tower M64-T2 by a minimum of 5 feet
8	Between Towers M97-T1 and M97-T2	San Bernardino County, California	Railroad	Raise Towers M97-T1 and M97-T2 by 18.5 feet
Lugo-Mohave 500 kV Transmission Line				
9	Between Towers M4-T2 and M4-T3	San Bernardino County, California	Ground	Remove approximately 3.5 feet of concrete below conductor
10	Between Towers M8-T1 and M8-T2	San Bernardino County, California	12 kV crossing wire	Reframe distribution line — to be lowered by a minimum of 5 feet
11	Between Towers M20-T3 and M20-T4	San Bernardino County, California	115 kV crossing wire	This would be corrected by the proposed mitigation between towers M20-T2 and M20-T3 on the Eldorado-Lugo 500 kV transmission line (Reframe 115 kV line) — lower by a minimum of 5 feet
12	Between Towers M22-T3 and M22-T4	San Bernardino County, California	Ground	Raise Tower M22-T4 by a minimum of 15 feet
13	Between Towers M29-T3 and M30-T1	San Bernardino County, California	Ground	Grade/remove berm by approxi-mately 2 feet
14	Between Towers M68-T1 and M68-T2	San Bernardino County, California	Ground/highway	Raise Tower M68-T1 by a minimum of 8.5 feet
15	Between Towers M89-T1 and M89-T2	San Bernardino County, California	Ground	Modify conductor
Eldorado-Mohave 500 kV Transmission Line				
16	Between Towers M4-T1 and M4-T2	Clark County, Nevada	230 kV crossing wire	Raise Tower M4-T1 by a minimum of 18.5 feet and modify foundation as required

1 - This proposed mitigation would also correct the discrepancy between towers M20-T3 and M20-T4 on the Lugo-Mohave 500 kV Transmission Line.

Attachment 4.B

Tower Modifications Associated with Optical Ground Wire Installation

Table 4.B-1. Tower Modifications Associated with Optical Ground Wire Installation

Splice Location[1]	Structure Type	Ground Wire Peak Modification	Body Modification	Bent Steel Repair
Lugo-Mohave 500 kV Transmission Line Splice Locations				
M0-T1*	DHA-2	—	—	—
M2-T3	ELD-1	—	—	—
M5-T4	EHT-2	Yes	—	—
M9-T1	ELD-T-1	—	—	—
M12-T2	EMT-3	Yes	—	—
M15-T3	EMT-3	Yes	Yes	—
M18-T4	EHD-1	—	—	—
M22-T2	ELD-2	—	—	—
M24-T5	ELD-1	—	—	—
M27-T3	EMT-3	Yes	—	—
M29-T3	EMT-3	Yes	—	—
M31-T1	EMT-3	Yes	—	—
M33-T2	EMT-3	Yes	—	—
M36-T3	EMT-3	Yes	—	—
M40-T1	EMT-3	Yes	Yes	—
M42-T4	ELD-1	—	—	—
M46-T2	EMT-2	Yes	Yes	—
M49-T3	ELD-1	—	—	—
M53-T1	EMT-3	Yes	—	—
M56-T2	EMT-2	Yes	Yes	—
M59-T3	EMT-2	Yes	Yes	—
M63-T1	EMT-3	Yes	—	—
M66-T2	ELD-2	—	—	—
M68-T4	EMT-3	Yes	Yes	—
M69-T1	ELD-1	—	—	—
M72-T1	EMT-2	Yes	Yes	—
M75-T3	EMT-1	Yes	Yes	—
M78-T4	ELD-1	—	—	—
M82-T1	EMT-2	Yes	Yes	—
M85-T2	EMT-3	Yes	Yes	—
M88-T4	EMT-1	Yes	Yes	—
M92-T1	EMT-2	Yes	Yes	—
M95-T1	EMT-3	Yes	—	—
M98-T2	EMT-3	Yes	Yes	—
M102-T1	EMT-3	Yes	Yes	—
M105-T2	EMT-3	Yes	—	—
M108-T2	EMT-3	Yes	—	—
M111-T3	EMT-3	Yes	—	—
M114-T4	EMT-1	Yes	Yes	—
M118-T2	EMT-2	Yes	Yes	—
M121-T2	EMT-3	Yes	—	—
M124-T3	EMT-3	Yes	—	—

Table 4.B-1. Tower Modifications Associated with Optical Ground Wire Installation

Splice Location[1]	Structure Type	Ground Wire Peak Modification	Body Modification	Bent Steel Repair
M128-T1	EMT-2	Yes	Yes	—
M131-T2	EMT-3	Yes	—	—
M134-T2	EMT-3	Yes	—	—
M137-T3	EMT-2	Yes	Yes	—
M141-T1	EMT-2	Yes	Yes	—
M144-T2	EMT-3	Yes	—	—
M147-T4	EMT-3	Yes	—	—
M151-T1	EMT-3	Yes	—	—
M154-T3	EMT-2	Yes	Yes	—
M157-T1	EMT-2	Yes	Yes	—
M160-T2	EHT-S-2	Yes	—	—
M163-T4	EMT-3	Yes	—	—
M167-T1	EMT-3	Yes	—	—
M170-T1	EMT-2	Yes	Yes	—
M173-T2	ELD-1	—	—	—
Eldorado-Mohave 500 kV Transmission Line Splice Locations				
M0-T1	EDE-1	—	—	—
M2-T1	ELD-1	—	—	—
M4-T1	EMT-3	Yes	Yes	Yes
M6-T2	EHT-S-3	Yes	—	Yes
M9-T3	EMT-2	Yes	Yes	Yes
M13-T1	EMT-3	Yes	Yes	Yes
M16-T3	ELD-T-1	—	—	—
M19-T3	EMT-3	Yes	—	—
M23-T1	EMT-3	Yes	—	—
M26-T2	EMT-3	Yes	Yes	—
M29-T4	EMT-3	Yes	—	—
M33-T2	EMT-3	Yes	—	—
M36-T4	EMT-4	Yes	—	—
M40-T1	EMT-3	Yes	—	—
M43-T3	EMT-1	Yes	Yes	—
M46-T3	EMT-3	Yes	—	—
M49-T4	ELD-1	—	—	—
M53-T1	EHT-S-2	Yes	—	—
M56-T1	EMT-3	Yes	Yes	—
M59-T2*	DHA-1	—	—	—
Total, Eldorado-Mohave 500 kV Transmission Line		15	6	4
Total, Lugo-Mohave 500 kV Transmission Line		45	21	0

1 - Asterisks are given for locations that are possible splice locations. These locations are not to be used if the optical ground wire is run straight into the substation rack.

Attachment 4.C

Construction Equipment and
Workforce Estimates

Table 4.C-1. Construction Equipment and Workforce Estimates

Activity	Equipment Type	Approx. Total Days Used	Approx. Quantity	Approx. Number of Workers	On-Road Type	Off-Road Type	Output (Hp)	Approx. Use (hours/day)	Approx. Use by State (percent) CA	NV	Maximum Days Used 2019	2020
Capacitors												
Capacitors - Eldorado Series Cap - SC3 - Commissioning: Testing	Scissor Lift	40	3	10	—	Aerial Lifts	50	6	0	100	74	0
Capacitors - Eldorado Series Cap - SC3 - Commissioning: Testing	Foreman's Truck	40	1	10	Passenger	—	—	—	0	100	74	0
Capacitors - Eldorado Series Cap - SC3 - Commissioning: Testing	Job Site Utility Cart	35	1	10	Passenger	—	—	—	0	100	74	0
Capacitors - Eldorado Series Cap - SC3 - Commissioning: Testing	Test Truck	40	1	10	Delivery	—	—	—	0	100	74	0
Capacitors - Eldorado Series Cap - SC3 - Commissioning: Testing	Tool Truck	35	1	10	Delivery	—	—	—	0	100	74	0
Capacitors - Eldorado Series Cap - SC3 - Commissioning: Testing	Worker Commute Automobile	40	10	10	Passenger	—	—	—	0	100	74	0
Capacitors - Eldorado Series Cap - SC3 - Demo: Removals, Refurbishing	250-Ton Hydraulic Crane	15	1	5	—	Cranes	450	5	0	100	54	0
Capacitors - Eldorado Series Cap - SC3 - Demo: Removals, Refurbishing	500-Gallon Water Buffalo with Truck	15	1	5	—	Off-Highway Trucks	185	5	0	100	54	0
Capacitors - Eldorado Series Cap - SC3 - Demo: Removals, Refurbishing	Bobcat Skid Steer	15	1	5	—	Skid Steer Loaders	93	8	0	100	54	0
Capacitors - Eldorado Series Cap - SC3 - Demo: Removals, Refurbishing	Bobcat with Auger	15	1	5	—	Skid Steer Loaders	93	8	0	100	54	0
Capacitors - Eldorado Series Cap - SC3 - Demo: Removals, Refurbishing	Bobcat with Sweeper	15	1	5	—	Skid Steer Loaders	93	8	0	100	54	0
Capacitors - Eldorado Series Cap - SC3 - Demo: Removals, Refurbishing	Ditch Witch	20	1	5	—	Trenchers	42	8	0	100	54	0
Capacitors - Eldorado Series Cap - SC3 - Demo: Removals, Refurbishing	Mini Excavator	15	1	5	—	Excavators	50	8	0	100	54	0
Capacitors - Eldorado Series Cap - SC3 - Demo: Removals, Refurbishing	10-Cubic-Yard Dump Truck	20	3	5	HHDT	—	—	—	0	100	54	0
Capacitors - Eldorado Series Cap - SC3 - Demo: Removals, Refurbishing	4,000-Gallon Water Truck	20	3	5	HHDT	—	—	—	0	100	54	0
Capacitors - Eldorado Series Cap - SC3 - Demo: Removals, Refurbishing	Foreman's Truck	15	1	5	Passenger	—	—	—	0	100	54	0
Capacitors - Eldorado Series Cap - SC3 - Demo: Removals, Refurbishing	Job Site Utility Cart	15	1	5	Passenger	—	—	—	0	100	54	0
Capacitors - Eldorado Series Cap - SC3 - Demo: Removals, Refurbishing	Low Bed Equipment Hauler (5 axle)	15	1	5	HHDT	—	—	—	0	100	54	0
Capacitors - Eldorado Series Cap - SC3 - Demo: Removals, Refurbishing	Low Bed Equipment Hauler (7 axle)	15	1	5	HHDT	—	—	—	0	100	54	0
Capacitors - Eldorado Series Cap - SC3 - Demo: Removals, Refurbishing	Worker Commute Automobile	20	5	5	Passenger	—	—	—	0	100	54	0
Capacitors - Eldorado Series Cap - SC3 - Installations: Equipment, Wiring	135-Foot Manlift	20	1	15	—	Aerial Lifts	75	5	0	100	66	0
Capacitors - Eldorado Series Cap - SC3 - Installations: Equipment, Wiring	20,000-Pound Forklift	40	1	15	—	Forklifts	150	8	0	100	66	0
Capacitors - Eldorado Series Cap - SC3 - Installations: Equipment, Wiring	27-Ton Boom Truck	40	1	15	—	Cranes	350	5	0	100	66	0
Capacitors - Eldorado Series Cap - SC3 - Installations: Equipment, Wiring	65-Foot Manlift	40	1	15	—	Aerial Lifts	75	5	0	100	66	0
Capacitors - Eldorado Series Cap - SC3 - Installations: Equipment, Wiring	85-Foot Manlift	30	1	15	—	Aerial Lifts	75	5	0	100	66	0
Capacitors - Eldorado Series Cap - SC3 - Installations: Equipment, Wiring	Bobcat with Forks	90	2	15	—	Skid Steer Loaders	93	8	0	100	66	0
Capacitors - Eldorado Series Cap - SC3 - Installations: Equipment, Wiring	Crane	10	1	15	—	Cranes	350	5	0	100	66	0
Capacitors - Eldorado Series Cap - SC3 - Installations: Equipment, Wiring	Genie 45-Foot Manlift	35	1	15	—	Aerial Lifts	75	5	0	100	66	0
Capacitors - Eldorado Series Cap - SC3 - Installations: Equipment, Wiring	Scissor Lift	95	3	15	—	Aerial Lifts	50	6	0	100	66	0
Capacitors - Eldorado Series Cap - SC3 - Installations: Equipment, Wiring	Tele-Handler Forklift (5,000-7,000 lbs)	75	1	15	—	Rough Terrain Forklifts	150	8	0	100	66	0
Capacitors - Eldorado Series Cap - SC3 - Installations: Equipment, Wiring	Tele-Handler Forklift (8,000-12,000 lbs)	50	1	15	—	Rough Terrain Forklifts	150	8	0	100	66	0
Capacitors - Eldorado Series Cap - SC3 - Installations: Equipment, Wiring	Foreman's Truck	95	1	15	Passenger	—	—	—	0	100	66	0
Capacitors - Eldorado Series Cap - SC3 - Installations: Equipment, Wiring	Job Site Utility Cart	95	1	15	Passenger	—	—	—	0	100	66	0
Capacitors - Eldorado Series Cap - SC3 - Installations: Equipment, Wiring	Tool Truck	95	1	15	Delivery	—	—	—	0	100	66	0
Capacitors - Eldorado Series Cap - SC3 - Installations: Equipment, Wiring	Worker Commute Automobile	95	15	15	Passenger	—	—	—	0	100	66	0
Capacitors - Ludlow Series Cap - SC5 - Civil: Foundations, Below Grade, Stone Cover	140 Motor Grader	25	1	12	—	Graders	250	8	100	0	73	0
Capacitors - Ludlow Series Cap - SC5 - Civil: Foundations, Below Grade, Stone Cover	250-Ton Hydraulic Crane	30	1	12	—	Cranes	450	5	100	0	73	0
Capacitors - Ludlow Series Cap - SC5 - Civil: Foundations, Below Grade, Stone Cover	50,000-Pound Excavator/Breaker	30	1	12	—	Excavators	200	8	100	0	73	0

Table 4.C-1. Construction Equipment and Workforce Estimates

Activity	Equipment Type	Approx. Total Days Used	Approx. Quantity	Approx. Number of Workers	On-Road Type	Off-Road Type	Output (Hp)	Approx. Use (hours/day)	Approx. Use by State (percent) CA	NV	Maximum Days Used 2019	2020
Capacitors - Ludlow Series Cap - SC5 - Civil: Foundations, Below Grade, Stone Cover	500-Gallon Water Buffalo with Truck	90	1	12	—	Off-Highway Trucks	185	5	100	0	73	0
Capacitors - Ludlow Series Cap - SC5 - Civil: Foundations, Below Grade, Stone Cover	75,000-Pound Excavator	30	1	12	—	Excavators	350	8	100	0	73	0
Capacitors - Ludlow Series Cap - SC5 - Civil: Foundations, Below Grade, Stone Cover	84-Inch Vibratory Roller Compactor	35	2	12	—	Rollers	130	8	100	0	73	0
Capacitors - Ludlow Series Cap - SC5 - Civil: Foundations, Below Grade, Stone Cover	Bobcat Compactor	50	1	12	—	Skid Steer Loaders	93	8	100	0	73	0
Capacitors - Ludlow Series Cap - SC5 - Civil: Foundations, Below Grade, Stone Cover	Bobcat Skid Steer	90	1	12	—	Skid Steer Loaders	93	8	100	0	73	0
Capacitors - Ludlow Series Cap - SC5 - Civil: Foundations, Below Grade, Stone Cover	Bobcat with Auger	90	1	12	—	Skid Steer Loaders	93	8	100	0	73	0
Capacitors - Ludlow Series Cap - SC5 - Civil: Foundations, Below Grade, Stone Cover	Bobcat with Sweeper	90	1	12	—	Skid Steer Loaders	93	8	100	0	73	0
Capacitors - Ludlow Series Cap - SC5 - Civil: Foundations, Below Grade, Stone Cover	Cat 623 Scraper	30	1	12	—	Graders	400	8	100	0	73	0
Capacitors - Ludlow Series Cap - SC5 - Civil: Foundations, Below Grade, Stone Cover	Cat 950 Loader	40	1	12	—	Tractors/Loaders/ Backhoes	130	8	100	0	73	0
Capacitors - Ludlow Series Cap - SC5 - Civil: Foundations, Below Grade, Stone Cover	D-6 Cat Dozer	40	1	12	—	Crawler Tractors	215	8	100	0	73	0
Capacitors - Ludlow Series Cap - SC5 - Civil: Foundations, Below Grade, Stone Cover	Ditch Witch	50	1	12	—	Trenchers	42	8	100	0	73	0
Capacitors - Ludlow Series Cap - SC5 - Civil: Foundations, Below Grade, Stone Cover	LoDrill Over 50,000 Pounds	20	1	12	—	Bore/Drill Rigs	350	5	100	0	73	0
Capacitors - Ludlow Series Cap - SC5 - Civil: Foundations, Below Grade, Stone Cover	LoDrill up to 50,000 Pounds	30	1	12	—	Bore/Drill Rigs	200	5	100	0	73	0
Capacitors - Ludlow Series Cap - SC5 - Civil: Foundations, Below Grade, Stone Cover	Mini Excavator	50	1	12	—	Excavators	50	8	100	0	73	0
Capacitors - Ludlow Series Cap - SC5 - Civil: Foundations, Below Grade, Stone Cover	Premiertrak 300 Rock Crusher	10	1	12	—	Crushing/Proc. Equipment	280	9	100	0	73	0
Capacitors - Ludlow Series Cap - SC5 - Civil: Foundations, Below Grade, Stone Cover	Skip Loader	100	1	12	—	Tractors/Loaders/ Backhoes	150	4	100	0	73	0
Capacitors - Ludlow Series Cap - SC5 - Civil: Foundations, Below Grade, Stone Cover	Vermeer RT-450 Trencher	30	1	12	—	Trenchers	50	8	100	0	73	0
Capacitors - Ludlow Series Cap - SC5 - Civil: Foundations, Below Grade, Stone Cover	10-Cubic-Yard Dump Truck	100	3	12	HHDT	—	—	—	100	0	73	0
Capacitors - Ludlow Series Cap - SC5 - Civil: Foundations, Below Grade, Stone Cover	4,000-Gallon Water Truck	100	3	12	HHDT	—	—	—	100	0	73	0
Capacitors - Ludlow Series Cap - SC5 - Civil: Foundations, Below Grade, Stone Cover	Foreman's Truck	90	1	12	Passenger	—	—	—	100	0	73	0
Capacitors - Ludlow Series Cap - SC5 - Civil: Foundations, Below Grade, Stone Cover	Job Site Utility Cart	90	1	12	Passenger	—	—	—	100	0	73	0
Capacitors - Ludlow Series Cap - SC5 - Civil: Foundations, Below Grade, Stone Cover	Low Bed Equipment Hauler (5 axle)	40	1	12	HHDT	—	—	—	100	0	73	0
Capacitors - Ludlow Series Cap - SC5 - Civil: Foundations, Below Grade, Stone Cover	Low Bed Equipment Hauler (7 axle)	40	1	12	HHDT	—	—	—	100	0	73	0
Capacitors - Ludlow Series Cap - SC5 - Civil: Foundations, Below Grade, Stone Cover	Low Side End Dump	100	3	12	HHDT	—	—	—	100	0	73	0
Capacitors - Ludlow Series Cap - SC5 - Civil: Foundations, Below Grade, Stone Cover	Tool Truck	50	1	12	Delivery	—	—	—	100	0	73	0
Capacitors - Ludlow Series Cap - SC5 - Civil: Foundations, Below Grade, Stone Cover	Worker Commute Automobile	100	12	12	Passenger	—	—	—	100	0	73	0
Capacitors - Ludlow Series Cap - SC5 - Commissioning: Testing	Scissor Lift	50	3	10	—	Aerial Lifts	50	6	100	0	0	34
Capacitors - Ludlow Series Cap - SC5 - Commissioning: Testing	Foreman’s Truck	50	1	10	Passenger	—	—	—	100	0	0	34
Capacitors - Ludlow Series Cap - SC5 - Commissioning: Testing	Job Site Utility Cart	50	1	10	Passenger	—	—	—	100	0	0	34
Capacitors - Ludlow Series Cap - SC5 - Commissioning: Testing	Test Truck	50	1	10	Delivery	—	—	—	100	0	0	34
Capacitors - Ludlow Series Cap - SC5 - Commissioning: Testing	Tool Truck	50	1	10	Delivery	—	—	—	100	0	0	34
Capacitors - Ludlow Series Cap - SC5 - Commissioning: Testing	Worker Commute Automobile	50	10	10	Passenger	—	—	—	100	0	0	34
Capacitors - Ludlow Series Cap - SC5 - Grading	140 Motor Grader	25	1	12	—	Graders	250	8	100	0	60	0
Capacitors - Ludlow Series Cap - SC5 - Grading	250-Ton Hydraulic Crane	30	1	12	—	Cranes	450	5	100	0	60	0
Capacitors - Ludlow Series Cap - SC5 - Grading	50,000-Pound Excavator/Breaker	30	1	12	—	Excavators	200	8	100	0	60	0
Capacitors - Ludlow Series Cap - SC5 - Grading	500-Gallon Water Buffalo with Truck	90	1	12	—	Off-Highway Trucks	185	5	100	0	60	0
Capacitors - Ludlow Series Cap - SC5 - Grading	75,000-Pound Excavator	30	1	12	—	Excavators	350	8	100	0	60	0
Capacitors - Ludlow Series Cap - SC5 - Grading	84-Inch Vibratory Roller Compactor	35	2	12	—	Rollers	130	8	100	0	60	0

