APPENDIX I

Fire Protection Plan

DRAFT

BOULDER BRUSH FACILITIES
FIRE PROTECTION PLAN
PDS2019-MUP-19-002

Prepared for:

County of San Diego
Planning and Development Services
5510 Overland Avenue, Suite 310
San Diego, California 92123

Facilities Proponent:

Boulder Brush LLC
11455 El Camino Real, Suite 160
San Diego, California 92130

Prepared by:

DUDEK
605 Third Street
Encinitas, California 92024
Principal Author: Michael Huff, Project Manager

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ACRONYMS AND ABBREVIATIONS

amsl	above mean sea level
BLM	Bureau of Land Management
CAL FIRE	California Department of Forestry and Fire Protection
CCFC	County Consolidated Fire Code
CFC	California Fire Code
CEQA	California Environmental Quality Act
CPUC	California Public Utilities Commission
CSA	County Service Areas
CSD	Community Service District
FMZ	Fuel Modification Zone
FPP	Fire Protection Plan
GO	General Order
GPM	gallons per minute
HPwren	High Performance Wireless Research and Education Network
I	Interstate
IFC	International Fire Code
kV	kilovolt
MUP	Major Use Permit
MW	megawatt
NFPA	National Fire Protection Association
SDCFA	San Diego County Fire Authority
SDG&E	San Diego Gas & Electric
SanGIS	San Diego Geographic Information Source
SRA	State Responsibility Area

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EXECUTIVE SUMMARY

This Fire Protection Plan (FPP) has been prepared pursuant to Section 4903 of the San Diego County Consolidated Fire Code to address potential adverse environmental effects that the Campo Wind Project with Boulder Brush Facilities (Project) may have on or from wildland fire. This FPP provides analysis and documentation that the Boulder Brush Facilities are consistent with the San Diego County (County) significance checklist and does not exacerbate the exposer of people or structures to a significant risk of loss, injury or death involving wildland fires based on its conformance with applicable fire and building codes.

This FPP provides analysis of the fire environment and its potential impact on the Boulder Brush Facilities as well as potential impacts on existing fire protection services due to Boulder Brush Facilities implementation. Requirements and recommendations herein are based on site-specific fire environment analysis and the characteristics of the Boulder Brush Facilities, and incorporate input from the County, area fire planning documents, site risk analysis, and standard principles of fire protection planning.

The Boulder Brush Facilities would provide supporting infrastructure for the Campo Wind Facilities, a wind energy project that would be located within the Campo Band of Diegueño Mission Indians Reservation (Reservation). The Boulder Brush Facilities would include 3.5 miles of overhead generation transmission line (Off-Reservation gen-tie line), a high-voltage substation, a 500-kilovolt (kV) switchyard, connection to the existing San Diego Gas & Electric (SDG&E) Sunrise Powerlink, and access roads with defensible space. The Off-Reservation gen-tie line would carry energy from the Campo Wind Facilities, located on the Reservation, to the high-voltage substation and 500 kV switchyard on private land.

The Boulder Brush facilities would be located on privately owned land near Boulevard, San Diego County, California. The Boulder Brush Facilities would be located within a corridor of approximately 320 acres of land (Boulder Brush Corridor) within the approximately 2,000 acres of Private Lease land inside the Boulder Brush Boundary. The Project gen-tie line would carry energy from the Campo Wind Facilities on land within the Reservation to the high-voltage substation and 500 kV switchyard.

The Boulder Brush Boundary vicinity consists of a mixture of large-lot rural residences and open space with mountainous terrain consisting of steep slopes, prominent ridgelines, and rock outcroppings. The 500 kV Sunrise Powerlink traverses the northeast portion of the Boulder Brush Boundary. Wind turbines associated with the Tule Wind project are located immediately adjacent to the east, north, and northwest, and the Kumeyaay Wind project turbines are located approximately 1 mile west of the Boulder Brush Boundary.

The Boulder Brush Boundary is primarily located in a Very High Fire Hazard Severity Zone, as statutorily designated by the California Department of Forestry and Fire Protection (CAL FIRE) (CAL FIRE 2007). The Boulder Brush Corridor is located in an area with historically fire adapted vegetation communities including chaparral, scrub, and oak woodlands, which are vegetation communities that experience occasional wildfire and can burn in an extreme manner under the occasional severe fire weather (dry and windy) conditions that occur in the area. Based on the region's fuels, fire history, and expected fire behavior, moderate intensity fires would be expected to occur in the area. The rocky terrain and open fuel beds on the lands within the Boulder Brush Boundary result in the anticipated moderate intensity fire behavior. The applicable County fire codes and additional measures required by this FPP directly address the fire concerns associated with the Boulder Brush Facilities.

Fire protection for the land within the Boulder Brush Boundary is provided by several agencies, with the San Diego County Fire Authority (SDCFA) and CAL FIRE providing significant resources. CAL FIRE has the primary responsibility for wildfire protection within State Responsibility Areas (SRA). SRA are recognized by the Board of Forestry and Fire Protection as areas where CAL FIRE is the primary emergency response agency responsible for fire suppression and prevention (Board of Forestry and Fire Protection 2019). Both SDCFA and CAL FIRE are co-located at the closet fire station, Station 47 in Boulevard. Response to the Boulder Brush Facilities from Station 47 will be within the acceptable time frame as designated in the County General Plan.

1 INTRODUCTION

This Fire Protection Plan (FPP) has been prepared for the Campo Wind Project with Boulder Brush Facilities (Project) near the community of Boulevard, in unincorporated San Diego County, California. The purpose of this FPP is to assess potential impacts resulting from wildland fire hazards and identify measures necessary to adequately mitigate those potential impacts. As part of the assessment, this FPP has considered the fire risk presented by the Boulder Brush Facilities, including: location and topography, geology (soils and slopes), combustible vegetation (fuel types), climatic conditions, fire history and the intended land use and configuration. This FPP addresses water supply, access, gen-tie line outside of the Campo Band of Diegueño Mission Indians Reservation (Reservation) Boundary, high-voltage substation, switchyard facilities, structural ignitability and ignition resistive features, and defensible space. This FPP identifies hazardous fuel reduction treatments and recommends the types and methods of treatment that would protect the Boulder Brush Facilities. This FPP recommends measures that the Boulder Brush Developer would take to reduce the probability of ignition of equipment or structures.

This FPP is consistent with the 2017 County Consolidated Fire Code (CCFC) and 2016 California Fire Code Ordinance (Section 49) and with the California Code of Regulations, Title 14, Fire Safe Regulations. This FPP is also consistent with the County of San Diego Guidelines for Determining Significance and Report Format, Wildland Fire and Fire Protection (2010).

The purpose of this FPP is to analyze the components of the Boulder Brush Facilities and their siting in a fire hazard area and to generate and memorialize the fire safety requirements of the Fire Authorities Having Jurisdiction. Recommendations of this FPP incorporate analysis of the Boulder Brush Facilities and of the potential cumulative impact on local emergency service resources. Recommendations for effectively mitigating identified impacts are based on site-specific characteristics and incorporate input from the Boulder Brush Developer and the San Diego County Fire Authority (SDCFA). This FPP incorporates applicable fire safety regulations and requirements and documents a selection of these regulations that are most pertinent to the Boulder Brush Facilities' components and location.

1.1 Boulder Brush Facilities Summary

1.1.1 Facilities Location

The Boulder Brush Facilities would be located within a corridor of approximately 320 acres of land (Boulder Brush Corridor) within the approximately 2,000 acres of Private Lease land inside the Boulder Brush Boundary adjacent to the northeast portion of the Reservation (Figure 1) in the eastern portion of unincorporated San Diego County. The Boulder Brush Facilities would be located approximately 5 miles north of the Community of Boulevard and 2.5 miles north of

Interstate (I) 8. Figure 2 illustrates the Boulder Brush Facilities' location. Primary access to the Boulder Brush Facilities would be provided from I-8 with local access provided via Ribbonwood Road. The land within the Boulder Brush Boundary is situated within Section 36 of Township 16 South, Range 6 East, Sections 5, 6, and 7 of Township 17 South, Range 7 East, as well as in Sections 19, 20, 25, 29, 30, 31, and 32 of Township 16 South, Range 7 East on the U.S. Geographical Survey, 7.5-minute, Live Oak Springs and Sombrero Peak, California quadrangle maps.

The Boulder Brush Facilities would be primarily constructed in areas of San Diego County classified as moderate to Very High Fire Hazard Severity Zone (FHSZ) by California Department of Forestry and Fire Protection (CAL FIRE). There are some small portions within the central portion of the Boulder Brush Corridor that are classified as Moderate or High FHSZ (CAL FIRE 2007). Fire hazard designations are based on topography, vegetation, and weather, amongst other factors with more hazardous sites including steep terrain, unmaintained fuels/vegetation, and wildland urban interface locations.

1.1.2 Existing Land Use

The Boulder Brush Boundary consists of largely undeveloped ranch land, a portion of which was historically grazed by cattle. The site also shows evidence of use by off-road recreational vehicles (motocross, ATVs and other off-road vehicles). Based on recent site visits and environmental field surveys conducted, there is no evidence of cattle grazing currently occurring within the Boulder Brush Boundary. Numerous 'No Trespassing' signs have been posted at locations along the Boulder Brush Boundary to deter off-road vehicle use.

Land ownership surrounding the Boulder Brush Boundary consists of a mixture of private, Bureau of Land Management (BLM), and tribal lands. The regional landscape consists of a mixture of large-lot rural residences and open space with mountainous terrain consisting of steep slopes, prominent ridgelines, and rock outcroppings. The 500-kilovolt (kV) Sunrise Powerlink traverses the northeast portion of the Boulder Brush Boundary. Wind turbines associated with the Tule Wind Project are located directly adjacent to the east, north, and northwest and the Kumeyaay Wind Project turbines are located approximately 1 mile west of the Boulder Brush Boundary.

1.1.3 Boulder Brush Facilities Description

The Boulder Brush Facilities, to be approved under a Major Use Permit (MUP), include the following components:

- Off-Reservation gen-tie line (approximately 3.5 miles)
- High-voltage substation

- 500-kilovolt (kV) switchyard and connection to the existing SDG&E Sunrise Powerlink
- Access roads
- Three 10,000-gallon water tanks
- Defensible space (fuel modification zones)

A map of the Boulder Brush Facilities is included as Figure 2 of this FPP. Please refer to Chapter 1, Project Description, of the EIR for a detailed description of Project components.

Off-Reservation Gen-Tie Line

Approximately 3.5 miles of the approximately 8.5-mile-long, overhead 230 kV gen-tie line that would transmit the electricity from the Campo Wind Facilities to the Off-Reservation high-voltage substation and switchyard would be constructed within the Boulder Brush Corridor on private land. This segment of the gen-tie line would require approximately 32 steel pole structures that, in addition to the transmission wires, would accommodate a fiber-optic ground wire attachment for lightning protection and internal communications. The height of the steel pole structures would vary by location, up to a maximum height of 150 feet (see Figure 1-4, Transmission Line Pole Structure of the Draft EIR).

High-Voltage Substation

A high-voltage substation would be constructed within the Boulder Brush Corridor and located adjacent to the proposed 500 kV switchyard at the northern portion of the Boulder Brush Boundary. This high-voltage substation would receive the electric energy transmitted from the Campo Wind Facilities along the 230 kV gen-tie line and convert it up to the 500 kV voltage via a 230 kV to 500 kV transformer before transmitting it onward to the adjacent switchyard. The high-voltage substation would require a fenced-in footprint of approximately 220 feet by 320 feet (1.6 acres). An additional approximately 1.0-acre area of disturbance would be required for site grading and clearing around the perimeter of the fenced-in footprint. The total disturbed area associated with the high-voltage substation would be approximately 2.5 acres. The cleared area surrounding the high-voltage substation and the area inside the high-voltage substation fence would be covered with gravel. An 8-foot-tall security fence consisting of 6-foot-tall chain-link fencing topped with an additional 2 feet of security wire would be installed around the perimeter of the high-voltage substation site. The high-voltage substation would include a contiguous fuel modification zone from 50 feet outside the perimeter fence inward onto the pad area. The high-voltage substation pad area would be free of vegetation around all electrical equipment. The high-voltage substation fence and the gravel area within the fence would be grounded.

500 kV Switchyard and Connection to the Existing SDG&E Sunrise Powerlink

A new 500 kV switchyard would be constructed on a stand-alone parcel within the Boulder Brush Corridor adjacent to the proposed high-voltage substation. Upon completion, this approximately 16-acre parcel and the switchyard would be transferred to SDG&E, who would then own, operate, and maintain the switchyard. The switchyard would interconnect the Project to the existing Sunrise Powerlink by a ring bus design with three 500 kV breakers, a control house, and a fenced-in graveled area. The connection to the Sunrise Powerlink would be made through incoming and outgoing connection lines to be constructed by SDG&E, which would effectively route the power through the ring bus. The Project's point of interconnection would be at an open position on that same bus within the switchyard. Figure 1-6, Switchyard Layout, of the Draft EIR shows a typical layout design for the switchyard.

The switchyard would require a fenced-in footprint of approximately 400 feet by 750 feet (6.9 acres). An additional approximately 9.5 acres of disturbed area would be required for the access road, incoming/outgoing connection lines, 0.6-acre retention pond, a 50-foot fuel modification zone around the perimeter of the switchyard, and site grading and clearing. Up to 30-feet tall fencing would be installed around the perimeter of the switchyard, in accordance with SDG&E requirements. Therefore, the total disturbance area for the switchyard and in/out lines would be approximately 16 acres.

Access Roads

On-Site Roadway Improvements

Primary access to the Boulder Brush Facilities would be provided from I-8, with local access provided via Ribbonwood Road. New access roads within the Boulder Brush Boundary would also be constructed to provide access and circulation to the Boulder Brush Facilities, including the gen-tie line poles, the high-voltage substation, and the switchyard. New permanent access roads would incorporate applicable federal and local standards regarding internal road design and circulation, particularly those provisions related to emergency vehicle access.

An approximately 3.5-mile-long and up to 30-foot-wide new paved access road from the Boulder Brush Facilities site entrance to the high-voltage substation and switchyard would be constructed. Approximately 2.6 miles of this paved access road would run parallel and adjacent to a portion of the proposed Off-Reservation gen-tie line and would also serve as access to approximately 24 Off-Reservation gen-tie line pole structures. This new paved access road would be a minimum of 20 feet in width and maximum of 30 feet in width, with 20 feet of fuel modification on each side of the road.

The approximately eight remaining Off-Reservation gen-tie line pole structures would be accessed by approximately 4 miles of improved decomposed granite roads, of which 2.8 miles are existing decomposed granite roads. The new and existing decomposed granite roads would be constructed or widened to a width of 16 feet. An approximately 20-foot-wide fuel modification zone would be maintained on either side of the on-site unpaved access roads for the Boulder Brush Facilities. All on-site roads would be privately maintained.

All unpaved access roads would consist of compacted native material and may also have approximately 4–6 inches of aggregate and/or geosynthetic material to provide the soil strength needed for construction. The temporary disturbance areas outside the final roadway width would be graded and compacted for use during construction and then decompacted and stabilized at the conclusion of construction. Roads would be constructed or upgraded in accordance with industry standards. Bulldozers and graders would be used to build and widen roads, and a water truck would be used for road compaction and dust control. Access roads would be maintained, as needed, during operations.

Off-Site Roadway Improvements

An approximately 1-mile off-site segment of Ribbonwood Road from the Opalocka Road/ Ribbonwood Road intersection to the Boulder Brush Facilities site entrance off Ribbonwood Road would be improved. This existing, unpaved roadway segment ranges from 12 feet wide to 40 feet wide. The proposed improved paved road would be a minimum of 20 feet in width (with a maximum of up to 30 feet). This improved off-site segment of Ribbonwood Road would connect to the on-site paved access road providing access to the Boulder Brush Facilities (see Figure 2 of this FPP).

Water Tanks

Three 10,000-gallon water tanks dedicated for firefighting purposes would be installed near the high-voltage substation and switchyard, as shown in Figure 2 of this FPP. The three water tanks would be sourced by Jacumba Community Service District (JCSD) or Padre Dam Municipal Water District (PDMWD) with non-potable water.

Defensible Space (Fuel Modification Zones)

Fire protection measures are defined in County Code Regulatory Ordinance, Title 9, Division 6, Chapter 1, County Fire Code. The regulations identify access road requirements and fuel modification zone requirements.

County Code, Section 96.1.503.1.1, specifies that "approved fire apparatus access roads shall be provided for every facility, building, or portion of building hereafter constructed or moved into or within the jurisdiction. The fire apparatus access road shall comply with the requirements of this section and shall extend within 150 feet of all portions of the facility and all portions of the exterior walls of the first story of the building as measured by an approved route around the exterior of the building or facility." Exceptions are as follows:

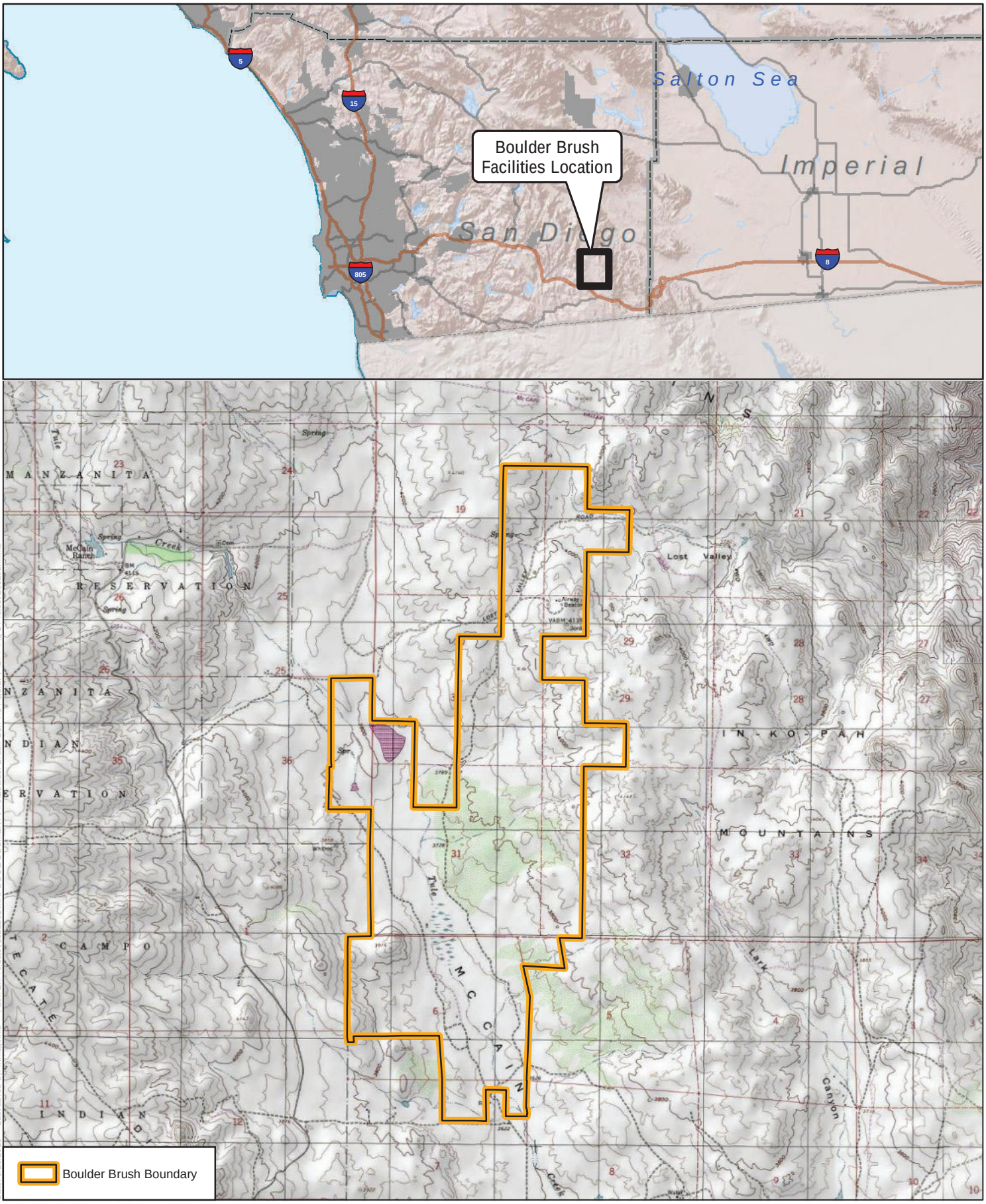
> **Exceptions:** The fire code official may increase the 150-foot minimum where:
>
> 1. Fire apparatus access roads cannot be installed because of topography, waterways, nonnegotiable grades or other similar conditions, and an approved alternative means of fire protection is provided.
> 2. There are no more than two Group R-3 or Group U occupancies.

