Chapter 2
Project Description

2.1 Introduction

The California Public Utilities Commission (CPUC) is responsible for environmental review and permitting of NextEra Energy Transmission West, LLC's (NEET West's) proposed Suncrest Dynamic Reactive Power Support Project (Proposed Project). The Proposed Project would involve construction of a dynamic reactive device and an approximately one-mile-long transmission line interconnecting with the existing Suncrest Substation in San Diego County, near the community of Alpine. The dynamic reactive device would provide voltage regulation and support for the existing transmission system in accordance with the California Independent System Operator Corporation's (CAISO's) 2013-2014 Transmission Plan.

This chapter describes the Proposed Project's objectives, location, components, construction process, operations, and anticipated permits and approvals. Information presented in this chapter is based primarily on the Proponent's Application and Proponent's Environmental Assessment (PEA) submitted to the CPUC by NEET West.

2.2 Proposed Project Background, Purpose and Objectives

The Proposed Project originates from the CAISO's 2013-2014 transmission planning process, which identified a need for a +300-million/-100-milliion volt-ampere reactive (megavar)[1] dynamic reactive device at the existing Suncrest Substation's 230-kilovolt (kV) bus[2] (CAISO 2014). CAISO determined that the retirement of the San Onofre Nuclear Generating Station (SONGS) and projected increases in renewable generating capacity in the Imperial Valley would cause loading and voltage stability issues in the transmission system in the area of the existing Suncrest Substation. CAISO recommended reactive power support at the Suncrest Substation to correct these deficiencies and allow the transmission system to function as designed.

The existing Suncrest Substation is operated by San Diego Gas & Electric Company (SDG&E) and was completed in 2012 as part of SDG&E's Sunrise Powerlink project. The Sunrise Powerlink is a high-voltage electric transmission system connecting the Imperial Valley to major demand centers in San Diego, and is depicted on Figure 2-1. Among other things, the Suncrest Substation functions to "step down" the incoming energy on the 500-kV transmission line from the southeast to a voltage where it can be transported on the two

[1] Volt-ampere reactive (var) is a unit by which reactive power is expressed in an alternating current (AC) electric power system. Reactive power is described in the following paragraphs in this section. Megavar means one million vars. Reactive power may also be expressed as megavolt amperes reactive (MVAR).

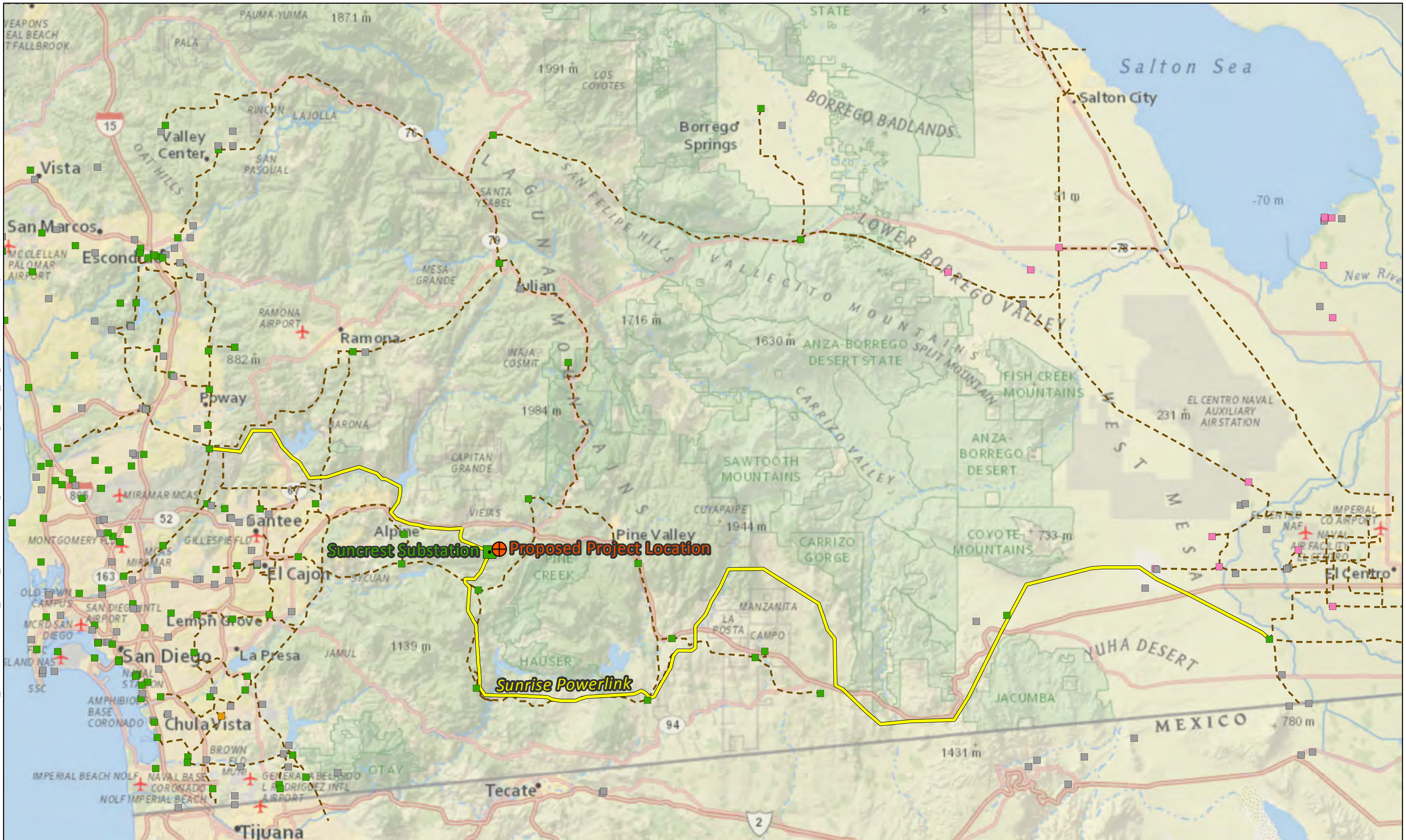
[2] A bus or busbar is a metallic strip or bar that conducts electricity within a substation or other electrical apparatus. Buses are often the connection points for incoming transmission lines into a substation.

230-kV lines leaving the substation to the northwest towards the Sycamore Canyon Substation and San Diego.

The retirement of SONGS and anticipated increases in renewable energy production to meet the state's 50 percent Renewable Portfolio Standard (RPS),[1] as well as anticipated future retirement of coastal gas-fired generation utilizing once-through cooling, are causing issues throughout the transmission grid in Southern California. In addition to the proposed dynamic reactive device at the Suncrest Substation, CAISO's 2013-2014 Transmission Plan recommended a number of other upgrades in the Southern California area, including a similar reactive support facility at the San Luis Rey Substation (CAISO 2014). Previous transmission plans had also recommended reactive support facilities at the Talega Substation and in the vicinity of SONGS.

Part of the challenge with the retirement of SONGS is that many renewable power sources do not produce reactive power at the same level as traditional power sources, such as natural gas or nuclear. As opposed to "real power," which is the element of electricity that performs useful work[2] and is measured in watts, reactive power functions to support voltage levels needed to maintain transmission system reliability. One way of thinking about reactive power is that it is the portion of electricity in an AC system[3] that carries the voltage[4] and current[5] up and down around an average value, analogous to a person climbing up and down a ladder to fill a water tank, one bucket at a time (Sauer 2003). The energy that it takes to climb up and down the ladder without carrying anything is solely reactive power because the start and end state are the same from an energy conservation perspective. Carrying a bucket of water up the ladder and dumping it into the water tank requires both reactive and real power because energy is lost in the transfer of water or the work performed (Sauer 2003).

[1] California's RPS, first established in 2002 under Senate Bill (SB) 1078 and most recently expanded in 2015 under SB 350, requires electric retail sellers and publicly owned utilities to procure 50 percent of their electricity from eligible renewable energy resources by 2030.
[2] In physics, work is said to have been done when a force acting upon an object causes a displacement of that object.
[3] AC is an electric current in which the flow of electric charge periodically reverses direction. By contrast, direct current is a current where electric charge flows in one direction. The U.S. interconnected grid is almost entirely an AC system where the voltages and currents alternate up and down 60 times per second (Sauer 2003).
[4] Voltage, also known as electric potential difference or electric pressure, is the difference in electric potential energy between two points per unit electric charge.
[5] Current is the flow of electric charge.



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Sources: Content may not reflect National Geographic's current map policy.
Sources: National Geographic, Esri, DeLorme, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.
NEET West, 2015.

Proposed Project Location

Transmission System
- Sunrise Powerlink
- Other Transmission Lines
- Suncrest Substation

Other Substations (by owner)
- San Diego Gas & Electric Co
- Imperial Irrigation District
- Southern California Edison Co
- Undetermined Company

Figure 2-1
Regional Transmission System

Suncrest Dynamic Reactive Power Support Project

In an electric transmission system, reactive power is essential to the ability to transmit power to meet demands and the operation of the system as a whole. For example, if the reactive power in a transmission system is too low, inductive loads[1] such as transformers will be unable to maintain the voltages necessary to operate, resulting in a "voltage collapse" causing blackouts. In terms of the water-carrying analogy, a situation where reactive power is not sufficient to maintain voltage may be represented by the person carrying the water up the ladder getting too tired and ultimately collapsing under the weight of the water, which may then create additional pressure on other "people" carrying water up their ladders causing them to collapse as well (Sauer 2003). Such a voltage collapse failure may occur even if there is sufficient real power (water in the analogy) available to meet the load.

For these reasons, reactive power support is needed at certain substations in Southern California. Substations represent large inductive loads in the system, and with the loss of a large producer of reactive power in SONGS and projected increases in power sources that do not produce as much reactive power as traditional sources, additional reactive power is needed for transformers to maintain adequate voltages. Without additional reactive power, it is possible that the transmission system will not be able to deliver new solar photovoltaic and other renewable power generation from the Imperial Valley to consumers in the San Diego and Los Angeles areas.

The +300/-100 megavar reactive device at the Suncrest Substation was identified as a policy-driven need in CAISO's 2013-2014 Transmission Plan to meet California's 50 percent RPS. CAISO conducted a competitive bid solicitation process for the Suncrest dynamic reactive facility and selected NEET West to construct the Proposed Project. NEET West's proposal included a Static VAR compensator (SVC) interconnected with the existing Suncrest Substation via an approximately one-mile-long transmission line. The proposed SVC device would provide +300/-100 megavar of continuous or quasi-continuous reactive power response following system disturbances. The addition of the proposed SVC device allows the transmission system to operate reliably and to import the same amounts of power as originally designed, regardless of whether it is from a conventional or renewable source.

Following its selection by CAISO in January 2015 as the approved project sponsor, NEET West submitted a PEA to the CPUC in August 2015, as part of its application (A.15-08-027) for a Certificate of Public Convenience and Necessity, as specified in CPUC General Order (G.O.) 131-D.

The objectives of the Proposed Project are as follows:

- Provide reactive support at or connected to the Suncrest Substation;
- Improve and maintain the reliability of the transmission grid; and
- Support achievement of the state's RPS by facilitating delivery of a higher percentage of renewable energy generation from the Imperial Valley area to population centers to the west.