Table 4.C-1. Construction Equipment and Workforce Estimates

Activity	Equipment Type	Approx. Total Days Used	Approx. Quantity	Approx. Number of Workers	On-Road Type	Off-Road Type	Output (Hp)	Approx. Use (hours/day)	Approx. Use by State (percent)		Maximum Days Used	
									CA	NV	2019	2020
Capacitors - Ludlow Series Cap - SC5 - Grading	Bobcat Compactor	50	1	12	—	Skid Steer Loaders	93	8	100	0	60	0
Capacitors - Ludlow Series Cap - SC5 - Grading	Bobcat Skid Steer	90	1	12	—	Skid Steer Loaders	93	8	100	0	60	0
Capacitors - Ludlow Series Cap - SC5 - Grading	Bobcat with Auger	90	1	12	—	Skid Steer Loaders	93	8	100	0	60	0
Capacitors - Ludlow Series Cap - SC5 - Grading	Bobcat with Sweeper	90	1	12	—	Skid Steer Loaders	93	8	100	0	60	0
Capacitors - Ludlow Series Cap - SC5 - Grading	Cat 623 Scraper	30	1	12	—	Graders	400	8	100	0	60	0
Capacitors - Ludlow Series Cap - SC5 - Grading	Cat 950 Loader	40	1	12	—	Tractors/Loaders/ Backhoes	130	8	100	0	60	0
Capacitors - Ludlow Series Cap - SC5 - Grading	D-6 Cat Dozer	40	1	12	—	Crawler Tractors	215	8	100	0	60	0
Capacitors - Ludlow Series Cap - SC5 - Grading	Ditch Witch	50	1	12	—	Trenchers	42	8	100	0	60	0
Capacitors - Ludlow Series Cap - SC5 - Grading	LoDrill Over 50,000 Pounds	20	1	12	—	Bore/Drill Rigs	350	5	100	0	60	0
Capacitors - Ludlow Series Cap - SC5 - Grading	LoDrill up to 50,000 Pounds	30	1	12	—	Bore/Drill Rigs	200	5	100	0	60	0
Capacitors - Ludlow Series Cap - SC5 - Grading	Mini Excavator	50	1	12	—	Excavators	50	8	100	0	60	0
Capacitors - Ludlow Series Cap - SC5 - Grading	Premiertrak 300 Rock Crusher	10	1	12	—	Crushing/Proc. Equipment	280	9	100	0	60	0
Capacitors - Ludlow Series Cap - SC5 - Grading	Skip Loader	100	1	12	—	Tractors/Loaders/ Backhoes	150	4	100	0	60	0
Capacitors - Ludlow Series Cap - SC5 - Grading	Vermeer RT-450 Trencher	30	1	12	—	Trenchers	50	8	100	0	60	0
Capacitors - Ludlow Series Cap - SC5 - Grading	10-Cubic-Yard Dump Truck	100	3	12	HHDT	—	—	—	100	0	60	0
Capacitors - Ludlow Series Cap - SC5 - Grading	4,000-Gallon Water Truck	100	3	12	HHDT	—	—	—	100	0	60	0
Capacitors - Ludlow Series Cap - SC5 - Grading	Foreman's Truck	90	1	12	Passenger	—	—	—	100	0	60	0
Capacitors - Ludlow Series Cap - SC5 - Grading	Job Site Utility Cart	90	1	12	Passenger	—	—	—	100	0	60	0
Capacitors - Ludlow Series Cap - SC5 - Grading	Low Bed Equipment Hauler (5 axle)	40	1	12	HHDT	—	—	—	100	0	60	0
Capacitors - Ludlow Series Cap - SC5 - Grading	Low Bed Equipment Hauler (7 axle)	40	1	12	HHDT	—	—	—	100	0	60	0
Capacitors - Ludlow Series Cap - SC5 - Grading	Low Side End Dump	100	3	12	HHDT	—	—	—	100	0	60	0
Capacitors - Ludlow Series Cap - SC5 - Grading	Tool Truck	50	1	12	Delivery	—	—	—	100	0	60	0
Capacitors - Ludlow Series Cap - SC5 - Grading	Worker Commute Automobile	100	12	12	Passenger	—	—	—	100	0	60	0
Capacitors - Ludlow Series Cap - SC5 - Installations: Structures, Equipment, Wiring	135-Foot Manlift	20	1	20	—	Aerial Lifts	75	5	100	0	83	53
Capacitors - Ludlow Series Cap - SC5 - Installations: Structures, Equipment, Wiring	20,000-Pound Forklift	40	1	20	—	Forklifts	150	8	100	0	83	53
Capacitors - Ludlow Series Cap - SC5 - Installations: Structures, Equipment, Wiring	27-Ton Boom Truck	60	1	20	—	Cranes	350	5	100	0	83	53
Capacitors - Ludlow Series Cap - SC5 - Installations: Structures, Equipment, Wiring	65-Foot Manlift	40	1	20	—	Aerial Lifts	75	5	100	0	83	53
Capacitors - Ludlow Series Cap - SC5 - Installations: Structures, Equipment, Wiring	85-Foot Manlift	40	1	20	—	Aerial Lifts	75	5	100	0	83	53
Capacitors - Ludlow Series Cap - SC5 - Installations: Structures, Equipment, Wiring	Bobcat with Forks	100	2	20	—	Skid Steer Loaders	93	8	100	0	83	53
Capacitors - Ludlow Series Cap - SC5 - Installations: Structures, Equipment, Wiring	Crane	20	1	20	—	Cranes	350	5	100	0	83	53
Capacitors - Ludlow Series Cap - SC5 - Installations: Structures, Equipment, Wiring	Generator	100	1	20	—	Generator Sets	50	12	100	0	83	53
Capacitors - Ludlow Series Cap - SC5 - Installations: Structures, Equipment, Wiring	Genie 45-Foot Manlift	40	1	20	—	Aerial Lifts	75	5	100	0	83	53
Capacitors - Ludlow Series Cap - SC5 - Installations: Structures, Equipment, Wiring	Scissor Lift	100	3	20	—	Aerial Lifts	50	6	100	0	83	53
Capacitors - Ludlow Series Cap - SC5 - Installations: Structures, Equipment, Wiring	Tele-Handler Forklift (5,000-7,000 lbs)	85	1	20	—	Rough Terrain Forklifts	150	8	100	0	83	53
Capacitors - Ludlow Series Cap - SC5 - Installations: Structures, Equipment, Wiring	Tele-Handler Forklift (8,000-12,000 lbs)	65	1	20	—	Rough Terrain Forklifts	150	8	100	0	83	53
Capacitors - Ludlow Series Cap - SC5 - Installations: Structures, Equipment, Wiring	Foreman's Truck	100	1	20	Passenger	—	—	—	100	0	83	53

Table 4.C-1. Construction Equipment and Workforce Estimates

Activity	Equipment Type	Approx. Total Days Used	Approx. Quantity	Approx. Number of Workers	On-Road Type	Off-Road Type	Output (Hp)	Approx. Use (hours/day)	Approx. Use by State (percent) CA	NV	Maximum Days Used 2019	2020
Capacitors - Ludlow Series Cap - SC5 - Installations: Structures, Equipment, Wiring	Job Site Utility Cart	100	1	20	Passenger	—	—	—	100	0	83	53
Capacitors - Ludlow Series Cap - SC5 - Installations: Structures, Equipment, Wiring	Tool Truck	100	1	20	Delivery	—	—	—	100	0	83	53
Capacitors - Ludlow Series Cap - SC5 - Installations: Structures, Equipment, Wiring	Worker Commute Automobile	100	20	20	Passenger	—	—	—	100	0	83	53
Capacitors - Lugo Series Cap - SC1 - Commissioning: Testing	Foreman's Truck	35	1	6	Passenger	—	—	—	100	0	0	54
Capacitors - Lugo Series Cap - SC1 - Commissioning: Testing	Job Site Utility Cart	35	1	6	Passenger	—	—	—	100	0	0	54
Capacitors - Lugo Series Cap - SC1 - Commissioning: Testing	Test Truck	35	1	6	Delivery	—	—	—	100	0	0	54
Capacitors - Lugo Series Cap - SC1 - Commissioning: Testing	Tool Truck	35	1	6	Delivery	—	—	—	100	0	0	54
Capacitors - Lugo Series Cap - SC1 - Commissioning: Testing	Worker Commute Automobile	35	6	6	Passenger	—	—	—	100	0	0	54
Capacitors - Lugo Series Cap - SC1 - Demo: Removals, Refurbishing	250-Ton Hydraulic Crane	30	1	5	—	Cranes	450	5	100	0	48	0
Capacitors - Lugo Series Cap - SC1 - Demo: Removals, Refurbishing	500-Gallon Water Buffalo with Truck	30	1	5	—	Off-Highway Trucks	185	5	100	0	48	0
Capacitors - Lugo Series Cap - SC1 - Demo: Removals, Refurbishing	Bobcat Skid Steer	30	1	5	—	Skid Steer Loaders	93	8	100	0	48	0
Capacitors - Lugo Series Cap - SC1 - Demo: Removals, Refurbishing	Bobcat with Auger	30	1	5	—	Skid Steer Loaders	93	8	100	0	48	0
Capacitors - Lugo Series Cap - SC1 - Demo: Removals, Refurbishing	Bobcat with Sweeper	30	1	5	—	Skid Steer Loaders	93	8	100	0	48	0
Capacitors - Lugo Series Cap - SC1 - Demo: Removals, Refurbishing	10-Cubic-Yard Dump Truck	30	3	5	HHDT	—	—	—	100	0	48	0
Capacitors - Lugo Series Cap - SC1 - Demo: Removals, Refurbishing	4,000 Water Truck	30	3	5	HHDT	—	—	—	100	0	48	0
Capacitors - Lugo Series Cap - SC1 - Demo: Removals, Refurbishing	Foreman's Truck	30	1	5	Passenger	—	—	—	100	0	48	0
Capacitors - Lugo Series Cap - SC1 - Demo: Removals, Refurbishing	Job site Utility Cart	30	1	5	Passenger	—	—	—	100	0	48	0
Capacitors - Lugo Series Cap - SC1 - Demo: Removals, Refurbishing	Low Bed Equipment Hauler (5 axle)	20	1	5	HHDT	—	—	—	100	0	48	0
Capacitors - Lugo Series Cap - SC1 - Demo: Removals, Refurbishing	Low Bed Equipment Hauler (7 axle)	20	1	5	HHDT	—	—	—	100	0	48	0
Capacitors - Lugo Series Cap - SC1 - Demo: Removals, Refurbishing	Worker Commute Automobile	30	5	5	Passenger	—	—	—	100	0	48	0
Capacitors - Lugo Series Cap - SC1 - Installations: Equipment, Wiring	135-Foot Manlift	40	1	15	—	Aerial Lifts	75	5	100	0	53	13
Capacitors - Lugo Series Cap - SC1 - Installations: Equipment, Wiring	20,000-Pound Forklift	50	1	15	—	Forklifts	150	8	100	0	53	13
Capacitors - Lugo Series Cap - SC1 - Installations: Equipment, Wiring	27-Ton Boom Truck	50	1	15	—	Cranes	350	5	100	0	53	13
Capacitors - Lugo Series Cap - SC1 - Installations: Equipment, Wiring	65-Foot Manlift	50	1	15	—	Aerial Lifts	75	5	100	0	53	13
Capacitors - Lugo Series Cap - SC1 - Installations: Equipment, Wiring	85-Foot Manlift	40	1	15	—	Aerial Lifts	75	5	100	0	53	13
Capacitors - Lugo Series Cap - SC1 - Installations: Equipment, Wiring	Bobcat with Forks	50	2	15	—	Skid Steer Loaders	93	8	100	0	53	13
Capacitors - Lugo Series Cap - SC1 - Installations: Equipment, Wiring	Crane	20	1	15	—	Cranes	350	5	100	0	53	13
Capacitors - Lugo Series Cap - SC1 - Installations: Equipment, Wiring	Genie 45-Foot Manlift	50	1	15	—	Aerial Lifts	75	5	100	0	53	13
Capacitors - Lugo Series Cap - SC1 - Installations: Equipment, Wiring	Scissor Lift	50	3	15	—	Aerial Lifts	50	6	100	0	53	13
Capacitors - Lugo Series Cap - SC1 - Installations: Equipment, Wiring	Tele-Handler Forklift (5,000-7,000 lbs)	50	1	15	—	Rough Terrain Forklifts	150	8	100	0	53	13
Capacitors - Lugo Series Cap - SC1 - Installations: Equipment, Wiring	Tele-Handler Forklift (8,000-12,000 lbs)	50	1	15	—	Rough Terrain Forklifts	150	8	100	0	53	13
Capacitors - Lugo Series Cap - SC1 - Installations: Equipment, Wiring	Foreman's Truck	50	1	15	Passenger	—	—	—	100	0	53	13
Capacitors - Lugo Series Cap - SC1 - Installations: Equipment, Wiring	Job Site Utility Cart	50	1	15	Passenger	—	—	—	100	0	53	13
Capacitors - Lugo Series Cap - SC1 - Installations: Equipment, Wiring	Tool Truck	50	1	15	Delivery	—	—	—	100	0	53	13
Capacitors - Lugo Series Cap - SC1 - Installations: Equipment, Wiring	Worker Commute Automobile	50	15	15	Passenger	—	—	—	100	0	53	13
Capacitors - Lugo Series Cap - SC4 - Commissioning: Testing	Foreman's Truck	35	1	6	Passenger	—	—	—	100	0	0	41
Capacitors - Lugo Series Cap - SC4 - Commissioning: Testing	Job Site Utility Cart	35	1	6	Passenger	—	—	—	100	0	0	41
Capacitors - Lugo Series Cap - SC4 - Commissioning: Testing	Test Truck	35	1	6	Delivery	—	—	—	100	0	0	41
Capacitors - Lugo Series Cap - SC4 - Commissioning: Testing	Tool Truck	35	1	6	Delivery	—	—	—	100	0	0	41