County Code, Section 96.1.202, defines a fuel modification zone as a strip of land where combustible vegetation has been thinned or modified or both and partially or totally replaced with fire-resistant plants to provide an acceptable level of risk from vegetation fires. Fuel modification reduces the radiant and convective heat on a structure and provides valuable defensible space for firefighters to make an effective stand against an approaching fire front.

Permanent access roads would be constructed to provide access to the high-voltage substation and switchyard. County Code, Section 96.1.4907.2.1, specifies fuel modification of combustible vegetation from sides of roadways**.** Details regarding the extent of defensible space and fuel modification zones will be determined prior to final design with the input of relevant fire authorities. The Fire Authority Having Jurisdiction may require a property owner to modify combustible vegetation in the area within 20 feet from each side of the driveway or a public or private road adjacent to the property to establish a fuel modification zone. The nearest fire station, CAL FIRE Boulevard, is located just south of I-8, off of Ribbonwood Road.

1.1.4 Construction Fire Prevention Plan

A Construction Fire Prevention Plan (CFPP) has been prepared for the Boulder Brush Facilities and is included as Appendix A to this FPP. The CFPP provides standard protocols and approaches for reducing the potential of ignitions for typical construction site activities. When employed, the concepts discussed in the CFPP would help minimize and avoid ignitions as well as extinguish any ignitions while they are small and controllable.



SOURCE: USGS 7.5 Minute Series, Live Oak Springs and Sombrero Peak Quadrangles

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0 2,000 4,000 Feet

FIGURE 1

Boulder Brush Boundary

Fire Protection Plan Boulder Brush Facilities

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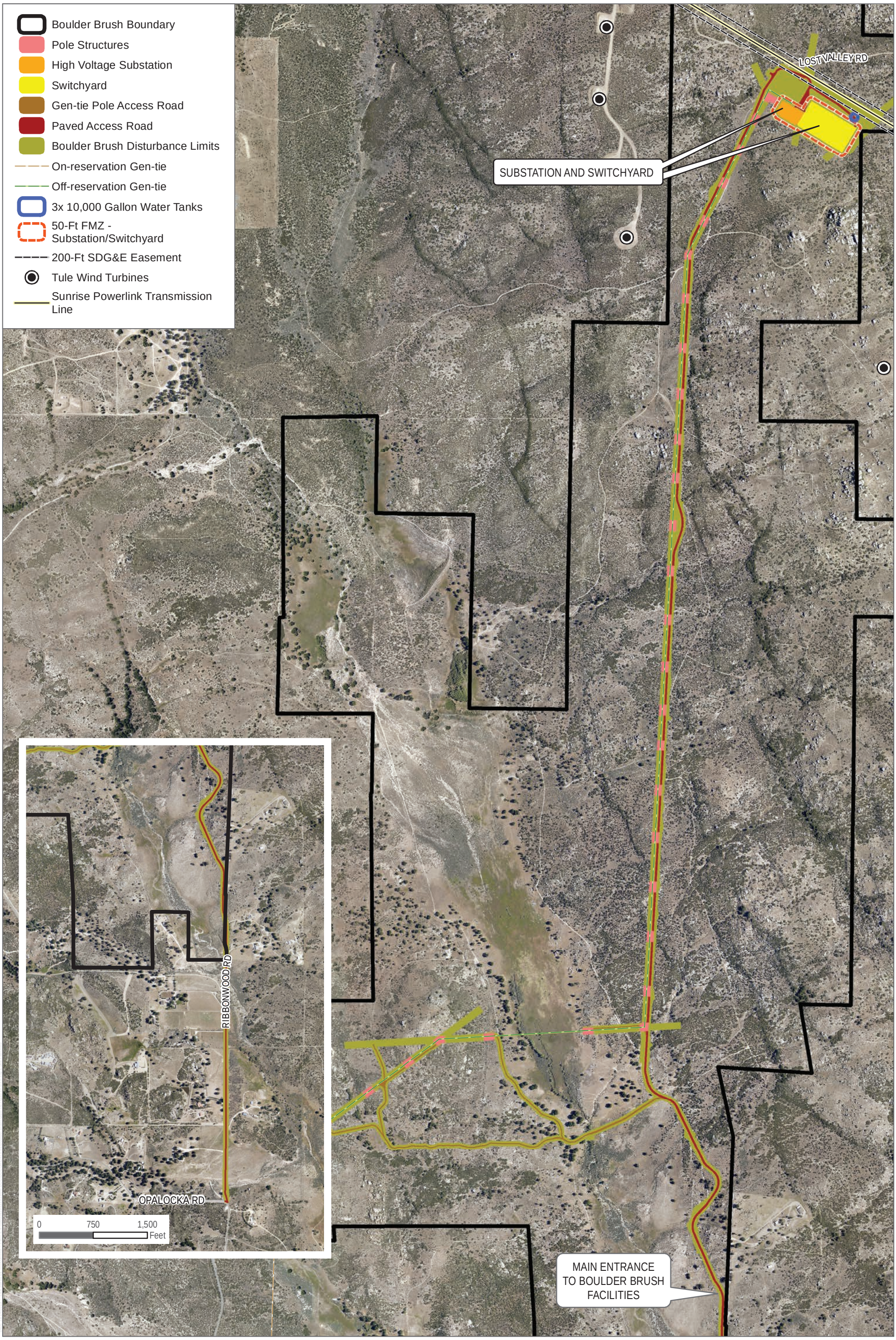

SOURCE: SANGIS 2017

DUDEK N 0 600 1,200 Feet

FIGURE 2

Boulder Brush Facilities Location

Fire Protection Plan Boulder Brush Facilities

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2 PROPOSED FACILITIES SITE RISK ASSESSMENT

2.1 Field Assessment

A field assessment of the Boulder Brush Boundary was conducted on June 13, 2018, in order to document existing site conditions. While on site, Dudek's Fire Protection Planners assessed the topography, natural vegetation and fuel loading, surrounding land use and general susceptibility to wildfire. Among the field tasks that were completed include the following:

- Vegetation estimates and mapping refinements
- Fuel load analysis
- Topographic features documentation
- Photograph documentation
- Confirmation/verification of hazard assumptions
- Ingress/egress documentation.
- Nearby Fire Station reconnaissance

Field observations were utilized in generating the fire behavior models and formulating the recommendations detailed in this FPP.

2.2 Site Characteristics and Fire Environment

2.2.1 Topography

In general, east San Diego County includes terrain that is susceptible to wildfire spread including steep slopes, ravines, mountains, and valleys. The Boulder Brush Boundary lies between two major drainage divides: the Tecate Divide to the west, and the In-Ko-Pah Mountains to the east. The terrain in the Boulder Brush Boundary is undulating, and ranges from valley bottoms to boulder-covered ridge lines. The slopes surrounding the hills and valleys are moderate (relatively flat up to 25%). The elevation across the Boulder Brush Boundary ranges from approximately 3,280 feet above mean sea level to approximately 4,120 feet above mean sea level.

2.2.2 Climate

Eastern San Diego County and the Boulder Brush Boundary are influenced by the Pacific Ocean and are frequently under the influence of a seasonal, migratory subtropical high-pressure cell known as the "Pacific High" (WRCC 2017a). Wet winters and dry summers with mild seasonal changes characterize the Southern California climate. This climate pattern is occasionally interrupted by

extreme periods of hot weather, winter storms, or dry, easterly Santa Ana winds (WRCC 2017a). The average high temperature in the area is approximately 76.3°F, with average highs in the summer and early fall months (July–October) reaching 93.8°F. The average precipitation for the area is approximately 14.82 inches per year, with the majority of rainfall concentrated in the months of December (2.06 inches), January (3.04 inches), February (2.77 inches), and March (2.30 inches), while smaller amounts of rain are experienced during the other months of the year (WRCC 2017b).

The prevailing wind pattern is from the west (on-shore), but the presence of the Pacific Ocean causes a diurnal wind pattern known as the land/sea breeze system. During the day, winds are from the west–southwest (sea) and at night winds are from the northeast (land). During the summer season, the diurnal winds may average slightly higher than the winds during the winter season due to greater pressure gradient forces. Surface winds can also be influenced locally by topography and slope variations. The highest wind velocities are associated with downslope, canyon, and Santa Ana winds.

The Boulder Brush Boundary area's Southern California's climate has a large influence on the fire risk as drying vegetation during the summer months becomes fuel available to advancing flames should an ignition be realized. Typically, the highest fire danger is produced by the high-pressure systems that occur in the Great Basin, which result in the Santa Ana winds of Southern California. Sustained wind speeds recorded during recent major fires in San Diego County exceeded 30 mph and may exceed 50 mph during extreme conditions. The Santa Ana wind conditions are a reversal of the prevailing southwesterly winds that usually occur on a region-wide basis during late summer and early fall. Santa Ana winds are warm and dry winds that flow from the higher desert elevations in the north through the mountain passes and canyons. As they converge through the canyons, their velocities increase. Consequently, peak velocities are highest at the mouths of canyons and dissipate as they spread across valley floors. Santa Ana winds generally coincide with the regional drought period and the period of highest fire danger. The Boulder Brush Boundary is affected by Santa Ana winds.

2.2.3 Vegetation

2.2.3.1 Fuels (Vegetation)

As presented in Figure 3, Site Vegetation Map, the Boulder Brush Boundary is undeveloped and comprised of a variety of vegetation types that were mapped by Dudek biologists (Dudek 2019). Extensive vegetation type mapping is useful for fire planning because it enables each vegetation community to be assigned a fuel model, which is used by a software program to predict fire characteristics, as discussed in Chapter 4. The site's vegetative fuel types consist of approximately 11 vegetation communities and four non-native communities or land cover types. Native

vegetation communities within the Boulder Brush Boundary are montane buckwheat scrub, big sagebrush scrub, granitic northern mixed chaparral, chamise chaparral, granitic chamise chaparral, red shank chaparral, semi-desert chaparral, wildflower field, emergent wetland, southern arroyo willow riparian forest, and coast live oak woodland. Two non-native vegetation communities, disturbed habitat and eucalyptus woodland, and two land cover types, unvegetated stream channel and urban/developed. Semi-desert chaparral, red shank chaparral, Montane buckwheat scrub, and granitic northern mixed chaparral communities are the most common plant communities on and adjacent to the Boulder Brush Boundary. The chaparral vegetation communities are considered to be the flammable fuels that would facilitate wildfire throughout the region. Appendix B to this FPP provides photographs of the fuel types within the Boulder Brush Boundary in its current, undeveloped condition.

2.2.3.2 Vegetation Dynamics

The vegetation characteristics described above are used to model fire behavior, discussed in Chapter 4 of this FPP. Variations in vegetative cover type and species composition have a direct effect on fire behavior. Some plant communities and their associated plant species have increased flammability based on plant physiology (resin content), biological function (flowering, retention of dead plant material), physical structure (bark thickness, leaf size, branching patterns), and overall fuel loading. For example, grass dominated plant communities become seasonally prone to ignition and produce lower intensity, higher spread rate fires. In comparison, chaparral can produce higher heat intensity and higher flame lengths under strong, dry wind patterns, but does not typically ignite or spread as quickly as light, flashy grass fuels.

Fire presence and absence at varying cycles or regimes disrupts plant succession, setting plant communities to an earlier state where less fuel is present for a period of time as the plant community begins its succession again. In general, high frequency fires tend to convert shrublands to grasslands or maintain grasslands, while fire exclusion tends to convert grasslands to shrublands, over time. In general, biomass and associated fuel loading will increase over time, assuming that disturbance (fire, or grading) or fuel reduction efforts are not diligently implemented.

It is possible to alter successional pathways for varying plant communities through manual alteration. This concept is a key component in the overall establishment and maintenance of the proposed fuel modification zones around the gen-tie poles, high-voltage substation, switchyard and access roads. The fuel modification within the Boulder Brush Corridor will consist of thinned, modified or replaced fire-resistant plants to provide an acceptable level of risk from vegetation fires. Planting, if applicable, used in the defensible space would consist of low-growing ground cover selected from the SDCFA desirable plant list.

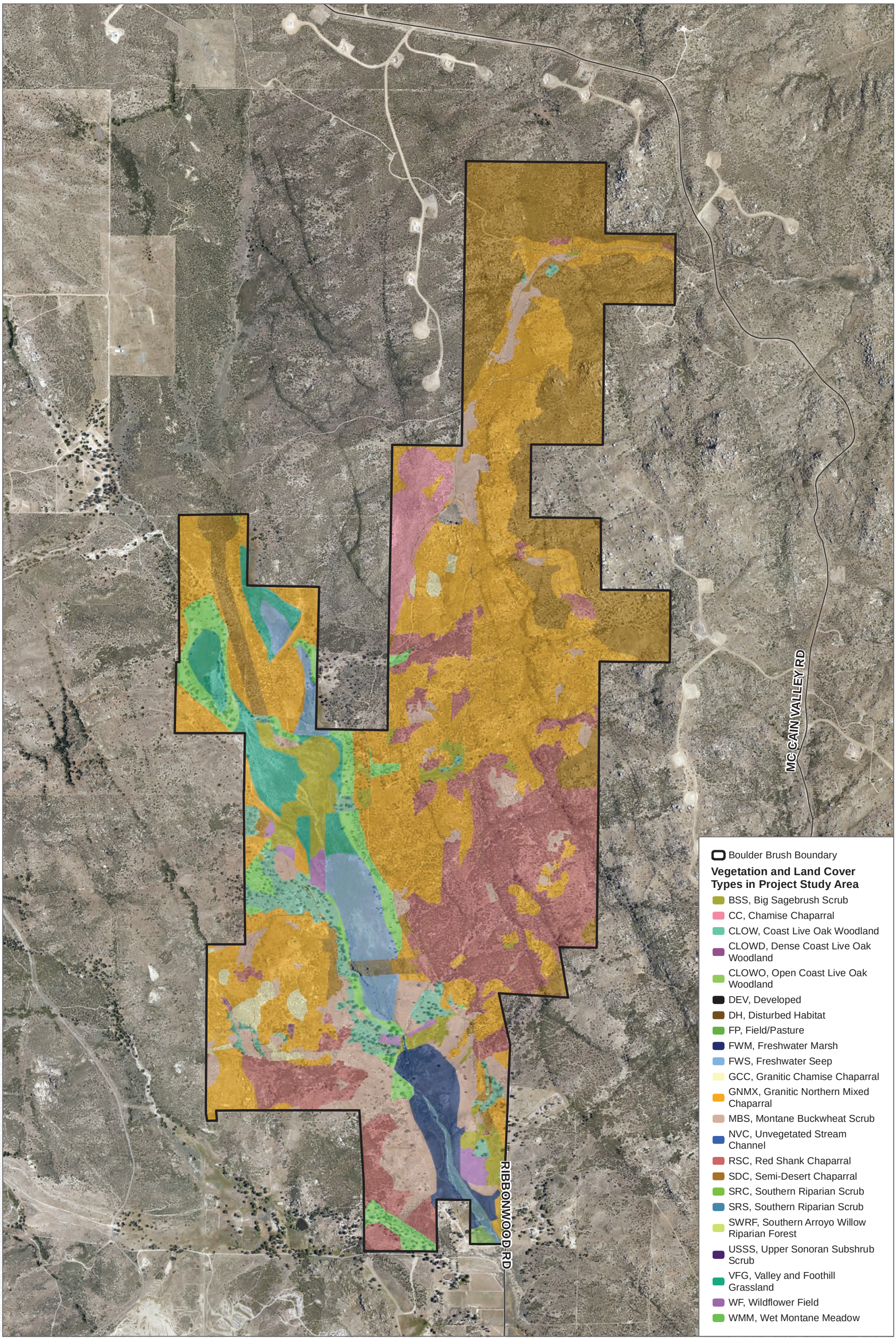
2.2.4 Fire History

Fire history information can provide an understanding of fire frequency, fire type, most vulnerable facilities areas, and significant ignition sources, amongst others. Fire history represented in this FPP utilizes the Fire and Resource Assessment Program (FRAP) database. FRAP summarizes fire perimeter data dating to the late 1800s, but which is incomplete due to the fact that it includes only fires over 10 acres in size and has incomplete perimeter data, especially for the first half of the 20th century (Syphard and Keeley 2016). However, the data does provide a summary of recorded fires and can be used to show whether large fires have occurred in the Boulder Brush Boundary, which indicates whether they may be possible in the future.

Figure 4 presents a graphical view of the recorded fire history. As presented in the exhibit, there have been 21 fires recorded since 1911 by CAL FIRE in their FRAP database[1] in a fire buffer area of 3 miles of the Boulder Brush Boundary. A total of three fires, ranging from 695 acres (Carrizo 1983 fire) to 64,420 acres (Un-named 1944 Fire) are noted to have burned onto the northern portion of the Boulder Brush Boundary (CAL FIRE 2018).

Based on an analysis of the CAL FIRE FRAP fire history data set, specifically the years in which the fires burned, the average interval between wildfires in this portion of the County was calculated to be five years with intervals ranging between 1 and 27 years (CAL FIRE 2018). Based on this analysis, it is expected that wildfire that could impact the Boulder Brush Facilities may occur, if weather conditions coincide, roughly every five years with the realistic possibility of shorter interval occurrences, as observed in the fire history records. Further, the large expanses of open space surrounding the Boulder Brush Boundary and potential ignition sources along I-8 and nearby off-road vehicle trails, contribute to increased potential risk and wildfire hazard in the area.