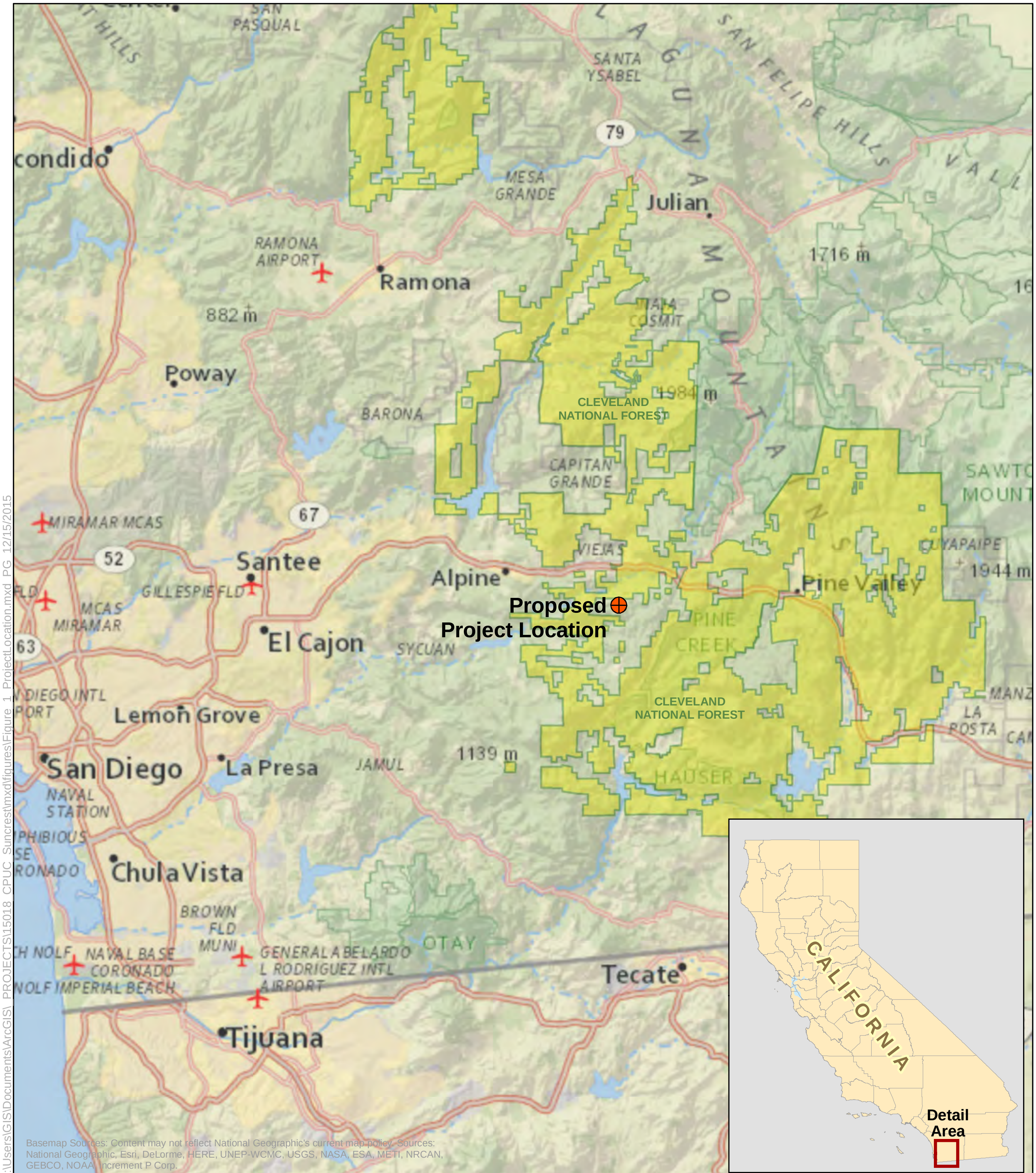
[1] A load is a device to which power is delivered. An inductive load is a part of an electrical circuit that uses magnetic energy to produce work. Examples of inductive loads would be most types of motors and transformers.

2.3 Proposed Project Location and Setting

The Proposed Project would be located in unincorporated south-central San Diego County, approximately 3.75 miles southeast of the community of Alpine, off of Bell Bluff Truck Trail. Figure 2-2 shows the Project location. The lands surrounding the Proposed Project are primarily undeveloped, with some rural-residential development present to the east and south, and the existing Suncrest Substation at the Project's western terminus. The nearest residence is approximately 0.6 mile to the southeast. Interstate-8 is located approximately 1.8 miles to the north of the Project area and Japatul Valley Road is approximately 1.2 miles to the southeast. The Proposed Project would be located on property (assessor's parcel numbers [APNs] 523-040-080 and 523-030-130) currently owned by private parties within the administrative boundary of the Cleveland National Forest. Elevations in the Project area range from 3,000 to 3,200 feet above mean sea level, and the area's topography is undulating with steep hills interspersed with narrow valleys and relatively deep canyons. The habitat types in the Project vicinity are primarily chaparral scrub and oak woodlands.

The proposed SVC facility, described below in Section 2.4.1.1, would be constructed immediately south of Bell Bluff Truck Trail within a portion of APN 523-040-080 (see Figure 2-3). NEET West has an option agreement to purchase a 6-acre portion of this parcel for construction of the SVC. This area, known as the Wilson Construction Yard (shown on Figure 2-4), was used as a construction staging/laydown area during construction of the Suncrest Substation. The area was used for storage and staging of materials, assemblage of the lattice tower segments, helicopter transport operations of materials and tower segments, and as a temporary water basin (SDG&E Undated). As part of the initial brush clearing for the area, native vegetation was cut into small pieces and incorporated into the topsoil, which was salvaged to a depth of approximately 6 inches. Grading was required within the Wilson Construction Yard, with a total of 10.27 acres impacted, and rock/gravel less than 3 inches in diameter was imported to the yard for soil stabilization and dust control during helicopter activities (the imported rock was removed following construction activities). The initial phase of construction at the yard occurred in June 2011 and the yard was utilized through a portion of 2012 (SDG&E Undated).

Following completion of the Suncrest Substation, in accordance with the restoration plan prepared for the Sunrise Powerlink, *Sunrise Powerlink Restoration Plan for Sensitive Vegetation in Temporary Impact Areas,* and the site-specific restoration plan prepared for the Wilson Construction Yard, *Site-Specific Restoration Plan (SRP): SRP AS-47 Southern Foothills; Link 3; Wilson* (AECOM and RECON Environmental 2012), the Wilson Construction Yard was de-compacted by ripping and cross-ripping between 18-24 inches and then recontoured to its original topography (SDG&E Undated). The salvaged topsoil was then redistributed over the site and seeded with a mix of native plant species representative of the pre-project valley needlegrass habitat condition at the site. The recontouring and seeding was conducted in fall of 2012, and maintenance and monitoring of the restoration site has been conducted since. In March 2016, the Wilson Construction Yard restoration was signed-off as complete by both the California Department of Fish and Wildlife (CDFW) and the U.S. Fish and Wildlife Service (USFWS). CDFW and USFWS certified that the site had achieved the restoration plan's primary success standards, which primarily relate to percentage of native species cover.



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Proposed Project Location

Cleveland National Forest

Figure 2-2
Project Location

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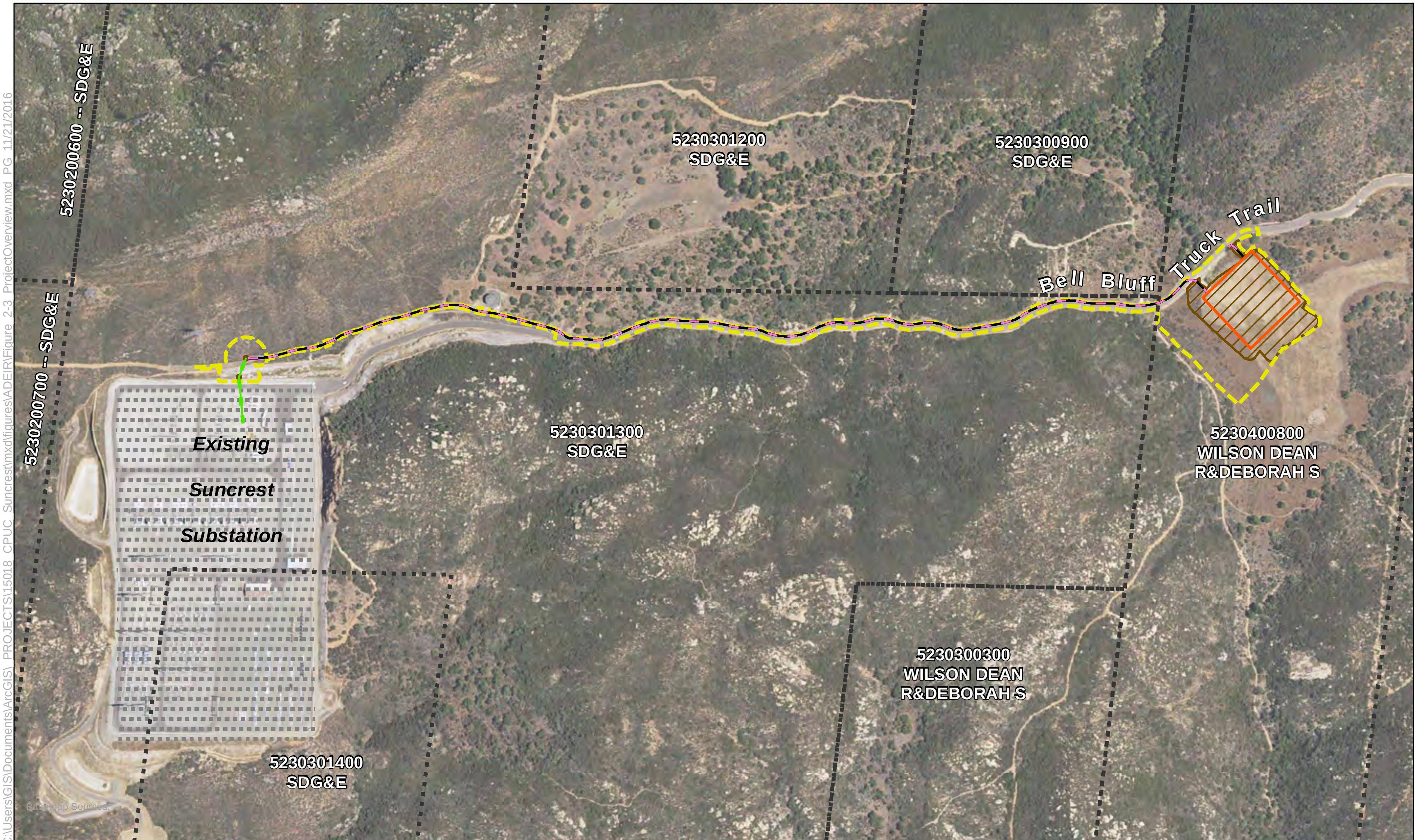
Suncrest Dynamic Reactive Power Support Project