Table 4.C-1. Construction Equipment and Workforce Estimates

Activity	Equipment Type	Approx. Total Days Used	Approx. Quantity	Approx. Number of Workers	On-Road Type	Off-Road Type	Output (Hp)	Approx. Use (hours/day)	Approx. Use by State (percent)		Maximum Days Used	
									CA	NV	2019	2020
Capacitors - Lugo Series Cap - SC4 - Commissioning: Testing	Worker Commute Automobile	35	6	6	Passenger	—	—	—	100	0	0	41
Capacitors - Lugo Series Cap - SC4 - Demo: Removals, Refurbishing	250-Ton Hydraulic Crane	30	1	5	—	Cranes	450	5	100	0	56	0
Capacitors - Lugo Series Cap - SC4 - Demo: Removals, Refurbishing	500-Gallon Water Buffalo with Truck	30	1	5	—	Off-Highway Trucks	185	5	100	0	56	0
Capacitors - Lugo Series Cap - SC4 - Demo: Removals, Refurbishing	Bobcat Skid Steer	30	1	5	—	Skid Steer Loaders	93	8	100	0	56	0
Capacitors - Lugo Series Cap - SC4 - Demo: Removals, Refurbishing	Bobcat with Auger	30	1	5	—	Skid Steer Loaders	93	8	100	0	56	0
Capacitors - Lugo Series Cap - SC4 - Demo: Removals, Refurbishing	Bobcat with Sweeper	30	1	5	—	Skid Steer Loaders	93	8	100	0	56	0
Capacitors - Lugo Series Cap - SC4 - Demo: Removals, Refurbishing	10-Cubic-Yard Dump Truck	30	3	5	HHDT	—	—	—	100	0	56	0
Capacitors - Lugo Series Cap - SC4 - Demo: Removals, Refurbishing	4,000 Water Truck	30	3	5	HHDT	—	—	—	100	0	56	0
Capacitors - Lugo Series Cap - SC4 - Demo: Removals, Refurbishing	Foreman's Truck	30	1	5	Passenger	—	—	—	100	0	56	0
Capacitors - Lugo Series Cap - SC4 - Demo: Removals, Refurbishing	Job site Utility Cart	30	1	5	Passenger	—	—	—	100	0	56	0
Capacitors - Lugo Series Cap - SC4 - Demo: Removals, Refurbishing	Low Bed Equipment Hauler (5 axle)	20	1	5	HHDT	—	—	—	100	0	56	0
Capacitors - Lugo Series Cap - SC4 - Demo: Removals, Refurbishing	Low Bed Equipment Hauler (7 axle)	20	1	5	HHDT	—	—	—	100	0	56	0
Capacitors - Lugo Series Cap - SC4 - Demo: Removals, Refurbishing	Worker Commute Automobile	30	5	5	Passenger	—	—	—	100	0	56	0
Capacitors - Lugo Series Cap - SC4 - Installations: Equipment, Wiring	135-Foot Manlift	40	1	15	—	Aerial Lifts	75	5	100	0	41	37
Capacitors - Lugo Series Cap - SC4 - Installations: Equipment, Wiring	20,000-Pound Forklift	50	1	15	—	Forklifts	150	8	100	0	41	37
Capacitors - Lugo Series Cap - SC4 - Installations: Equipment, Wiring	27-Ton Boom Truck	50	1	15	—	Cranes	350	5	100	0	41	37
Capacitors - Lugo Series Cap - SC4 - Installations: Equipment, Wiring	65-Foot Manlift	50	1	15	—	Aerial Lifts	75	5	100	0	41	37
Capacitors - Lugo Series Cap - SC4 - Installations: Equipment, Wiring	85-Foot Manlift	40	1	15	—	Aerial Lifts	75	5	100	0	41	37
Capacitors - Lugo Series Cap - SC4 - Installations: Equipment, Wiring	Bobcat with Forks	50	2	15	—	Skid Steer Loaders	93	8	100	0	41	37
Capacitors - Lugo Series Cap - SC4 - Installations: Equipment, Wiring	Crane	20	1	15	—	Cranes	350	5	100	0	41	37
Capacitors - Lugo Series Cap - SC4 - Installations: Equipment, Wiring	Genie 45-Foot Manlift	50	1	15	—	Aerial Lifts	75	5	100	0	41	37
Capacitors - Lugo Series Cap - SC4 - Installations: Equipment, Wiring	Scissor Lift	50	3	15	—	Aerial Lifts	50	6	100	0	41	37
Capacitors - Lugo Series Cap - SC4 - Installations: Equipment, Wiring	Tele-Handler Forklift (5,000-7,000 lbs)	50	1	15	—	Rough Terrain Forklifts	150	8	100	0	41	37
Capacitors - Lugo Series Cap - SC4 - Installations: Equipment, Wiring	Tele-Handler Forklift (8,000-12,000 lbs)	50	1	15	—	Rough Terrain Forklifts	150	8	100	0	41	37
Capacitors - Lugo Series Cap - SC4 - Installations: Equipment, Wiring	Foreman's Truck	50	1	15	Passenger	—	—	—	100	0	41	37
Capacitors - Lugo Series Cap - SC4 - Installations: Equipment, Wiring	Job Site Utility Cart	50	1	15	Passenger	—	—	—	100	0	41	37
Capacitors - Lugo Series Cap - SC4 - Installations: Equipment, Wiring	Tool Truck	50	1	15	Delivery	—	—	—	100	0	41	37
Capacitors - Lugo Series Cap - SC4 - Installations: Equipment, Wiring	Worker Commute Automobile	50	15	15	Passenger	—	—	—	100	0	41	37
Capacitors - Mohave Series Cap - SC6 - Civil: Grading, Foundations, Below Grade	250-Ton Hydraulic Crane	30	1	10	—	Cranes	450	5	0	100	80	0
Capacitors - Mohave Series Cap - SC6 - Civil: Grading, Foundations, Below Grade	50,000-Pound Excavator/Breaker	30	1	10	—	Excavators	200	8	0	100	80	0
Capacitors - Mohave Series Cap - SC6 - Civil: Grading, Foundations, Below Grade	500-Gallon Water Buffalo with Truck	90	1	10	—	Off-Highway Trucks	185	8	0	100	80	0
Capacitors - Mohave Series Cap - SC6 - Civil: Grading, Foundations, Below Grade	75,000-Pound Excavator	30	1	10	—	Excavators	350	8	0	100	80	0
Capacitors - Mohave Series Cap - SC6 - Civil: Grading, Foundations, Below Grade	84-Inch Vibratory Roller Compactor	35	1	10	—	Rollers	130	8	0	100	80	0
Capacitors - Mohave Series Cap - SC6 - Civil: Grading, Foundations, Below Grade	Bobcat Compactor	50	1	10	—	Skid Steer Loaders	93	8	0	100	80	0
Capacitors - Mohave Series Cap - SC6 - Civil: Grading, Foundations, Below Grade	Bobcat Skid Steer	90	1	10	—	Skid Steer Loaders	93	8	0	100	80	0
Capacitors - Mohave Series Cap - SC6 - Civil: Grading, Foundations, Below Grade	Bobcat with Auger	90	1	10	—	Skid Steer Loaders	93	8	0	100	80	0
Capacitors - Mohave Series Cap - SC6 - Civil: Grading, Foundations, Below Grade	Bobcat with Sweeper	90	1	10	—	Skid Steer Loaders	93	4	0	100	80	0
Capacitors - Mohave Series Cap - SC6 - Civil: Grading, Foundations, Below Grade	Cat 950 Loader	40	1	10	—	Tractors/Loaders/ Backhoes	130	8	0	100	80	0

Table 4.C-1. Construction Equipment and Workforce Estimates

Activity	Equipment Type	Approx. Total Days Used	Approx. Quantity	Approx. Number of Workers	On-Road Type	Off-Road Type	Output (Hp)	Approx. Use (hours/day)	Approx. Use by State (percent) CA	NV	Maximum Days Used 2019	2020
Capacitors - Mohave Series Cap - SC6 - Civil: Grading, Foundations, Below Grade	D-6 Cat Dozer	40	1	10	—	Crawler Tractors	215	8	0	100	80	0
Capacitors - Mohave Series Cap - SC6 - Civil: Grading, Foundations, Below Grade	Ditch Witch	50	1	10	—	Trenchers	42	8	0	100	80	0
Capacitors - Mohave Series Cap - SC6 - Civil: Grading, Foundations, Below Grade	Drill Rig	50	1	10	—	Bore/Drill Rigs	500	5	0	100	80	0
Capacitors - Mohave Series Cap - SC6 - Civil: Grading, Foundations, Below Grade	Excavator with Breaker	50	1	10	—	Excavators	524	5	0	100	80	0
Capacitors - Mohave Series Cap - SC6 - Civil: Grading, Foundations, Below Grade	LoDrill Over 50,000 Pounds	20	1	10	—	Bore/Drill Rigs	350	5	0	100	80	0
Capacitors - Mohave Series Cap - SC6 - Civil: Grading, Foundations, Below Grade	LoDrill up to 50,000 Pounds	30	1	10	—	Bore/Drill Rigs	200	5	0	100	80	0
Capacitors - Mohave Series Cap - SC6 - Civil: Grading, Foundations, Below Grade	Mini Excavator	50	1	10	—	Excavators	50	5	0	100	80	0
Capacitors - Mohave Series Cap - SC6 - Civil: Grading, Foundations, Below Grade	Motor Grader	25	1	10	—	Graders	250	8	0	100	80	0
Capacitors - Mohave Series Cap - SC6 - Civil: Grading, Foundations, Below Grade	Skip Loader	90	1	10	—	Tractors/Loaders/ Backhoes	150	5	0	100	80	0
Capacitors - Mohave Series Cap - SC6 - Civil: Grading, Foundations, Below Grade	Vermeer RT-450 Trencher	30	1	10	—	Trenchers	50	5	0	100	80	0
Capacitors - Mohave Series Cap - SC6 - Civil: Grading, Foundations, Below Grade	10 Cubic Yard Dump Truck	90	3	10	HHDT	—	—	—	0	100	80	0
Capacitors - Mohave Series Cap - SC6 - Civil: Grading, Foundations, Below Grade	4,000-Gallon Water Truck	90	3	10	HHDT	—	—	—	0	100	80	0
Capacitors - Mohave Series Cap - SC6 - Civil: Grading, Foundations, Below Grade	8,000-Gallon Water Pull	40	1	10	HHDT	—	—	—	0	100	80	0
Capacitors - Mohave Series Cap - SC6 - Civil: Grading, Foundations, Below Grade	Foreman's Truck	90	1	10	Passenger	—	—	—	0	100	80	0
Capacitors - Mohave Series Cap - SC6 - Civil: Grading, Foundations, Below Grade	Job Site Utility Cart	90	1	10	Passenger	—	—	—	0	100	80	0
Capacitors - Mohave Series Cap - SC6 - Civil: Grading, Foundations, Below Grade	Low Bed Equipment Hauler (5 axle)	40	1	10	HHDT	—	—	—	0	100	80	0
Capacitors - Mohave Series Cap - SC6 - Civil: Grading, Foundations, Below Grade	Low Bed Equipment Hauler (7 axle)	40	1	10	HHDT	—	—	—	0	100	80	0
Capacitors - Mohave Series Cap - SC6 - Civil: Grading, Foundations, Below Grade	Low Side End Dump	90	3	10	HHDT	—	—	—	0	100	80	0
Capacitors - Mohave Series Cap - SC6 - Civil: Grading, Foundations, Below Grade	Tool Truck	50	1	10	Delivery	—	—	—	0	100	80	0
Capacitors - Mohave Series Cap - SC6 - Civil: Grading, Foundations, Below Grade	Worker Commute	90	10	10	Passenger	—	—	—	0	100	80	0
Capacitors - Mohave Series Cap - SC6 - Commissioning: Testing	Scissor Lift	50	3	6	—	Aerial Lifts	50	6	0	100	38	0
Capacitors - Mohave Series Cap - SC6 - Commissioning: Testing	Foreman's Truck	50	1	6	Passenger	—	—	—	0	100	38	0
Capacitors - Mohave Series Cap - SC6 - Commissioning: Testing	Job Site Utility Cart	50	1	6	Passenger	—	—	—	0	100	38	0
Capacitors - Mohave Series Cap - SC6 - Commissioning: Testing	Test Truck	40	1	6	Delivery	—	—	—	0	100	38	0
Capacitors - Mohave Series Cap - SC6 - Commissioning: Testing	Tool Truck	50	1	6	Delivery	—	—	—	0	100	38	0
Capacitors - Mohave Series Cap - SC6 - Commissioning: Testing	Worker Commute Automobile	50	6	6	Passenger	—	—	—	0	100	38	0
Capacitors - Mohave Series Cap - SC6 - Demo: Removals, Refurbishing	250-Ton Hydraulic Crane	30	1	10	—	Cranes	450	5	0	100	26	0
Capacitors - Mohave Series Cap - SC6 - Demo: Removals, Refurbishing	50,000-Pound Excavator/Breaker	30	1	10	—	Excavators	200	8	0	100	26	0
Capacitors - Mohave Series Cap - SC6 - Demo: Removals, Refurbishing	500-Gallon Water Buffalo with Truck	90	1	10	—	Off-Highway Trucks	185	8	0	100	26	0
Capacitors - Mohave Series Cap - SC6 - Demo: Removals, Refurbishing	75,000-Pound Excavator	30	1	10	—	Excavators	350	8	0	100	26	0
Capacitors - Mohave Series Cap - SC6 - Demo: Removals, Refurbishing	84-Inch Vibratory Roller Compactor	35	1	10	—	Rollers	130	8	0	100	26	0
Capacitors - Mohave Series Cap - SC6 - Demo: Removals, Refurbishing	Bobcat Compactor	50	1	10	—	Skid Steer Loaders	93	8	0	100	26	0
Capacitors - Mohave Series Cap - SC6 - Demo: Removals, Refurbishing	Bobcat Skid Steer	90	1	10	—	Skid Steer Loaders	93	8	0	100	26	0
Capacitors - Mohave Series Cap - SC6 - Demo: Removals, Refurbishing	Bobcat with Auger	90	1	10	—	Skid Steer Loaders	93	8	0	100	26	0
Capacitors - Mohave Series Cap - SC6 - Demo: Removals, Refurbishing	Bobcat with Sweeper	90	1	10	—	Skid Steer Loaders	93	4	0	100	26	0
Capacitors - Mohave Series Cap - SC6 - Demo: Removals, Refurbishing	Cat 950 Loader	40	1	10	—	Tractors/Loaders/ Backhoes	130	8	0	100	26	0
Capacitors - Mohave Series Cap - SC6 - Demo: Removals, Refurbishing	D-6 Cat Dozer	40	1	10	—	Crawler Tractors	215	8	0	100	26	0
Capacitors - Mohave Series Cap - SC6 - Demo: Removals, Refurbishing	Ditch Witch	50	1	10	—	Trenchers	42	8	0	100	26	0
Capacitors - Mohave Series Cap - SC6 - Demo: Removals, Refurbishing	Drill Rig	50	1	10	—	Bore/Drill Rigs	500	5	0	100	26	0

Table 4.C-1. Construction Equipment and Workforce Estimates

Activity	Equipment Type	Approx. Total Days Used	Approx. Quantity	Approx. Number of Workers	On-Road Type	Off-Road Type	Output (Hp)	Approx. Use (hours/day)	Approx. Use by State (percent)		Maximum Days Used	
									CA	NV	2019	2020
Capacitors - Mohave Series Cap - SC6 - Demo: Removals, Refurbishing	Excavator with Breaker	50	1	10	—	Excavators	524	5	0	100	26	0
Capacitors - Mohave Series Cap - SC6 - Demo: Removals, Refurbishing	LoDrill Over 50,000 Pounds	20	1	10	—	Bore/Drill Rigs	350	5	0	100	26	0
Capacitors - Mohave Series Cap - SC6 - Demo: Removals, Refurbishing	LoDrill up to 50,000 Pounds	30	1	10	—	Bore/Drill Rigs	200	5	0	100	26	0
Capacitors - Mohave Series Cap - SC6 - Demo: Removals, Refurbishing	Mini Excavator	50	1	10	—	Excavators	50	5	0	100	26	0
Capacitors - Mohave Series Cap - SC6 - Demo: Removals, Refurbishing	Motor Grader	25	1	10	—	Graders	250	8	0	100	26	0
Capacitors - Mohave Series Cap - SC6 - Demo: Removals, Refurbishing	Skip Loader	90	1	10	—	Tractors/Loaders/ Backhoes	150	5	0	100	26	0
Capacitors - Mohave Series Cap - SC6 - Demo: Removals, Refurbishing	Vermeer RT-450 Trencher	30	1	10	—	Trenchers	50	5	0	100	26	0
Capacitors - Mohave Series Cap - SC6 - Demo: Removals, Refurbishing	10 Cubic Yard Dump Truck	90	3	10	HHDT	—	—	—	0	100	26	0
Capacitors - Mohave Series Cap - SC6 - Demo: Removals, Refurbishing	4,000-Gallon Water Truck	90	3	10	HHDT	—	—	—	0	100	26	0
Capacitors - Mohave Series Cap - SC6 - Demo: Removals, Refurbishing	8,000-Gallon Water Pull	40	1	10	HHDT	—	—	—	0	100	26	0
Capacitors - Mohave Series Cap - SC6 - Demo: Removals, Refurbishing	Foreman's Truck	90	1	10	Passenger	—	—	—	0	100	26	0
Capacitors - Mohave Series Cap - SC6 - Demo: Removals, Refurbishing	Job Site Utility Cart	90	1	10	Passenger	—	—	—	0	100	26	0
Capacitors - Mohave Series Cap - SC6 - Demo: Removals, Refurbishing	Low Bed Equipment Hauler (5 axle)	40	1	10	HHDT	—	—	—	0	100	26	0
Capacitors - Mohave Series Cap - SC6 - Demo: Removals, Refurbishing	Low Bed Equipment Hauler (7 axle)	40	1	10	HHDT	—	—	—	0	100	26	0
Capacitors - Mohave Series Cap - SC6 - Demo: Removals, Refurbishing	Low Side End Dump	90	3	10	HHDT	—	—	—	0	100	26	0
Capacitors - Mohave Series Cap - SC6 - Demo: Removals, Refurbishing	Tool Truck	50	1	10	Delivery	—	—	—	0	100	26	0
Capacitors - Mohave Series Cap - SC6 - Demo: Removals, Refurbishing	Worker Commute Automobile	90	10	10	Passenger	—	—	—	0	100	26	0
Capacitors - Mohave Series Cap - SC6 - Installations: Equipment, Wiring	135-Foot Manlift	20	1	15	—	Aerial Lifts	75	5	0	100	108	0
Capacitors - Mohave Series Cap - SC6 - Installations: Equipment, Wiring	20,000-Pound Forklift	40	1	15	—	Forklifts	150	8	0	100	108	0
Capacitors - Mohave Series Cap - SC6 - Installations: Equipment, Wiring	27-Ton Boom Truck	60	1	15	—	Cranes	350	5	0	100	108	0
Capacitors - Mohave Series Cap - SC6 - Installations: Equipment, Wiring	65-Foot Manlift	40	1	15	—	Aerial Lifts	75	5	0	100	108	0
Capacitors - Mohave Series Cap - SC6 - Installations: Equipment, Wiring	85-Foot Manlift	40	1	15	—	Aerial Lifts	75	5	0	100	108	0
Capacitors - Mohave Series Cap - SC6 - Installations: Equipment, Wiring	Bobcat with Forks	90	2	15	—	Skid Steer Loaders	93	8	0	100	108	0
Capacitors - Mohave Series Cap - SC6 - Installations: Equipment, Wiring	Crane	20	1	15	—	Cranes	350	5	0	100	108	0
Capacitors - Mohave Series Cap - SC6 - Installations: Equipment, Wiring	Generator	90	1	15	—	Generator Sets	50	12	0	100	108	0
Capacitors - Mohave Series Cap - SC6 - Installations: Equipment, Wiring	Genie 45-Foot Manlift	40	1	15	—	Aerial Lifts	75	5	0	100	108	0
Capacitors - Mohave Series Cap - SC6 - Installations: Equipment, Wiring	Scissor Lift	90	3	15	—	Aerial Lifts	50	6	0	100	108	0
Capacitors - Mohave Series Cap - SC6 - Installations: Equipment, Wiring	Tele-Handler Forklift (5,000-7,000 lbs)	85	1	15	—	Rough Terrain Forklifts	150	8	0	100	108	0
Capacitors - Mohave Series Cap - SC6 - Installations: Equipment, Wiring	Tele-Handler Forklift (8,000-12,000 lbs)	65	1	15	—	Rough Terrain Forklifts	150	8	0	100	108	0
Capacitors - Mohave Series Cap - SC6 - Installations: Equipment, Wiring	Foreman's Truck	90	1	15	Passenger	—	—	—	0	100	108	0
Capacitors - Mohave Series Cap - SC6 - Installations: Equipment, Wiring	Job Site Utility Cart	90	1	15	Passenger	—	—	—	0	100	108	0
Capacitors - Mohave Series Cap - SC6 - Installations: Equipment, Wiring	Tool Truck	90	1	15	Delivery	—	—	—	0	100	108	0
Capacitors - Mohave Series Cap - SC6 - Installations: Equipment, Wiring	Worker Commute Automobile	90	15	15	Passenger	—	—	—	0	100	108	0
Capacitors - Newberry Springs Series Cap - SC2 - Civil: Foundations, Below Grade, Stone Cover	140 Motor Grader	25	1	12	—	Graders	250	8	100	0	88	0
Capacitors - Newberry Springs Series Cap - SC2 - Civil: Foundations, Below Grade, Stone Cover	250-Ton Hydraulic Crane	30	1	12	—	Cranes	450	5	100	0	88	0
Capacitors - Newberry Springs Series Cap - SC2 - Civil: Foundations, Below Grade, Stone Cover	50,000-Pound Excavator/Breaker	30	1	12	—	Excavators	200	8	100	0	88	0
Capacitors - Newberry Springs Series Cap - SC2 - Civil: Foundations, Below Grade, Stone Cover	500-Gallon Water Buffalo w/Truck	90	1	12	—	Off-Highway Trucks	185	5	100	0	88	0
Capacitors - Newberry Springs Series Cap - SC2 - Civil: Foundations, Below Grade, Stone Cover	75,000-Pound Excavator	30	1	12	—	Excavators	350	8	100	0	88	0