[1] Based on polygon GIS data from CAL FIRE's FRAP, which includes data from CAL FIRE, USDA Forest Service Region 5, BLM, NPS, Contract Counties and other agencies. The data set is a comprehensive fire perimeter GIS layer for public and private lands throughout the state and covers fires 10 acres and greater between 1911–2018.



SOURCE: SANGIS 2017

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0 800 1,600 Feet

FIGURE 3

Site Vegetation Map

Fire Protection Plan Boulder Brush Facilities

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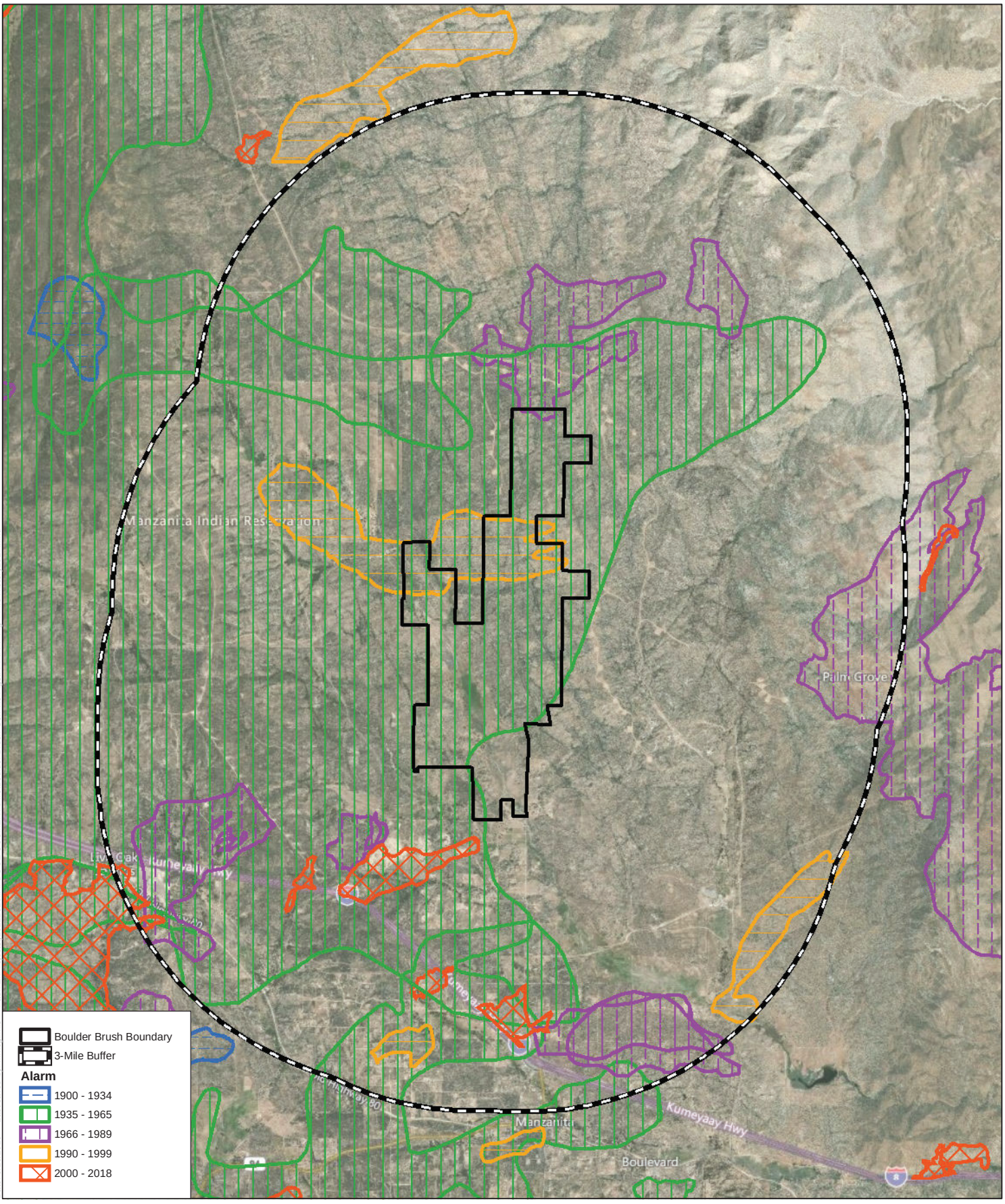

SOURCE: AERIAL- BING MAPPING SERVICE; FIRE DATA-CALFIRE 2017

FIGURE 4

Vicinity Fire History Map

Fire Protection Plan Boulder Brush Facilities

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3 DETERMINATION OF FACILITIES EFFECTS

FPPs provide an evaluation of the adverse environmental effects a proposed project may have from wildland fire. The FPP must provide mitigation for identified impacts to ensure that development projects do not unnecessarily expose people or structures to a significant loss, injury or death involving wildland fires. Significance is determined by answering the following guideline questions consistent with Appendix G of the CEQA Guidelines (CCR, Title 14, Division 6, Chapter 3).

Would the facilities expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?

The wildland fire risk in the vicinity of the Boulder Brush Facilities has been analyzed and it has been determined that wildfires are likely occurrences, but would not be significantly increased in frequency, duration, or size with the construction of the Boulder Brush Facilities with the design features directed by County Fire Code and this FPP. The Boulder Brush Facilities would include a 3.5 mile gen-tie line with approximately 32 pole structures, a high-voltage substation, a switchyard, and a connection to the existing SDG&E Powerlink. New access roads would include a 3.5 mile long paved primary access road (minimum 20 feet in width/maximum 30 feet in width) from the Boulder Brush Boundary entrance to the substation and switchyard. New access roads would also include 16-foot-wide, decomposed granite access roads to gen-tie poles to the west of the paved road. Twenty feet of fuel modification would be maintained on each side of all access roads inside the Boulder Brush Boundary. Up to 20 feet of fuel modification would be maintained on each side of the portion of the paved access road outside of the Boulder Brush Boundary, depending on the width of available access easements. In addition, a contiguous fuel modification zone 50 feet outside of the perimeter fences (approximately 100 feet from the electrical components) around the high-voltage substation and switchyard would be maintained. These fuel modification zones would be cleared and may be revegetated with fire resistant vegetation, consistent with SDCFA and CAL FIRE standard defensible space practices. The Campo Wind Facilities would include an operations and maintenance facility on the Reservation with up to 12 permanent staff to conduct on-site operation, inspection, and maintenance activities during operations for the Project, including the Boulder Brush Facilities.

The types of potential ignition sources that currently exist within the Boulder Brush Boundary and surrounding areas include off-road vehicles, electrical transmission lines, and machinery associated with rural residential, amongst others. The Boulder Brush Facilities include potential ignition sources (high-voltage substation, switchyard and gen-tie line), but would also include conversion of ignitable fuels to modified or replaced fire-resistant plants to provide an acceptable

level of risk from vegetation fires, and include 24-hour surveillance by a combination of existing webcams in east San Diego County (SDG&E fire watch cameras and University of California, San Diego HPwren [High Performance Wireless Research and Education Network] cameras), 24-hour remote monitoring via Supervisory Control and Data Acquisition System, and by on-site workers, anticipated to aid in earlier observation and reporting of wildfires.

The Boulder Brush Facilities would be designed and built to current fire codes. Additionally, participation in a Fire Service Developer Agreement would ensure funds that are used to support fire agency capabilities, and combined with other provided fire safety features at the Boulder Brush Facilities. The Project would be equipped with up to three water trucks, each with a 4,000-gallon capacity, during construction. During construction, one pickup truck outfitted with skid-mounted fire pump, hose, and nozzle, will be located on the Project Site. After construction is completed, one pickup truck with skid mounted fire pump would remain on the Project Site during Project operations. The pick-up can be used for other purposes but would remain on the Project Site and will be staffed by personnel that are properly trained to use the equipment. In addition, three 10,000-gallon water tanks would be installed adjacent to the northeast entrance to the switchyard dedicated for firefighting purposes during Project operations.

Would the facilities result in inadequate emergency access?

The Boulder Brush Facilities would include fire access and circulation throughout the Boulder Brush Corridor. The primary access road to the high-voltage substation and switchyard on private land would be a minimum of 20 feet wide (up to 30 feet wide) and supportive of fire apparatus. Access roads to the gen-tie line structures (poles) would be 16 feet wide decomposed granite roads. Through improvements to existing roads and installation of new access roads, access on the site would be improved from current conditions, which provides only limited access on dirt roads. Emergency access is, therefore, considered adequate for this type of facility.

Would the facilities result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance service ratios, response times or other performance objectives for fire protection?

The Boulder Brush Facilities are projected to add fewer than 0.5 calls per year to the co-located CAL FIRE and SDCFA Boulevard Fire Station 47. As discussed further below, currently Fire Station 47 is providing adequate response times per the San Diego General Plan (County of San Diego 2011), and the Boulder Brush Facilities would not adversely impact that ability. During construction of the Boulder Brush Facilities, which is anticipated to occur over approximately 14

months, a conservative estimate of 12 calls would potentially be generated from a maximum of 144 construction workers. During operations, employees would generate up to 0.5 call per year. Boulevard Fire Station 47 is within a short driving distance of the site. The addition of 0.5 calls per year (12 calls per year for the temporary construction period) to a rural fire station that currently responds to approximately one call per day is considered insignificant and would not require the construction of additional fire station facilities based on that increase alone. With implementation of the Boulder Brush Facilities, the Boulder Brush Developer would participate in a Fire Service Developer Agreement with the County, which would outline a fair-share funding agreement for fire services. Funding provided by the Boulder Brush Developer would result in capital that can be used toward firefighting and emergency response augments, improvements, and additions to such that SDCFA and area firefighting agencies would be able to perform their mission into the future at levels consistent with the County General Plan.

Would the facilities have sufficient water supplies available to serve the facilities from existing entitlements and resources, or are new or expanded entitlements needed?

Three 10,000-gallon water tanks dedicated for firefighting purposes would be installed adjacent to the northeast entrance to the switchyard. A Fire Department Connection (FDC) would be located within approximately 150 to 250 feet of both the west entrance to the switchyard and the entrance to the high-voltage substation. This FDC would be connected to the water tanks by an underground water pipe. The additional water availability proposed on-site, via the three 10,000-gallon water tanks dedicated for firefighting purposes, would provide sufficient water for firefighting needs for the Boulder Brush Facilities. Water needed for filling the water tanks would be provided by an off-site water purveyor. Boulder Brush Facilities Water Availability Forms are included in Appendices E-1 (Jacumba CSD) and E-2 (Padre Dam WMD) of this FPP.

The measures described in the responses to these significance questions are provided more detail in the following sections.

Substantially impair an adopted emergency response plan or emergency evacuation plan?

The Boulder Brush Facilities are projected to add fewer than 0.5 calls per year to the co-located CAL FIRE and SDCFA Boulevard Fire Station 47. Currently Fire Station 47 is providing adequate response times per the San Diego General Plan (County of San Diego 2011), and the Boulder Brush Facilities would not adversely impact that ability. During construction of the Boulder Brush Facilities, which is anticipated to occur over approximately 14 months, a conservative estimate of 12 calls would potentially be generated from a maximum of 144 construction workers. During operations, employees would generate up to 0.5 calls per year. Boulevard Fire Station 47 is within a short driving distance of the site. The addition of 0.5 calls per year (12 calls per year for the

temporary construction period) to a rural fire station that currently responds to approximately one call per day is not considered significant and would not impair emergency response. With implementation of the Boulder Brush Facilities, the Boulder Brush Developer would participate in a Fire Service Developer Agreement with the County, which would outline a fair-share funding agreement for fire services. Funding provided by the Boulder Brush Developer would result in capital that can be used toward firefighting and emergency response augments, improvements, and additions to such that SDCFA and area firefighting agencies would be able to perform their mission into the future at levels consistent with the County General Plan.

The Boulder Brush Facilities would include fire access and circulation throughout the Boulder Brush Corridor and emergency access would be adequate for this type of facility. Construction of the Boulder Brush Facilities would not decrease or inhibit adequate response action or times from Fire Station 47, the access roads to the facilities would be improved, and the Boulder Brush Developer will adhere to the Fire Service Developer Agreement to help fund for fire services that would be used to improving future fire services that are consistent with the County General Plan; therefore, construction and implementation of the Boulder Brush Facilities would not impair an adopted emergency response and emergency evacuation plan.

Due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to, pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire?

The Boulder Brush Corridor has slopes, prevailing Santa Ana winds, combustible vegetation, and historical fires that create a potentially significant risk for exacerbating wildfire risks. Typically, the highest fire danger is produced by the high-pressure systems that occur in the Great Basin, which result in the Santa Ana winds of Southern California. Sustained wind speeds recorded during recent major fires in San Diego County exceeded 30 miles per hour and may exceed 50 miles per hour during extreme conditions. As discussed below in Chapter 4, a model was run to determine possible fire behaviors within and immediately surrounding the perimeter of the Boulder Brush Boundary. Based on the fire behavior modeling results presented herein, the maximum flame lengths anticipated in untreated, chaparral fuels could reach 63.6 feet in height with rapid rates of spread (14.3 mph) under extreme weather conditions, represented by Santa Ana winds blowing at maximum winds of 56 mph. Embers could be generated from a surface fire resulting in ignition of receptive fuel beds 3.4 miles downwind.

The Boulder Brush Facilities would be provided defensible space by a Fuel Modification Zone (FMZ) buffer around each gen-tie power line pole, the high-voltage substation, the switchyard, and roads. Prescribed FMZs would be maintained on at least an annual basis or more often, as needed. None of the plants on the prohibited plant list (Appendix F to this FPP) shall be allowed

on site. Planting, if applicable, used in the defensible space will consist of low-growing ground cover selected from the SDCFA desirable plant list. A potential plant mix for the FMZ areas is included as Appendix G to this FPP. The planting list and spacing will be reviewed and approved by the SDCFA Fire Marshal.

A contiguous fuel modification zone 50 feet outside of the perimeter fences (approximately 100 feet from the electrical components) around the high-voltage substation and switchyard would be maintained. The high-voltage substation pad area will be free of vegetation around all electrical equipment.

The following specifications apply to FMZs:

- Non-combustible surface (gravel, dirt, rock, etc.) is acceptable, or:
- Cleared of all existing native vegetation or prohibited plants.
- If the area is planted with native annual and perennial grasses they shall be allowed to grow and produce seed during the winter and spring. As grasses begin to cure (dry out), they will be cut to 6 inches or less in height.

Other modifications would include 20 feet vegetation clearance along the side of the primary access road, a minimum of 13 feet 6 inches of vertical vegetation clearance along the roadway(s) to allow for unobstructed emergency vehicle access throughout the project site, however, we are not aware of any trees along the roadways that meet this requirement, adhering to the California Public Utilities Commission and CCR, Title 14 Section 1254 regulations, pre-construction vegetation management, and annual maintenance and funding of FMZs by Boulder Brush Developer (Chapter 4). Additionally, the Boulder Brush Facilities would not include structures downslope or downstream of potential flooding or land sliding areas resulting from possible post-fire slope instability. Boulder Brush Facilities would be either on ridge tops, relatively flat areas, or, if constructed on or adjacent to slopes such as gen-tie line support structures, with sufficient foundations such as pilings to ensure stability during any post-fire runoff induced movements of exposed surface materials.

FMZs planned for the Boulder Brush Facilities are designed to reduce flame length and fire intensity near these structures to levels that would not be anticipated to damage or threaten the Boulder Brush Facilities. With implementation of this FPP, CFPP, and adherence to the Fire Service Developer Agreement, construction and implementation of the Boulder Brush Facilities would not substantially exacerbate wildfire or the spread of wildfire.

Require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines, or other utilities) that may exacerbate fire risk or that result in temporary or ongoing impacts to the environment?

The Boulder Brush Facilities would include approximately 3.5 miles of overhead gen-tie line, a high-voltage substation, a 500 kV switchyard, a connection to the existing SDG&E Sunrise Powerlink, and access roads with defensible space.

FMZs would be established that would minimize potential fires that would damage the Boulder Brush Facilities or exacerbate wildfires. In addition, Chapter 7 of this FPP provides a list of measures that address the identified potential fire hazards on the site. The measures would work together to result in reduced fire threat and heightened fire protection. These include code-exceeding measures such as gen-tie line poles would be non-combustible (steel) with lightning protection, Boulder Brush Developer-funded annual FMZ inspections to ensure compliance with this FPP, and implementation of a CFPP. The Boulder Brush Facilities' installation and maintenance of associated infrastructure would not exacerbate fire risk or result in temporary or ongoing impacts to the environment.

Expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes?

FMZs would be established that would minimize potential fires that would damage the Boulder Brush Facilities or exacerbate wildfires. The Boulder Brush Facilities would not include structures downslope or downstream of potential flooding or land sliding areas resulting from possible post-fire slope instability. In addition, the Boulder Brush Facilities would adhere to a list of measures, outlined in Chapter 7 below, that address the identified potential fire hazards. Therefore, Boulder Brush Facilities would not expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes.

4 ANTICIPATED FIRE BEHAVIOR

4.1 Fire Behavior Modeling

Fire behavior modeling was conducted to document the type and intensity of fire that would be expected for land within the Boulder Brush Boundary given characteristic features such as topography, vegetation, and weather. The BehavePlus 5.0.5., fire behavior modeling software package was used to analyze fire behavior for the wildland fuels within and surrounding the perimeter (approximately 0.1 miles) of the Boulder Brush Boundary. Modeling results are provided below and a more detailed presentation of the BehavePlus analysis, including fuel moisture and weather input variables, is provided in Appendix C to this FPP.

4.2 BehavePlus Fire Behavior Modeling Effort

Fuel Models are simply tools to help fire experts realistically estimate fire behavior for a vegetation type. Fuel models are selected by their vegetation type; fuel stratum most likely to carry the fire; and depth and compactness of the fuels. Fire behavior modeling was conducted for vegetative types that are within or surround the Boulder Brush Boundary. The vegetation types are represented primarily by five fuel models as shown in Table 1. Other fuel models may exist, but not at quantities that significantly influence fire behavior within the Boulder Brush Boundary. Fuel models were selected from Standard Fire Behavior Fuel Models: a Comprehensive Set for Use with Rothermel's Surface Fire Spread Model (Scott and Burgan 2005).