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Feet

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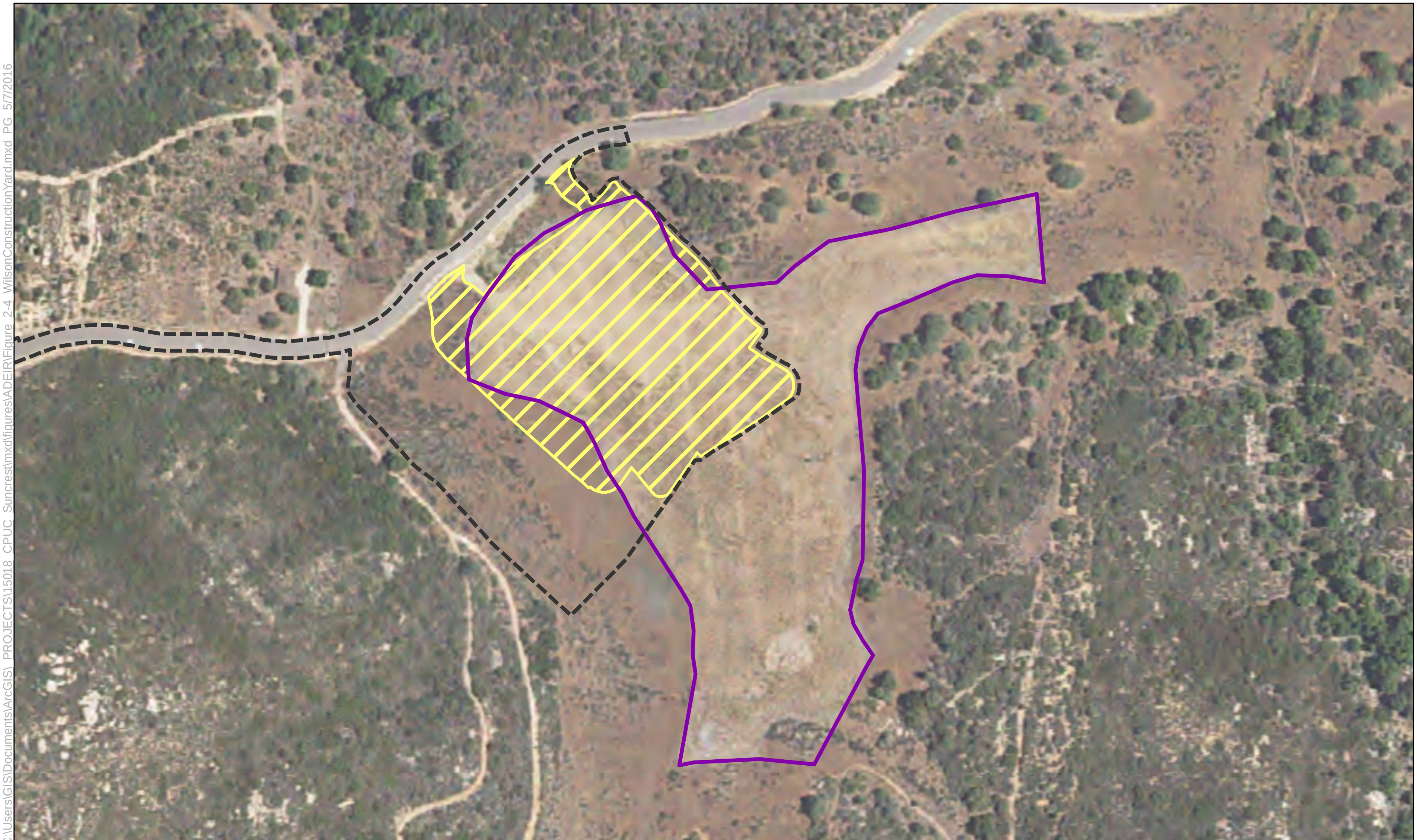
Project Components

- Project Area (limit of disturbance)
- Underground Transmission Line
- Overhead Transmission Line
- SVC Area
- Fenced Area
- Parcel Boundary (with APN and Owner)

Figure 2-3
Project Overview

Suncrest Dynamic Reactive Power Support Project



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WilsonConstructionYard

Total SVC Area

Proposed Project Area (limit of disturbance)

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Imagery Source: NAIP

Figure 2-4
Wilson Construction Yard

Suncrest Dynamic Reactive Power Support Project

The one-mile-long transmission line component of the Proposed Project, described in Section 2.4.1.2, would be located primarily within Bell Bluff Truck Trail, as shown on Figure 2-3. Bell Bluff Truck Trail is a private, paved, secured road in the area of the Proposed Project. Approximately one mile east of the proposed SVC site there is a security gate operated by SDG&E restricting public access to the existing substation site. Bell Bluff Truck Trail is approximately 30 feet wide from the location of the proposed SVC west to the intersection with the access road to the existing Suncrest Substation (this portion of the road was widened and newly constructed as part of the Suncrest Substation construction), and approximately 12 feet wide west of the intersection with the substation access road.

The lands surrounding Bell Bluff Truck Trail west of the proposed SVC are included as part of the Lightner Mitigation Site, which was established in accordance with the Sunrise Powerlink environmental review documents. The Lightner Mitigation Site encompasses the Suncrest Substation (see Figure 2-5) and would include APN 523-030-130. This property is scheduled to be transferred from SDG&E to the U.S. Forest Service for conservation in perpetuity (SDG&E 2011). The Lightner Mitigation Site was established in part to compensate for impacts to waters of the U.S. and waters of the state during construction of the Suncrest Substation/Sunrise Powerlink, and is described in the Final Habitat Mitigation and Monitoring Plan for the Sunrise Powerlink (SDG&E 2011).

2.4 Proposed Project

The Proposed Project would involve construction and operation of a SVC dynamic reactive device and approximately one-mile-long transmission line. Figure 2-3 above shows the primary Project components. The Proposed Project would disturb approximately 12 acres during construction, with Project features occupying a permanent footprint of approximately 6 acres. The following subsections describe the Proposed Project's components, anticipated construction process, and operation.

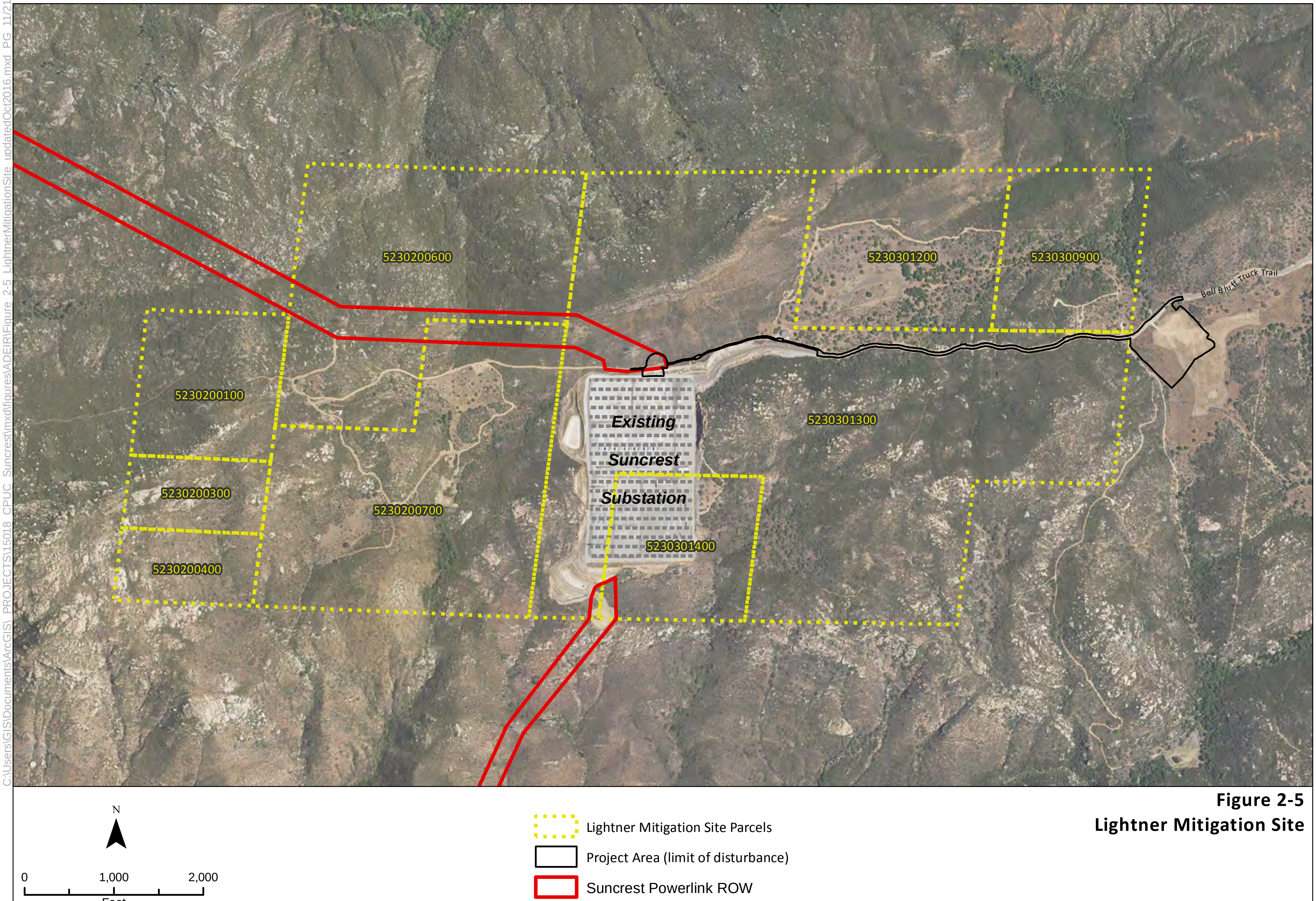
2.4.1 Proposed Project Components

2.4.1.1 SVC Components

The SVC would be a set of electrical devices, including thyristor[1]-controlled reactors and capacitor[2] banks, designed to provide fast-acting reactive power to the existing transmission system. The SVC would have no moving parts, other than internal switchgear, and would be operated based on the load and voltage conditions at the Suncrest Substation. Essentially, if the power system's reactive load is capacitive (i.e., leading), the SVC would use the thyristor-controlled reactors to consume vars from the system, thus lowering the voltage. If the system's reactive load is inductive (i.e., lagging), the capacitor banks would be automatically switched in, thereby increasing voltage.

[1] A thyristor is a solid-state semiconductor device that acts as a bistable switch.

[2] A capacitor is a passive two-terminal electrical component used to store energy temporarily in an electric field. In electric transmission systems, capacitors can be used to provide local sources of reactive power.



Lightner Mitigation Site Parcels

Project Area (limit of disturbance)

Suncrest Powerlink ROW

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Figure 2-5
Lightner Mitigation Site

Suncrest Dynamic Reactive Power Support Project

The proposed SVC's electrical equipment would be contained within a fenced area of approximately 2.58 acres. The total size of the SVC, however, including associated site improvements (e.g., access driveways, stormwater detention basin), would be approximately 6 acres.