Table 4.C-1. Construction Equipment and Workforce Estimates

Activity	Equipment Type	Approx. Total Days Used	Approx. Quantity	Approx. Number of Workers	On-Road Type	Off-Road Type	Output (Hp)	Approx. Use (hours/day)	Approx. Use by State (percent) CA	NV	Maximum Days Used 2019	2020
Capacitors - Newberry Springs Series Cap - SC2 - Civil: Foundations, Below Grade, Stone Cover	84-Inch Vibratory Roller Compactor	35	2	12	—	Rollers	130	8	100	0	88	0
Capacitors - Newberry Springs Series Cap - SC2 - Civil: Foundations, Below Grade, Stone Cover	Bobcat Compactor	50	1	12	—	Skid Steer Loaders	93	8	100	0	88	0
Capacitors - Newberry Springs Series Cap - SC2 - Civil: Foundations, Below Grade, Stone Cover	Bobcat Skid Steer	90	1	12	—	Skid Steer Loaders	93	8	100	0	88	0
Capacitors - Newberry Springs Series Cap - SC2 - Civil: Foundations, Below Grade, Stone Cover	Bobcat with Auger	90	1	12	—	Skid Steer Loaders	93	8	100	0	88	0
Capacitors - Newberry Springs Series Cap - SC2 - Civil: Foundations, Below Grade, Stone Cover	Bobcat with Sweeper	90	1	12	—	Skid Steer Loaders	93	8	100	0	88	0
Capacitors - Newberry Springs Series Cap - SC2 - Civil: Foundations, Below Grade, Stone Cover	Cat 623 Scraper	30	1	12	—	Graders	400	8	100	0	88	0
Capacitors - Newberry Springs Series Cap - SC2 - Civil: Foundations, Below Grade, Stone Cover	Cat 950 Loader	40	1	12	—	Tractors/Loaders/ Backhoes	130	8	100	0	88	0
Capacitors - Newberry Springs Series Cap - SC2 - Civil: Foundations, Below Grade, Stone Cover	D-6 Cat Dozer	40	1	12	—	Crawler Tractors	215	8	100	0	88	0
Capacitors - Newberry Springs Series Cap - SC2 - Civil: Foundations, Below Grade, Stone Cover	Ditch Witch	50	1	12	—	Trenchers	42	8	100	0	88	0
Capacitors - Newberry Springs Series Cap - SC2 - Civil: Foundations, Below Grade, Stone Cover	LoDrill Over 50,000 Pounds	20	1	12	—	Bore/Drill Rigs	350	5	100	0	88	0
Capacitors - Newberry Springs Series Cap - SC2 - Civil: Foundations, Below Grade, Stone Cover	LoDrill up to 50,000 Pounds	30	1	12	—	Bore/Drill Rigs	200	5	100	0	88	0
Capacitors - Newberry Springs Series Cap - SC2 - Civil: Foundations, Below Grade, Stone Cover	Mini Excavator	50	1	12	—	Excavators	50	8	100	0	88	0
Capacitors - Newberry Springs Series Cap - SC2 - Civil: Foundations, Below Grade, Stone Cover	Premiertrak 300 Rock Crusher	10	1	12	—	Crushing/Proc. Equipment	280	9	100	0	88	0
Capacitors - Newberry Springs Series Cap - SC2 - Civil: Foundations, Below Grade, Stone Cover	Skip Loader	100	1	12	—	Tractors/Loaders/ Backhoes	150	4	100	0	88	0
Capacitors - Newberry Springs Series Cap - SC2 - Civil: Foundations, Below Grade, Stone Cover	Vermeer RT-450 Trencher	30	1	12	—	Trenchers	50	8	100	0	88	0
Capacitors - Newberry Springs Series Cap - SC2 - Civil: Foundations, Below Grade, Stone Cover	10-Cubic-Yard Dump Truck	100	3	12	HHDT	—	—	—	100	0	88	0
Capacitors - Newberry Springs Series Cap - SC2 - Civil: Foundations, Below Grade, Stone Cover	4,000-Gallon Water Truck	100	3	12	HHDT	—	—	—	100	0	88	0
Capacitors - Newberry Springs Series Cap - SC2 - Civil: Foundations, Below Grade, Stone Cover	Foreman's Truck	90	1	12	Passenger	—	—	—	100	0	88	0
Capacitors - Newberry Springs Series Cap - SC2 - Civil: Foundations, Below Grade, Stone Cover	Job Site Utility Cart	90	1	12	Passenger	—	—	—	100	0	88	0
Capacitors - Newberry Springs Series Cap - SC2 - Civil: Foundations, Below Grade, Stone Cover	Low Bed Equipment Hauler (5 axle)	40	1	12	HHDT	—	—	—	100	0	88	0
Capacitors - Newberry Springs Series Cap - SC2 - Civil: Foundations, Below Grade, Stone Cover	Low Bed Equipment Hauler (7 axle)	40	1	12	HHDT	—	—	—	100	0	88	0
Capacitors - Newberry Springs Series Cap - SC2 - Civil: Foundations, Below Grade, Stone Cover	Low Side End Dump	100	3	12	HHDT	—	—	—	100	0	88	0
Capacitors - Newberry Springs Series Cap - SC2 - Civil: Foundations, Below Grade, Stone Cover	Tool Truck	50	1	12	Delivery	—	—	—	100	0	88	0
Capacitors - Newberry Springs Series Cap - SC2 - Civil: Foundations, Below Grade, Stone Cover	Worker Commute Automobile	100	12	12	Passenger	—	—	—	100	0	88	0
Capacitors - Newberry Springs Series Cap - SC2 - Commissioning: Testing	Scissor Lift	35	3	10	—	Aerial Lifts	50	6	100	0	0	28
Capacitors - Newberry Springs Series Cap - SC2 - Commissioning: Testing	Foreman's Truck	35	1	10	Passenger	—	—	—	100	0	0	28
Capacitors - Newberry Springs Series Cap - SC2 - Commissioning: Testing	Job Site Utility Cart	35	1	10	Passenger	—	—	—	100	0	0	28
Capacitors - Newberry Springs Series Cap - SC2 - Commissioning: Testing	Test Truck	35	1	10	Delivery	—	—	—	100	0	0	28
Capacitors - Newberry Springs Series Cap - SC2 - Commissioning: Testing	Tool Truck	35	1	10	Delivery	—	—	—	100	0	0	28
Capacitors - Newberry Springs Series Cap - SC2 - Commissioning: Testing	Worker Commute Automobile	35	10	10	Passenger	—	—	—	100	0	0	28
Capacitors - Newberry Springs Series Cap - SC2 - Grading	140 Motor Grader	25	1	12	—	Graders	250	8	100	0	46	0
Capacitors - Newberry Springs Series Cap - SC2 - Grading	250-Ton Hydraulic Crane	30	1	12	—	Cranes	450	5	100	0	46	0
Capacitors - Newberry Springs Series Cap - SC2 - Grading	50,000-Pound Excavator/Breaker	30	1	12	—	Excavators	200	8	100	0	46	0
Capacitors - Newberry Springs Series Cap - SC2 - Grading	500-Gallon Water Buffalo w/Truck	90	1	12	—	Off-Highway Trucks	185	5	100	0	46	0
Capacitors - Newberry Springs Series Cap - SC2 - Grading	75,000-Pound Excavator	30	1	12	—	Excavators	350	8	100	0	46	0
Capacitors - Newberry Springs Series Cap - SC2 - Grading	84-Inch Vibratory Roller Compactor	35	2	12	—	Rollers	130	8	100	0	46	0
Capacitors - Newberry Springs Series Cap - SC2 - Grading	Bobcat Compactor	50	1	12	—	Skid Steer Loaders	93	8	100	0	46	0
Capacitors - Newberry Springs Series Cap - SC2 - Grading	Bobcat Skid Steer	90	1	12	—	Skid Steer Loaders	93	8	100	0	46	0

Table 4.C-1. Construction Equipment and Workforce Estimates

Activity	Equipment Type	Approx. Total Days Used	Approx. Quantity	Approx. Number of Workers	On-Road Type	Off-Road Type	Output (Hp)	Approx. Use (hours/day)	Approx. Use by State (percent)		Maximum Days Used	
									CA	NV	2019	2020
Capacitors - Newberry Springs Series Cap - SC2 - Grading	Bobcat with Auger	90	1	12	—	Skid Steer Loaders	93	8	100	0	46	0
Capacitors - Newberry Springs Series Cap - SC2 - Grading	Bobcat with Sweeper	90	1	12	—	Skid Steer Loaders	93	8	100	0	46	0
Capacitors - Newberry Springs Series Cap - SC2 - Grading	Cat 623 Scraper	30	1	12	—	Graders	400	8	100	0	46	0
Capacitors - Newberry Springs Series Cap - SC2 - Grading	Cat 950 Loader	40	1	12	—	Tractors/Loaders/ Backhoes	130	8	100	0	46	0
Capacitors - Newberry Springs Series Cap - SC2 - Grading	D-6 Cat Dozer	40	1	12	—	Crawler Tractors	215	8	100	0	46	0
Capacitors - Newberry Springs Series Cap - SC2 - Grading	Ditch Witch	50	1	12	—	Trenchers	42	8	100	0	46	0
Capacitors - Newberry Springs Series Cap - SC2 - Grading	LoDrill Over 50,000 Pounds	20	1	12	—	Bore/Drill Rigs	350	5	100	0	46	0
Capacitors - Newberry Springs Series Cap - SC2 - Grading	LoDrill up to 50,000 Pounds	30	1	12	—	Bore/Drill Rigs	200	5	100	0	46	0
Capacitors - Newberry Springs Series Cap - SC2 - Grading	Mini Excavator	50	1	12	—	Excavators	50	8	100	0	46	0
Capacitors - Newberry Springs Series Cap - SC2 - Grading	Premiertrak 300 Rock Crusher	10	1	12	—	Crushing/Proc. Equipment	280	9	100	0	46	0
Capacitors - Newberry Springs Series Cap - SC2 - Grading	Skip Loader	100	1	12	—	Tractors/Loaders/ Backhoes	150	4	100	0	46	0
Capacitors - Newberry Springs Series Cap - SC2 - Grading	Vermeer RT-450 Trencher	30	1	12	—	Trenchers	50	8	100	0	46	0
Capacitors - Newberry Springs Series Cap - SC2 - Grading	10-Cubic-Yard Dump Truck	100	3	12	HHDT	—	—	—	100	0	46	0
Capacitors - Newberry Springs Series Cap - SC2 - Grading	4,000-Gallon Water Truck	100	3	12	HHDT	—	—	—	100	0	46	0
Capacitors - Newberry Springs Series Cap - SC2 - Grading	Foreman's Truck	90	1	12	Passenger	—	—	—	100	0	46	0
Capacitors - Newberry Springs Series Cap - SC2 - Grading	Job Site Utility Cart	90	1	12	Passenger	—	—	—	100	0	46	0
Capacitors - Newberry Springs Series Cap - SC2 - Grading	Low Bed Equipment Hauler (5 axle)	40	1	12	HHDT	—	—	—	100	0	46	0
Capacitors - Newberry Springs Series Cap - SC2 - Grading	Low Bed Equipment Hauler (7 axle)	40	1	12	HHDT	—	—	—	100	0	46	0
Capacitors - Newberry Springs Series Cap - SC2 - Grading	Low Side End Dump	100	3	12	HHDT	—	—	—	100	0	46	0
Capacitors - Newberry Springs Series Cap - SC2 - Grading	Tool Truck	50	1	12	Delivery	—	—	—	100	0	46	0
Capacitors - Newberry Springs Series Cap - SC2 - Grading	Worker Commute Automobile	100	12	12	Passenger	—	—	—	100	0	46	0
Capacitors - Newberry Springs Series Cap - SC2 - Installations: Structures, Equipment, Wiring	135-Foot Manlift	20	1	20	—	Aerial Lifts	75	5	100	0	101	40
Capacitors - Newberry Springs Series Cap - SC2 - Installations: Structures, Equipment, Wiring	20,000-Pound Forklift	40	1	20	—	Forklifts	150	8	100	0	101	40
Capacitors - Newberry Springs Series Cap - SC2 - Installations: Structures, Equipment, Wiring	27-Ton Boom Truck	60	1	20	—	Cranes	350	5	100	0	101	40
Capacitors - Newberry Springs Series Cap - SC2 - Installations: Structures, Equipment, Wiring	65-Foot Manlift	40	1	20	—	Aerial Lifts	75	5	100	0	101	40
Capacitors - Newberry Springs Series Cap - SC2 - Installations: Structures, Equipment, Wiring	85-Foot Manlift	40	1	20	—	Aerial Lifts	75	5	100	0	101	40
Capacitors - Newberry Springs Series Cap - SC2 - Installations: Structures, Equipment, Wiring	Bobcat with Forks	100	2	20	—	Skid Steer Loaders	93	8	100	0	101	40
Capacitors - Newberry Springs Series Cap - SC2 - Installations: Structures, Equipment, Wiring	Crane	20	1	20	—	Cranes	350	5	100	0	101	40
Capacitors - Newberry Springs Series Cap - SC2 - Installations: Structures, Equipment, Wiring	Generator	100	1	20	—	Generator Sets	50	10	100	0	101	40
Capacitors - Newberry Springs Series Cap - SC2 - Installations: Structures, Equipment, Wiring	Genie 45-Foot Manlift	40	1	20	—	Aerial Lifts	75	5	100	0	101	40
Capacitors - Newberry Springs Series Cap - SC2 - Installations: Structures, Equipment, Wiring	Scissor Lift	100	3	20	—	Aerial Lifts	50	6	100	0	101	40
Capacitors - Newberry Springs Series Cap - SC2 - Installations: Structures, Equipment, Wiring	Tele-Handler Forklift (5,000-7,000 lbs)	85	1	20	—	Rough Terrain Forklifts	150	8	100	0	101	40
Capacitors - Newberry Springs Series Cap - SC2 - Installations: Structures, Equipment, Wiring	Tele-Handler Forklift (8,000-12,000 lbs)	65	1	20	—	Rough Terrain Forklifts	150	8	100	0	101	40
Capacitors - Newberry Springs Series Cap - SC2 - Installations: Structures, Equipment, Wiring	Foreman's Truck	100	1	20	Passenger	—	—	—	100	0	101	40
Capacitors - Newberry Springs Series Cap - SC2 - Installations: Structures, Equipment, Wiring	Job Site Utility Cart	100	1	20	Passenger	—	—	—	100	0	101	40
Capacitors - Newberry Springs Series Cap - SC2 - Installations: Structures, Equipment, Wiring	Tool Truck	100	1	20	Delivery	—	—	—	100	0	101	40