Table 1
Fuel Model Assignments and Characteristics

Fuel Model	Vegetation Description	Land within Boulder Brush Boundary	Fuel Bed Depth
Gr1	Freshwater Marsh; Freshwater Seep; Wet Montane Meadow	Valley areas within Boulder Brush Boundary	<0.5 feet
Gr4	Valley and Foothill Grassland, Wildflower Field	Valley areas within Boulder Brush Boundary	2.0 feet
Gs2	Coast Live Oak Woodland	Southwestern portion of Boulder Brush Boundary	1.5 feet
Sh2	Flat-topped Buckwheat; Semi-Desert Chaparral; Southern Riparian Scrub; Southern Arroyo Willow Riparian Forest	Throughout the Boulder Brush Boundary	<3.0 feet
Sh5	Chamise Chaparral; Granitic Chamise Chaparral; Granitic Northern Mixed Chaparral; Montane Buckwheat Scrub; Red Shank Chaparral; Sagebrush Scrub; Upper Sonoran Subshrub Scrub	Throughout the Boulder Brush Boundary	6.0 feet

4.3 Fire Behavior Modeling Results

Fire behavior results derived from the BehavePlus modeling efforts are presented in Table 2 and on Figure 5. Five focused analyses (fire scenarios) were completed, each assuming worst-case fire weather conditions for a fire approaching the Boulder Brush Boundary from the west or east. The vegetation types within the Boulder Brush Boundary and surrounding areas were modeled as a Fuel Model GR1 (Short Sparse Dry Climate Grasses fuelbed), Fuel Model Gr4 (Non-Maintained, Moderate Load, Dry Climate Grasses fuelbed), Fuel Model Gs2 (Moderate Load, Dry Climate grass-Shrub fuelbed), Fuel Model Sh2 (Moderate Load Dry Climate Shrub fuelbed), Sh5 (High Load, Dry Climate Shrub fuelbed), and Tl6 (Moderate Load Broadleaf Litter fuelbed). This detailed analysis compared fire behavior within and beyond (approximately 0.1 miles) the Boulder Brush Boundary with outputs including surface fire flame length (feet), rate of spread (mph), fireline intensity (BTU/ft./s), and spotting distance (miles).

The results presented in Table 2 depict values based on inputs to the BehavePlus software. The fuels models used in this analysis are dynamic models that were designed by the U.S. Forest Service to more accurately represent Southern California fuel beds. Changes in slope, weather, or pockets of different fuel types are not accounted for in this analysis. Model results should be used as a basis for planning only, as actual fire behavior for a given location would be affected by many factors, including unique weather patterns, small-scale topographic variations, or changing vegetation patterns.

Table 2
BehavePlus Fire Behavior Modeling Results

Fuel Models	Flame Length (feet)	Spread Rate (mph)	Fireline Intensity (Btu/ft./s)	Spot Fire[1] (miles)
Scenario 1: Chaparral-scrub;10% average slope, 56 mph peak winds				
Granitic Northern Mixed Chaparral (Sh5)	63.6	14.3	47,230	3.4
Upper Sonoran Subshrub Scrub (Sh5)	63.6	14.3	47,230	3.4
Semi-desert Chaparral (Sh2)	23.8	2.3	5,600	1.8
Scenario 2: Chaparal-scrub;10% average slope, 56 mph peak winds				
Granitic Northern Mixed Chaparral (Sh5)	63.5	14.3	47,120	3.4
Red Shank Chaparral (Sh5)	63.5	14.3	47,120	3.4
Semi-desert Chaparral (Sh2)	23.8	2.3	5,588	1.7
Scenario 3: Chaparral-scrub-riparian scrub-open oak woodland-marsh;10% average slope, 56 mph peak winds				
Granitic Northern Mixed Chaparral (Sh5)	63.6	14.3	47,249	3.4
Red Shank Chaparral (Sh5)	63.6	14.3	47,249	3.4
Semi-desert Chaparral (Sh2)	23.8	2.3	5,602	1.7
Flat-topped Buckwheat (Sh2)	23.8	2.3	5,602	1.7

Table 2
BehavePlus Fire Behavior Modeling Results

Fuel Models	Flame Length (feet)	Spread Rate (mph)	Fireline Intensity (Btu/ft./s)	Spot Fire[1] (miles)
Coast Live Oak Woodland (Gs2)	30.2	9.6	9,392	2.0
Freshwater Marsh (Gr1)	4.0	0.7	115	0.4
Southern Riparian Scrub (Sh2)	23.8	2.3	5,602	1.7
Scenario 4: Chaparral-scrub-grassland- oak woodland;10% slope, Summer weather (18 mph)				
Granitic Northern Mixed Chaparral (Sh5)	25.9	2.4	6,717	0.8
Red Shank Chaparral (Sh5)	25.9	2.4	6,717	0.8
Flat-topped Buckwheat (Sh2)	9.1	0.3	693	0.4
Coast Live Oak Woodland (Gs2)	10.5	1.2	948	0.4
Freshwater Seep (Gr1)	2.9	0.4	59	0.2
Valley and Foothill Grassland (Gr4)	19.8	4.3	3,737	0.7
Scenario 5: Chaparral-scrub-grassland- oak woodland;10% slope, Summer weather (18 mph)				
Granitic Northern Mixed Chaparral (Sh5)	26.0	2.4	6,777	0.8
Semi-desert Chaparral (Sh2)	9.2	0.3	700	0.4
Sagebrush Scrub (Sh5)	26.0	2.4	6,777	0.8
Coast Live Oak Woodland (Gs2)	10.6	1.2	956	0.4
Freshwater Seep (Gr1)	2.9	0.4	59	0.2
Valley and Foothill Grassland (Gr4)	19.9	4.4	3,769	0.7

Notes: Btu/ft/s = British thermal units per foot per second.
[1] Spotting distance from a wind driven surface fire.

Based on the fire behavior modeling results presented herein, the maximum flame lengths anticipated in untreated, chaparral fuels could reach 63.6 feet in height with rapid rates of spread (14.3 mph) under extreme weather conditions, represented by Santa Ana winds blowing at maximum winds of 56 mph. Embers could be generated from a surface fire resulting in ignition of receptive fuel beds 3.4 miles downwind.

Fires approaching from the southwest or west and pushed by ocean breezes exhibit less severe fire behavior. Under typical summer weather conditions, a chaparral fire could have flame lengths ranging from 9 to 26 feet in height and spread rates up to 2.4 mph. The maximum flame lengths anticipated in oak woodlands or grasslands could reach up to 10.6 to 19.9 feet, respectively. Spotting distances, where airborne embers can ignite new fires downwind of the initial fire, range from 0.2 to 0.8 miles.

Flame lengths would be reduced to several feet or lower in the thinned areas of the FMZ adjacent to the proposed high-voltage substation, switchyard, around the gen-tie poles, and along the roads. FMZs planned for the Boulder Brush Facilities are designed to reduce flame length and fire intensity near the

proposed high-voltage substation, switchyard, around the gen-tie poles, and along the roads to levels that would not be anticipated to damage or threaten these Boulder Brush Facilities.

4.4 Boulder Brush Boundary Fire Assessment

Wildland fires are a common natural hazard in most of Southern California with a long and extensive history. Southern California landscapes include a diverse range of plant communities, including vast tracts of shrublands and riparian habitats. Wildfire in this Mediterranean-type ecosystem ultimately affects the structure and functions of vegetation communities (Keeley and Keeley 1984) and will continue to have a substantial and recurring role (Keeley and Fotheringham 2003). Supporting this are the facts that (1) native landscapes, from forest to grasslands, become highly flammable each fall, and (2) the climate of Southern California has been characterized by fire climatologists as the worst fire climate in the United States (Keeley 2004) with high winds (Santa Ana) occurring during autumn after a 6-month drought period each year. Based on this research, the anticipated growing population of north San Diego County wildland urban interface areas, and the regions fire history, it can be anticipated that periodic wildfires will occur in the open space areas of San Diego County, with the Tecate Divide corridor, being no exception. As such, the Boulder Brush Facilities are expected to be vulnerable to recurring wildfire ignition and spread and may be subject to nearby wildfire that could, under worst case conditions, spread through the site. Wildland fire from the north, south, west, and east is possible given the existence of open space lands and ignition sources. Currently, the most significant wildfire threat is considered to be during Santa Ana conditions with wind-driven wildfire from the northeast/east. This type of fire would also have the potential to produce embers and is subject to unstable wind patterns, resulting in eddies and wind/terrain assisted fire runs up side canyons and "chimneys."[2]

[2] Steep valleys, chutes, drainages, and similar terrain are sometimes referred to as chimneys.

BehavePlus Fire Behavior Inputs

Model Variable	Summer Weather Condition (Onshore Wind)	Peak Weather Condition (Offshore Wind)
Fire Scenarios	4,5	1,2,3
1 h fuel moisture	2%	1%
10 h fuel moisture	4%	2%
100 h fuel moisture	6%	4%
Live herbaceous moisture	50%	30%
Live woody moisture	80%	50%
20 ft. wind speed	18 mph	56 mph
Wind adjustment factor (BehavePlus)	0.6	0.6
Slope Steepness	5% to 15%	5% to 15%

BehavePlus Fire Behavior Modeling Results

Fuel Models	Flame Length (feet)	Spread Rate (mph)	Fireline Intensity (Btu/ft/s)	Spot Fire (miles)
Scenario 1: Chaparral-scrub;10% average slope, 56 mph peak winds				
Granitic Northern Mixed Chaparral (Sh5)	63.6	14.3	47,230	3.4
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Scenario 2: Chaparal-scrub;10% average slope, 56 mph peak winds				
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Red Shank Chaparral (Sh5)	63.5	14.3	47,120	3.4
Semi-desert Chaparral (Sh2)	23.8	2.3	5,588	1.7
Scenario 3: *Chaparral-scrub-riparian scrub-open oak woodland-marsh;10% average slope, 56 mph peak winds*				
Granitic Northern Mixed Chaparral (Sh5)	63.6	14.3	47,249	3.4
Red Shank Chaparral (Sh5)	63.6	14.3	47,249	3.4
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Scenario 4: *Chaparral-scrub-grassland- oak woodland;10% slope,* Summer weather (18 mph)				
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Red Shank Chaparral (Sh5)	25.9	2.4	6,717	0.8
Flat-topped Buckwheat (Sh2)	9.1	0.3	693	0.4
Coast Live Oak Woodland (Gs2)	10.5	1.2	948	0.4
Freshwater Seep (Gr1)	2.9	0.4	59	0.2
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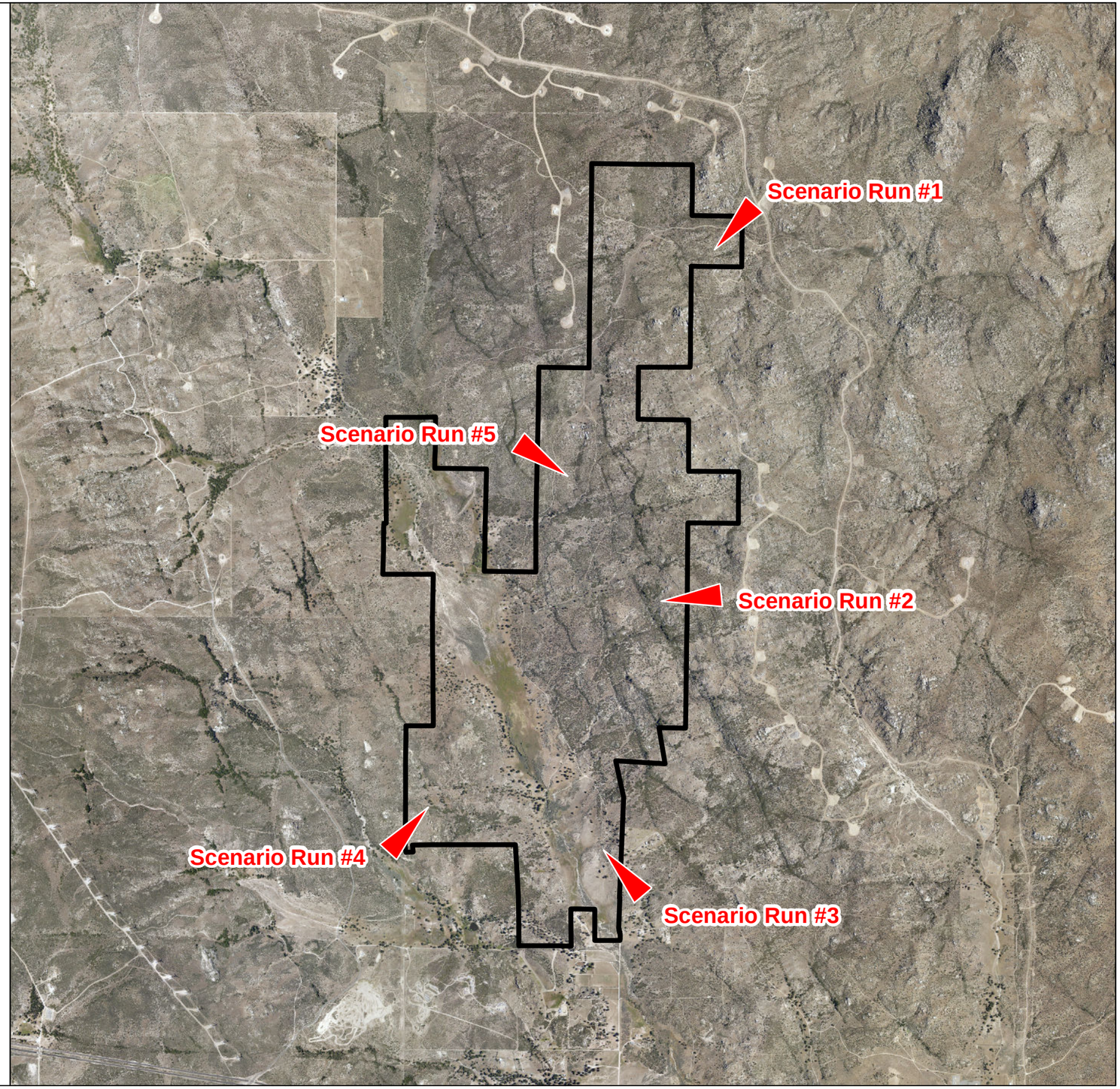
Freshwater Seep (Gr1)	2.9	0.4	59	0.2
Valley and Foothill Grassland (Gr4)	19.9	4.4	3,769	0.7



SOURCE: AERIAL: SANGIS 2017

DUDEK 0 1,500 3,000 Feet

FIGURE 5

BehavePlus Fire Behavior Modeling

Fire Protection Plan Boulder Brush Facilities

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5 ANALYSIS OF BOULDER BRUSH FACILITIES IMPACTS

5.1 Adequate Emergency Services

5.1.1 Emergency Response

The Boulder Brush Facilities would be located within the CAL FIRE SRA and SDCFA responsibility area. Emergency response to the Boulder Brush Facilities would be provided, initially, by the SDCFA and/or CAL FIRE from the co-located Station 47 in Boulevard. The Boulevard Fire Station is located at 40080 Ribbonwood Road and is staffed with County volunteers and CAL FIRE firefighters. The Boulevard Fire Station is approximately 6.8 miles from the most remote portion of the Boulder Brush Boundary (high-voltage substation and switchyard location) with a calculated travel time of approximately 12.2 minutes.[3] This is compliant with the required Consolidated Fire Code and General Plan response time and distance requirements for rural land use zoning. A Fire Service Facility Availability Form is included in Appendix D to this FPP. In addition to this responding fire station, there are additional resources available through automatic or mutual aid agreements. The region's fire resources are discussed further in the following sections.

Within the unincorporated region's emergency services system, fire and emergency medical services are provided by Fire Protection Districts, County Service Areas (CSAs), and CAL FIRE. Collectively, there are over 2,800 firefighters responsible for protecting the San Diego region from fire. Generally, each agency is responsible for structural fire protection and wildland fire protection within their area of responsibility. However, mutual and automatic aid agreements enable non-lead fire agencies to respond to fire emergencies outside their district boundaries. Interdependencies that exist among the region's fire protection agencies are primarily voluntary as no local governmental agency can exert authority over another.

Due to the remote location of the Boulder Brush Boundary, fire services generally consist of volunteer departments. However, CAL FIRE provides fire protection for a large part of east San Diego County. The unincorporated area of San Diego County has a Cooperative Fire Protection Agreement with CAL FIRE for the provision of fire and emergency services in East County. CAL FIRE responds to wildland fires, structure fires, floods, hazardous material spills, swift water rescues, civil disturbances, earthquakes, and medical emergencies. CAL FIRE co-operates the Boulevard Fire Station. CAL FIRE staffs the station with full-time 24/7 career firefighters through

[3] Travel distances were derived from Google Earth road data and driving on the access roads to fire stations from Facilities site while travel times were calculated applying the nationally recognized Insurance Services Office (ISO) Public Protection Classification Program's Response Time Standard formula (T=0.65 + 1.7 D, where T= time and D = distance). The ISO response travel time formula discounts speed for intersections, vehicle deceleration and acceleration, and does not include turnout time.

an Amador contract (staffing continues through the "off season" with the County under which, the County funds CAL FIRE presence during this period. The primary responsibility of the CAL FIRE is wildfire protection. CAL FIRE, in association with the California Department of Corrections and Rehabilitation, also jointly manages McCain Valley Camp and provides inmates with a limited level of training in fire safety and suppression techniques. Crew levels at the camp fluctuate and the response is typically for wildland fire, flood control, and community projects. McCain Valley Camp is located at 2550 McCain Valley Road, approximately 2.6 miles southeast of the Boulder Brush Boundary.

5.1.1.1 Emergency Service Level

Currently Fire Station 47 is providing adequate response times per the San Diego County General Plan, and the Boulder Brush Facilities would not adversely impact that ability. During construction of the Boulder Brush Facilities, which is anticipated to occur over approximately 14 months, a conservative estimate of 12 calls per year would potentially be generated. Station 47 is within a short driving distance of the Project Site. This is based on a peak maximum of 144 construction workers, which would equate to the estimated 12 calls per year ((82 ÷ 1,000) × 144) for the temporary construction period for Boulder Brush Facilities. The addition of 0.5 calls per year (12 calls per year for the temporary construction period) to a rural fire station that currently responds to approximately one call per day in its respective primary service area[4] is considered less than significant and would not require the construction of additional fire station facilities based on that increase alone. For reference, a station that responds to 5 calls per day in an urban setting is considered average and 10 calls per day is considered busy. Therefore, the Boulder Brush Facilities are not expected to cause a decline in the emergency response times. A Fire Service Facility Availability Form is included as Appendix D to this FPP.

5.1.1.2 Response Personnel Training

Studies (Grant 2010 and others, Starr 2017) indicate that for some types of energy-producing facilities and gen-tie line fire data is lacking and under reported. The same studies evaluated what measures provide the best results for improving response capabilities and firefighter safety. The types of measures that provide the most benefit are firefighter training, proper labeling, firefighter familiarizing, and extreme caution during fire response. To that end, the Boulder Brush Developer should implement the following measures:

- Conduct training sessions with local fire station personnel.

[4] SDCFA Boulevard Fire Station responded to 302 calls during 2017 (Pine, pers. comm. 2018).

- Provide a Technical Report (Refer to Appendix H to this FPP) identifying facility-specific firefighting issues.
- Provide a SDCFA-approved and CAL FIRE-approved training video that would be provided to local fire agencies for refresher training and training new firefighters who may rotate into potentially responding stations.
- Create consistent and clear labeling and placarding warnings on all electrical equipment.
- Provide system technical contact information for reliably available key personnel who can assist responding firefighters with technical aspects of the Boulder Brush Facilities.

5.2 Fire Access

5.2.1 Fire and Maintenance Access Roads for Boulder Brush Facilities

Main access to the Boulder Brush Boundary would be provided by Ribbonwood Road from Opalocka Road. Ribbonwood Road intersects with I-8 to the south of the Boulder Brush Boundary. Additionally, the access road from the intersection of Opalocka and Ribbonwood road through the main entrance at the Boulder Brush Boundary and up to the high-voltage substation and switchyard would be widened to a minimum of 20 feet (maximum 30 feet width) and paved.