Electrical Equipment and Facilities

While the final design and layout of the SVC facility may vary based on manufacturer's specific proposals (the final design would be procured through an engineering, procurement, and construction contract and functional specification, where manufacturers would have the flexibility to configure their SVC candidate designs in an optimal manner to meet the requirements of the specification), all candidate designs would be anticipated to include the following electrical equipment and facilities:

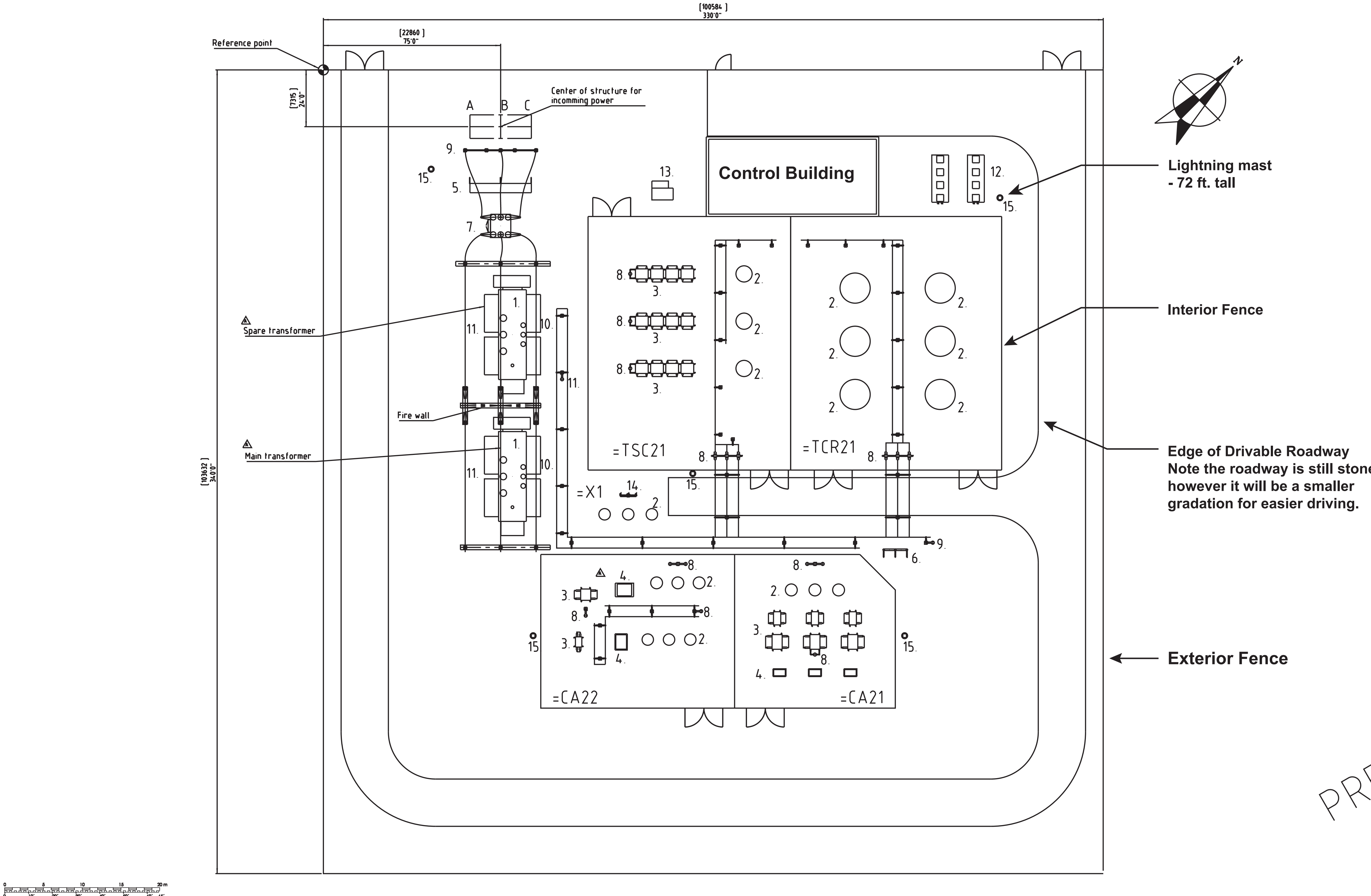
- Lightning shielding masts
- 230-kV circuit breaker
- 230-kV main stringbus and busbar
- 230-kV group operated air break switch
- 230-kV lightning arresters
- 230-kV potential measurement transformers
- Two single phase 230-kV main power transformers (one would be a spare), outdoor heating, venting and air conditioning equipment and thyristor/convertor cooling equipment
- Outdoor capacitor banks
- Outdoor air core reactors
- Outdoor medium voltage[1] busbars
- Outdoor medium voltage instrument/auxiliary transformers
- Outdoor medium voltage surge arrestors
- Outdoor medium voltage group-operated air break switches
- Control house of approximately 2,500 square feet containing the following equipment:
  - Thyristor valves and/or insulated-gate bipolar transistor (IGBT)[2] convertors

[1] Medium voltage is commonly defined as greater than 1 kV and less than 100 kV. The actual voltage rating of the Proposed Project equipment may vary based on manufacturer's proposals.
[2] An IGBT is a three-terminal power semiconductor device primarily used as an electronic switch.

- Protective relaying and control equipment
- Supervisory control and data acquisition (SCADA)[1] equipment
- Cooling equipment
- AC/DC auxiliary power equipment
- Spare parts and maintenance tool storage
- Miscellaneous support facilities

The preliminary layout and arrangement of the outdoor equipment at the proposed SVC is shown in Figure 2-6; however, as noted above, the actual layout of the equipment at the Proposed Project facility may vary from the figure based on the candidate designs submitted by manufacturers. All major equipment (e.g., power transformers, power circuit breakers, control buildings, capacitors, and reactors) would be installed on concrete foundations. The transformers at the SVC would each require a maximum of 10,000 to 13,000 gallons of oil. Secondary containment structures designed to contain the oil volume of the transformers plus the 25-year, 24-hour storm event would be included as part of the project, as described further below. The lightning shielding masts would be the tallest structures within the SVC at approximately 75-feet-high.

[1] SCADA is a system for remote monitoring and control that operates with coded signals over communication channels. It is commonly used to remotely operate large industrial processes such as electric power transmission systems.



PRELIMINARY

1	Transformer
2	Reactor
3	Capacitor
4	Resistor
5	Disconnector
6	Grounding switch
7	Circuit breaker
8	Current transformer
9	Voltage transformer
10	Surge capacitor
11	Surge arrester
12	Cooling tower
13	Auxiliary Transformer
14	Fuse
15	Lightning mast

Figure 2-6
Preliminary SVC Layout

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Suncrest Dynamic Reactive Power Support Project

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Associated Site Improvements

In addition to the electrical equipment, the SVC would include the following facilities or components:

- Two new 20-foot-wide by 95-foot-long access driveways from Bell Bluff Truck Trail to the SVC;
- A stormwater detention basin, sized to capture the runoff from the 85th percentile of a 25-year, 24-hour rain event, and earthen swales to divert run-on stormwater;
- A Mechanically Stabilized Earth retaining wall approximately 480 feet long and 15 feet tall at its highest point (an average height of 8 feet) along the east side of the facility;
- Chain link and barb wire security fencing approximately 7 feet high with secure gates accessible only by NEET West staff and emergency services personnel;
- Transformer oil containment basins designed to contain the oil volume of the transformers plus stormwater from the 25-year 24-hour storm event;
- A 10,000-gallon water tank for fire suppression outside the Suncrest SVC fence and adjacent to the northeastern driveway; and
- Signage and lighting.

The new driveways would be graveled and would include paved turning aprons off of Bell Bluff Truck Trail, an internal circulation route, and associated improvements. The turning aprons would be designed to accommodate large construction and haul vehicles and would occupy a total area of approximately 5,000 square feet. The access driveways would be entirely located within the 6-acre area of APN 523-040-080 that NEET West intends to acquire in fee title.

The stormwater detention basin would be sized based on the 85th percentile of the 25-year, 24-hour rainfall event. It would be designed to capture the runoff from such an event and then release the captured water over 48 hours. Overflow from the basin would occur through a rip-rap spillway that would provide for sheet-flow of the stormwater to the adjacent land surface during storms that exceed the basin's design capacity. A series of earthen swales would be constructed around the SVC facility to divert stormwater that would otherwise run onto the site. The swales would discharge any run-on water via shallow, concentrated sheet flow to the adjacent land surface, and would include rip rap aprons at discharge locations for erosion control.

The retaining wall would be built on grade (i.e., not above grade) on the east side of the SVC to provide slope stability, minimize the potential for erosion, and avoid the need for additional land and impacts to oak woodlands east of the Proposed Project site. The retaining wall would be supported by a concrete foundation constructed of concrete blocks, installed 1 to 2 feet below grade. Depending on the soil and rock conditions, anchors or reinforced geogrid strips, with a maximum embedment length of approximately 12 feet, may be installed to support the wall.

The lighting at the SVC facility would conform to National Electric Safety Code (NESC) requirements and applicable outdoor San Diego County outdoor lighting codes. NESC recommends illuminating substation facilities to a minimum of 22 lux or 2 foot-candles. Remotely-controlled lighting would be provided at a level sufficient to provide safe entry and exit to the SVC site and control building. Additional manually-controlled lighting would be available for use, when required, to further support safe working conditions at the SVC.

2.4.1.2 Transmission Line Components

The transmission line connecting the SVC to the existing Suncrest Substation would be approximately one mile in length and would be installed primarily underground. As shown in Figure 2-3, the proposed transmission line would follow the alignment of, and be located within, Bell Bluff Truck Trail for the majority of its length. The last approximately 300 feet of the line would transition to an overhead span via a new riser pole to be installed just north of the road. The overhead span would contain two poles in total; the 85- to 95-foot-tall riser pole (at the transition from underground to overhead) and an approximately 116-foot-tall intermediate pole which would be installed approximately 35 feet outside the Suncrest Substation. NEET West would own the riser pole. The intermediate pole would become the change of ownership pole, with NEET West owning the overhead span between the riser pole and the intermediate pole and SDG&E owning the overhead span from the intermediate pole into the Suncrest Substation.

Note: NEET West had originally proposed a single riser pole for the overhead transmission line connecting to the Suncrest Substation in the PEA they submitted to CPUC. Under this original proposal, it was believed that the single riser pole could be maintained via bucket trucks extended from Bell Bluff Truck Trail. Coordination with SDG&E, however, indicated that SDG&E would need a larger permanent maintenance pad to maintain the pole. As installation of a maintenance pad would involve cutting into the hillside, and would potentially introduce new significant impacts, NEET West developed the current "two-pole" design. This design allows SDG&E to maintain the intermediate pole (i.e., the new change of ownership pole) from the existing graveled access road, which runs along the perimeter of the existing Suncrest Substation, thereby avoiding the need for a new permanent work pad.

Underground Transmission Line

The proposed transmission line would be a new 230-kV single-circuit line composed of cross-linked polyethylene-insulated, solid-dielectric, copper or aluminum conductor cables. The line would consist of three separate 230-kV conductor cables. The cables would be installed within polyvinyl chloride (PVC) conduits in a concrete-encased duct bank system. The duct bank system would include four conduits for the 230-kV cables (three for the cables plus one spare) as well as four smaller conduits for fiber optic cables, which would provide communications for line relaying, SCADA, and other devices as required. The duct bank system would be approximately 30 inches wide by 24 inches tall, with the bottom of the duct bank approximately 5 feet below grade. Up to five underground splice vaults would be installed along the transmission line alignment (roughly every 900 feet) to allow for installation of the underground cables and for operation and maintenance of the transmission line.

While the majority of the transmission line would be installed within Bell Bluff Truck Trail, at vault locations, temporary disturbance may be required outside of the roadbed to facilitate installation of the vaults. The permanent vault structures would be located within the existing paved roadbed.

Riser Pole and Above-Ground Transmission Line Segment

A riser pole would be installed on the road shoulder north of Bell Bluff Truck Trail. The riser pole would be between 85 to 95 feet tall, with a base of approximately 7 feet in diameter plus an area of permanent disturbance approximately 15 feet in radius from the pole. The riser pole would be accessed by Bell Bluff Truck Trail. In between the riser pole and Suncrest Substation, a secondary or intermediate pole would be installed approximately 35 feet north of the existing substation fence line. This intermediate pole would be approximately 116 feet tall, with a base of approximately 7 feet in diameter. The intermediate pole would be accessed by the existing Suncrest Substation paved driveway and graveled service road leading to and around Suncrest Substation. The intermediate pole would be situated on the hillside on the north side of the graveled service road, between 5 and 10 feet from the road edge. Approximately 0.37 acre of temporary and 0.01 acre of permanent disturbance would be required to construct, operate, and maintain this intermediate pole.