Table 4.C-1. Construction Equipment and Workforce Estimates

Activity	Equipment Type	Approx. Total Days Used	Approx. Quantity	Approx. Number of Workers	On-Road Type	Off-Road Type	Output (Hp)	Approx. Use (hours/day)	Approx. Use by State (percent) CA	NV	Maximum Days Used 2019	2020
Capacitors - Newberry Springs Series Cap - SC2 - Installations: Structures, Equipment, Wiring	Worker Commute Automobile	100	20	20	Passenger	—	—	—	100	0	101	40
Transmission												
Transmission - 500 kV - Survey (1)	1-Ton Truck, 4x4	90	2	8	Passenger	—	—	—	75	25	236	156
Transmission - 500 kV - Survey (1)	Worker Commute Automobile	90	8	8	Passenger	—	—	—	75	25	236	156
Transmission - 500 kV - Fiber Splicing and Termination	1-Ton Truck, 4x4	60	1	5	Passenger	—	—	—	75	25	184	132
Transmission - 500 kV - Fiber Splicing and Termination	Medium Duty Splicing Lab Truck	60	2	5	Delivery	—	—	—	75	25	184	132
Transmission - 500 kV - Fiber Splicing and Termination	Worker Commute Automobile	60	5	5	Passenger	—	—	—	75	25	184	132
Transmission - 500 kV - Lugo-Moh - Guard Structure Installation (5)	Auger Truck	30	1	6	—	Bore/Drill Rigs	210	4	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Guard Structure Installation (5)	Boom/Crane Truck	30	1	6	—	Cranes	350	6	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Guard Structure Installation (5)	Compressor Trailer	30	1	6	—	Air Compressors	60	4	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Guard Structure Installation (5)	Digger Derrick 6060	30	2	6	—	Bore/Drill Rigs	300	8	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Guard Structure Installation (5)	Manlift/Bucket Truck	30	1	6	—	Aerial Lifts	250	4	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Guard Structure Installation (5)	1-Ton Truck, 4x4	30	1	6	Passenger	—	—	—	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Guard Structure Installation (5)	3/4-Ton Truck, 4x4	30	1	6	Passenger	—	—	—	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Guard Structure Installation (5)	Extendable Flat Bed Pole Truck	30	1	6	HHDT	—	—	—	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Guard Structure Installation (5)	Worker Commute Automobile	30	6	6	Passenger	—	—	—	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Guard Structure Removal (15)	Boom/Crane Truck	20	1	6	—	Cranes	350	6	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Guard Structure Removal (15)	Compressor Trailer	20	1	6	—	Air Compressors	60	4	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Guard Structure Removal (15)	Digger Derrick 6060	20	2	6	—	Bore/Drill Rigs	300	8	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Guard Structure Removal (15)	Manlift/Bucket Truck	20	1	6	—	Aerial Lifts	250	4	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Guard Structure Removal (15)	1-Ton Truck, 4x4	20	1	6	Passenger	—	—	—	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Guard Structure Removal (15)	3/4-Ton Truck, 4x4	20	1	6	Passenger	—	—	—	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Guard Structure Removal (15)	Extendable Flat Bed Pole Truck	20	1	6	HHDT	—	—	—	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Guard Structure Removal (15)	Worker Commute Automobile	20	6	6	Passenger	—	—	—	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Install Underground Fiber	Manlift/Bucket Truck	15	3	5	—	Aerial Lifts	250	6	100	0	80	0
Transmission - 500 kV - Lugo-Moh - Install Underground Fiber	Wire Truck/Trailer	15	1	5	—	Other Construction Equipment	10	6	100	0	80	0
Transmission - 500 kV - Lugo-Moh - Install Underground Fiber	1-Ton Truck, 4x4	15	1	5	Passenger	—	—	—	100	0	80	0
Transmission - 500 kV - Lugo-Moh - Install Underground Fiber	Worker Commute Automobile	15	5	5	Passenger	—	—	—	100	0	80	0
Transmission - 500 kV - Lugo-Moh - Pull-site preparation	Backhoe/Front Loader	8	1	5	—	Tractors/Loaders/ Backhoes	200	4	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Pull-site preparation	Drum Type Compactor	8	1	5	—	Rollers	100	6	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Pull-site preparation	Excavator	4	1	5	—	Excavators	160	4	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Pull-site preparation	Motor Grader	8	1	5	—	Graders	250	6	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Pull-site preparation	Track Type Dozer	8	1	5	—	Crawler Tractors	150	4	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Pull-site preparation	1-Ton Truck, 4x4	8	1	5	Passenger	—	—	—	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Pull-site preparation	Lowboy Truck/Trailer	8	1	5	HHDT	—	—	—	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Pull-site preparation	Water Truck	8	1	5	HHDT	—	—	—	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Pull-site preparation	Worker Commute	8	5	5	Passenger	—	—	—	95	5	66	53
Transmission - 500 kV - Lugo-Moh - R/W Clearing	Backhoe/Front Loader	82	1	5	—	Tractors/Loaders/ Backhoes	200	6	95	5	66	53

Table 4.C-1. Construction Equipment and Workforce Estimates

Activity	Equipment Type	Approx. Total Days Used	Approx. Quantity	Approx. Number of Workers	On-Road Type	Off-Road Type	Output (Hp)	Approx. Use (hours/day)	Approx. Use by State (percent) CA	NV	Maximum Days Used 2019	2020
Transmission - 500 kV - Lugo-Moh - R/W Clearing	Motor Grader	82	1	5	—	Graders	250	6	95	5	66	53
Transmission - 500 kV - Lugo-Moh - R/W Clearing	Track Type Dozer	82	1	5	—	Crawler Tractors	150	6	95	5	66	53
Transmission - 500 kV - Lugo-Moh - R/W Clearing	1-Ton Truck, 4x4	82	1	5	Passenger	—	—	—	95	5	66	53
Transmission - 500 kV - Lugo-Moh - R/W Clearing	Lowboy Truck/Trailer	82	1	5	HHDT	—	—	—	95	5	66	53
Transmission - 500 kV - Lugo-Moh - R/W Clearing	Water Truck	82	1	5	HHDT	—	—	—	95	5	66	53
Transmission - 500 kV - Lugo-Moh - R/W Clearing	Worker Commute Automobile	82	5	5	Passenger	—	—	—	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Remove OHGW, Install OPGW, Splicing, Peak Mod (14)	Hughes 530F Helicopter	210	4	44	—	—	NA	6	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Remove OHGW, Install OPGW, Splicing, Peak Mod (14)	Backhoe/Front Loader	210	1	44	—	Tractors/Loaders/ Backhoes	200	4	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Remove OHGW, Install OPGW, Splicing, Peak Mod (14)	Boom/Crane Truck	210	2	44	—	Cranes	350	8	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Remove OHGW, Install OPGW, Splicing, Peak Mod (14)	Bullwheel Puller	150	1	44	—	Other Construction Equipment	350	8	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Remove OHGW, Install OPGW, Splicing, Peak Mod (14)	D8 Cat	210	2	44	—	Crawler Tractors	350	2	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Remove OHGW, Install OPGW, Splicing, Peak Mod (14)	Manlift/Bucket Truck	210	4	44	—	Aerial Lifts	250	8	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Remove OHGW, Install OPGW, Splicing, Peak Mod (14)	R/T Crane (M)	210	2	44	—	Cranes	215	4	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Remove OHGW, Install OPGW, Splicing, Peak Mod (14)	Sag Cat w/2 winches	105	2	44	—	Crawler Tractors	350	2	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Remove OHGW, Install OPGW, Splicing, Peak Mod (14)	Skid Steer Mulcher	210	2	44	—	Tractors/Loaders/ Backhoes	110	8	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Remove OHGW, Install OPGW, Splicing, Peak Mod (14)	Static Truck/Tensioner	210	1	44	—	Other Construction Equipment	350	8	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Remove OHGW, Install OPGW, Splicing, Peak Mod (14)	Wire Truck/Trailer	150	4	44	—	Other Construction Equipment	10	6	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Remove OHGW, Install OPGW, Splicing, Peak Mod (14)	1-Ton Truck, 4x4	210	6	44	Passenger	—	—	—	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Remove OHGW, Install OPGW, Splicing, Peak Mod (14)	3/4-Ton Truck, 4x4	210	4	44	Passenger	—	—	—	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Remove OHGW, Install OPGW, Splicing, Peak Mod (14)	Dump Truck	210	1	44	HHDT	—	—	—	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Remove OHGW, Install OPGW, Splicing, Peak Mod (14)	Fuel, Helicopter Support Truck	210	4	44	HHDT	—	—	—	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Remove OHGW, Install OPGW, Splicing, Peak Mod (14)	Lowboy Truck/Trailer	210	3	44	HHDT	—	—	—	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Remove OHGW, Install OPGW, Splicing, Peak Mod (14)	Splicing Lab	210	2	44	Passenger	—	—	—	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Remove OHGW, Install OPGW, Splicing, Peak Mod (14)	Worker Commute Automobile	210	44	44	Passenger	—	—	—	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Restoration (16)	Backhoe/Front Loader	82	1	7	—	Tractors/Loaders/ Backhoes	200	4	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Restoration (16)	Drum Type Compactor	82	1	7	—	Rollers	100	4	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Restoration (16)	Motor Grader	82	1	7	—	Graders	250	6	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Restoration (16)	1-Ton Truck, 4x4	82	2	7	Passenger	—	—	—	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Restoration (16)	Lowboy Truck/Trailer	82	1	7	HHDT	—	—	—	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Restoration (16)	Water Truck	82	1	7	HHDT	—	—	—	95	5	66	53
Transmission - 500 kV - Lugo-Moh - Restoration (16)	Worker Commute	82	7	7	Passenger	—	—	—	95	5	66	53
Transmission - 500 kV - Marshalling Yard (2)	Boom/Crane Truck	78	1	4	—	Cranes	350	2	75	25	79	0
Transmission - 500 kV - Marshalling Yard (2)	R/T Forklift	78	1	4	—	Rough Terrain Forklifts	125	6	75	25	79	0
Transmission - 500 kV - Marshalling Yard (2)	1-Ton Truck, 4x4	78	1	4	Passenger	—	—	—	75	25	79	0
Transmission - 500 kV - Marshalling Yard (2)	Truck, Semi-Tractor	78	1	4	HHDT	—	—	—	75	25	79	0

Table 4.C-1. Construction Equipment and Workforce Estimates

Activity	Equipment Type	Approx. Total Days Used	Approx. Quantity	Approx. Number of Workers	On-Road Type	Off-Road Type	Output (Hp)	Approx. Use (hours/day)	Approx. Use by State (percent) CA	NV	Maximum Days Used 2019	2020
Transmission - 500 kV - Marshalling Yard (2)	Water Truck	78	1	4	HHDT	—	—	—	75	25	79	0
Transmission - 500 kV - Marshalling Yard (2)	Worker Commute Automobile	78	4	4	Passenger	—	—	—	75	25	79	0
Transmission - 500 kV - Moh-Eld - Guard Structure Installation (5)	Auger Truck	30	1	6	—	Bore/Drill Rigs	210	4	0	100	54	0
Transmission - 500 kV - Moh-Eld - Guard Structure Installation (5)	Boom/Crane Truck	30	1	6	—	Cranes	350	6	0	100	54	0
Transmission - 500 kV - Moh-Eld - Guard Structure Installation (5)	Compressor Trailer	30	1	6	—	Air Compressors	60	4	0	100	54	0
Transmission - 500 kV - Moh-Eld - Guard Structure Installation (5)	Digger Derrick 6060	30	2	6	—	Bore/Drill Rigs	300	8	0	100	54	0
Transmission - 500 kV - Moh-Eld - Guard Structure Installation (5)	Manlift/Bucket Truck	30	1	6	—	Aerial Lifts	250	4	0	100	54	0
Transmission - 500 kV - Moh-Eld - Guard Structure Installation (5)	1-Ton Truck, 4x4	30	1	6	Passenger	—	—	—	0	100	54	0
Transmission - 500 kV - Moh-Eld - Guard Structure Installation (5)	3/4-Ton Truck, 4x4	30	1	6	Passenger	—	—	—	0	100	54	0
Transmission - 500 kV - Moh-Eld - Guard Structure Installation (5)	Extendable Flat Bed Pole Truck	30	1	6	HHDT	—	—	—	0	100	54	0
Transmission - 500 kV - Moh-Eld - Guard Structure Installation (5)	Worker Commute Automobile	30	6	6	Passenger	—	—	—	0	100	54	0
Transmission - 500 kV - Moh-Eld - Guard Structure Removal (15)	Boom/Crane Truck	20	1	6	—	Cranes	350	6	0	100	54	0
Transmission - 500 kV - Moh-Eld - Guard Structure Removal (15)	Compressor Trailer	20	1	6	—	Air Compressors	60	4	0	100	54	0
Transmission - 500 kV - Moh-Eld - Guard Structure Removal (15)	Digger Derrick 6060	20	2	6	—	Bore/Drill Rigs	300	8	0	100	54	0
Transmission - 500 kV - Moh-Eld - Guard Structure Removal (15)	Manlift/Bucket Truck	20	1	6	—	Aerial Lifts	250	4	0	100	54	0
Transmission - 500 kV - Moh-Eld - Guard Structure Removal (15)	1-Ton Truck, 4x4	20	1	6	Passenger	—	—	—	0	100	54	0
Transmission - 500 kV - Moh-Eld - Guard Structure Removal (15)	3/4-Ton Truck, 4x4	20	1	6	Passenger	—	—	—	0	100	54	0
Transmission - 500 kV - Moh-Eld - Guard Structure Removal (15)	Extendable Flat Bed Pole Truck	20	1	6	HHDT	—	—	—	0	100	54	0
Transmission - 500 kV - Moh-Eld - Guard Structure Removal (15)	Worker Commute Automobile	20	6	6	Passenger	—	—	—	0	100	54	0
Transmission - 500 kV - Moh-Eld - LST Foundation Reinforcement14	Auger Truck	20	1	7	—	Bore/Drill Rigs	210	6	0	100	7	0
Transmission - 500 kV - Moh-Eld - LST Foundation Reinforcement14	Backhoe/Front Loader	20	1	7	—	Tractors/Loaders/ Backhoes	200	6	0	100	7	0
Transmission - 500 kV - Moh-Eld - LST Foundation Reinforcement14	Boom/Crane Truck	20	1	7	—	Cranes	350	4	0	100	7	0
Transmission - 500 kV - Moh-Eld - LST Foundation Reinforcement14	3/4-Ton Truck, 4x4	20	2	7	Passenger	—	—	—	0	100	7	0
Transmission - 500 kV - Moh-Eld - LST Foundation Reinforcement14	Concrete Mixer Truck	15	3	7	HHDT	—	—	—	0	100	7	0
Transmission - 500 kV - Moh-Eld - LST Foundation Reinforcement14	Dump Truck	20	1	7	HHDT	—	—	—	0	100	7	0
Transmission - 500 kV - Moh-Eld - LST Foundation Reinforcement14	Water Truck	20	1	7	HHDT	—	—	—	0	100	7	0
Transmission - 500 kV - Moh-Eld - LST Foundation Reinforcement14	Worker Commute Automobile	20	7	7	Passenger	—	—	—	0	100	7	0
Transmission - 500 kV - Moh-Eld - Pull-site preparation	Backhoe/Front Loader	8	1	5	—	Tractors/Loaders/ Backhoes	200	4	0	100	54	0
Transmission - 500 kV - Moh-Eld - Pull-site preparation	Drum Type Compactor	8	1	5	—	Rollers	100	6	0	100	54	0
Transmission - 500 kV - Moh-Eld - Pull-site preparation	Excavator	4	1	5	—	Excavators	160	4	0	100	54	0
Transmission - 500 kV - Moh-Eld - Pull-site preparation	Motor Grader	8	1	5	—	Graders	250	6	0	100	54	0
Transmission - 500 kV - Moh-Eld - Pull-site preparation	Track Type Dozer	8	1	5	—	Crawler Tractors	150	4	0	100	54	0
Transmission - 500 kV - Moh-Eld - Pull-site preparation	1-Ton Truck, 4x4	8	1	5	Passenger	—	—	—	0	100	54	0
Transmission - 500 kV - Moh-Eld - Pull-site preparation	Lowboy Truck/Trailer	8	1	5	HHDT	—	—	—	0	100	54	0
Transmission - 500 kV - Moh-Eld - Pull-site preparation	Water Truck	8	1	5	HHDT	—	—	—	0	100	54	0
Transmission - 500 kV - Moh-Eld - Pull-site preparation	Worker Commute	8	5	5	Passenger	—	—	—	0	100	54	0
Transmission - 500 kV - Moh-Eld - R/W Clearing	Backhoe/Front Loader	82	1	5	—	Tractors/Loaders/ Backhoes	200	6	0	100	54	0
Transmission - 500 kV - Moh-Eld - R/W Clearing	Motor Grader	82	1	5	—	Graders	250	6	0	100	54	0