Fire Access Roads (Internal)

Access roads to the gen-tie line poles would be 16 feet wide decomposed granite roads. The new, paved access route to the high-voltage substation and switchyard would be designed, constructed, and maintained to support the imposed loads of fire apparatus (not less than 75,000 pounds) so as to provide all-weather driving capabilities.

Dead-Ends

Road distance thresholds specified under Section 503.1.3 of the County Consolidated Fire Code restrict maximum dead-end road lengths for varying parcel size (County of San Diego 2017). The roads to the high-voltage substation and gen-tie line pole structures would provide opportunities for fire engine turn-around, thus meeting County Fire Code requirements.

Vertical Clearance

Minimum vertical clearance of 13 feet 6 inches will be maintained for the Boulder Brush Facilities' Fire Access Road from the driving surface, for unobstructed emergency vehicle access.

Grade

Road grades are not expected to exceed 10%, complying with the CCFC for the decomposed granite aggregate road surface (County of San Diego 2017). Areas where the road surface may exceed 10% would be provided appropriate measures in consultation with SDCFA.

Gates

The double swing or slide gates at the entrances to the Boulder Brush Facilities high-voltage substation shall be equipped with a fire accessible padlock. The gates have a measured opening of at least 26 feet and will be installed in compliance with CCFC Section 503.5 and 503.6 and to the satisfaction of the Director of Public Works. The high-voltage substation would be fenced up to 8 feet tall consisting of a 6-foot-high chain-link structure with additional 2 feet of security wiring located at the top. Up to 30-feet tall fencing would be installed around the perimeter of the switchyard, in accordance with SDG&E requirements.

5.2.2 Identification

Identification of roads and structures will comply with CCFC, Section 505.

5.3 Water

Three 10,000-gallon water tanks dedicated for firefighting purposes would be installed adjacent to the northeast entrance to the switchyard. A Fire Department Connection (FDC) would be located within approximately 150 to 250 feet of both the west entrance to the switchyard and the entrance to the high-voltage substation. This FDC would be connected to the water tanks by an underground water pipe. Water would be stored in aboveground tanks complying with the requirements of the SDCFA. The tanks shall comply with NFPA 22, Private Fire Protection Water Tanks. A procedure for ongoing inspection, maintenance, and filling of tanks would be in place. Water needed for filling the water tanks would be provided by an off-site water purveyor (Refer to Appendices E-1 and E-2, Project Facility Availability Forms – Water (Padre Dam Municipal Water District and Jacumba Community Service District). The tanks and fire engine connections shall be located on the side of the fire access road(s). The tanks shall each be labeled “Fire Water: 10,000 gallons” using reflective paint.

5.4 Defensible Space and Vegetation Management

The Boulder Brush Facilities would be provided defensible space by a FMZ buffer around each gen-tie line pole, the high-voltage substation, the switchyard, and roads. Prescribed FMZs would be maintained on at least an annual basis or more often, as needed. None of the plants on the

prohibited plant list (Appendix F to this FPP) shall be allowed on site. Planting, if applicable, used in the defensible space will consist of low-growing ground cover selected from the SDCFA desirable plant list. A potential plant mix for the FMZ areas is included as Appendix G to this FPP. The planting list and spacing will be reviewed and approved by the SDCFA Fire Marshal.

5.4.1 Fuel Modification

The high-voltage substation and switchyard would include contiguous FMZ of 50 feet starting from the perimeter fence. The high-voltage substation pad area will be free of vegetation around all electrical equipment. Each Off-Reservation gen-tie pole structure would include an FMZ having a radius of 20 feet from pole center.

5.4.1.1 Fuel Modification Requirements

The following specifications apply to Boulder Brush Facilities FMZs:

- Non-combustible surface (gravel, dirt, rock, etc.) is acceptable, or:
- Cleared of all existing native vegetation or prohibited plants.
- If the area is planted with native annual and perennial grasses they shall be allowed to grow and produce seed during the winter and spring. As grasses begin to cure (dry out), they will be cut to 6 inches or less in height.

5.4.1.2 Other Vegetation Management

1. **Roadway-Adjacent Defensible Space**

   An area of 20 feet from each side of access roads inside the Boulder Brush Boundary shall be maintained clear of vegetation in accordance with the FMZ requirements outlined above in Section 5.4.1.1. An area of up to 20 feet (depending on the remaining width of available access easement after accounting for the width of the road) from each side of the paved access road outside of the Boulder Brush Boundary to the intersection at Opalocka Road shall be maintained clear of vegetation. These areas shall be maintained by the Boulder Brush Developer. Vertical clearance of 13 feet 6 inches shall also be maintained along all access roads.

2. **Electrical Transmission Line Vegetation Management**

   In addition to the Boulder Brush Facilities fuel modification requirements, all interconnection transmission lines would require standard vegetation clearance for overhead span and riser poles. Overhead transmission line and transmission pole

vegetation management is regulated by various codes and ordinances including by the following regulations:

California Public Utilities Commission

GO 95: Rules for Overhead Electric Line Construction

GO 95 is the standard governing the design, construction, operation, and maintenance of overhead electric lines in California. It was adopted in 1941 and updated most recently in 2006.

GO 95 includes safety standards for overhead electric lines, including minimum distances for conductor spacing, minimum conductor ground clearance, standards for calculating maximum sag, and vegetation clearance requirements.

Vegetation clearance requirements of GO 95 are:

GO 95: Rule 35, Tree Trimming Criteria, defines minimum vegetation clearances around power lines.

Rule 35 guidelines specify, at the time of trimming require:

- 4 feet radial clearances are required for any conductor of a line operating at 2,400 volts or more, but less than 72,000 volts;
- 6 feet radial clearances are required for any conductor of a line operating at 72,000 volts or more, but less than 110,000 volts;
- 10 feet radial clearances are required for any conductor of a line operating at 110,000 volts or more, but less than 300,000 volts (this would apply to the facilities);
- 15 feet radial clearances are required for any conductor of a line operating at 300,000 volts or more.

CCR, Title 14 Section 1254

The firebreak clearances required by PRC Section 4292 are applicable within an imaginary cylindrical space surrounding each pole or tower on which a switch, fuse, transformer or lightning arrester is attached and surrounding each dead-end or corner pole, unless such pole or tower is exempt from minimum clearance requirements by provisions of CCR, Title 14 Section 1255 or PRC Section 4296.

The radius of the cylindroids is 10 feet measured horizontally from the outer circumference of the specified pole or tower with height equal to the distance from the intersection of the imaginary vertical exterior surface of the cylindroid with the ground to an intersection with a horizontal plane passing through the highest point at which a conductor is attached to such pole or tower.

Flammable vegetation and materials located wholly or partially within the firebreak space shall be treated as follows:

- At ground level – remove flammable materials, including but not limited to, ground litter, duff and dead or desiccated vegetation that will propagate fire;
- From 0 to 8 feet above ground level – remove flammable trash, debris or other materials, grass, herbaceous and brush vegetation. All limbs and foliage of living trees shall be removed up to a height of 8 feet;
- From 8 feet to horizontal plane of highest point of conductor attachment – remove dead, diseased or dying limbs and foliage from living sound trees and any dead, diseased or dying trees in their entirety.

3. Pre-Construction Vegetation Management

- A minimum of 50 feet of fuel modification must be maintained on the perimeter of all construction-related work areas where hot welding activities are to occur.
- Perimeter FMZs for the high-voltage substation and switchyard must be implemented prior to commencement of construction utilizing combustible materials.

4. Prohibited Plants

Certain plants are considered to be prohibited in the landscape due to characteristics that make them highly flammable. These characteristics can be physical or chemical. The plants included in the Prohibited Plant List (Appendix F to this FPP) are unacceptable from a fire safety standpoint, and shall not be planted on the site.

5.4.1.3 Fuel Modification Zone Vegetation Maintenance

Vegetation management within all FMZs shall be completed annually by May 15 of each year and more often as needed for fire safety, as determined by the SDCFA. The Boulder Brush Developer shall be responsible for all vegetation management throughout the Boulder Brush Corridor, in compliance with the requirements detailed herein. The Boulder Brush Developer shall be responsible for ensuring long-term funding and ongoing compliance with all provisions of this FPP, including vegetation planting, fuel modification, vegetation management, and maintenance requirements throughout the Boulder Brush Corridor.

Fuel modification maintenance work may be provided by mowing, trimming, or other methods that result in the desired low-fuel conditions detailed herein.

As a further means of ensuring the FMZ is maintained per this FPP, the Boulder Brush Developer shall obtain an inspection and report from a SDCFA-authorized Wildland Fire Safety Inspector by June 1 of each year, certifying that vegetation management activities throughout the Boulder Brush Corridor have been performed pursuant to this FPP. This effort further ensures vegetation maintenance and compliance with no impact on the SDCFA.

6 CUMULATIVE IMPACT ANALYSIS

For emergency response, the cumulative study area would be the SDCFA and/or CAL FIRE jurisdictional boundaries. The Boulder Brush Facilities and other projects may have a cumulative impact on the ability of local agencies to protect residents from wildfires. These facilities and other development in the study area would increase the population and/or activities and ignition sources in the Boulevard/Jacumba area, which may increase the chances of a wildfire and increase the number of people and structures exposed to risk of loss, injury, or death.

The potential cumulative impacts from multiple projects in a specific area can cause fire response service decline and must be analyzed for each project. The Boulder Brush Facilities along with solar and/or other wind projects in the greater Boulevard/Jacumba region represent an increase in potential service demand along with challenges regarding rescue or firefighting within or adjacent to electrical facilities.

Despite the generally low calculated increase in number of calls per year anticipated from the Boulder Brush Facilities, it contributes to the cumulative impact on fire services, when considered with other anticipated projects in the study area. The cumulative impact results in a situation where response capabilities may erode and service levels may decline.

The Boulder Brush Developer will participate in a Fire Service Developer Agreement. Fire Service Developer Agreements ensure funding for firefighting and emergency medical resources to comply with General Plan Safety Element Policy S-6.3 for new development, which requires development projects to contribute fair-share funding toward fire services. Funding provided by projects result in capital that can be used toward firefighting and emergency response improvements so that the County's firefighting agencies are able to perform their mission into the future at levels consistent with the General Plan. Implementation of FPPs and CFPPs, and project design features would reduce the Boulder Brush Facilities' proportionate share of fire impacts on a cumulative level, and the payment of fair-share fees would ensure consistency with County General Plan policies.

The requirements described in this FPP, including fire protection systems, pre-planning, education and training, and FMZs, are designed to aid firefighting personnel such that the Boulder Brush Facilities are defensible and on-site construction personnel are protected and potential cumulative impacts to the fire authority are mitigated.

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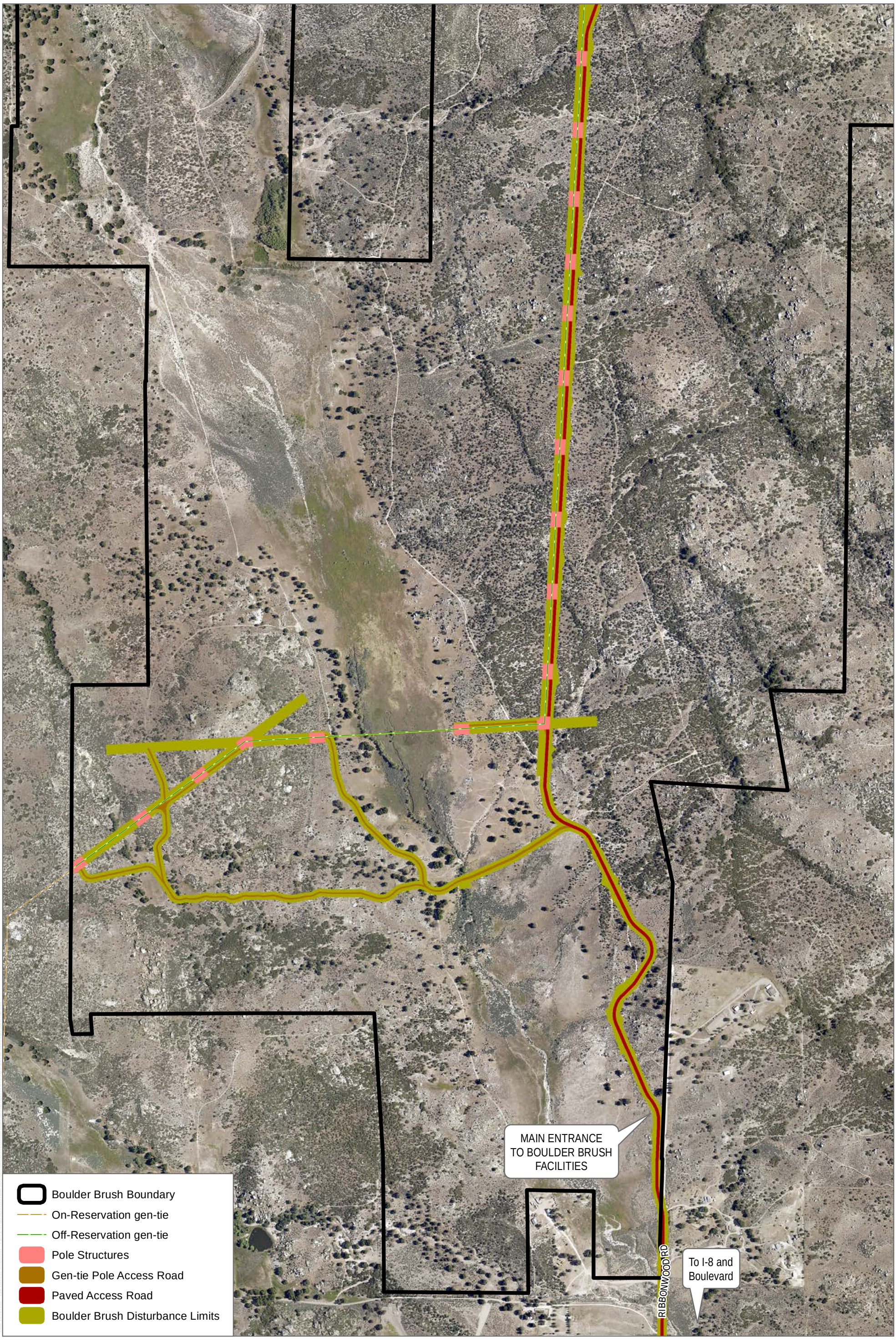
7 FIRE PROTECTION MEASURES AND DESIGN CONSIDERATIONS

As presented in this FPP, the Boulder Brush Facilities would be compliant with measures that address the identified potential fire hazards on the site. The measures would work together to result in reduced fire threat and heightened fire protection. Figures 6 and 7, Fire Safety Plan (South and North Half, respectively), show the locations of important site safety features including roads, on-site water storage tanks, fire access roadways, and FMZs. Additionally, the following measures shall be implemented for the Boulder Brush Facilities: FMZs throughout the Boulder Brush Corridor for Off-Reservation gen-tie power line structures, high-voltage substation, switchyard, and access roads (Required measure).

- A technical report (See Appendix H to this FPP for more details) indicating special precautions for firefighting response (Code-exceeding measure).
- Up to 30-foot wide primary access road that connects to the high-voltage substation and switchyard. 16-foot wide roads provide access to Off-Reservation gen-tie power line structures (Required measure).
- Off-Reservation gen-tie power line poles would be non-combustible (steel) with lightning protection (Code-exceeding measure).
- Participation in an Agreement with SDCFA, for funding firefighting and emergency medical resources, the details of which will be determined in the Fire Service Developer Agreement (Required measure).
- Boulder Brush Developer annual fuel modification zone inspections to ensure compliance with this FPP (Code-exceeding measure).
- Motion sensor illuminated (and/or reflective) signage at main entrance (Required measure).
- Preparation and implementation of a CFPP for the Boulder Brush Facilities. (Code-exceeding measure).
- Class B/C, 15-pound portable carbon dioxide (CO_2) fire extinguishers mounted at high-voltage transformer units (Required measure).
- Three 10,000-gallon water tanks will be installed near the switchyard and high-voltage substation dedicated for firefighting purposes (Required measure).
- During construction, one pick-up truck would be outfitted with Skid-Mounted Unit, including fire pump, hoses, and nozzle, and personnel properly trained to use the firefighting equipment. After construction is completed, the pickup truck will remain on the Project Site and personnel will be trained to use the firefighting equipment (Required measure).

- Boulder Brush Facilities contact information with local fire agencies/stations to assist responding firefighters during an emergency (Required measure).
- On-going maintenance of all facility components for the life of the Boulder Brush Facilities (Required measure).
- Maintenance logs to be kept and made available upon request to SDCFA/CAL FIRE (Required measure).
- Consistent placarding and labeling of all components for fire safety/response (Required measure).
- A contiguous fuel modification zone 50 feet outside of the perimeter fences (approximately 100 feet from the electrical components) around the high-voltage substation and switchyard would be maintained. The high-voltage substation pad area will be free of vegetation around all electrical equipment (Required measures).