The slope on which the intermediate pole would be constructed is currently undergoing revegetation by SDG&E per mitigation requirements in the Sunrise Powerlink EIR/EIS.

Depending on the results of geotechnical testing, alternative construction methods, such as pole installation on micropile foundations, may be required for installation of the riser and intermediate poles. Micropile foundations typically consist of small-diameter (i.e., less than 300 millimeters) drilled and grouted replacement piles (i.e., a pile placed or constructed within a previously drilled borehole replacing the excavated ground). Micropiles are installed by drilling a borehole, reinforcing the hole with a casing or other enforcement structure, and grouting the hole. The new riser and intermediate poles would facilitate entry into the existing substation via an approximately 300-foot-long overhead span of 1272 kcmil[1] (45/7) aluminum steel reinforced, non-specular, "Bittern" conductors. The approximate vertical distance between the conductors would be 16.5 feet and clearance to the ground would be a minimum of 30 feet in compliance with CPUC G.O. 95, *Rules for Overhead Electric Line Construction.* SDG&E would be responsible for stringing the conductor cables required to connect SDG&E equipment at the Suncrest Substation.

Additionally, SDG&E would need to add electrical infrastructure to facilitate interconnection to SDG&E equipment at the Suncrest Substation. SDG&E would add foundations, support structures, grounding, conduits and wiring, bus work, breakers, disconnect switches, control, protection, metering, communication support racks and SCADA and communication facilities to the existing 230-kV substation yard.

Communication Cables

Primary and secondary optical ground wires (OPGW) would be used to carry the fiber optic communications and protective relaying from the termination structure into the substation. Two splice boxes, one for each OPGW, would be installed on the base of the riser pole, and

[1] A circular mil is a unit of area equal to the area of a circle with the diameter of one mil (i.e., one thousandth of an inch). One thousand circular mils is abbreviated as kcmil, and is often used to define large electrical wire sizes.

two splice boxes on the base of the intermediate pole. Surge arresters would be placed on the riser pole arms to protect the underground cable from transient surges.

2.4.2 Project Construction

Construction of the SVC and transmission line would require similar methods of site preparation, excavation, installation of equipment and structures, and restoration. Substantial grading would only be anticipated for the SVC; a very limited amount of grading would be necessary for construction of the transmission line. Anticipated construction methods are described further below for each project component. Information on the construction schedule, equipment, access and staging, water use, and utility connections for the project as a whole is presented in the following section.

2.4.2.1 SVC Construction

Construction of the SVC would occur in a phased approach beginning with site preparation and grading of the site, followed by installation of the foundations and underground equipment, and finally, installation and testing of the electrical equipment. Prior to clearing and grubbing, all necessary surveys, marking, and installation of stormwater management features (e.g., silt fence, fiber rolls, etc.) would be completed.

Site Preparation, Grading, and Earthwork

Construction of the SVC would require clearing of approximately 8.56 acres of California buckwheat scrub, non-native grassland, and ruderal lands. The SVC facility would be located on the site of the old Wilson Construction Yard, which was impacted during construction of the existing Suncrest Substation. Vegetation removal would be completed using mechanized removal equipment or by hand using chain saws. Following initial clearing, topsoil would be salvaged to a depth of approximately 6 inches (or less if subsoil is not present to that depth) in all areas to be restored and would be stored on-site or at a nearby approved work area for use in site restoration, as appropriate.

Following site clearing/vegetation removal, grading and excavation would be conducted. Grading would include both removal of excess material as well as importation of fill and gravel material. Table 2-1 provides a summary of anticipated grading activities and material quantities.

In general, earthwork activities (e.g., grading, excavation) would be completed such that the site meets project design specifications and matches proposed grades. Geotechnical borings completed to date in the vicinity of the SVC site have found predominately gravel, clayey sand, and decomposed granite. Based on information obtained from soil borings performed near the corners of the proposed SVC site and the results of the geotechnical investigation performed for the Proposed Project, NEET West anticipates that the majority of the SVC site can be excavated by conventional methods, although a minimal amount of hydraulic hammering or blasting may be required.

Table 2-1. SVC Grading Summary

Item	Description	Quantity/Height
Total Cut	Excavated earthwork material (including topsoil)	21,000 cubic yards (cy)
Excess Material	Material to be removed from site	4,000 cy
Total Fill	Placed and compacted material (including surfacing material)	17,000 cy
Surfacing Material	Gravel to be imported (included in “Total Fill”)	2,500 cy
Maximum Cut-Slope Depth	Maximum depth of excavation from ground surface	15 feet
Maximum Fill-Slope	Maximum height of filling from ground surface	13 feet
Maximum Retaining Wall Height	Maximum height of retaining wall	15 feet

Conventional excavation practices would be used first to excavate to the location where bedrock is encountered. In areas where shallow bedrock is found, detonation blast holes would be drilled into the bedrock. Explosives would be detonated in the blast holes to crack the rock around the blast hole. Blast intensity is dependent on the amount of explosives used, frequency, and diameter of the holes where the explosives are placed, and timing of the detonation. NEET West describes the type of blasting that may be used for the Proposed Project as low-energy, localized blast, also referred to as micro-blasting. Micro-blasting is blasting in a highly controlled manner involving time delays between numerous small micro blasts to fracture rock without injecting material and to minimize noise effects. While it is anticipated that a minimal amount of blasting may be required for construction of the SVC, it is impossible to determine the exact location where blasting would be required until conventional excavation is conducted and areas of bedrock are identified.

Removal of material would typically extend to depths where competent materials, with high mechanical strength and resistance to erosion and deformation, are encountered. The maximum anticipated depth of excavation from ground surface would be 15 feet. Any material that requires processing prior to placement as fill will be mechanically processed on-site to achieve a maximum particle size and distribution suitable for conventional placement in engineered fills. As shown in Table 2-1, grading for construction of the SVC would be anticipated to result in the generation of 4,000 cy of excess material that would require off-site removal and disposal at a landfill. Additionally, approximately 2,500 cy (or 6 inches over the SVC footprint) of gravel would need to be imported and installed at the SVC site for grounding purposes. All clean spoils excavated by the Proposed Project would be reused on-site as fill, as feasible.

Foundations, Below-Grade Construction, and Equipment Installation

Following earthwork, all necessary below-grade construction, including structure and equipment foundations, underground ducts, ground grid, and construction of the control shelter, would begin. After below-grade work is completed, major equipment and structures would be installed and anchored on their respective foundations. It is anticipated that all major electrical and SVC equipment, such as power transformers, power circuit breakers, control building, capacitors, and reactors would be delivered to the SVC footprint and placed directly on the previously constructed foundations. Other SVC equipment such as air disconnect switches, instrument transformers, transmission structures, insulators, conductors, rigid bus, connectors, conduit, cable trench, rebar, etc., will be received and temporarily stored at the staging area prior to installation.

Work Area Restoration

Following completion of construction and demobilization, all temporarily disturbed work areas would be restored to their pre-construction conditions. Areas that were disturbed by grading, augering, or equipment movement would be recontoured to their original contours. Work areas would be decompacted, and salvaged topsoil materials would be re-spread following recontouring to aid in restoration of disturbed areas.

2.4.2.2 Transmission Line Construction

Similar to the SVC, construction of the transmission line would occur in a phased approach beginning with site preparation, followed by trenching, with duct bank and splice vault installation occurring concurrently, and finally, cable pulling, splicing, and termination. Prior to trenching, all necessary surveys, marking, and installation of stormwater management features (e.g., silt fence, fiber rolls) would be completed.

Site Preparation

Construction of the transmission line is anticipated to require minimal vegetation clearing, as the transmission line would be located primarily within (underneath) the paved surface of Bell Bluff Truck Trail. Vegetation clearing would only be required for the portion of the line alignment on the road shoulder in the areas of the new riser and intermediate poles. This area of impacts would be approximately 0.85 acre, with approximately 0.02 acre of permanent impacts at the riser and intermediate pole locations.

Trenching

Trenching required for duct bank and vault installation would involve asphalt cutting to expose the soil layer below the paved surface of Bell Bluff Truck Trail, followed by open-cut trenching techniques. The typical trench width for duct bank installation would be approximately 2.5 feet wide by 5 feet deep, while the typical trench width for vault installation would be 9 feet wide by 13 feet deep.

Excavation methods for digging the trenches for the underground alignment would include both conventional practices (e.g., a backhoe) and, potentially, blasting techniques. NEET West anticipates that 10 percent of the alignment, or approximately 530 linear feet of trench, could require blasting. Conventional excavation practices would be used first to excavate to the location where bedrock is encountered. In areas where shallow bedrock is found, detonation blast holes would be drilled into the bedrock. Explosives would be detonated in the blast holes to crack the rock around the blast hole. NEET West describes the type of blasting that may be used for construction of the Proposed Project as low-energy, localized rock blasting, which is also referred to as micro-blasting. Micro-blasting is blasting in a highly controlled manner involving time delays between numerous small micro blasts to fracture rock without injecting material and to minimize noise effects. NEET West states that it is not possible to determine the exact location where blasting would be required until conventional excavation is conducted and areas of bedrock are identified.

All excavated material, including soil, rock, concrete, and asphalt would be temporarily staged on-site and hauled off to an appropriate disposal facility, such as Miramar Landfill. It is anticipated that a total of 3,000 cy would be generated and hauled off-site from trenching for transmission line construction at a rate of 30 cy (three truck trips) per day.

Duct Bank & Splice Vault Installation

Within each open trench section, the duct bank would be installed approximately 5 feet deep, or 3 feet below the ground surface to the top of the duct bank. As mentioned above, the duct bank would be approximately 2.5 feet wide by 2 feet in height. The duct bank would be constructed by first installing the conduit (6-inch diameter for the electrical cable and 2-inch diameter for the telecommunications cable) separated by spacers and then placing 3,000-pounds-per-square-inch concrete around the conduits to form the duct bank. After duct banks have been installed, the trenches would be backfilled. It is anticipated that approximately 800 cy of native, non-thermal, or thermal backfill would be used in backfilling trenches for the Proposed Project. Each duct bank would be anticipated to have a minimum of 36 inches of cover, including 18 inches of road and sub-road material.

In areas where the duct bank alignment runs parallel to water lines, telecommunications utilities, or drainage culverts, a minimum horizontal clearance of 12 inches and vertical clearance of 6 inches would be provided. This clearance would need to be increased to 24 inches in all directions for existing SDG&E electric distribution feeder lines or other utilities that operate at temperatures greater than the surrounding earth temperature. Currently, it is known that there is an existing underground 12-kV distribution line owned by SDG&E, located on the south side of Bell Bluff Truck Trail, which the duct bank/transmission line would parallel for approximately 3,400 feet (0.64 mile). From the intersection of Bell Bluff Truck Trail and the Suncrest Substation access road (see Figure 2-2), NEET West anticipates having to cross a 12-kV distribution feeder, which powers a communication site on the north side of the Suncrest Substation, and a water pipe connecting SDG&E's water tank to the existing substation. Adequate clearance would be given to these existing utilities, as described above, and in accordance with CPUC G.O. 128, *Rules for Construction of Underground Electric Supply and Communication Systems.* Prior to construction, all existing utilities and culverts within the roadway would be located and potholed to ensure proper separation and avoidance.