Table 4.C-1. Construction Equipment and Workforce Estimates

Activity	Equipment Type	Approx. Total Days Used	Approx. Quantity	Approx. Number of Workers	On-Road Type	Off-Road Type	Output (Hp)	Approx. Use (hours/day)	Approx. Use by State (percent) CA	NV	Maximum Days Used 2019	2020
Transmission - 500 kV - Moh-Eld - R/W Clearing	Track Type Dozer	82	1	5	—	Crawler Tractors	150	6	0	100	54	0
Transmission - 500 kV - Moh-Eld - R/W Clearing	1-Ton Truck, 4x4	82	1	5	Passenger	—	—	—	0	100	54	0
Transmission - 500 kV - Moh-Eld - R/W Clearing	Lowboy Truck/Trailer	82	1	5	HHDT	—	—	—	0	100	54	0
Transmission - 500 kV - Moh-Eld - R/W Clearing	Water Truck	82	1	5	HHDT	—	—	—	0	100	54	0
Transmission - 500 kV - Moh-Eld - R/W Clearing	Worker Commute Automobile	82	5	5	Passenger	—	—	—	0	100	54	0
Transmission - 500 kV - Moh-Eld - Remove OHGW, Install OPGW, Splicing, Peak Mod (14)	Hughes 530F Helicopter	210	4	44	—	—	NA	6	0	100	54	0
Transmission - 500 kV - Moh-Eld - Remove OHGW, Install OPGW, Splicing, Peak Mod (14)	Backhoe/Front Loader	210	1	44	—	Tractors/Loaders/ Backhoes	200	4	0	100	54	0
Transmission - 500 kV - Moh-Eld - Remove OHGW, Install OPGW, Splicing, Peak Mod (14)	Boom/Crane Truck	210	2	44	—	Cranes	350	8	0	100	54	0
Transmission - 500 kV - Moh-Eld - Remove OHGW, Install OPGW, Splicing, Peak Mod (14)	Bullwheel Puller	150	1	44	—	Other Construction Equipment	350	8	0	100	54	0
Transmission - 500 kV - Moh-Eld - Remove OHGW, Install OPGW, Splicing, Peak Mod (14)	D8 Cat	210	2	44	—	Crawler Tractors	350	2	0	100	54	0
Transmission - 500 kV - Moh-Eld - Remove OHGW, Install OPGW, Splicing, Peak Mod (14)	Manlift/Bucket Truck	210	4	44	—	Aerial Lifts	250	8	0	100	54	0
Transmission - 500 kV - Moh-Eld - Remove OHGW, Install OPGW, Splicing, Peak Mod (14)	R/T Crane (M)	210	2	44	—	Cranes	215	4	0	100	54	0
Transmission - 500 kV - Moh-Eld - Remove OHGW, Install OPGW, Splicing, Peak Mod (14)	Sag Cat w/2 winches	105	2	44	—	Crawler Tractors	350	2	0	100	54	0
Transmission - 500 kV - Moh-Eld - Remove OHGW, Install OPGW, Splicing, Peak Mod (14)	Skid Steer Mulcher	210	2	44	—	Tractors/Loaders/ Backhoes	110	8	0	100	54	0
Transmission - 500 kV - Moh-Eld - Remove OHGW, Install OPGW, Splicing, Peak Mod (14)	Static Truck/Tensioner	210	1	44	—	Other Construction Equipment	350	8	0	100	54	0
Transmission - 500 kV - Moh-Eld - Remove OHGW, Install OPGW, Splicing, Peak Mod (14)	Wire Truck/Trailer	150	4	44	—	Other Construction Equipment	10	6	0	100	54	0
Transmission - 500 kV - Moh-Eld - Remove OHGW, Install OPGW, Splicing, Peak Mod (14)	1-Ton Truck, 4x4	210	6	44	Passenger	—	—	—	0	100	54	0
Transmission - 500 kV - Moh-Eld - Remove OHGW, Install OPGW, Splicing, Peak Mod (14)	3/4-Ton Truck, 4x4	210	4	44	Passenger	—	—	—	0	100	54	0
Transmission - 500 kV - Moh-Eld - Remove OHGW, Install OPGW, Splicing, Peak Mod (14)	Dump Truck	210	1	44	HHDT	—	—	—	0	100	54	0
Transmission - 500 kV - Moh-Eld - Remove OHGW, Install OPGW, Splicing, Peak Mod (14)	Fuel, Helicopter Support Truck	210	4	44	HHDT	—	—	—	0	100	54	0
Transmission - 500 kV - Moh-Eld - Remove OHGW, Install OPGW, Splicing, Peak Mod (14)	Lowboy Truck/Trailer	210	3	44	HHDT	—	—	—	0	100	54	0
Transmission - 500 kV - Moh-Eld - Remove OHGW, Install OPGW, Splicing, Peak Mod (14)	Splicing Lab	210	2	44	Passenger	—	—	—	0	100	54	0
Transmission - 500 kV - Moh-Eld - Remove OHGW, Install OPGW, Splicing, Peak Mod (14)	Worker Commute Automobile	210	44	44	Passenger	—	—	—	0	100	54	0
Transmission - 500 kV - Moh-Eld - Restoration (16)	Backhoe/Front Loader	82	1	7	—	Tractors/Loaders/ Backhoes	200	4	0	100	54	0
Transmission - 500 kV - Moh-Eld - Restoration (16)	Drum Type Compactor	82	1	7	—	Rollers	100	4	0	100	54	0
Transmission - 500 kV - Moh-Eld - Restoration (16)	Motor Grader	82	1	7	—	Graders	250	6	0	100	54	0
Transmission - 500 kV - Moh-Eld - Restoration (16)	1-Ton Truck, 4x4	82	2	7	Passenger	—	—	—	0	100	54	0
Transmission - 500 kV - Moh-Eld - Restoration (16)	Lowboy Truck/Trailer	82	1	7	HHDT	—	—	—	0	100	54	0
Transmission - 500 kV - Moh-Eld - Restoration (16)	Water Truck	82	1	7	HHDT	—	—	—	0	100	54	0
Transmission - 500 kV - Moh-Eld - Restoration (16)	Worker Commute Automobile	82	7	7	Passenger	—	—	—	0	100	54	0
Transmission - 500 kV - Overhead Conductor Modifications	Manlift/Bucket Truck	6	3	5	—	Aerial Lifts	250	6	100	0	79	1
Transmission - 500 kV - Overhead Conductor Modifications	Wire Truck/Trailer	6	1	5	—	Other Construction Equipment	10	6	100	0	79	1
Transmission - 500 kV - Overhead Conductor Modifications	1-Ton Truck, 4x4	6	1	5	Passenger	—	—	—	100	0	79	1
Transmission - 500 kV - Overhead Conductor Modifications	Worker Commute Automobile	6	5	5	Passenger	—	—	—	100	0	79	1
Transmission - 500 kV - Install TSP Foundations	Auger Truck	3	1	6	—	Bore/Drill Rigs	210	6	100	0	53	104

Table 4.C-1. Construction Equipment and Workforce Estimates

Activity	Equipment Type	Approx. Total Days Used	Approx. Quantity	Approx. Number of Workers	On-Road Type	Off-Road Type	Output (Hp)	Approx. Use (hours/day)	Approx. Use by State (percent) CA	NV	Maximum Days Used 2019	2020
Transmission - 500 kV - Install TSP Foundations	Backhoe/Front Loader	6	1	6	—	Tractors/Loaders/ Backhoes	200	6	100	0	53	104
Transmission - 500 kV - Install TSP Foundations	Boom/Crane Truck	6	1	6	—	Cranes	350	4	100	0	53	104
Transmission - 500 kV - Install TSP Foundations	3/4-Ton Truck, 4x4	6	2	6	Passenger	—	—	—	100	0	53	104
Transmission - 500 kV - Install TSP Foundations	Concrete Mixer Truck	4	3	6	HHDT	—	—	—	100	0	53	104
Transmission - 500 kV - Install TSP Foundations	Dump Truck	6	1	6	HHDT	—	—	—	100	0	53	104
Transmission - 500 kV - Install TSP Foundations	Water Truck	6	1	6	HHDT	—	—	—	100	0	53	104
Transmission - 500 kV - Install TSP Foundations	Worker Commute	6	6	6	Passenger	—	—	—	100	0	53	104
Transmission - 500 kV - Install Trench (17)	Backhoe/Front Loader	90	1	8	—	Tractors/Loaders/ Backhoes	200	6	75	25	79	78
Transmission - 500 kV - Install Trench (17)	Compressor Trailer	90	1	8	—	Air Compressors	60	6	75	25	79	78
Transmission - 500 kV - Install Trench (17)	1-Ton Truck, 4x4	90	2	8	Passenger	—	—	—	75	25	79	78
Transmission - 500 kV - Install Trench (17)	Dump Truck	90	2	8	HHDT	—	—	—	75	25	79	78
Transmission - 500 kV - Install Trench (17)	Water Truck	90	1	8	HHDT	—	—	—	75	25	79	78
Transmission - 500 kV - Install Trench (17)	Worker Commute	90	8	8	Passenger	—	—	—	75	25	79	78
Transmission - 500 kV - TSP Assembly	Boom/Crane Truck	2	1	10	—	Cranes	350	8	100	0	53	104
Transmission - 500 kV - TSP Assembly	Compressor Trailer	2	1	10	—	Air Compressors	60	6	100	0	53	104
Transmission - 500 kV - TSP Assembly	1-Ton Truck, 4x4	2	2	10	Passenger	—	—	—	100	0	53	104
Transmission - 500 kV - TSP Assembly	3/4-Ton Truck, 4x4	2	2	10	Passenger	—	—	—	100	0	53	104
Transmission - 500 kV - TSP Assembly	Worker Commute	2	10	10	Passenger	—	—	—	100	0	53	104
Transmission - 500 kV - TSP Erection	Compressor Trailer	2	1	10	—	Air Compressors	60	4	100	0	53	104
Transmission - 500 kV - TSP Erection	R/T Crane (L)	2	1	10	—	Cranes	275	8	100	0	53	104
Transmission - 500 kV - TSP Erection	1-Ton Truck, 4x4	2	2	10	Passenger	—	—	—	100	0	53	104
Transmission - 500 kV - TSP Erection	3/4-Ton Truck, 4x4	2	2	10	Passenger	—	—	—	100	0	53	104
Transmission - 500 kV - TSP Erection	Worker Commute Automobile	2	10	10	Passenger	—	—	—	100	0	53	104
Transmission - 500 kV - TSP Foundation Removal	Backhoe/Front Loader	8	1	4	—	Tractors/Loaders/ Backhoes	200	6	100	0	53	104
Transmission - 500 kV - TSP Foundation Removal	Compressor Trailer	8	1	4	—	Air Compressors	60	8	100	0	53	104
Transmission - 500 kV - TSP Foundation Removal	Excavator	8	1	4	—	Excavators	160	4	100	0	53	104
Transmission - 500 kV - TSP Foundation Removal	3/4-Ton Truck, 4x4	8	1	4	Passenger	—	—	—	100	0	53	104
Transmission - 500 kV - TSP Foundation Removal	Dump Truck	8	1	4	HHDT	—	—	—	100	0	53	104
Transmission - 500 kV - TSP Foundation Removal	Worker Commute Automobile	8	4	4	Passenger	—	—	—	100	0	53	104
Transmission - 500 kV - TSP Haul	Boom/Crane Truck	1	1	4	—	Cranes	350	6	100	0	53	104
Transmission - 500 kV - TSP Haul	3/4-Ton Truck, 4x4	1	1	4	Passenger	—	—	—	100	0	53	104
Transmission - 500 kV - TSP Haul	Flat Bed Pole Truck	1	1	4	HHDT	—	—	—	100	0	53	104
Transmission - 500 kV - TSP Haul	Worker Commute Automobile	1	4	4	Passenger	—	—	—	100	0	53	104
Transmission - 500 kV - TSP Removal	Boom/Crane Truck	6	1	6	—	Cranes	350	6	100	0	53	104
Transmission - 500 kV - TSP Removal	Compressor Trailer	6	1	6	—	Air Compressors	60	8	100	0	53	104
Transmission - 500 kV - TSP Removal	R/T Crane (M)	6	1	6	—	Cranes	215	6	100	0	53	104
Transmission - 500 kV - TSP Removal	1-Ton Truck, 4x4	6	2	6	Passenger	—	—	—	100	0	53	104
Transmission - 500 kV - TSP Removal	Flat Bed Truck/Trailer	6	1	6	HHDT	—	—	—	100	0	53	104

Table 4.C-1. Construction Equipment and Workforce Estimates

Activity	Equipment Type	Approx. Total Days Used	Approx. Quantity	Approx. Number of Workers	On-Road Type	Off-Road Type	Output (Hp)	Approx. Use (hours/day)	Approx. Use by State (percent) CA	NV	Maximum Days Used 2019	2020
Transmission - 500 kV - TSP Removal	Worker Commute Automobile	6	6	6	Passenger	—	—	—	100	0	53	104
Transmission - 500 kV - Wood Pole Modification (6)	Boom/Crane Truck	2	1	10	—	Cranes	350	6	75	25	105	91
Transmission - 500 kV - Wood Pole Modification (6)	Compressor Trailer	2	1	10	—	Air Compressors	60	4	75	25	105	91
Transmission - 500 kV - Wood Pole Modification (6)	Manlift/Bucket Truck	2	1	10	—	Aerial Lifts	250	6	75	25	105	91
Transmission - 500 kV - Wood Pole Modification (6)	1-Ton Truck, 4x4	2	2	10	Passenger	—	—	—	75	25	105	91
Transmission - 500 kV - Wood Pole Modification (6)	Flat Bed Truck/Trailer	2	1	10	HHDT	—	—	—	75	25	105	91
Transmission - 500 kV - Wood Pole Modification (6)	Worker Commute Automobile	2	10	10	Passenger	—	—	—	75	25	105	91
Telecommunications												
Telecom - Barstow Communication Repeater - Tower/Shelter Installation	Backhoe/Front Loader	10	1	8	—	Tractors/Loaders/ Backhoes	200	6	100	0	79	0
Telecom - Barstow Communication Repeater - Tower/Shelter Installation	Concrete Pump	2	1	8	—	Pumps	350	6	100	0	79	0
Telecom - Barstow Communication Repeater - Tower/Shelter Installation	Crane	6	1	8	—	Cranes	350	4	100	0	79	0
Telecom - Barstow Communication Repeater - Tower/Shelter Installation	Drill Rig	7	1	8	—	Bore/Drill Rigs	500	6	100	0	79	0
Telecom - Barstow Communication Repeater - Tower/Shelter Installation	Fork lift	10	1	8	—	Forklifts	200	4	100	0	79	0
Telecom - Barstow Communication Repeater - Tower/Shelter Installation	1-Ton Crew Cab 4x4	12	1	8	Passenger	—	—	—	100	0	79	0
Telecom - Barstow Communication Repeater - Tower/Shelter Installation	2-Ton Truck	12	1	8	Delivery	—	—	—	100	0	79	0
Telecom - Barstow Communication Repeater - Tower/Shelter Installation	Concrete Truck	2	1	8	HHDT	—	—	—	100	0	79	0
Telecom - Barstow Communication Repeater - Tower/Shelter Installation	Dump Truck	7	1	8	HHDT	—	—	—	100	0	79	0
Telecom - Barstow Communication Repeater - Tower/Shelter Installation	Flat Bed Truck	2	1	8	HHDT	—	—	—	100	0	79	0
Telecom - Barstow Communication Repeater - Tower/Shelter Installation	Worker Commute Automobile	12	8	8	Passenger	—	—	—	100	0	79	0
Telecom - Kelbaker Communication Repeater - Tower/Shelter Installation	Backhoe/front loader	10	1	8	—	Tractors/Loaders/ Backhoes	200	6	100	0	79	0
Telecom - Kelbaker Communication Repeater - Tower/Shelter Installation	Concrete Pump	2	1	8	—	Pumps	350	6	100	0	79	0
Telecom - Kelbaker Communication Repeater - Tower/Shelter Installation	Crane	6	1	8	—	Cranes	350	4	100	0	79	0
Telecom - Kelbaker Communication Repeater - Tower/Shelter Installation	Drill Rig	7	1	8	—	Bore/Drill Rigs	500	6	100	0	79	0
Telecom - Kelbaker Communication Repeater - Tower/Shelter Installation	Fork lift	10	1	8	—	Forklifts	200	4	100	0	79	0
Telecom - Kelbaker Communication Repeater - Tower/Shelter Installation	1-Ton Crew Cab 4x4	12	1	8	Passenger	—	—	—	100	0	79	0
Telecom - Kelbaker Communication Repeater - Tower/Shelter Installation	2-Ton Truck	12	1	8	Delivery	—	—	—	100	0	79	0
Telecom - Kelbaker Communication Repeater - Tower/Shelter Installation	Concrete Truck	2	1	8	HHDT	—	—	—	100	0	79	0
Telecom - Kelbaker Communication Repeater - Tower/Shelter Installation	Dump Truck	7	1	8	HHDT	—	—	—	100	0	79	0
Telecom - Kelbaker Communication Repeater - Tower/Shelter Installation	Flat Bed Truck	2	1	8	HHDT	—	—	—	100	0	79	0
Telecom - Kelbaker Communication Repeater - Tower/Shelter Installation	Worker Commute	12	8	8	Passenger	—	—	—	100	0	79	0
Telecom - Lanfair Communication Repeater - Tower/Shelter Installation	Backhoe/Front Loader	10	1	8	—	Tractors/Loaders/ Backhoes	200	6	100	0	79	0
Telecom - Lanfair Communication Repeater - Tower/Shelter Installation	Concrete Pump	2	1	8	—	Pumps	350	6	100	0	79	0
Telecom - Lanfair Communication Repeater - Tower/Shelter Installation	Crane	6	1	8	—	Cranes	350	4	100	0	79	0
Telecom - Lanfair Communication Repeater - Tower/Shelter Installation	Drill Rig	7	1	8	—	Bore/Drill Rigs	500	6	100	0	79	0
Telecom - Lanfair Communication Repeater - Tower/Shelter Installation	Fork lift	10	1	8	—	Forklifts	200	4	100	0	79	0
Telecom - Lanfair Communication Repeater - Tower/Shelter Installation	1-Ton Crew Cab 4x4	12	1	8	Passenger	—	—	—	100	0	79	0
Telecom - Lanfair Communication Repeater - Tower/Shelter Installation	2-Ton Truck	12	1	8	Delivery	—	—	—	100	0	79	0
Telecom - Lanfair Communication Repeater - Tower/Shelter Installation	Concrete Truck	2	1	8	HHDT	—	—	—	100	0	79	0