SOURCE: SANGIS 2017

DUDEK

0 500 1,000 Feet

FIGURE 6

Fire Safety Plan - South Half

Fire Protection Plan Boulder Brush Facilities

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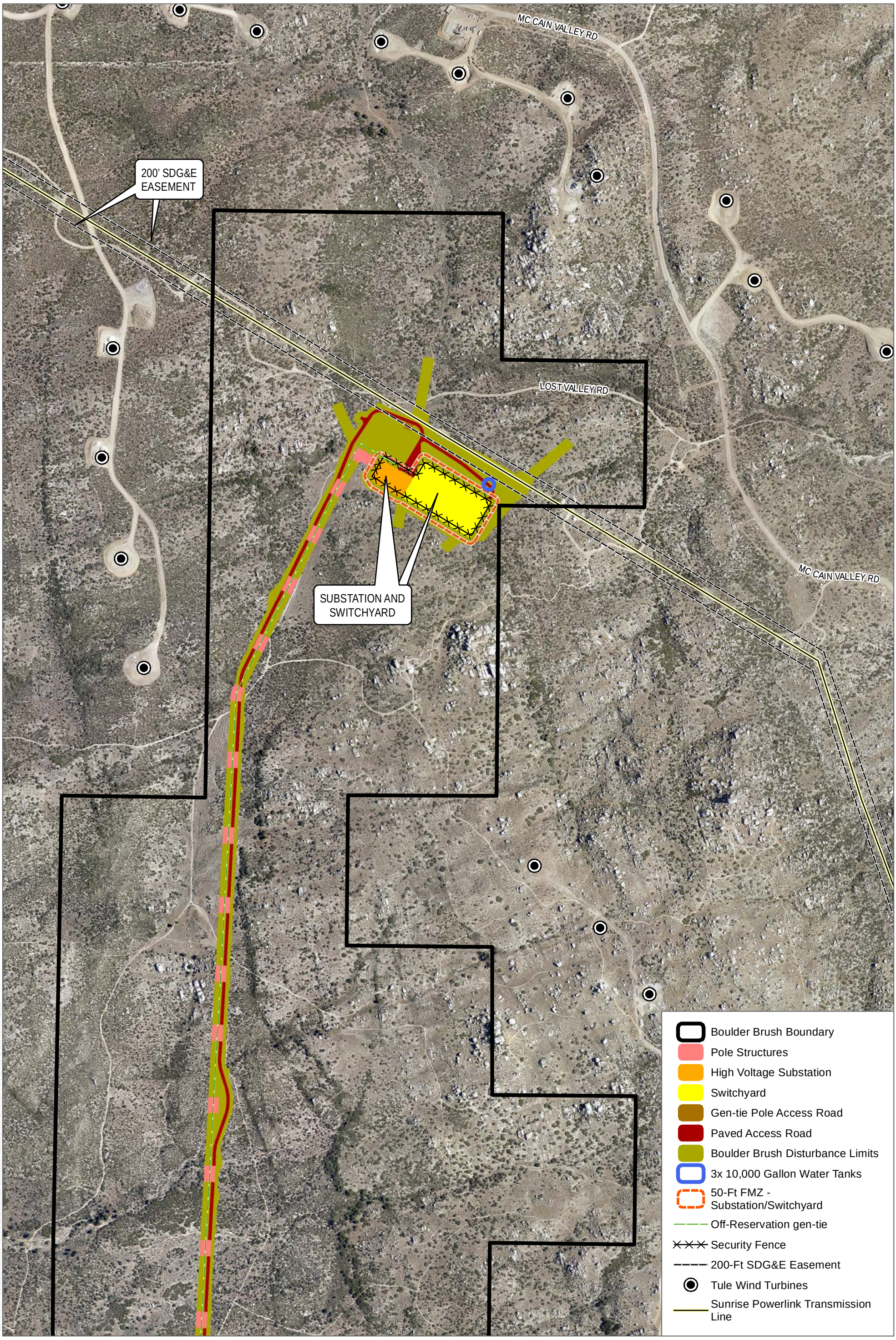

SOURCE: AERIAL-SANGIS 2017

DUDEK

0 400 800 Feet

FIGURE 7

Fire Safety Plan - North Half

Fire Protection Plan Boulder Brush Facilities

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8 CONCLUSION

This FPP has been prepared in support of the MUP for facilities entitlement of the Boulder Brush Facilities as required in compliance with the County's conditions for FPP content. The requirements in this document meet the intent and purpose of the Code for fire safety, building design elements, and fuel management/modification requirements of San Diego County. This FPP documents required fire safety features required by applicable codes and recommends additional mitigation measures that will enhance fire safety and have reduced the significance level to "less than significant" in accordance with the stated Significance Guidelines, without lessening health, life, or fire safety.

The Boulder Brush Facilities provide fire access, on-site water dedicated for firefighting purposes, facilities built to ignition resistant standards, fuel modification and vegetation management, and measures for fire protection during construction. The FMZs identified for the Boulder Brush Facilities are based on fire behavior modeling representing the fire environment and the type of fire that would be anticipated within the Boulder Brush Boundary. The FMZs would be maintained by removing all dead and dying materials, maintaining all grass and weed heights, maintain appropriate shrub and chaparral spacing, and would be inspected annually by a SDCFA-approved, Boulder Brush Developer-funded wildland fire inspector. In addition, plants that establish or are introduced to the FMZs that are on the prohibited plant list would be removed.

In addition, the Boulder Brush Developer will participate in a Fire Service Developer Agreement, which provides resources in this portion of eastern San Diego County by requiring projects to provide funding toward fire department assets (stations, apparatus, equipment, personnel).

Ultimately, it is the intent of this FPP to guide, through code and fire mitigating requirements, the construction of energy generation and transmission facilities that are defensible from wildfire and, in turn, do not represent significant threats of ignition sources for the adjacent native habitat. It must be noted that during extreme fire conditions, there are no guarantees that a given structure will not burn. Precautions and design features identified in this FPP are designed to reduce the likelihood that fire would impinge upon Boulder Brush Facilities. There are no guarantees that fire would not occur in the area, nor would fire not damage property or cause harm to persons or their property. Implementation of the required enhanced construction features provided by the applicable codes and the fuel modification requirements provided in this FPP will accomplish the goal of this FPP to assist firefighters in their efforts to defend the Boulder Brush Facilities.

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10 LIST OF PREPARERS

Facilities Manager/Senior Fire Protection Planner:

Michael Huff
Fire Protection Planner; San Diego County California Environmental Quality Act Consultant List
Dudek

FPP Preparation and Fire Behavior Modeling:

Michael Scott
Urban Forester/Fire Protection Planner
Dudek

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APPENDIX A

Construction Fire Prevention Plan

Appendix A of FPP
BOULDER BRUSH FACILITIES
CONSTRUCTION FIRE PREVENTION PLAN

Prepared for:

Boulder Brush LLC
11455 El Camino Real, Suite 160
San Diego, California 92130

For submittal to:

County of San Diego
Planning and Development Services
5510 Overland Avenue, Suite 310
San Diego, California 92123

Prepared by:

DUDEK
605 Third Street
Encinitas, California 92024

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APPENDIX

FIGURES

TABLE

ACRONYMS AND ABBREVIATIONS

CAL FIRE	California Department of Forestry and Fire Protection
CFC	California Fire Code
CFPP	Construction Fire Prevention Plan
CFR	Code of Federal Regulations
FMZ	Fuel Modification Zone
FPP	Fire Protection Plan
I	Interstate
kV	kilovolt
O&M	operations and maintenance facility
RFW	Red Flag Warning
SDCFA	San Diego County Fire Authority
SDG&E	San Diego Gas & Electric
SSO	Site Safety Officer
TBD	To Be Determined

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DEFINITIONS

1. **Activity Risk**: Activity risks include those actions that present a risk of igniting a wildfire.
2. **Fire Patrol**: The Site Safety Officer will be assigned as "fire patrol" specifically to monitor work activities when an activity risk exists for fire compliance.
3. **Fire Season**: Fire season is no longer officially designated by the wildland fire agencies. Southern California is considered to be in fire season on a yearlong basis. The California Department of Forestry and Fire Protection adjusts their staffing patterns as fire conditions moderate or escalate and this can be used as an indicator of potential fire activity.
4. **Fire Tools**: Essential firefighting tools to be staged near work activities are a 46-inch round point shovel, Pulaski, McLeod, 5-gallon "Indian" Backpack hand-pump water extinguisher, and a minimum 10 pound 4-A: 80-BC dry chemical fire extinguisher.
5. **Incident Commander**: The Incident Commander would be the positively identified single point of contact for utility resources (people and equipment) on a particular emergency incident. This person would interface with the Site Safety Officer, as necessary.
6. **Incident Command System**: The Incident Command System is "a systematic tool used for the command, control, and coordination of emergency response" according to the Federal Highway Administration. A more detailed definition of an Incident Command System according to the U.S. Center for Excellence in Disaster Management and Humanitarian Assistance is "a set of personnel, policies, procedures, facilities, and equipment, integrated into a common organizational structure designed to improve emergency response operations of all types and complexities."
7. **Red Flag Warning (RFW):** A red flag warning is issued for a stated period of time by the National Weather Service using pre-determined criteria to identify particularly critical wildfire danger in a particular geographic area.
8. **Site Safety Officer (SSO):** The Site Safety Officer (or designated fire safety coordinator) serves as a liaison to the emergency service agencies and all contractors or inspectors on the jobsite for the utilities on emergency incidents and construction-related activities. The Site Safety Officer has the authority to stop any facilities work that appears to pose a particular fire risk or hazard.

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1 SUMMARY

This Construction Fire Prevention Plan (CFPP) provides basic direction for fire safety awareness on land within the Boulder Brush Boundary during the construction and decommissioning phases of the Boulder Brush Facilities. CFPPs do not anticipate every potential fire scenario that may occur during these phases but attempt to educate site personnel to the danger associated with fire ignitions. If fire ignitions involve off-site vegetation under certain weather conditions, they can develop into large scale wildfires that burn many acres and threaten public and private assets. Therefore, this CFPP provides standard protocols and approaches for reducing the potential of ignitions for typical construction and other site activities. The concepts discussed in this CFPP would help minimize and avoid ignitions and extinguish any ignitions while they are small and controllable. This CFPP summarizes Boulder Brush Facilities components; readers should refer to Chapter 1, Project Description, of the Draft Environmental Impact Report for a detailed description of Project components.

Note: The National Weather Service may issue Red Flag Warnings (RFWs) at any time when humidity and wind conditions meet pre-determined thresholds that promote fire ignition and spread. Because the majority of acreage burned in California occurs during RFW weather conditions, construction activities, such as hot work, would be limited to low fire hazard, non-hot work, until the RFW has been lifted. For more details see Sections 7 and 8 of this CFPP.

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2 INTRODUCTION

This Construction Fire Protection Plan (CFPP) has been prepared for the Boulder Brush Facilities near the community of Boulevard, in unincorporated San Diego County, California. Boulder Brush LLC (Boulder Brush Developer), proposes to develop, finance, construct, own, operate and maintain, and ultimately decommission supporting transmission infrastructure on private lands in southeastern San Diego County. The Boulder Brush Facilities are anticipated to operate for up to 38 years, after which it would be decommissioned, except for the SDG&E-owned and operated switchyard and connection lines to Sunrise Powerlink, which would not be decommissioned. All decommissioning would occur within the Boulder Brush Corridor and disturbance limits, and would involve similar, though reduced construction equipment and activities. Please refer to Chapter 1, Project Description, of the Draft Environmental Impact Report (EIR) for a detailed description of the Campo Wind Project with Boulder Brush Facilities (Project) components.

The primary goals of this CFPP are to address the identified ignition sources and risks so that the personnel involved with constructing and final decommissioning of the Boulder Brush Facilities have clearly defined protocols and procedures for reducing fire risk and maintaining a fire safe worksite. The CFPP provides standard protocols and approaches for reducing the potential of ignitions for typical construction site activities. When employed, the concepts discussed in the CFPP would help minimize and avoid ignitions as well as extinguish any ignitions while they are small and controllable.

As part of the assessment, this CFPP has considered the fire risk presented by the Boulder Brush Facilities including: location and topography, geology (soils and slopes), combustible vegetation (fuel types), climatic conditions, fire history and the intended land use and configuration.

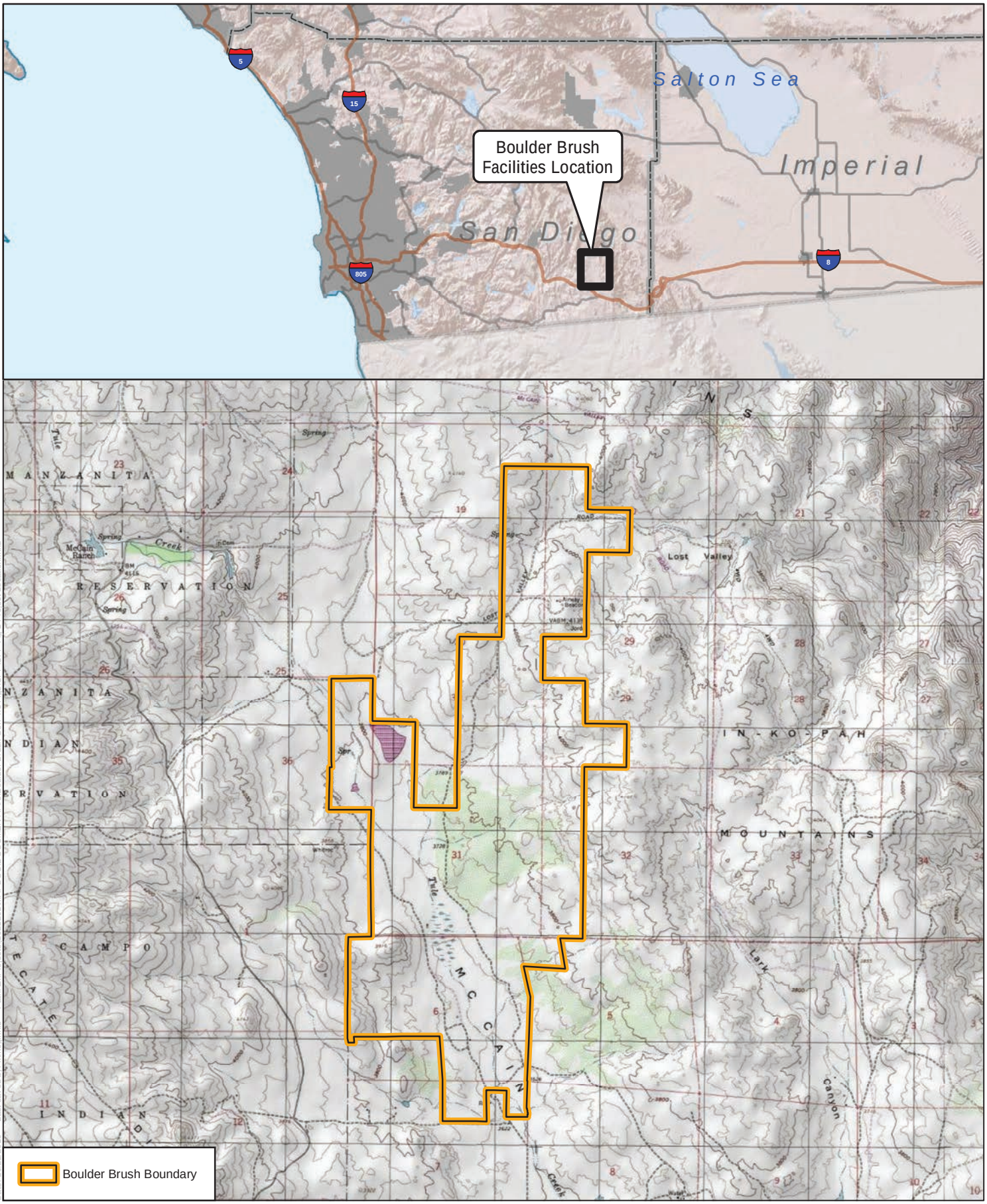
The Boulder Brush Facilities would be located within a corridor of approximately 320 acres of land (Boulder Brush Corridor) within the approximately 2,000-acre Boulder Brush Boundary adjacent to the northeast portion of the Campo Band of Diegueño Mission Indians Reservation (Reservation) (Figure 1, Boulder Brush Boundary) in the eastern portion of unincorporated San Diego County. The Boulder Brush Facilities would be located approximately 5 miles north of the Community of Boulevard and 2.5 miles north of Interstate (I) 8. Figure 2 illustrates the location of the Boulder Brush Facilities. Primary access to the Boulder Brush Facilities would be provided from I-8 with local access provided via Ribbonwood Road. The land within the Boulder Brush Boundary is situated within Section 36 of Township 16 South, Range 6 East, Sections 5, 6, and 7 of Township 17 South, Range 7 East, as well as in Sections 19, 20, 25, 29, 30, 31, and 32 of Township 16 South, Range 7 East on the U.S. Geographical Survey, 7.5-minute, Live Oak Springs and Sombrero Peak, California, quadrangle maps.

The Boulder Brush Facilities would be primarily constructed in areas of San Diego County classified as moderate to Very High Fire Hazard Severity Zone (FHSZ) by the California Department of Forestry and Fire Protection (CAL FIRE). There are some small portions within the central portion of the Boulder Brush Corridor that are classified as a Moderate of High FHZS (CAL FIRE 2007). Fire hazard designations are based on topography, vegetation, and weather, among other factors, with more hazardous sites including steep terrain, unmaintained fuels/vegetation, and wildland urban interface locations.

The Boulder Brush Boundary consists of largely undeveloped ranch land, a portion of which was historically grazed by cattle. There is also evidence of use by off-road recreational vehicles (motocross, ATVs and other off-road vehicles) within the Boulder Brush Boundary. Based on recent site visits and environmental field surveys conducted, there is no evidence of cattle grazing currently occurring within the Boulder Brush Boundary. Numerous 'No Trespassing' signs have been posted at locations along the Boulder Brush Boundary to deter off-road vehicle use.

Land ownership surrounding the Boulder Brush Boundary consists of a mixture of private, Bureau of Land Management (BLM), and tribal lands. The regional landscape consists of a mixture of large-lot rural residences and open space with mountainous terrain consisting of steep slopes, prominent ridgelines, and rock outcroppings. The 500-kilovolt (kV) Sunrise Powerlink traverses the northeast portion of the Boulder Brush Boundary. Wind turbines associated with the Tule Wind Project are located directly adjacent to the east, north, and northwest and the Kumeyaay Wind Project turbines are located approximately one mile west of the Boulder Brush Boundary.

Fire protection within the Boulder Brush Boundary is shared by several agencies, with the San Diego County Fire Authority (SDCFA) and CAL FIRE providing significant resources. CAL FIRE has the primary responsibility for wildfire protection within state responsibility areas. SDCFA and CAL FIRE are co-located at the closest fire station, Station 47, in Boulevard, approximately 6.8 miles to the most remote portion of the Boulder Brush Facilities (i.e., high-voltage substation and switchyard).



SOURCE: USGS 7.5 Minute Series, Live Oak Springs and Sombrero Peak Quadrangles

DUDEK

0 2,000 4,000 Feet

FIGURE 1

Boulder Brush Boundary

Construction Fire Protection Plan Boulder Brush Facilities

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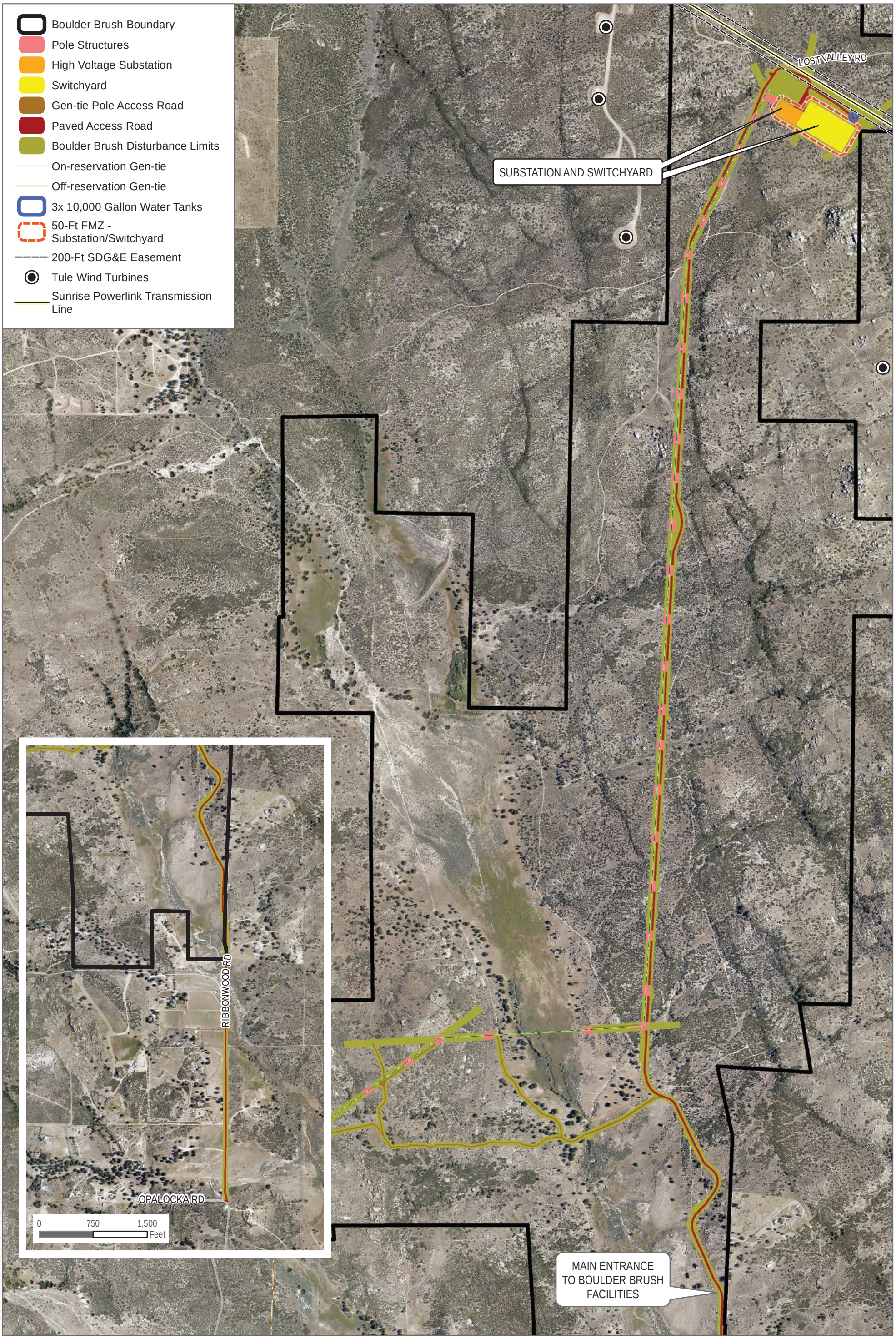

SOURCE: SANGIS 2017

DUDEK N 0 600 1,200 Feet

FIGURE 2

Boulder Brush Facilities Location

Construction Fire Protection Plan Boulder Brush Facilities

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3 EMERGENCY NOTIFICATION PROCEDURES

Any fire event at or near the Boulder Brush Facilities would trigger the emergency notification procedures identified in this section. Fire reporting is critical for tracking where, when, how, and why fire ignitions occur and would help the fire agencies develop protocols for reducing their occurrence.