During trenching for the underground duct bank, additional excavation would occur in the location of the proposed splice vaults; up to five underground splice vaults may be required for the underground transmission line, spaced approximately 900 feet apart. The vaults would be pre-fabricated steel-reinforced concrete with approximate dimensions of 30 feet long by 8 feet wide by 11 feet deep, so the excavation would be large enough to accommodate these dimensions. Installation of each vault would occur over a 1-week period following a sequence of: excavation and shoring of the vault pit; delivery and installation of the vault; fill and compaction of backfill; and restoration of the excavated area to pre-construction conditions. Backfill for the vaults would consist of either compacted native soil, slurry, or concrete.

Riser Pole and Intermediate Pole Construction

The work areas for the riser pole and intermediate pole would first be cleared of vegetation and then be slightly graded prior to excavating for the pole foundations. Temporary work pads may be required to excavate for the foundations or install the poles at either location. The excavation depths would be approximately 20 feet deep. Approximately 30 cy of material would be removed from each pole location and re-used onsite or disposed of at an approved off-site location. Following construction of the pole foundations, the riser pole and intermediate pole structures would be installed.

Due to the likely presence of rock either at or very near the ground surface, installation of the riser pole and intermediate pole may require localized blasting or other alternative excavation techniques to install the poles. Alternative methods may include pole installation on a micro-pile foundation. Micropiles typically consist of small-diameter (less than 300 millimeters) drilled and grouted replacement piles (i.e., a pile placed or constructed within a previously drilled borehole replacing the excavated ground). Micropiles are installed by drilling a borehole, reinforcing the hole with a casing or other enforcement structure, and grouting the hole. Micropiles would be 35 to 40 feet deep under a 10-foot-deep pile cap. These foundations would use up to 70 cy of concrete.

Cable Pulling, Splicing & Termination

Following installation of the duct bank, splice vaults, and riser and intermediate poles, the electric and telecommunications cables would be installed in the duct banks. The cables would be pulled into the duct banks by placing a pulling rig on one end of the duct bank section and a cable reel on the other. Cables would be pulled through each segment between splice vaults, and then spliced at each splice vault location. Stringing of the conductor and OPGW between the intermediate pole and riser pole would be conducted using pulling and tensioning equipment set up on Bell Bluff Truck Trail and the Suncrest Substation service road. For the last span into the Suncrest Substation, SDG&E would place pulling and tensioning equipment on their service road and within the substation to pull the conductor and OPGW into place to make the final terminations at the A-frame structure.

A splice trailer would be located adjacent to the vault manhole to facilitate splicing (i.e., stripping of the cable jacket, shield, and insulation, and connection of the two cables on either side of the vault). At the ends of cables in the SVC facility and on the riser pole, the cable jacket, shield, and insulation would be stripped back to facilitate the installation of a terminator.[1] Temporary scaffolding may be required to reach the elevated terminations on the riser pole. Prior to energizing, each phase would be tested to ensure proper splicing and continuity.

Electric and telecommunication cable would be spliced into the SVC facility after being pulled through their respective ducts. Fiber optic cable routed to the existing Suncrest Substation would need to be spliced to connect to the OPGW in a splice box located on the intermediate pole. A splice box would also be installed on the riser pole to connect the underground fiber to the OPGW.

SDG&E would be responsible for construction activities necessary for supporting interconnection of the Project Applicant's facility and equipment to SDG&E equipment within

[1] A terminator is a resistor placed at the end of an electrical wire or cable to prevent a radio frequency signal from being reflected back from the end, causing interference.

the Suncrest Substation. This would involve adding foundations, support structures, grounding, conduits and wiring, bus work, breakers, disconnect switches, control, protection, metering, communication support racks and SCADA and communication facilities to the existing 230-kV substation yard.

Work Area Restoration

Following completion of construction and demobilization, all work areas utilized for construction would, to the extent practicable, be restored to their pre-construction conditions. All residual construction debris and waste would be removed and transported off-site to an approved disposal and/or recycling facility. The disturbed portion of Bell Bluff Truck Trail would be restored by replacing the aggregate road base and installing an asphalt cap. Any road signage or markings removed or disturbed during construction would be replaced.

2.4.2.3 Overall Construction Schedule, Equipment, Access, Water Use, and Utility Connections Information

Construction Schedule

Construction of the SVC and transmission line is expected to occur simultaneously. Overall, the Proposed Project would be anticipated to take 11 months to construct (6.5 months for construction; 2.5 months for testing and commissioning; and 2 months for restoration and cleanup) and is targeted to be operational by early 2018. Typically, construction would occur 10 hours per day, 6 days per week, Monday through Saturday, between 7 a.m. and 7 p.m.; however, certain time-sensitive activities and/or activities which are not noise-intensive may occur outside these hours.

Construction Workforce & Equipment

The peak employment during Project construction is anticipated to be 64 workers, although on average, the workforce on site would be less (approximately 40 to 50 persons [or less] per day). As a conservative assumption for the environmental impacts analysis in later chapters of this EIR, the total number of unique construction workers over the entire construction period will be approximately 120. In addition to construction workers, visitors to the site during construction would include NEET West management, engineering consultants, government inspectors, and construction monitors, who would visit the site intermittently. The workers for the more common development tasks of grading and building foundations for the SVC and riser pole structure are likely to be hired from San Diego County. Workers for installing the SVC and underground transmission line will have specialized skills and may be drawn from either San Diego County or further away. Equipment to be used during Project construction would be anticipated to include, but not be limited to, bulldozers, excavators, backhoes, loaders, graders, scrapers, cranes, drill rigs, skid steer, dump trucks, tractor-trailers, splice trailers, water trucks, concrete mixer trucks, line trucks, fork lifts, pulling rigs, reel trailers, transformer low-boy trucks and trailers, and pick-up trucks.

Site Access & Construction Staging

The primary access to the Project site during construction would be along Bell Bluff Truck Trail. Bell Bluff Truck Trail is an existing, private, approximately 30-foot-wide (though it decreases to 12-foot-wide west of the intersection with the Suncrest Substation access road; see Figure 2-3), paved road that provides access to the proposed SVC site and the existing

Suncrest Substation from Jatapul Valley Road. As described under Section 2.4.1, "Proposed Project Components," two new access driveways would be constructed off of Bell Bluff Truck Trail to allow for access of the proposed SVC site. During construction of the transmission line, the Project would use nearly all of the one mile of Bell Bluff Truck Trail between the SVC site westward to the Suncrest Substation for vehicle movements and staging. Bell Bluff Truck Trail would also be used to access the riser pole structure, while the paved Suncrest Substation driveway and graveled service road would be used to access the intermediate pole outside the Suncrest Substation fence. No new temporary or permanent access roads would be required for construction of the underground transmission line.

During construction of the transmission line, work would primarily occur within the paved portions of Bell Bluff Truck Trail. Excavation would extend onto the road shoulder or outside the paved portion of the road only at the splice vault locations and for installation of the riser and intermediate poles. The Proposed Project would use one primary 2.56-acre material receiving and staging area located immediately west of the proposed SVC on APN 523-040-080. The Project Applicant would obtain a temporary construction easement from the private landowner to use this staging area prior to construction. Preparation of the staging area would involve grubbing, clearing, and limited grading. Perimeter security fencing would be installed around the outer limits of the SVC work area, and lighting would also be installed for security purposes. A security professional would monitor the staging area nightly, after normal working hours, and on weekends during the day if no construction personnel are present.

While it is anticipated that all major electrical and SVC equipment, such as power transformers, power circuit breakers, the control building, etc., would be delivered to the SVC site and placed directly on the previously constructed foundations, other SVC equipment, such as air break switches, instrument transformers, transmission structures, insulators, etc., would be received and temporarily stored at the staging area prior to installation. All construction equipment and vehicles associated with SVC construction would be parked within the staging area while inactive and at the completion of each workday, where practical.

Materials associated with the transmission line (e.g., conductor cable reels, fiber reels, manholes, vaults) would be stored at the SVC staging area. Construction equipment used in construction of the transmission line may be staged along Bell Bluff Truck Trail at active work sites based on safety considerations and/or to reduce potential environmental impacts associated with moving heavy equipment back to staging areas at the end of each workday.

Water Use

Overall, it is anticipated that approximately 2,600,000 gallons (~8 acre-feet) of water will be required during project construction. This water would be used on-site for the cutting of asphalt pavement, dust control, fire suppression reserve in compliance with the Project's Construction Fire Protection Plan, concrete washout, and other construction activities, including restoration work. Water usage would vary based on the construction activity/phase, but would average approximately 13,100 gallons per day for the entire project for the approximate construction duration of 196 workdays. All water to be used during Project construction would be supplied by water truck.

Currently, NEET West is negotiating a water services agreement with the Padre Dam Municipal Water District (PDMWD) for use of recycled water from their water recycling facility, located approximately 19 miles from the Project site. NEET West is also coordinating with the owner of the property on which the SVC would be built for use of the property owner's storage ponds. There already exists a PVC pipeline between the property owner's storage ponds and a water tank at the SVC site, so use of this water could potentially reduce substantially the number of truck trips necessary. Assuming the on-site water source is not available and water must be hauled in from an off-site location such as PDMWD's Water Recycling Facility, it is anticipated truck trips would average three per day (with a peak of up to 6 trips per day during below-grade construction for the SVC).

Utility Connections

AC power for construction and operation at the SVC facility (e.g., for power during construction and permanent lighting) would be provided from a nearby underground 12-kV distribution line located underneath Bell Bluff Truck Trail. This distribution line would be tapped and service would be brought into the SVC site. The service line would be brought in via an underground duct bank and would be installed in cooperation with SDG&E. All disturbances associated with the distribution would be contained within previously described areas of disturbance associated with other Project components. In addition to the power provided by the SDG&E distribution line, additional power for construction activities may be supplied by portable gas or diesel generators.

No new temporary or permanent sewer connections would be required for the Proposed Project. Portable toilets would be located at the staging area at the SVC facility. Portable toilets may be towed behind vehicles to the work locations for the underground transmission line each morning and then taken off of the road each evening and stored overnight at the SVC staging area.

2.4.3 Project Operation and Maintenance

2.4.3.1 Operation

NEET West anticipates remotely operating the Proposed Project from its affiliate Lone Star Transmission, LLC's control center in Austin, Texas. No staff would be needed on site to operate the Proposed Project. The SVC would operate in response to system disturbances or based on voltage/load conditions experienced at the Suncrest Substation. Depending on the conditions, the SVC would either produce or consume reactive power (i.e., vars) primarily through automatic operation/response of its thyristor-controlled reactors and capacitor banks. Essentially, if the power system's reactive load is capacitive (i.e., leading), the SVC would use the thyristor-controlled reactors to consume vars from the system, thus lowering the voltage. If the system's reactive load is inductive (i.e., lagging), the capacitor banks would be automatically switched in, thereby increasing voltage.