Table 4.C-1. Construction Equipment and Workforce Estimates

Activity	Equipment Type	Approx. Total Days Used	Approx. Quantity	Approx. Number of Workers	On-Road Type	Off-Road Type	Output (Hp)	Approx. Use (hours/day)	Approx. Use by State (percent) CA	Approx. Use by State (percent) NV	Maximum Days Used 2019	Maximum Days Used 2020
Telecom - Lanfair Communication Repeater - Tower/Shelter Installation	Dump Truck	7	1	8	HHDT	—	—	—	100	0	79	0
Telecom - Lanfair Communication Repeater - Tower/Shelter Installation	Flat Bed Truck	2	1	8	HHDT	—	—	—	100	0	79	0
Telecom - Lanfair Communication Repeater - Tower/Shelter Installation	Worker Commute Automobile	12	8	8	Passenger	—	—	—	100	0	79	0
Distribution												
Distribution - Barstow Communication Repeater - Overhead Line Work (2)	55-Foot Double Bucket Truck	1	1	6	—	Aerial Lifts	300	7	100	0	79	78
Distribution - Barstow Communication Repeater - Overhead Line Work (2)	60-Foot Digger Derrick	1	1	6	—	Bore/Drill Rigs	275	4	100	0	79	78
Distribution - Barstow Communication Repeater - Overhead Line Work (2)	1-Ton Crew Cab, 4x4	1	1	6	Passenger	—	—	—	100	0	79	78
Distribution - Barstow Communication Repeater - Overhead Line Work (2)	Worker Commute Automobile	1	6	6	Passenger	—	—	—	100	0	79	78
Distribution - Barstow Communication Repeater - Pole Installation (5)	55-Foot Double Bucket Truck	1	1	6	—	Aerial Lifts	300	7	100	0	79	78
Distribution - Barstow Communication Repeater - Pole Installation (5)	60-Foot Digger Derrick	1	1	6	—	Bore/Drill Rigs	275	4	100	0	79	78
Distribution - Barstow Communication Repeater - Pole Installation (5)	1-Ton Crew Cab, 4x4	1	2	6	Passenger	—	—	—	100	0	79	78
Distribution - Barstow Communication Repeater - Pole Installation (5)	Worker Commute Automobile	1	6	6	Passenger	—	—	—	100	0	79	78
Distribution - Barstow Communication Repeater - Trenching, Structure Excavation (1)	Backhoe Front Loader	1	1	4	—	Tractors/Loaders/ Backhoes	300	8	100	0	79	78
Distribution - Barstow Communication Repeater - Trenching, Structure Excavation (1)	1-Ton Crew Cab	1	1	4	Passenger	—	—	—	100	0	79	78
Distribution - Barstow Communication Repeater - Trenching, Structure Excavation (1)	Dump Truck	1	1	4	HHDT	—	—	—	100	0	79	78
Distribution - Barstow Communication Repeater - Trenching, Structure Excavation (1)	Worker Commute Automobile	1	4	4	Passenger	—	—	—	100	0	79	78
Distribution - Barstow Communication Repeater - Underground Cable Makeup (4)	55-Foot Double Bucket Truck	1	1	3	—	Aerial Lifts	300	4	100	0	79	78
Distribution - Barstow Communication Repeater - Underground Cable Makeup (4)	1- Ton Crew Cab, 4x4	1	1	3	Passenger	—	—	—	100	0	79	78
Distribution - Barstow Communication Repeater - Underground Cable Makeup (4)	Worker Commute Automobile	1	3	3	Passenger	—	—	—	100	0	79	78
Distribution - Barstow Communication Repeater - Underground Cable Pulling (3) & Transformer Installation	55-Foot Double Bucket Truck	1	1	4	—	Aerial Lifts	300	7	100	0	79	78
Distribution - Barstow Communication Repeater - Underground Cable Pulling (3) & Transformer Installation	Hydraulic Rewind Puller	1	1	4	—	Other Construction Equipment	300	6	100	0	79	78
Distribution - Barstow Communication Repeater - Underground Cable Pulling (3) & Transformer Installation	1-Ton Crew Cab, 4x4	1	1	4	Passenger	—	—	—	100	0	79	78
Distribution - Barstow Communication Repeater - Underground Cable Pulling (3) & Transformer Installation	Worker Commute Automobile	1	4	4	Passenger	—	—	—	100	0	79	78
Distribution - Deep Creek T-Line Undercrossing - Overhead Line Work (2)	55-Foot Double Bucket Truck	1	1	6	—	Aerial Lifts	300	7	100	0	39	0
Distribution - Deep Creek T-Line Undercrossing - Overhead Line Work (2)	60-Foot Digger Derrick	1	1	6	—	Bore/Drill Rigs	275	4	100	0	39	0
Distribution - Deep Creek T-Line Undercrossing - Overhead Line Work (2)	1-Ton Crew Cab, 4x4	1	1	6	Passenger	—	—	—	100	0	39	0
Distribution - Deep Creek T-Line Undercrossing - Overhead Line Work (2)	Worker Commute Automobile	1	6	6	Passenger	—	—	—	100	0	39	0
Distribution - Kelbaker Communication Repeater - Overhead Line Work (2)	55-Foot Double Bucket Truck	2	1	6	—	Aerial Lifts	300	7	100	0	79	78
Distribution - Kelbaker Communication Repeater - Overhead Line Work (2)	60-Foot Digger Derrick	2	1	6	—	Bore/Drill Rigs	275	4	100	0	79	78
Distribution - Kelbaker Communication Repeater - Overhead Line Work (2)	1-Ton Crew Cab, 4x4	2	1	6	Passenger	—	—	—	100	0	79	78
Distribution - Kelbaker Communication Repeater - Overhead Line Work (2)	Worker Commute Automobile	2	6	6	Passenger	—	—	—	100	0	79	78
Distribution - Kelbaker Communication Repeater - Pole Installation (5)	55-Foot Double Bucket Truck	4	1	6	—	Aerial Lifts	300	7	100	0	79	78
Distribution - Kelbaker Communication Repeater - Pole Installation (5)	60-Foot Digger Derrick	4	1	6	—	Bore/Drill Rigs	275	4	100	0	79	78
Distribution - Kelbaker Communication Repeater - Pole Installation (5)	1-Ton Crew Cab, 4x4	4	2	6	Passenger	—	—	—	100	0	79	78
Distribution - Kelbaker Communication Repeater - Pole Installation (5)	Worker Commute Automobile	4	6	6	Passenger	—	—	—	100	0	79	78
Distribution - Kelbaker Communication Repeater - Trenching, Structure Excavation (1)	Backhoe/Front Loader	1	1	4	—	Tractors/Loaders/ Backhoes	200	8	100	0	79	78

Table 4.C-1. Construction Equipment and Workforce Estimates

Activity	Equipment Type	Approx. Total Days Used	Approx. Quantity	Approx. Number of Workers	On-Road Type	Off-Road Type	Output (Hp)	Approx. Use (hours/day)	Approx. Use by State (percent)		Maximum Days Used	
									CA	NV	2019	2020
Distribution - Kelbaker Communication Repeater - Trenching, Structure Excavation (1)	1-Ton Crew Cab	1	1	4	Passenger	—	—	—	100	0	79	78
Distribution - Kelbaker Communication Repeater - Trenching, Structure Excavation (1)	Dump Truck	1	1	4	HHDT	—	—	—	100	0	79	78
Distribution - Kelbaker Communication Repeater - Trenching, Structure Excavation (1)	Worker Commute Automobile	1	4	4	Passenger	—	—	—	100	0	79	78
Distribution - Kelbaker Communication Repeater - Underground Cable Makeup (4)	55-Foot Double Bucket Truck	1	1	3	—	Aerial Lifts	300	4	100	0	79	78
Distribution - Kelbaker Communication Repeater - Underground Cable Makeup (4)	1-Ton Crew Cab, 4x4	1	1	3	Passenger	—	—	—	100	0	79	78
Distribution - Kelbaker Communication Repeater - Underground Cable Makeup (4)	Worker Commute Automobile	1	3	3	Passenger	—	—	—	100	0	79	78
Distribution - Kelbaker Communication Repeater - Underground Cable Pulling (3) & Transformer Installation	55-Foot Double Bucket Truck	1	1	4	—	Aerial Lifts	300	7	100	0	79	78
Distribution - Kelbaker Communication Repeater - Underground Cable Pulling (3) & Transformer Installation	Hydraulic Rewind Puller	1	1	4	—	Other Construction Equipment	300	6	100	0	79	78
Distribution - Kelbaker Communication Repeater - Underground Cable Pulling (3) & Transformer Installation	1-Ton Crew Cab, 4x4	1	1	4	Passenger	—	—	—	100	0	79	78
Distribution - Kelbaker Communication Repeater - Underground Cable Pulling (3) & Transformer Installation	Worker Commute Automobile	1	4	4	Passenger	—	—	—	100	0	79	78
Distribution - Lanfair Communication Repeater - Overhead Line Work (2)	55-Foot Double Bucket Truck	3	1	6	—	Aerial Lifts	300	7	100	0	79	78
Distribution - Lanfair Communication Repeater - Overhead Line Work (2)	60-Foot Digger Derrick	3	1	6	—	Bore/Drill Rigs	275	4	100	0	79	78
Distribution - Lanfair Communication Repeater - Overhead Line Work (2)	1-Ton Crew Cab, 4x4	3	1	6	Passenger	—	—	—	100	0	79	78
Distribution - Lanfair Communication Repeater - Overhead Line Work (2)	Worker Commute Automobile	3	6	6	Passenger	—	—	—	100	0	79	78
Distribution - Lanfair Communication Repeater - Pole Installation (5)	55-Foot Double Bucket Truck	9	1	6	—	Aerial Lifts	300	7	100	0	79	78
Distribution - Lanfair Communication Repeater - Pole Installation (5)	60-Foot Digger Derrick	9	1	6	—	Bore/Drill Rigs	275	4	100	0	79	78
Distribution - Lanfair Communication Repeater - Pole Installation (5)	1-Ton Crew Cab, 4x4	9	2	6	Passenger	—	—	—	100	0	79	78
Distribution - Lanfair Communication Repeater - Pole Installation (5)	Worker Commute Automobile	9	6	6	Passenger	—	—	—	100	0	79	78
Distribution - Lanfair Communication Repeater - Trenching, Structure Excavation (1)	Backhoe Front Loader	1	1	4	—	Tractors/Loaders/ Backhoes	300	8	100	0	79	78
Distribution - Lanfair Communication Repeater - Trenching, Structure Excavation (1)	1-Ton Crew Cab	1	1	4	Passenger	—	—	—	100	0	79	78
Distribution - Lanfair Communication Repeater - Trenching, Structure Excavation (1)	Dump Truck	1	1	4	HHDT	—	—	—	100	0	79	78
Distribution - Lanfair Communication Repeater - Trenching, Structure Excavation (1)	Worker Commute Automobile	1	4	4	Passenger	—	—	—	100	0	79	78
Distribution - Lanfair Communication Repeater - Underground Cable Makeup (4)	55-Foot Double Bucket Truck	1	1	3	—	Aerial Lifts	300	4	100	0	79	78
Distribution - Lanfair Communication Repeater - Underground Cable Makeup (4)	1-Ton Crew Cab, 4x4	1	1	3	Passenger	—	—	—	100	0	79	78
Distribution - Lanfair Communication Repeater - Underground Cable Makeup (4)	Worker Commute Automobile	1	3	3	Passenger	—	—	—	100	0	79	78
Distribution - Lanfair Communication Repeater - Underground Cable Pulling (3) & Transformer Installation	55-Foot Double Bucket Truck	1	1	4	—	Aerial Lifts	300	7	100	0	79	78
Distribution - Lanfair Communication Repeater - Underground Cable Pulling (3) & Transformer Installation	Hydraulic Rewind Puller	1	1	4	—	Other Construction Equipment	300	6	100	0	79	78
Distribution - Lanfair Communication Repeater - Underground Cable Pulling (3) & Transformer Installation	1-Ton Crew Cab, 4x4	1	1	4	Passenger	—	—	—	100	0	79	78
Distribution - Lanfair Communication Repeater - Underground Cable Pulling (3) & Transformer Installation	Worker Commute Automobile	1	4	4	Passenger	—	—	—	100	0	79	78
Distribution - Ludlow Series Cap - SC5 - Overhead Line Work (2)	100-Foot Bucket Truck	4	1	6	—	Aerial Lifts	350	8	100	0	79	78
Distribution - Ludlow Series Cap - SC5 - Overhead Line Work (2)	40-Ton Crane	4	1	6	—	Cranes	300	8	100	0	79	78
Distribution - Ludlow Series Cap - SC5 - Overhead Line Work (2)	55-Foot Double Bucket Truck	40	1	6	—	Aerial Lifts	300	7	100	0	79	78
Distribution - Ludlow Series Cap - SC5 - Overhead Line Work (2)	60-Foot Digger Derrick	40	1	6	—	Bore/Drill Rigs	275	4	100	0	79	78

Table 4.C-1. Construction Equipment and Workforce Estimates

Activity	Equipment Type	Approx. Total Days Used	Approx. Quantity	Approx. Number of Workers	On-Road Type	Off-Road Type	Output (Hp)	Approx. Use (hours/day)	Approx. Use by State (percent) CA	NV	Maximum Days Used 2019	2020
Distribution - Ludlow Series Cap - SC5 - Overhead Line Work (2)	1-Ton Crew Cab, 4x4	40	2	6	Passenger	—	—	—	100	0	79	78
Distribution - Ludlow Series Cap - SC5 - Overhead Line Work (2)	Worker Commute Automobile	40	6	6	Passenger	—	—	—	100	0	79	78
Distribution - Ludlow Series Cap - SC5 - Pole Installation (5)	55-Foot Double Bucket Truck	4	1	6	—	Aerial Lifts	300	7	100	0	79	78
Distribution - Ludlow Series Cap - SC5 - Pole Installation (5)	60-Foot Digger Derrick	4	1	6	—	Bore/Drill Rigs	275	4	100	0	79	78
Distribution - Ludlow Series Cap - SC5 - Pole Installation (5)	1-Ton Crew Cab, 4x4	4	2	6	Passenger	—	—	—	100	0	79	78
Distribution - Ludlow Series Cap - SC5 - Pole Installation (5)	Worker Commute Automobile	4	6	6	Passenger	—	—	—	100	0	79	78
Distribution - Ludlow Series Cap - SC5 - Trenching, Structure Excavation (1)	Backhoe Front Loader	1	1	4	—	Tractors/Loaders/ Backhoes	300	8	100	0	79	78
Distribution - Ludlow Series Cap - SC5 - Trenching, Structure Excavation (1)	1-Ton Crew Cab	1	1	4	Passenger	—	—	—	100	0	79	78
Distribution - Ludlow Series Cap - SC5 - Trenching, Structure Excavation (1)	Dump Truck	1	1	4	HHDT	—	—	—	100	0	79	78
Distribution - Ludlow Series Cap - SC5 - Trenching, Structure Excavation (1)	Worker Commute Automobile	1	4	4	Passenger	—	—	—	100	0	79	78
Distribution - Ludlow Series Cap - SC5 - Underground Cable Makeup (4)	55-Foot Double Bucket Truck	1	1	3	—	Aerial Lifts	300	4	100	0	79	78
Distribution - Ludlow Series Cap - SC5 - Underground Cable Makeup (4)	1- Ton Crew Cab, 4x4	1	1	3	Passenger	—	—	—	100	0	79	78
Distribution - Ludlow Series Cap - SC5 - Underground Cable Makeup (4)	Worker Commute Automobile	1	3	3	Passenger	—	—	—	100	0	79	78
Distribution - Newberry Springs Series Cap - SC2 - Overhead Line Work (2)	100-Foot Bucket Truck	4	1	6	—	Aerial Lifts	350	8	100	0	79	78
Distribution - Newberry Springs Series Cap - SC2 - Overhead Line Work (2)	40-Ton Crane	4	1	6	—	Cranes	300	8	100	0	79	78
Distribution - Newberry Springs Series Cap - SC2 - Overhead Line Work (2)	55-Foot Double Bucket Truck	4	1	6	—	Aerial Lifts	300	7	100	0	79	78
Distribution - Newberry Springs Series Cap - SC2 - Overhead Line Work (2)	60-Foot Digger Derrick	4	1	6	—	Bore/Drill Rigs	275	4	100	0	79	78
Distribution - Newberry Springs Series Cap - SC2 - Overhead Line Work (2)	1-Ton Crew Cab, 4x4	4	2	6	Passenger	—	—	—	100	0	79	78
Distribution - Newberry Springs Series Cap - SC2 - Overhead Line Work (2)	Worker Commute Automobile	4	6	6	Passenger	—	—	—	100	0	79	78
Distribution - Newberry Springs Series Cap - SC2 - Pole Installation (5)	55-Foot Double Bucket Truck	4	1	6	—	Aerial Lifts	300	7	100	0	79	78
Distribution - Newberry Springs Series Cap - SC2 - Pole Installation (5)	60-Foot Digger Derrick	4	1	6	—	Bore/Drill Rigs	275	4	100	0	79	78
Distribution - Newberry Springs Series Cap - SC2 - Pole Installation (5)	1-Ton Crew Cab, 4x4	4	2	6	Passenger	—	—	—	100	0	79	78
Distribution - Newberry Springs Series Cap - SC2 - Pole Installation (5)	Worker Commute Automobile	4	6	6	Passenger	—	—	—	100	0	79	78
Distribution - Newberry Springs Series Cap - SC2 - Trenching, Structure Excavation (1)	Backhoe Front Loader	1	1	4	—	Tractors/Loaders/ Backhoes	300	8	100	0	79	78
Distribution - Newberry Springs Series Cap - SC2 - Trenching, Structure Excavation (1)	1-Ton Crew Cab	1	1	4	Passenger	—	—	—	100	0	79	78
Distribution - Newberry Springs Series Cap - SC2 - Trenching, Structure Excavation (1)	Dump Truck	1	1	4	HHDT	—	—	—	100	0	79	78
Distribution - Newberry Springs Series Cap - SC2 - Trenching, Structure Excavation (1)	Worker Commute Automobile	1	4	4	Passenger	—	—	—	100	0	79	78
Distribution - Newberry Springs Series Cap - SC2 - Underground Cable Makeup (4)	55-Foot Double Bucket Truck	1	1	3	—	Aerial Lifts	300	4	100	0	79	78
Distribution - Newberry Springs Series Cap - SC2 - Underground Cable Makeup (4)	1-Ton Crew Cab, 4x4	1	1	3	Passenger	—	—	—	100	0	79	78
Distribution - Newberry Springs Series Cap - SC2 - Underground Cable Makeup (4)	Worker Commute Automobile	1	3	3	Passenger	—	—	—	100	0	79	78
Distribution - Newberry Springs Series Cap - SC2 - Underground Cable Pulling (3) & Transformer Installation	55-Foot Double Bucket Truck	1	1	4	—	Aerial Lifts	300	7	100	0	79	78
Distribution - Newberry Springs Series Cap - SC2 - Underground Cable Pulling (3) & Transformer Installation	Hydraulic Rewind Puller	1	1	4	—	Other Construction Equipment	300	6	100	0	79	78
Distribution - Newberry Springs Series Cap - SC2 - Underground Cable Pulling (3) & Transformer Installation	1-Ton Crew Cab, 4x4	1	1	4	Passenger	—	—	—	100	0	79	78
Distribution - Newberry Springs Series Cap - SC2 - Underground Cable Pulling (3) & Transformer Installation	Worker Commute Automobile	1	4	4	Passenger	—	—	—	100	0	79	78
Substations												
Substation - ELD Sub-Line Pos - Electrical (Phase 1)	Bobcat	85	2	15	—	Skid Steer Loaders	200	5	0	100	0	30