3.1 First Call 9-1-1

Reporting fires and other emergencies: The first call should be to 9-1-1 so that appropriate apparatuses can be dispatched.

The personnel in Table 1 are the primary site contacts to be notified during a fire emergency.

Table 1
Emergency Notification Primary Contacts

Name[a]	Position	Telephone Number[1]
TBD	Site Safety Officer	TBD
TBD	Site Manager	TBD
TBD	Facilities Manager	TBD
TBD	Facilities Engineer	TBD
TBD	Construction Supervisor	TBD

TBD = to be determined

1 Upon designation of each positions listed, the names and telephone numbers would be inserted into this table.

Technical Staff Contact: *Facilities contact information will be provided to local fire agencies/stations to assist responding firefighters during an emergency. A copy of this CFPP will be submitted to the responding fire agencies.*

The first call should be to 9-1-1 so that emergency responders can be dispatched. Travel times to the Boulder Brush Facilities require notification of 9-1-1 as early as possible after the fire or other emergency has been observed.

Emergency-related contacts near the Boulder Brush Facilities site include the following:

- Fire/Emergency Medical – CAL FIRE Dispatch Center, Monte Vista – 2249 Jamacha Road, El Cajon, California 92019 (619.590.3100)
- Fire/Emergency Medical – San Diego County Sheriff's Dispatch Center, Boulevard – 39919 Highway 94, Boulevard, California 91905 (9-1-1 and 858.565.5200)
- SDCFA/CAL FIRE Station 47 – 40080 Ribbonwood Road, Boulevard, California 91905 (619.390.2020)

- SDCFA Administrative Office – 5510 Overland Avenue, Suite 250, San Diego, California 92123 (858.974.5999)
- San Diego County Sheriff, Boulevard Office – 39919 Highway 94, Boulevard, California 91905 (619.766.4585)
- California Highway Patrol, El Cajon Office – 1722 E. Main Street, El Cajon, California 92021 (619.401.2000)
- Hospital El Centro Regional Medical Center – 1415 Ross Avenue, El Centro, California 92243 (760.339.7100)

To facilitate the arrival of fire services during construction, an emergency response meeting point would be established with SDCFA and CAL FIRE. The Site Safety Officer (SSO) or designee would meet the emergency response team at the meeting point, likely the Boulder Brush Facilities main entrance, to lead them onto the Boulder Brush Facilities. The meeting point would be selected with fire agency input.

3.2 Evacuation Procedures

During significant emergency situations at or near the Boulder Brush Facilities, the construction site manager or SSO, in consultation with law enforcement or fire authorities, if possible, may issue an evacuation notice. When an evacuation has been called, site employees would gather at the designated assembly area, and the SSO would account for personnel as time allows. Once employees are accounted for, or sooner if dictated by the emergency, the vehicles would safely convoy from the Boulder Brush Facilities to safe zones, which are generally areas off site and away from the threat. Should there still be persons within the Boulder Brush Boundary after the evacuation has been called, the SSO would send convened personnel off site to safe zones, and the SSO and site supervisors would perform a sweep of the Boulder Brush Corridor to locate persons and reconvene at the assembly area. Once personnel are accounted for, all personnel would exit the area (see Figure 3, Fire Safety Plan – South Half, and Figure 4, Fire Safety Plan – North Half). The primary designated assembly area is located near the main entrance to Boulder Brush Boundary as illustrated in Figure 5, Evacuation Routes.

Should a structure or wildland fire (or other emergency) occur that threatens the primary assembly area, other locations may be designated as secondary assembly areas by the SSO or construction site supervisors, as dictated by the situation. The SSO and construction site supervisors should be prepared to be available to the Incident Commander throughout the incident to facilitate information exchange.

3.2.1 Evacuation Routes

Depending on the type and severity of the emergency, along with weather and localized site conditions, roadways designated on Figure 5 would be used for evacuating the area. The primary site access and evacuation route to the south is through Ribbonwood Road, which intersects with I-8. I-8 offers travel options to the west or east. The SSO and site supervisors are primarily responsible for evacuations. They would employ procedures to determine the emergency, talk with all site personnel and fire officials, as possible, and declare the emergency status. Foreman-level supervisors would assist in accounting for personnel.

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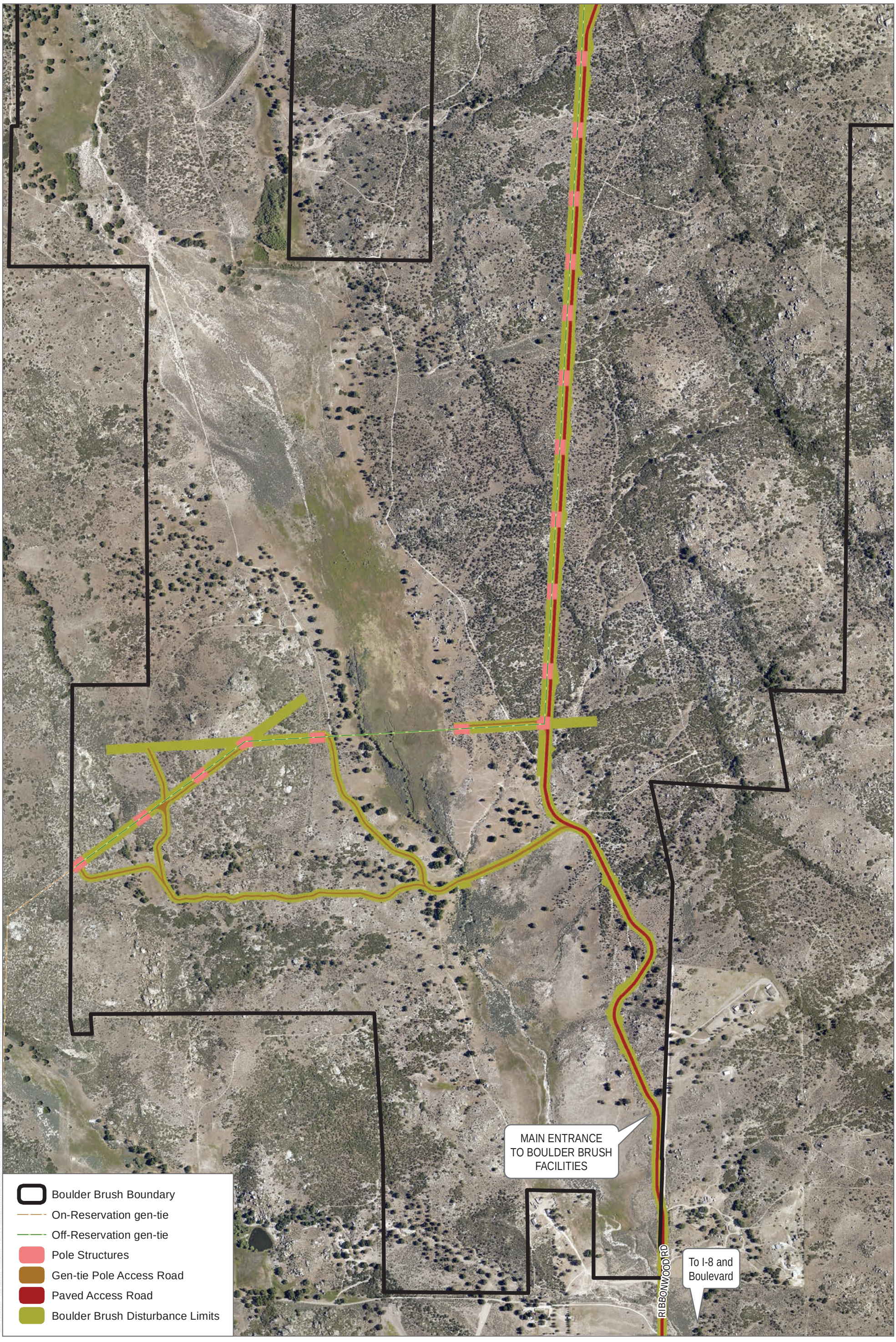

SOURCE: SANGIS 2017

DUDEK

0 500 1,000 Feet

FIGURE 3

Fire Safety Plan - South Half

Construction Fire Protection Plan Boulder Brush Facilities

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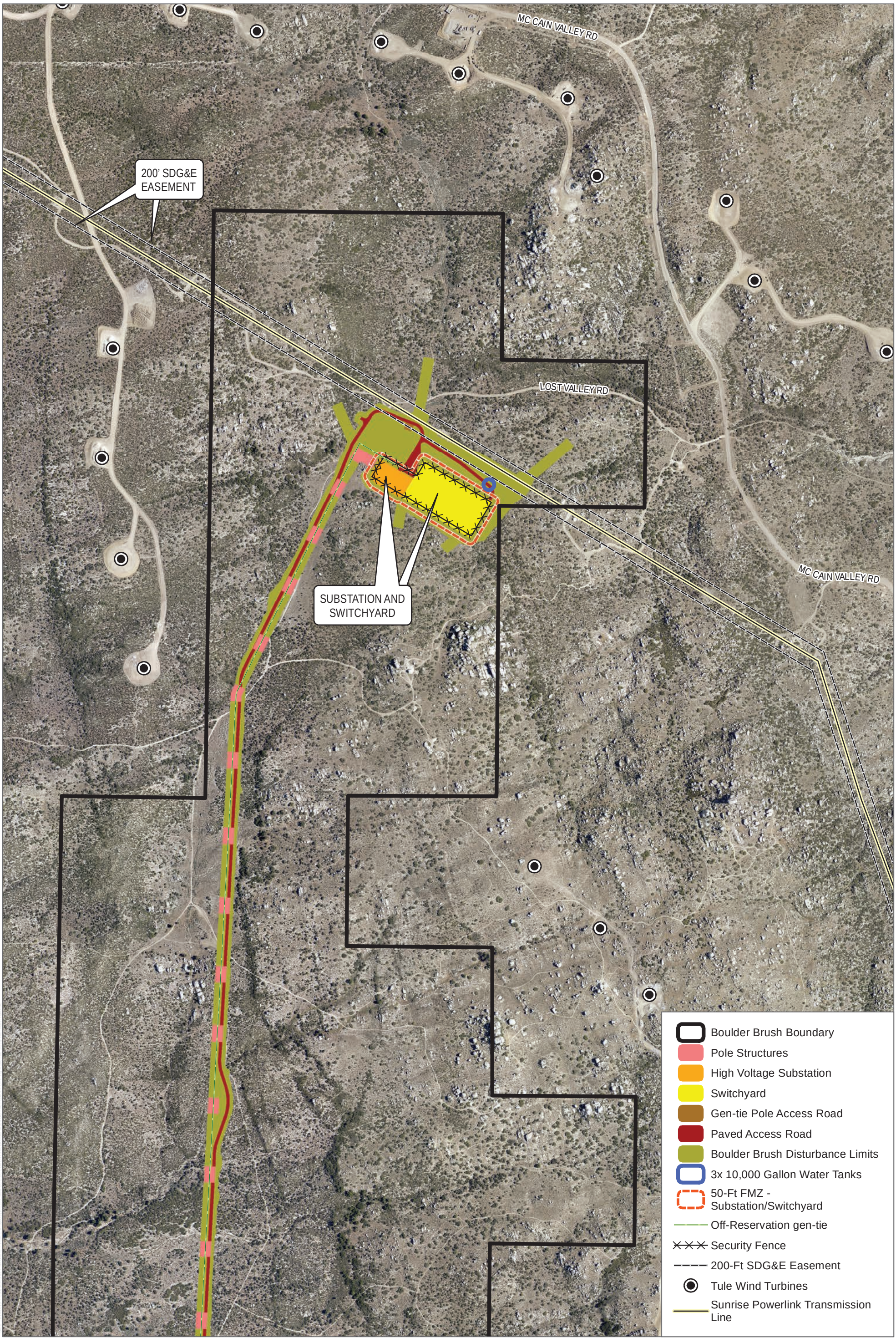

SOURCE: AERIAL-SANGIS 2017

DUDEK

0 400 800 Feet

FIGURE 4

Fire Safety Plan - North Half

Construction Fire Protection Plan Boulder Brush Facilities

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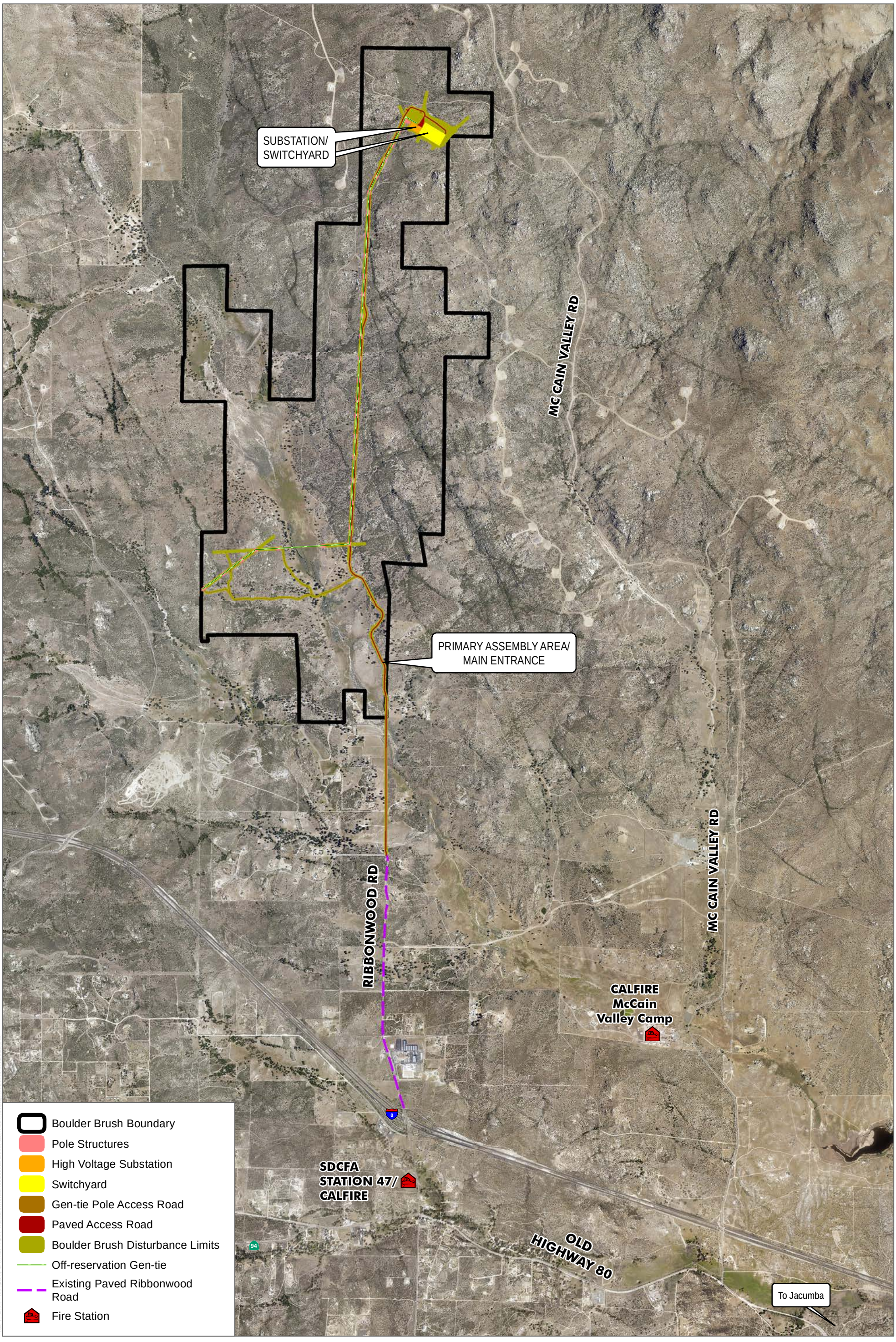

SOURCE: AERIAL-SANGIS 2017

DUDEK

0 1,300 2,600 Feet

FIGURE 5

Evacuation Routes

Construction Fire Protection Plan Boulder Brush Facilities

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4 BOULDER BRUSH FACILITIES ROLES AND RESPONSIBILITIES

Employees should know how to prevent and respond to fires and are responsible for adhering to policies regarding fire emergencies. The following sections detail general responsibilities by position.

4.1 Facilities Owner/Management

A site-specific Fire Protection Plan to determine overall fire risk has been prepared for approval by the SDCFA (Dudek 2019). The Boulder Brush Developer is required to implement necessary measures to reduce the risk and comply with federal, state, and local fire safety/protection policies. Additionally, owners/management would conduct necessary training and make equipment available to provide a safe working environment for employees and contractors, and would be contractually obligated to adhere to the Boulder Brush Facilities FPP and this CFPP.