NEET West would use standard monitoring, control, and protection equipment, including circuit breakers and other line relay protection equipment, and would monitor and operate the Proposed Project via an Energy Management System (EMS) with redundant servers and telecommunications to two data centers based in North and South Florida. The Proposed Project facilities would be dual scanned from both data centers and redundant Inter-Control Center Communications Protocol (ICCP or IEC 60870-6/TASE.2) servers would exchange SCADA data with the CAISO and neighboring transmission operator entities. The EMS would include displays and alarm processing to ensure transmission operations have real-time situational awareness. The EMS support personnel would perform daily checks of the applications and hardware to ensure they are in proper working order. The EMS system also would be maintained to ensure compliance with North American Electric Reliability Corporation (NERC) Critical Infrastructure Protection Standard requirements.

2.4.3.2 Inspections and Maintenance

Maintenance of the Proposed Project would be anticipated to include routine monthly inspections of SVC equipment, the balance of the substation equipment and the transmission line cable terminations. A more thorough annual inspection and assessment of the main SVC components would be performed and drive any planned equipment outages. While an annual offline outage of the SVC is typical, offline maintenance will be driven by the monthly and annual inspections and assessments. NEET West does not anticipate any transmission line inspections, other than the monthly and annual inspections and assessments of the termination points. Inspection and maintenance would be performed by NEET West local personnel, augmented as necessary by NEET West subject matter experts and the equipment Original Equipment Manufacturer.

NEET West anticipates creating a maintenance plan in accordance with the equipment vendors' directives, industry practice, NEET West's internal guidelines, and regulatory requirements. The plan would comply with the CAISO Transmission Control Agreement and Maintenance Practices Procedures and be approved by the CAISO before the start of commercial operation.

2.5 Permits and Approvals

The Proposed Project may be subject to a number of other regulatory permits and approvals, depending in part on the environmental analysis contained in this draft EIR, further surveys of environmental resources on or near the Project site, and the discretion of the regulatory agencies. Anticipated required permits and regulatory approvals for the Proposed Project are listed in Table 2-2 below**.**

Table 2-2. Proposed Project Permits and Approvals

Regulatory Agency	Law/Regulation	Permit/Authorization Type	Triggering Action
San Diego Regional Water Quality Control Board	Clean Water Act, Section 402	National Pollutant Discharge Elimination System (NPDES) General Construction Stormwater Permit	Disturbance of more than one acre of land during construction.
County of San Diego, Department of Environmental Health	Unified Program: various laws and regulations related to hazardous waste	Unified Program Facility Permit	Storage of transformer oil, which is classified as a hazardous substance under State law.
County of San Diego, Sheriff's Department	Blasting Permission	Blasting Permit	Potential use of blasting materials during construction

2.6 Applicant Proposed Measures

The Applicant, NEET West, would implement several measures to reduce the potential impacts of Project construction. Applicant proposed measures (APMs) that would be implemented for the Proposed Project are listed in Table 2-3.

Table 2-3. Applicant Proposed Measures (APMs) to be Implemented during Project Construction

APM Number and Title	APM Text
AIR-1: Fugitive Dust Control	During construction, water or non-toxic soil stabilizers will be applied in sufficient quantities on access roads, staging areas, work areas, and on stockpiles to control fugitive dust.
AIR-2: Speed Limits	During construction, vehicle speeds will be limited to 15 miles per hour on unpaved roads or work areas and vehicles should be turned around in established or designated areas only.
AIR-3: Vehicle Use and Idling Time	To the extent feasible construction vehicle use and idling time will be minimized. The ability to limit construction vehicle idling time is dependent upon the sequence of construction activities and when and where vehicles are needed or staged. Certain vehicles, such as large diesel powered vehicles, have extended warm-up times following start-up that limit their availability for use following startup. Where such diesel-powered vehicles are required for repetitive construction tasks, these vehicles may require more idling time. The Proposed Project will apply a "common sense" approach to vehicle use; if a vehicle is not required for use immediately or continuously for construction activities, its engine will be shut off. Construction foremen will include briefings to crews on vehicle use as part of preconstruction conferences. Those briefings will include discussion of a "common sense" approach to vehicle use.
AIR-4: Construction Equipment Emissions	Low-emission construction equipment will be utilized during construction of the Proposed Project. Construction equipment will be maintained per manufacturer specifications. All off-road construction diesel engines not registered under the CARB Statewide Portable Equipment Registration Program shall meet at a minimum the Tier 2 California Emission Standards for Off-Road Compression-Ignition Engines as specified in Cal. Code Regs., tit. 13 § 2423(b)(1).
AIR-5: Loss of Sulfur Hexafluoride (SF_6)	In operation of the SVC, NEET West will maintain the 230-kv circuit breaker so that the loss of SF_6 is less than 0.5% per year. To assess the loss of SF_6, NEET West will conduct monthly inspections and maintain the records of such inspections. NEET West will also participate in the U.S. Environmental Protection Agency's voluntary SF_6 Emission Reduction Partnership for Electric Power Systems.

2.7 Electric and Magnetic Fields

2.7.1 Overview

The CPUC does not consider electric and magnetic fields (EMF) to be an environmental issue in the context of CEQA because there is no agreement among scientists that EMF creates a potential health risk and because CEQA does not define or adopt standards for defining any potential risk from EMF.

The weather and the earth's geomagnetic field cause naturally occurring EMF, while various technological applications, such as communications technologies, personal electronic devices, electric generation and transmission, and radiological imaging cause man-made EMF (CPUC 2016). EMFs are typically characterized by their wavelength or frequency as either "non-ionizing"[1] or "ionizing" radiation, as shown in Table 2-4 below. In general, the higher the frequency of EMFs, the shorter their wavelength, and the shorter the wavelength, the greater the amount of energy is imparted when interacting with physical objects (CPUC 2016). From this table it can be seen that the EMF from the Proposed Project's 1-mile transmission line would be "non-ionizing."

Hertz (Hz) is a unit of frequency that is defined as one cycle per second. With respect to EMF, Hz values reflect the rate at which electric and magnetic fields change their direction each second. In the U.S., electric transmission lines typically operate at 60 Hz, which is considered an extremely low frequency (ELF) (CPUC 2016). By comparison, mobile phones operate at between 1.9 and 2.2 billion Hz (gigahertz), while X-rays operate at upwards of 30 X 1019 Hz (National Cancer Institute 2016).

Table 2-4. Types of EMF Radiation

Radiation Type	Definition	Forms of Radiation	Source Examples
Non-Ionizing	Low to mid-frequency radiation which is generally perceived as harmless due to its lack of potency.	▪ Extremely Low Frequency (ELF) ▪ Radiofrequency (RF) ▪ Microwaves ▪ Visual Light	▪ Microwave ovens ▪ Computers ▪ House energy smart meters ▪ Wireless (wifi) networks ▪ Cell phones ▪ Bluetooth devices ▪ Power lines ▪ MRIs
Ionizing	Mid to high-frequency radiation which can, under certain circumstances, lead to cellular and/or DNA damage with prolonged exposure.	▪ Ultraviolet (UV) ▪ X-Rays ▪ Gamma	▪ Ultraviolet light ▪ X-Rays ranging from 30 X 10^{16} Hz to 30 X 10^{19} Hz ▪ Some gamma rays

[1] Ionization is the process by which electrons are freed from atoms or electrons, thereby creating ions or charged particles. Ionizing radiation is radiation that carries enough energy to create ions.

Source: NIEHS 2016

2.7.1.1 Electric Fields

Electric fields from power lines from power lines are created whenever the lines are energized, with the strength of the field dependent directly on the voltage of the line creating it. Electric field strength is typically described in terms of kV per meter (kV/m). Electric field strength attenuates (reduces) rapidly as the distance from the source increases. Electric fields are reduced in many locations because they are effectively shielded by most objects or materials such as trees or houses.

Unlike magnetic fields, which penetrate almost everything and are unaffected by buildings trees, and other obstacles, electric fields are distorted by any object that is within the electric field including the human body. Even trying to measure an electric field with electronic instruments is difficult because the devices themselves will alter the levels recorded.

2.7.1.2 Magnetic Fields

Magnetic fields from power lines are created whenever current flows through power lines at any voltage. The strength of the field is directly dependent on the current in the line. Magnetic field strength is typically measured in milligauss (mG). Similar to electric fields, magnetic field strength attenuates rapidly with distance from the source. However, unlike electric fields, magnetic fields are not easily shielded by objects or materials. The nature of a magnetic field can be illustrated by considering a household appliance. When the appliance is energized by being plugged into an outlet but not turned on, no current flows through it. Under such circumstances, an electric field is generated around the cord and appliance, but no magnetic field is created. If the appliance is switched on, the electric field would still be present and a magnetic field would also be created. The electric field strength is directed related to the magnitude of the voltage from the outlet and the magnetic field strength is directly related to the magnitude of the current flowing in the cord and appliance. Table 2-5 shows typical magnetic fields from household appliances.

Table 2-5. Typical Magnetic Fields from Household Appliances

Appliance	Magnetic Field (mG) – 12" Distant	Magnetic Field (mG) – Maximum
Electric Range	3-30	100-1,200
Garbage Disposal	10-20	850-1,250
Clothes Washer	1-3	10-400
Toaster	0.6-8	70-150
Vacuum Cleaner	20-200	2,000-8,000
Hair Dryer	1-70	60-20,000
Electric Shaver	1-100	150-15,000
Fluorescent Desk Lamp	6-20	400-3,500
Circular Saw	10-250	2,000-10,000

Appliance	Magnetic Field (mG) – 12" Distant	Magnetic Field (mG) – Maximum
Electric Drill	25-35	4,000-8,000
Refrigerator	0.3-3	4-15

Source: CPUC 2016; Gauger 1985

At a distance of 12 inches, the magnetic field strengths range from 0.3 to 250 mG. At the source, magnetic field strengths from household appliances included in the table range from 4 mG to 20,000 mG. Field strength attenuates rapidly with distance from the source. Similar to household appliances, an underground transmission line will have a magnetic field that varies dependent upon the current in the transmission line and distance from the transmission line. The CPUC conducted an investigation of EMF levels along the underground double-circuit 230-kV transmission line located in Alpine Boulevard (CPUC 2016). Spot magnetic field measurements ranging from 21.4 mG to 29.0 mG were recorded directly above these buried transmission lines. The Proposed Project would include an underground single-circuit 230-kV transmission line. EMF levels in the vicinity of the Proposed Project's 230 kV single-circuit line are discussed in Section 2.7.4. The CPUC previously conducted an investigation of EMF levels along the underground double-circuit 230-kV transmission line located in Alpine Boulevard (CPUC 2016).

2.7.2 Scientific Background and Regulations Applicable to EMF

2.7.2.1 EMF Research

For more than 20 years, questions have been asked regarding the potential effects of EMFs from power lines, and research has been conducted to provide some basis for response. Earlier studies focused primarily on interactions with the electric fields from power lines. In the late 1970s, the subject of magnetic field interactions began to receive additional public attention and research levels increased. A substantial amount of research investigating both electric and magnetic fields has been conducted over the past several decades; however, much of the body of national and international research regarding EMF and public health risks remains contradictory or inconclusive (see Section 2.7.3 below).

Research related to EMF can be grouped into three general categories: cellular level studies, animal and human experiments, and epidemiological studies. Epidemiological studies have provided mixed results, with some studies showing an apparent relationship between magnetic fields and health effects while other similar studies do not. Laboratory studies and studies investigating a possible mechanism for health effects (mechanistic studies) provide little or no evidence to support this link.

Since 1979, public interest and concern specifically regarding magnetic fields from power lines has increased. The increase has generally been attributed to publication of the results of a single epidemiological study (Wertheimer and Leeper 1979). This study observed a statistical association between the high-current configuration (the "wire code") of electric power lines outside of homes in Denver and the incidence of childhood cancer. The "wire code" was assumed to be related to current flow of the line. The study did not take measurements of magnetic field intensity. Since publication of the Wertheimer and Leeper study, many epidemiological, laboratory, and animal studies regarding EMF have been conducted.