Table 4.C-1. Construction Equipment and Workforce Estimates

Activity	Equipment Type	Approx. Total Days Used	Approx. Quantity	Approx. Number of Workers	On-Road Type	Off-Road Type	Output (Hp)	Approx. Use (hours/day)	Approx. Use by State (percent)		Maximum Days Used	
									CA	NV	2019	2020
Substation - ELD Sub-Line Pos - Electrical (Phase 1)	Crane	85	1	15	—	Cranes	350	4	0	100	0	30
Substation - ELD Sub-Line Pos - Electrical (Phase 1)	Forklift	85	2	15	—	Forklifts	200	5	0	100	0	30
Substation - ELD Sub-Line Pos - Electrical (Phase 1)	Generator	85	2	15	—	Generator Sets	50	8	0	100	0	30
Substation - ELD Sub-Line Pos - Electrical (Phase 1)	Manlift	85	2	15	—	Aerial Lifts	150	5	0	100	0	30
Substation - ELD Sub-Line Pos - Electrical (Phase 1)	Foreman's Truck	85	1	15	Passenger	—	—	—	0	100	0	30
Substation - ELD Sub-Line Pos - Electrical (Phase 1)	Job Site Utility Cart	85	4	15	Passenger	—	—	—	0	100	0	30
Substation - ELD Sub-Line Pos - Electrical (Phase 1)	Tool Truck	85	2	15	Delivery	—	—	—	0	100	0	30
Substation - ELD Sub-Line Pos - Electrical (Phase 1)	Worker Commute Automobile	85	15	15	Passenger	—	—	—	0	100	0	30
Substation - ELD Sub-Line Pos - Grading/Civil (Phase 1)	Backhoe	70	2	15	—	Tractors/Loaders/ Backhoes	200	4	0	100	0	39
Substation - ELD Sub-Line Pos - Grading/Civil (Phase 1)	Bobcat	70	2	15	—	Skid Steer Loaders	200	5	0	100	0	39
Substation - ELD Sub-Line Pos - Grading/Civil (Phase 1)	Compactor	70	1	15	—	Rollers	300	5	0	100	0	39
Substation - ELD Sub-Line Pos - Grading/Civil (Phase 1)	Excavator	70	2	15	—	Excavators	160	5	0	100	0	39
Substation - ELD Sub-Line Pos - Grading/Civil (Phase 1)	Generator	70	2	15	—	Generator Sets	50	8	0	100	0	39
Substation - ELD Sub-Line Pos - Grading/Civil (Phase 1)	Grader	70	2	15	—	Graders	290	8	0	100	0	39
Substation - ELD Sub-Line Pos - Grading/Civil (Phase 1)	LoDrill	70	1	15	—	Bore/Drill Rigs	200	5	0	100	0	39
Substation - ELD Sub-Line Pos - Grading/Civil (Phase 1)	Skip Loader	70	1	15	—	Tractors/Loaders/ Backhoes	150	4	0	100	0	39
Substation - ELD Sub-Line Pos - Grading/Civil (Phase 1)	Trencher	70	1	15	—	Trenchers	175	5	0	100	0	39
Substation - ELD Sub-Line Pos - Grading/Civil (Phase 1)	Dump Truck	70	1	15	HHDT	—	—	—	0	100	0	39
Substation - ELD Sub-Line Pos - Grading/Civil (Phase 1)	Foreman's Truck	70	1	15	Passenger	—	—	—	0	100	0	39
Substation - ELD Sub-Line Pos - Grading/Civil (Phase 1)	Fuel Truck	70	1	15	HHDT	—	—	—	0	100	0	39
Substation - ELD Sub-Line Pos - Grading/Civil (Phase 1)	Job site Utility Cart	70	4	15	Passenger	—	—	—	0	100	0	39
Substation - ELD Sub-Line Pos - Grading/Civil (Phase 1)	Low Bed Hauler	70	1	15	HHDT	—	—	—	0	100	0	39
Substation - ELD Sub-Line Pos - Grading/Civil (Phase 1)	Tool Truck	70	2	15	Delivery	—	—	—	0	100	0	39
Substation - ELD Sub-Line Pos - Grading/Civil (Phase 1)	Water Truck	70	2	15	HHDT	—	—	—	0	100	0	39
Substation - ELD Sub-Line Pos - Grading/Civil (Phase 1)	Worker Commute Automobile	70	15	15	Passenger	—	—	—	0	100	0	39
Substation - ELD Sub-Line Pos - Survey (Phase 1 - Lugo)	Foreman's Truck	15	1	2	Passenger	—	—	—	0	100	184	156
Substation - ELD Sub-Line Pos - Survey (Phase 1 - Lugo)	Job site Utility Cart	15	1	2	Passenger	—	—	—	0	100	184	156
Substation - ELD Sub-Line Pos - Survey (Phase 1 - Lugo)	Tool Truck	15	1	2	Delivery	—	—	—	0	100	184	156
Substation - ELD Sub-Line Pos - Survey (Phase 1 - Lugo)	Worker Commute Automobile	15	2	2	Passenger	—	—	—	0	100	184	156
Substation - ELD Sub-Line Pos - Survey (Phase 2 - Mohave)	Foreman's Truck	15	1	2	Passenger	—	—	—	0	100	236	78
Substation - ELD Sub-Line Pos - Survey (Phase 2 - Mohave)	Job site Utility Cart	15	1	2	Passenger	—	—	—	0	100	236	78
Substation - ELD Sub-Line Pos - Survey (Phase 2 - Mohave)	Tool Truck	15	1	2	Delivery	—	—	—	0	100	236	78
Substation - ELD Sub-Line Pos - Survey (Phase 2 - Mohave)	Worker Commute Automobile	15	2	2	Passenger	—	—	—	0	100	236	78
Substation - ELD Sub-Line Pos - Testing	Test Truck	140	2	5	Delivery	—	—	—	0	100	0	66
Substation - ELD Sub-Line Pos - Testing	Worker Commute Automobile	140	4	5	Passenger	—	—	—	0	100	0	66
Substation - ELD Sub-Line Pos - Wiring	Manlift	60	1	5	—	Aerial Lifts	150	5	0	100	0	30
Substation - ELD Sub-Line Pos - Wiring	Foreman's Truck	60	1	5	Passenger	—	—	—	0	100	0	30
Substation - ELD Sub-Line Pos - Wiring	Job Site Utility Cart	60	2	5	Passenger	—	—	—	0	100	0	30
Substation - ELD Sub-Line Pos - Wiring	Tool Truck	60	2	5	Delivery	—	—	—	0	100	0	30

Table 4.C-1. Construction Equipment and Workforce Estimates

Activity	Equipment Type	Approx. Total Days Used	Approx. Quantity	Approx. Number of Workers	On-Road Type	Off-Road Type	Output (Hp)	Approx. Use (hours/day)	Approx. Use by State (percent) CA	NV	Maximum Days Used 2019	2020
Substation - ELD Sub-Line Pos - Wiring	Worker Commute Automobile	60	5	5	Passenger	—	—	—	0	100	0	30
Substation - Lugo-Line Pos - Electrical (SC1)	Bobcat	35	2	15	—	Skid Steer Loaders	200	5	100	0	0	95
Substation - Lugo-Line Pos - Electrical (SC1)	Crane	35	1	15	—	Cranes	350	4	100	0	0	95
Substation - Lugo-Line Pos - Electrical (SC1)	Forklift	35	2	15	—	Forklifts	200	5	100	0	0	95
Substation - Lugo-Line Pos - Electrical (SC1)	Generator	35	2	15	—	Generator Sets	50	8	100	0	0	95
Substation - Lugo-Line Pos - Electrical (SC1)	Manlift	35	2	15	—	Aerial Lifts	150	5	100	0	0	95
Substation - Lugo-Line Pos - Electrical (SC1)	Foreman's Truck	35	1	15	Passenger	—	—	—	100	0	0	95
Substation - Lugo-Line Pos - Electrical (SC1)	Job Site Utility Cart	35	4	15	Passenger	—	—	—	100	0	0	95
Substation - Lugo-Line Pos - Electrical (SC1)	Tool Truck	35	2	15	Delivery	—	—	—	100	0	0	95
Substation - Lugo-Line Pos - Electrical (SC1)	Worker Commute Automobile	35	15	15	Passenger	—	—	—	100	0	0	95
Substation - Lugo-Line Pos - Electrical (SC4)	Bobcat	35	2	15	—	Skid Steer Loaders	200	5	100	0	0	28
Substation - Lugo-Line Pos - Electrical (SC4)	Crane	35	1	15	—	Cranes	350	4	100	0	0	28
Substation - Lugo-Line Pos - Electrical (SC4)	Forklift	35	2	15	—	Forklifts	200	5	100	0	0	28
Substation - Lugo-Line Pos - Electrical (SC4)	Generator	35	2	15	—	Generator Sets	50	8	100	0	0	28
Substation - Lugo-Line Pos - Electrical (SC4)	Manlift	35	2	15	—	Aerial Lifts	150	5	100	0	0	28
Substation - Lugo-Line Pos - Electrical (SC4)	Foreman's Truck	35	1	15	Passenger	—	—	—	100	0	0	28
Substation - Lugo-Line Pos - Electrical (SC4)	Job Site Utility Cart	35	4	15	Passenger	—	—	—	100	0	0	28
Substation - Lugo-Line Pos - Electrical (SC4)	Tool Truck	35	2	15	Delivery	—	—	—	100	0	0	28
Substation - Lugo-Line Pos - Electrical (SC4)	Worker Commute Automobile	35	15	15	Passenger	—	—	—	100	0	0	28
Substation - Lugo-Line Pos - Grading/Civil	Backhoe	45	2	15	—	Tractors/Loaders/ Backhoes	200	4	100	0	53	27
Substation - Lugo-Line Pos - Grading/Civil	Bobcat	45	2	15	—	Skid Steer Loaders	200	5	100	0	53	27
Substation - Lugo-Line Pos - Grading/Civil	Compactor	45	1	15	—	Rollers	300	5	100	0	53	27
Substation - Lugo-Line Pos - Grading/Civil	Excavator	45	2	15	—	Excavators	160	5	100	0	53	27
Substation - Lugo-Line Pos - Grading/Civil	Generator	45	2	15	—	Generator Sets	50	8	100	0	53	27
Substation - Lugo-Line Pos - Grading/Civil	Grader	45	2	15	—	Graders	290	5	100	0	53	27
Substation - Lugo-Line Pos - Grading/Civil	LoDrill	45	1	15	—	Bore/Drill Rigs	200	5	100	0	53	27
Substation - Lugo-Line Pos - Grading/Civil	Skip Loader	45	1	15	—	Tractors/Loaders/ Backhoes	150	4	100	0	53	27
Substation - Lugo-Line Pos - Grading/Civil	Trencher	45	1	15	—	Trenchers	175	5	100	0	53	27
Substation - Lugo-Line Pos - Grading/Civil	Dump Truck	45	1	15	HHDT	—	—	—	100	0	53	27
Substation - Lugo-Line Pos - Grading/Civil	Foreman's Truck	45	1	15	Passenger	—	—	—	100	0	53	27
Substation - Lugo-Line Pos - Grading/Civil	Fuel Truck	45	1	15	HHDT	—	—	—	100	0	53	27
Substation - Lugo-Line Pos - Grading/Civil	Job Site Utility Cart	45	4	15	Passenger	—	—	—	100	0	53	27
Substation - Lugo-Line Pos - Grading/Civil	Low Bed Hauler	45	1	15	HHDT	—	—	—	100	0	53	27
Substation - Lugo-Line Pos - Grading/Civil	Tool Truck	45	2	15	Delivery	—	—	—	100	0	53	27
Substation - Lugo-Line Pos - Grading/Civil	Water Truck	45	2	15	HHDT	—	—	—	100	0	53	27
Substation - Lugo-Line Pos - Grading/Civil	Worker Commute Automobile	45	15	15	Passenger	—	—	—	100	0	53	27
Substation - Lugo-Line Pos - Survey	Foreman's Truck	15	1	2	Passenger	—	—	—	100	0	67	156
Substation - Lugo-Line Pos - Survey	Job Site Utility Cart	15	1	2	Passenger	—	—	—	100	0	67	156
Substation - Lugo-Line Pos - Survey	Tool Truck	15	1	2	Delivery	—	—	—	100	0	67	156

Table 4.C-1. Construction Equipment and Workforce Estimates

Activity	Equipment Type	Approx. Total Days Used	Approx. Quantity	Approx. Number of Workers	On-Road Type	Off-Road Type	Output (Hp)	Approx. Use (hours/day)	Approx. Use by State (percent)		Maximum Days Used	
									CA	NV	2019	2020
Substation - Lugo-Line Pos - Survey	Worker Commute Automobile	15	2	2	Passenger	—	—	—	100	0	67	156
Substation - Lugo-Line Pos - Testing (SC1)	Test Truck	60	2	4	Delivery	—	—	—	100	0	0	130
Substation - Lugo-Line Pos - Testing (SC1)	Worker Commute Automobile	60	4	4	Passenger	—	—	—	100	0	0	130
Substation - Lugo-Line Pos - Testing (SC4)	Test Truck	60	2	4	Delivery	—	—	—	100	0	0	26
Substation - Lugo-Line Pos - Testing (SC4)	Worker Commute Automobile	60	4	4	Passenger	—	—	—	100	0	0	26
Substation - Lugo-Line Pos - Wiring (SC1)	Manlift	45	1	5	—	Aerial Lifts	150	5	100	0	0	95
Substation - Lugo-Line Pos - Wiring (SC1)	Foreman's Truck	45	1	5	Passenger	—	—	—	100	0	0	95
Substation - Lugo-Line Pos - Wiring (SC1)	Job Site Utility Cart	45	2	5	Passenger	—	—	—	100	0	0	95
Substation - Lugo-Line Pos - Wiring (SC1)	Tool Truck	45	2	5	Delivery	—	—	—	100	0	0	95
Substation - Lugo-Line Pos - Wiring (SC1)	Worker Commute Automobile	45	5	5	Passenger	—	—	—	100	0	0	95
Substation - Mohave-Line Pos - Electrical	Bobcat	45	2	15	—	Skid Steer Loaders	200	5	0	100	0	30
Substation - Mohave-Line Pos - Electrical	Crane	45	1	15	—	Cranes	350	4	0	100	0	30
Substation - Mohave-Line Pos - Electrical	Forklift	45	2	15	—	Forklifts	200	5	0	100	0	30
Substation - Mohave-Line Pos - Electrical	Generator	45	2	15	—	Generator Sets	50	8	0	100	0	30
Substation - Mohave-Line Pos - Electrical	Manlift	45	2	15	—	Aerial Lifts	150	5	0	100	0	30
Substation - Mohave-Line Pos - Electrical	Foreman's Truck	45	1	15	Passenger	—	—	—	0	100	0	30
Substation - Mohave-Line Pos - Electrical	Job Site Utility Cart	45	4	15	Passenger	—	—	—	0	100	0	30
Substation - Mohave-Line Pos - Electrical	Tool Truck	45	2	15	Delivery	—	—	—	0	100	0	30
Substation - Mohave-Line Pos - Electrical	Worker Commute Automobile	45	15	15	Passenger	—	—	—	0	100	0	30
Substation - Mohave-Line Pos - Grading/Civil (Phase 1)	Backhoe	45	2	15	—	Tractors/Loaders/ Backhoes	200	4	0	100	0	40
Substation - Mohave-Line Pos - Grading/Civil (Phase 1)	Bobcat	45	2	15	—	Skid Steer Loaders	200	5	0	100	0	40
Substation - Mohave-Line Pos - Grading/Civil (Phase 1)	Compactor	45	1	15	—	Rollers	300	5	0	100	0	40
Substation - Mohave-Line Pos - Grading/Civil (Phase 1)	Excavator	45	2	15	—	Excavators	160	5	0	100	0	40
Substation - Mohave-Line Pos - Grading/Civil (Phase 1)	Generator	45	2	15	—	Generator Sets	50	8	0	100	0	40
Substation - Mohave-Line Pos - Grading/Civil (Phase 1)	Grader	45	2	15	—	Graders	290	5	0	100	0	40
Substation - Mohave-Line Pos - Grading/Civil (Phase 1)	LoDrill	45	1	15	—	Bore/Drill Rigs	200	5	0	100	0	40
Substation - Mohave-Line Pos - Grading/Civil (Phase 1)	Skip Loader	45	1	15	—	Tractors/Loaders/ Backhoes	150	4	0	100	0	40
Substation - Mohave-Line Pos - Grading/Civil (Phase 1)	Trencher	45	1	15	—	Trenchers	175	5	0	100	0	40
Substation - Mohave-Line Pos - Grading/Civil (Phase 1)	Dump Truck	45	1	15	HHDT	—	—	—	0	100	0	40
Substation - Mohave-Line Pos - Grading/Civil (Phase 1)	Foreman's Truck	45	1	15	Passenger	—	—	—	0	100	0	40
Substation - Mohave-Line Pos - Grading/Civil (Phase 1)	Fuel Truck	45	1	15	HHDT	—	—	—	0	100	0	40
Substation - Mohave-Line Pos - Grading/Civil (Phase 1)	Job site Utility Cart	45	4	15	Passenger	—	—	—	0	100	0	40
Substation - Mohave-Line Pos - Grading/Civil (Phase 1)	Low Bed Hauler	45	1	15	HHDT	—	—	—	0	100	0	40
Substation - Mohave-Line Pos - Grading/Civil (Phase 1)	Tool Truck	45	2	15	Delivery	—	—	—	0	100	0	40
Substation - Mohave-Line Pos - Grading/Civil (Phase 1)	Water Truck	45	2	15	HHDT	—	—	—	0	100	0	40
Substation - Mohave-Line Pos - Grading/Civil (Phase 1)	Worker Commute Automobile	45	15	15	Passenger	—	—	—	0	100	0	40
Substation - Mohave-Line Pos - Survey (Phase 1 - Eldorado)	Foreman's Truck	10	1	2	Passenger	—	—	—	0	100	236	78
Substation - Mohave-Line Pos - Survey (Phase 1 - Eldorado)	Job site Utility Cart	10	1	2	Passenger	—	—	—	0	100	236	78
Substation - Mohave-Line Pos - Survey (Phase 1 - Eldorado)	Tool Truck	10	1	2	Delivery	—	—	—	0	100	236	78

Table 4.C-1. Construction Equipment and Workforce Estimates

Activity	Equipment Type	Approx. Total Days Used	Approx. Quantity	Approx. Number of Workers	On-Road Type	Off-Road Type	Output (Hp)	Approx. Use (hours/day)	Approx. Use by State (percent)		Maximum Days Used	
									CA	NV	2019	2020
Substation - Mohave-Line Pos - Survey (Phase 1 - Eldorado)	Worker Commute Automobile	10	2	2	Passenger	—	—	—	0	100	236	78
Substation - Mohave-Line Pos - Testing	Test Truck	75	2	4	Delivery	—	—	—	0	100	0	39
Substation - Mohave-Line Pos - Testing	Worker Commute Automobile	75	4	4	Passenger	—	—	—	0	100	0	39
Substation - Mohave-Line Pos - Wiring	Manlift	25	1	5	—	Aerial Lifts	150	5	0	100	0	30
Substation - Mohave-Line Pos - Wiring	Foreman's Truck	60	1	5	Passenger	—	—	—	0	100	0	30
Substation - Mohave-Line Pos - Wiring	Job Site Utility Cart	60	2	5	Passenger	—	—	—	0	100	0	30
Substation - Mohave-Line Pos - Wiring	Tool Truck	60	2	5	Delivery	—	—	—	0	100	0	30
Substation - Mohave-Line Pos - Wiring	Worker Commute Automobile	60	5	5	Passenger	—	—	—	0	100	0	30