Research on ambient magnetic fields in homes and buildings in several western states found average magnetic field levels within most rooms to be approximately 1mG, while in a room with appliances present, the measured values ranged from 9 to 20 mG (Severson et al. 1988; Silva 1988). Immediately adjacent to appliances (within 12 inches), field values are much higher.

2.7.2.2 Methods to Reduce EMF

EMF levels from transmission lines can be reduced in three primary ways: shielding, field cancellation, or increasing the distance from the source. Shielding, which reduces exposure to electric fields, can be actively accomplished by placing trees or other physical barriers along the transmission line ROW. Shielding also results from existing structures the public may use or occupy along the line. Since electric fields can be blocked by most materials, shielding is effective for the electric fields but is not effective for magnetic fields.

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": three separate wires (conductors) on a transmission tower. The configuration of these three conductors can reduce magnetic fields. First, when the configuration places the three conductors closer together, the interference, or cancellation, of the fields from each wire is enhanced. This technique has practical limitations because of the potential for short circuits if the wires are placed too close together. There are also worker safety issues to consider if spacing is reduced. In underground lines, the three phases typically can be placed much closer together than for overhead lines because the cables are have dielectric insulation.

The distance between the source of fields and the public can be increased by either placing the wires higher aboveground, burying underground cables deeper, or by increasing the width of the right-of-way. For transmission lines, these methods can prove effective in reducing fields because the reduction of the field strength drops rapidly with distance.

2.7.2.3 Scientific Panel Reviews

Numerous panels of expert scientists have convened to review the data relevant to the question of whether exposure to power-frequency EMF is associated with adverse health effects. These evaluations have been conducted in order to advise governmental agencies or professional standard-setting groups. These panels of scientists first evaluate the available studies individually, not only to determine what specific information they can offer, but also in terms of the validity of their experimental design, methods of data collection, analysis, and suitability of the authors' conclusions to the nature and quality of the data presented. Subsequently, the individual studies, with their previously identified strengths and weaknesses, are evaluated collectively in an effort to identify whether there is a consistent pattern or trend in the data that would lead to a determination of possible or probable hazards to human health resulting from exposure to these fields.

These reviews include those prepared by international agencies such as the World Health Organization (WHO 1984, 1987, 2001, and 2007), the international Non-Ionizing Radiation Committee of the International Radiation Protection Association (IRPA/INIRC 1990), and governmental agencies of a number of countries, such as the U.S. Environmental Protection

Agency, the National Radiological Protection Board of the United Kingdom, the Health Council of the Netherlands, and the French and Danish Ministries of Health.

As noted below, these scientific panels have varied conclusions on the strength of the scientific evidence suggesting that power frequency EMF exposures pose any health risk.

In May 1999, the National Institute of Environmental Health Services (NIEHS) submitted to Congress its report titled, Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields, containing the following conclusion regarding EMF and health effects:

> Using criteria developed by the International Agency for Research on Cancer (IARC), none of the Working Group considered the evidence strong enough to label ELF-EMF exposure as a known human carcinogen or probable human carcinogen. However, a majority of the members of this Working Group concluded that exposure to power-line frequency ELF-EMF is a possible carcinogen.

In June 2001, a scientific working group of IARC (an agency of WHO) reviewed studies related to the carcinogenicity of EMF. Using standard IARC classification, magnetic fields were classified as “possibly carcinogenic to humans” based on epidemiological studies. “Possibly carcinogenic to humans” is a classification used to denote an agent for which there is limited evidence of carcinogenicity in humans and less than sufficient evidence of carcinogenicity in experimental animals. Other agents identified as “possibly carcinogenic to humans” include gasoline exhaust, styrene, welding fumes, and coffee (WHO 2001).

On behalf of the CPUC, the California Department of Health Services (DHS) completed a comprehensive review of existing studies related to EMF from power lines and potential health risks. This risk evaluation was undertaken by three staff scientists with the DHS. Each of these scientists is identified in the review results as an epidemiologist, and their work took place from 2000 to 2002. The results of this review titled *An Evaluation of the Possible Risks From Electric and Magnetic Fields From Power Lines, Internal Wiring, Electrical Occupations, and Appliances* were published in June 2002. The conclusions contained in the executive summary are provided below:

- To one degree or another, all three of the DHS scientists are inclined to believe that EMFs can cause some degree of increased risk of childhood leukemia, adult brain cancer, Lou Gehrig’s Disease, and miscarriage.
- They strongly believe that EMFs do not increase the risk of birth defects, or low birth weight.
- They strongly believe that EMFs are not universal carcinogens, since there are a number of cancer types that are not associated with EMF exposure.
- To one degree or another, they are inclined to believe that EMFs do not cause an increased risk of breast cancer, heart disease, Alzheimer’s Disease, depression, or symptoms attributed by some to sensitivity to EMFs. However, all three scientists had judgments that were “close to the dividing line between believing and not believing” that EMFs cause some degree of increased risk of suicide.

- For adult leukemia, two of the scientists are "close to the dividing line between "believing or not believing" and one was "prone to believe" that EMFs cause some degree of increased risk.

The report indicates that the DHS scientists are more inclined to believe that EMF exposure increased the risk of the health problems than the majority of the members of scientific committees that have previously convened to evaluate the scientific literature. With regard to why the DHS review's conclusions differ from those of other recent reviews, the report states:

> The three DHS scientists thought there were reasons why animal and test tube experiments might have failed to pick up a mechanism or a health problem; hence, the absence of much support from such animal and test tube studies did not reduce their confidence much or lead them to strongly distrust epidemiological evidence from statistical studies in human populations. They therefore had more faith in the quality of the epidemiological studies in human populations and hence gave more credence to them.

While the results of the DHS report indicate these scientists believe that EMF can cause some degree of increased risk for certain health problems, the report did not quantify the degree of risk or make any specific recommendations to the CPUC.

In addition to the uncertainty regarding the level of health risk posed by EMF, individual studies and scientific panels have not been able to determine or reach consensus regarding what level of magnetic field exposure might constitute a health risk. In some early epidemiological studies, increased health risks were discussed for daily time-weighted average field levels greater than 2 mG. However, the IARC scientific working group indicated that studies with average magnetic field levels of 3 to 4 mG played a pivotal role in their classification of EMF as a possible carcinogen.

The 2007 WHO [Environmental Health Criteria 238] report concluded that:

- Evidence for a link between Extremely Low Frequency (50 to 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 or health effects at low exposure levels."

2.7.3 Policies, Standards, and Regulations

A number of counties, states, and local governments have adopted or considered regulations or policies related to EMF exposure. The reasons for these actions have been varied; in general, however, the actions can be attributed to addressing public reaction to and perception of EMF as opposed to responding to the findings of any specific scientific research.

In 1991, the CPUC initiated an investigation into electric and magnetic fields associated with electric power facilities. This investigation explored the approach to potential mitigation measures for reducing public health impacts and possible development of policies, procedures or regulations. Following is a brief summary of CPUC guidelines and regulatory activity regarding EMF.

2.7.3.1 CPUC Decision No. 93-11-013

In Decision No. 93-11-013, CPUC took interim steps to address EMFs related to electric utility facilities and power lines. Based on its investigation of the possible impacts of EMF exposure associated with electric utility installations, CPUC recommended the following:

- No-cost and low-cost steps to reduce EMF levels;
- Workshops to develop EMF design guidelines;
- Uniform residential and workplace EMF measurement programs;
- Stakeholder and public involvement; and
- Funding for educational and research programs.

In explaining and justifying its decision, CPUC stated that although the scientific community had not yet isolated the impact, if any, of utility-related EMF exposures on public health, other jurisdictions and agencies have concluded that the best response to EMFs is to avoid unnecessary new exposure to EMFs if such avoidance can be achieved at a cost that is reasonable in light of the risk identified. The decision stated that "low-cost" steps to reduce EMF levels should be defined as roughly 4 percent of the total cost of a budgeted project, but emphasized that this should not be a hard-and-fast rule and that utilities should implement more or less costly solutions as they are determined to be effective.

2.7.3.2 CPUC Decision No. 06-01-042 and More Information

In 2006, CPUC revisited the EMF issue it had covered in its Decision No. 93-11-013 and affirmed its "low-cost/no-cost" policy for mitigation of EMF exposure for new utility transmission and substation projects. Decision No. 06-01-042 also reaffirmed the CPUC's policy of using a benchmark of 4 percent of transmission and substation project costs for EMF mitigation. In addition, Decision No, 06-01-042 adopted rules and policies to improve utility design guidelines for reducing EMF, and provided for a utility workshop to implement the policies and standardize design guidelines. Finally, Decision No. 06-01-042 restated CPUC's position that it is unable to determine whether there is a significant scientifically verifiable relationship between EMF exposure and negative health consequences.

The CPUC's EMF Design Guidelines for Electrical Facilities (July 21, 2006) document is available at http://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=4884. More information about activities taken by CPUC with respect to EMFs can be found at: http://www.cpuc.ca.gov/General.aspx?id=4879. In addition, the results of a 2016 CPUC field investigation on EMF levels along an underground 230-kV transmission line in Alpine, California can be found here: http://www.cpuc.ca.gov/environment/info/aspen/sunrise/Alpine%20Electromagnetic%20Field%20Investigation%20Report_Appendices.pdf.

2.7.4 EMF Data Applicable to the Proposed Project

Notable existing sources of EMFs in the vicinity of the Proposed Project include SDG&E's Suncrest Substation, and Sunrise Powerlink transmission lines

The Proposed Project would not generate any real power and is not a "power plant." The Proposed Project does not increase or decrease the amount of power flow over existing transmission lines, it only acts to support the line voltage on existing lines depending upon the proportion of renewable power flowing on the lines. The Proposed Project does not modify existing transmission lines nor alter the rated capacity of the existing Sunrise Powerlink 500-kV and 230-kv transmission lines, therefore, any potential future power flow along these existing lines would be within the levels foreseen when these facilities were originally approved.

The proposed SVC would inject or absorb reactive power based on system conditions so as to maintain adequate or desirable voltage levels in response to various possible system disturbances. The reactive power flow between the new SVC facility and the existing Suncrest Substation will vary throughout the day and will also vary from day to day and season to season. Since the EMF along the transmission line is directly related to the power flow on the line, it also vary over time. The maximum reactive power flow is expected to occur rarely, under certain emergency or contingency situations. The SVC is designed to provide a maximum +300/-100 MVAR of reactive power. Based on modeling of the maximum output, the EMF along the new 1-mile 230-kV transmission line, at the edges of its 20 foot-wide right-of-way, would be 41 mG at one edge of the right-of-way and 41.9 mG at the other edge of the right-of-way.

The Electric and Magnetic FMP for the Proposed Project evaluated EMF mitigation measures in its design and construction plan and adopted certain no-cost mitigation options (Appendix D of this DEIR). The no-cost EMF mitigation design options that have been included in the Suncrest Project design are as follows:

- Locate high current devices, such as transformers, capacitors, and reactors near the center of the SVC Facility to the extent practicable.
- Locate the SVC Facility fencing so as to maximize the distance between the EMF generating equipment and the property fence to the extent practicable.
- Arrange the underground 230-kv transmission cables in a triangular configuration and install these cables at a minimum of 36 inches below grade where practicable.

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