4.2 Site Safety Officer

The SSO or a designated fire safety coordinator would manage the Boulder Brush Facilities FPP and this CFPP and would maintain records pertaining to the plans. Among the other responsibilities of the SSO are the following:

- Understanding the CFPP and its mandates for training, fire prevention, fire suppression, and evacuation
- Understanding the fire risk associated with the Boulder Brush Facilities and with activities that would occur on site
- Developing and implementing the fire prevention and safety training program
- Ensuring that fire control equipment and systems are properly maintained and in good working condition
- Conducting fire safety surveys and making recommendations
- Posting fire rules on the Boulder Brush Facilities bulletin board at the contractor's field office and areas visible to employees
- Stopping Boulder Brush Facilities' work activities that pose a fire hazard or are not in compliance with this CFPP
- Reporting all fires ignited on the land within the Boulder Brush Boundary, whether structural, vegetation, electrical or other, to SDCFA and CAL FIRE

4.3 Supervisors

Supervisors are responsible for the following:

- Ensuring that employees receive appropriate fire safety training
- Notifying the SSO when changes in construction increase the risk of fire
- Enforcing fire prevention and protection policies
- Accounting for employees/contractors in the case of an evacuation
- Performing site sweeps to round up staff
- Facilitating fire agency access to the Boulder Brush Facilities
- Cooperating with the fire agencies/incident command during and following fires
- Identifying unsafe work practices that may lead to fire ignitions

4.4 Employees/Contractors

Employees and contractors would perform the following tasks:

- Complete required training before working on site
- Conduct construction safely to limit the risk of fire
- Report potential fire hazards to their supervisors
- Follow fire emergency procedures
- Understand the emergency evacuation protocols

5 FIRE SAFETY PLAN GOALS

The primary goals of this CFPP are to address the identified ignition sources and risks so that the personnel involved with the construction and decommissioning of the Boulder Brush Facilities have clearly defined protocols and procedures for reducing fire risk and maintaining a fire safe worksite. The following goals have been developed for the Boulder Brush Facilities (see also Appendix A, Common Fire Ignition Sources and Fire Prevention Measures):

- Prevent/minimize fires during construction and decommissioning
- Provide a safe work site for employees, contractors, visitors, and emergency personnel
- Prevent shock to emergency responders, workers, and unauthorized trespassers
- Prevent arcing or sparking, which could ignite vegetation on site
- Prevent or minimize dollar loss to the equipment
- Prevent or minimize potential for a fire starting on site to spread off site
- Provide water, appropriate fire extinguishers, and access for firefighters
- Provide adequate signage and shut off devices to stop power feed into power lines in the event of a line failure or fire in right-of-way
- Provide 1 to 3 – 4,000 gallon water trucks equipped with 10lb 4A:80 BC dry fire extinguishers, hoses, shovels, Pulaski's and McLeods when work involves the use of chainsaws, chippers, vegetation masticators, grinders, drill rigs, tractors, torches, or explosives
- Provide the ability to report a fire or other emergency to emergency dispatch center without delay and to make contact with internet websites and personnel
- Report fire ignitions, regardless of size, to the SDCFA and CAL FIRE

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6 SITE AND FACILITIES DESCRIPTION

6.1 Location

The Boulder Brush Facilities would be located within a corridor of approximately 320 acres within the approximately 2,000-acre Boulder Brush Boundary adjacent to the northeast portion of the Reservation (Figure 1) in the eastern portion of unincorporated San Diego County. Refer to Section 2, Introduction, and Figures 1 and 2.

6.2 Vegetation

As presented in Figure 3 of the Boulder Brush Facilities Fire Protection Plan (FPP), land within the Boulder Brush Boundary is undeveloped and comprised of a variety of vegetation types that were mapped by Dudek biologists (Dudek 2019). Vegetative fuel types consist of approximately 11 vegetation communities and four non-native communities or land cover types. Native vegetation communities within the Boulder Brush Boundary includes montane buckwheat scrub, big sagebrush scrub, granitic northern mixed chaparral, chamise chaparral, granitic chamise chaparral, red shank chaparral, semi-desert chaparral, wildflower field, emergent wetland, southern arroyo willow riparian forest, and coast live oak woodland. Two non-native vegetation communities, disturbed habitat and eucalyptus woodland, and two land cover types, unvegetated stream channel and urban/developed. Semi-desert chaparral, red shank chaparral, Montane buckwheat scrub, and granitic northern mixed chaparral communities are the most common plant communities on and adjacent to the Boulder Brush Boundary.

6.3 Boulder Brush Facilities Description

The Boulder Brush Facilities include the following components:

- Off-Reservation gen-tie line (approximately 3.5 miles)
- High-voltage substation
- 500-kilovolt (kV) switchyard and connection to the existing SDG&E Sunrise Powerlink
- Access roads
- Three 10,000-gallon water tanks
- Defensible space (fuel modification zones)

A map of the Boulder Brush Facilities is included as Figure 2 of this CFPP. Please refer to Chapter 1 of the Draft EIR for a detailed description of Project components.

Off-Reservation Gen-Tie Line

Approximately 3.5 miles of the approximately 8.5-mile-long, overhead 230 kV gen-tie line that would transmit the electricity from the Campo Wind Facilities to the Off-Reservation high-voltage substation and switchyard would be constructed within the Boulder Brush Corridor on private land. This segment of the gen-tie line would require approximately 32 steel pole structures that, in addition to the transmission wires, would accommodate a fiber-optic ground wire attachment for lightning protection and internal communications. The height of the steel pole structures would vary by location, up to a maximum height of 150 feet (see Figure 1-5, Transmission Line Pole Structure Example, in Chapter 1 of the Draft EIR).

High-Voltage Substation

A high-voltage substation would be constructed within the Boulder Brush Corridor and located adjacent to the proposed 500 kV switchyard. This high-voltage substation would receive the electric energy transmitted from the Campo Wind Facilities along the 230 kV gen-tie line and convert it up to the 500 kV voltage via a 230 kV to 500 kV transformer before transmitting it onward to the adjacent switchyard.

The high-voltage substation would require a fenced-in footprint of approximately 220 feet by 320 feet (1.6 acres). An additional approximately 1.0-acre area of disturbance would be required for site grading and clearing around the perimeter of the fenced-in footprint. The total disturbed area associated with the high-voltage substation would be approximately 2.5 acres. The cleared area surrounding the high-voltage substation and the area inside the high-voltage substation fence would be covered with gravel. An 8-foot-tall security fence consisting of 6-foot-tall chain-link fencing topped with an additional 2 feet of security wire would be installed around the perimeter of the high-voltage substation site. The high-voltage substation would include a contiguous fuel modification zone from 50 feet outside the perimeter fence inward onto the pad area (approximately 100 feet from the electrical components). The high-voltage substation pad area would be free of vegetation around all electrical equipment. The high-voltage substation fence and the gravel area within the fence would be grounded.

500 kV Switchyard and Connection to the Existing SDG&E Sunrise Powerlink

A new 500 kV switchyard would be constructed on a stand-alone parcel within the Boulder Brush Corridor adjacent to the proposed high-voltage substation. Upon completion, this approximately 16-acre parcel and the switchyard would be transferred to SDG&E, who would then own, operate, and maintain the switchyard. The switchyard would interconnect the Project to the existing Sunrise Powerlink by a ring bus design with three 500 kV breakers, a control house, and a fenced-in

graveled area. The connection to the Sunrise Powerlink would be made through incoming and outgoing connection lines, to be constructed by SDG&E, that would effectively route the power through the ring bus. The Project's point of interconnection would be at an open position on that same bus within the switchyard. Figure 1-7, Switchyard Layout, in Chapter 1 of the Draft EIR shows a typical layout design for the switchyard.

The switchyard would require a fenced-in footprint of approximately 400 feet by 750 feet (6.9 acres). An additional approximately 9.5 acres of disturbed area would be required for the access road, incoming/outgoing connection lines, 0.6-acre retention pond, a 50-foot fuel modification zone around the perimeter of the switchyard (approximately 100 feet from the electrical components), and site grading and clearing. Up to a 30-foot tall fence would be installed around the perimeter of the switchyard, in accordance with SDG&E requirements. Therefore, the total disturbance area for the switchyard and in/out lines would be approximately 16 acres.

Access Roads

On-Site Roadway Improvements

To the extent feasible, new access roads would follow existing disturbed areas within the Boulder Brush Boundary to provide access and circulation to the Boulder Brush Facilities, including the gen-tie line poles, the high-voltage substation, and the switchyard (see Figure 1-9A, Project Access Roads, and Figure 1-9B, Boulder Brush Access Roads, in Chapter 1 of the Draft EIR).

Primary access to the Boulder Brush Facilities would be provided from I-8, with local access provided via Ribbonwood Road. New permanent access roads would incorporate applicable federal and local standards regarding internal road design and circulation, particularly those provisions related to emergency vehicle access. An approximately 3.5-mile-long and up to 30-foot-wide new paved access road from the Boulder Brush Facilities site entrance to the high-voltage substation and switchyard would be constructed. Approximately 2.6 miles of this paved access road would run parallel and adjacent to a portion of the proposed Off-Reservation gen-tie line and would also serve as access to approximately 24 Off-Reservation gen-tie line pole structures. This new paved access road would be a minimum of 20 feet in width and maximum of 30 feet in width, with 20 feet of fuel modification on each side of the road.

The approximately eight remaining Off-Reservation gen-tie line pole structures would be accessed by approximately 4 miles of improved decomposed granite roads, of which 2.8 miles would be located in areas of prior disturbance. The decomposed granite roads would be constructed or widened to a width of 16 feet. An approximately 20-foot-wide fuel modification zone would be

maintained on either side of the on-site unpaved access roads for the Boulder Brush Facilities. All on-site roads would be privately maintained.

All unpaved access roads would consist of compacted native material and may also have approximately 4–6 inches of aggregate and/or geosynthetic material to provide the soil strength needed for construction. The temporary disturbance areas outside the final roadway width would be graded and compacted for use during construction and then decompacted and stabilized at the conclusion of construction. Roads would be constructed or upgraded in accordance with industry standards. Bulldozers and graders would be used to build and widen roads, and a water truck would be used for road compaction and dust control. Access roads would be maintained, as needed, during operations.

Off-Site Roadway Improvements

An approximately 1-mile off-site segment of Ribbonwood Road from the Opalocka Road/ Ribbonwood Road intersection to the Boulder Brush Facilities site entrance off Ribbonwood Road would be improved. This existing, unpaved roadway segment ranges from 12 feet wide to 40 feet wide and would be widened up to 30 feet and paved. A 20-foot-wide fuel modification on either side of this road would be provided where feasible. Subject to County approval, the width of the fuel modification zone along either side of the portion of the access road outside of the Boulder Brush Boundary (between Opalocka Road and the Boulder Brush Boundary) would depend upon the final width of the improved, paved access road and its placement relative to the access easements that it will reside within. The proposed improved paved road would be a minimum of 20 feet in width (with a maximum of up to 30 feet). This paved road would link to the on-site up to 30-foot-wide paved access road providing access to the Boulder Brush Facilities including the high-voltage substation and switchyard (see Figures 1-9A and 1-9B in Chapter 1 of the Draft EIR).

Water Tanks

Three 10,000-gallon water tanks dedicated for firefighting purposes would be installed near the high-voltage substation and switchyard, in a location subject to County approval. The three water tanks would be sourced by Jacumba Community Service District (JCSD) or Padre Dam Municipal Water District (PDMWD) with non-potable water.

Defensible Space (Fuel Modification Zones)

Fire protection measures are defined in County Code Regulatory Ordinance, Title 9, Division 6, Chapter 1, County Fire Code. The regulations identify access road requirements and fuel modification zone requirements.

County Code, Section 96.1.503.1.1, specifies that "approved fire apparatus access roads shall be provided for every facility, building, or portion of building hereafter constructed or moved into or within the jurisdiction. The fire apparatus access road shall comply with the requirements of this section and shall extend within 150 feet of all portions of the facility and all portions of the exterior walls of the first story of the building as measured by an approved route around the exterior of the building or facility." Exceptions are as follows:

> **Exceptions:** The fire code official may increase the 150-foot minimum where:
>
> 1. Fire apparatus access roads cannot be installed because of topography, waterways, nonnegotiable grades or other similar conditions, and an approved alternative means of fire protection is provided.
> 2. There are no more than two Group R-3 or Group U occupancies.

County Code, Section 96.1.202, defines a fuel modification zone as a strip of land where combustible vegetation has been thinned or modified or both and partially or totally replaced with fire-resistant plants to provide an acceptable level of risk from vegetation fires. Fuel modification reduces the radiant and convective heat on a structure and provides valuable defensible space for firefighters to make an effective stand against an approaching fire front.

Permanent access roads would be constructed to provide access to the high-voltage substation and switchyard. County Code, Section 96.1.4907.2.1, specifies fuel modification of combustible vegetation from sides of roadways**.** Details regarding the extent of defensible space and fuel modification zones will be determined prior to final design with the input of relevant fire authorities. The Fire Authority Having Jurisdiction may require a property owner to modify combustible vegetation in the area within 20 feet from each side of the driveway or a public or private road adjacent to the property to establish a fuel modification zone. The nearest fire station, CAL FIRE Boulevard, is located just south of I-8, off of Ribbonwood Road.

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7 Boulder Brush Facilities Specific Risk Summary

7.1 Fire Risk

Fire risks are assessed based on the potential frequency (probability of an incident occurring) and consequence (potential damage should an event occur). The evaluation of fire risks must take into account the frequency and severity of fires and other significant incidents. This includes common risk types and heightened sources of risk.

Common risks that result in emergency calls include accidental injuries (residential, vehicle, other); medical-related incidents, including heart attacks, strokes, and other serious conditions and illnesses; accidental vegetation fires; and occasional structure fires.

Among the listed potential causes of fire incidents resulting from construction of the Boulder Brush Facilities are construction-related activities that could elevate the probability of ignition. Potential sources of fire risk could include the following:

- Explosion/arcs, arc flashing, electrical shorts, sparking, motor or other machinery fire, wiring and harnessing fire, overheated junction boxes, and rodents chewing on wires and causing arcing;
- Vegetation clearing for access roads, gen-tie line pole locations, and the high-voltage substation and switchyard sites;
- Off-road vehicle use could cause an ignition (e.g., catalytic converter, faulty brakes, etc.);
- Idling or parked vehicles and equipment in areas of grass and other vegetation;
- Hot work[1] activities conducted during a Red Flag Warning[2];
- Construction waste that has accumulated on site associated with electrical equipment could create a fire hazard and shall be contained within metal containers;
- Operation of generators, pumps, or other equipment capable of producing sparks or exhaust heat to cause ignition;
- Trash cans, smoking areas, and other combustible storage around the construction areas;
- Switchgear and cable fire.

[1] 'Hot work" is defined in Section 7.5.

[2] The National Weather Service may issue Red Flag Warnings (RFW) at any time when humidity and wind conditions meet pre-determined thresholds that would promote fire ignition and spread. Because the majority of acreage burned in California occurs during RFW weather conditions, certain construction activities, such as hot work, would be limited to low fire hazard, non-hot work, until the RFW has been lifted.

The Boulder Brush Facilities fire risks are associated with the following listed in Section 7.1.1.

7.1.1 Construction and Decommissioning Phase Fire Risks

The following list includes construction and decommissioning phase fire risks for the Boulder Brush Facilities:

- **Earth-moving equipment** – Create sparks, heat sources, and fuel or hydraulic leaks
- **Chainsaws** – May result in vegetation ignition from overheating, spark, and fuel leak
- **Vehicles** – Heated exhausts/catalytic converters in contact with vegetation may result in ignition
- **Welders** – Open heat source that may result in metallic sparks coming into contact with vegetation
- **Wood chippers** – Include flammable fuels and hydraulic fluid that may leak or spray onto vegetation with a hose failure
- **Compost piles** – Large piles that are allowed to dry and are left on site for extended periods that may result in combustion and potential for embers landing in adjacent vegetation
- **Grinders** – Sparks from grinding metal components that may land on a receptive fuel bed
- **Torches** – Heat source, open flame, and resulting heated metal shards that may come in contact with vegetation
- **Dynamite/blasting** – If necessary, blasting that may cause vegetation ignition from open flame, excessive heat, or contact of heated material on dry vegetation
- **Other human-caused accidental ignitions** – Ignitions related to discarded cigarettes, matches, temporary electrical connections, inappropriately placed generators, poor maintenance of equipment, and other factors

Fire Prevention Measures for Construction and Decommissioning Activities

The following measures shall be implemented to prevent fire during construction and decommissioning activities:

- Minimize combustible and flammable materials storage on site.
- Store any combustible or flammable materials that need to be on site away from ignition sources.

- Clear parking areas and fuel or oil storage areas of grass and brush by a distance of at least 30 feet.
- Keep evacuation routes free of obstructions.
- Label containers of potentially hazardous materials with their contents and store in the same location as flammable or combustible liquids.
- Perform "hot work" according to fire safety practices in a controlled environment and with fire suppression equipment at the job site. A fire watch person (Fire Patrol), with extinguishing capability (e.g. fire extinguishers), should be in place for all 'Hot Work" activities during construction. Ensure hot work adheres to the guidelines provided.
- Dispose of combustible waste promptly and according to applicable laws and regulations.
- Report and repair fuel leaks without delay.
- Do not overload circuits or rely on extension cords where other options would be safer.
- Turn off and unplug electrical equipment when not in use.
- Direct contractors on site to restrict use of chainsaws, chippers, vegetation masticators, grinders, drill rigs, tractors, torches, and explosives during Red Flag Warnings. When the above tools are used, a water truck (4,000 gallon) equipped with hoses, shovels, Pulaskis, and McLeods shall easily be accessible to personnel.
- Equip construction-related vehicles with a 10lb 4A:80 BC dry chemical fire extinguisher, a 5-gallon backpack pump fire extinguisher, a 46-inch round-point shovel, and a first aid kit.
- When an evacuation has been called, site employees gather at the designated assembly area and the SSO would account for personnel. Once all personnel are accounted for, the vehicles would safely convoy from the Boulder Brush Facilities site to safe zones, which are generally areas off site and away from the threat.

7.1.2 Consultants and Contractor On-Site Fire Risk

Consultants and contractors should know how to prevent and respond to fires and are responsible for adhering to the policies outlined in this CFPP, regarding fire emergencies. These general fire prevention measures should help in the efforts to prevent a fire from occurring while on site.

Fire Prevention Measures for Consultants/Contractors

The following list includes fire prevention measures for consultants/contractors:

- Vehicles shall be equipped with the following fire prevention equipment:
  - 10 pound, 4A:80 BC dry chemical fire extinguisher
  - 46-inch round-point shovel
  - 5 gallons of water or a 5-gallon water backpack
  - First aid kit
- No driving (cars, trucks, all-terrain vehicles, or similar) over unmaintained dry vegetation shall occur.
- Vehicles can be parked a minimum of 10 feet from any vegetation.
- Site activities shall be restricted during Red Flag Warning weather periods; stay alert to fire and weather conditions and evacuate employees, if safe to do so.
- Consultants/contractors shall conduct operations safely to limit the risk of fire.
- Hot work shall adhere to the guidelines provided below in Section 7.5.
- During significant emergency situations, an evacuation notice may be issued by the site manager/supervisor or SSO. When an evacuation has been called, consultant or contractor employees shall gather at the designated assembly area, and the SSO shall account for personnel. Once personnel are accounted for, the vehicles shall safely convoy from the Boulder Brush Facilities site to safe zones, which are generally areas off site and away from the threat.

7.2 Boulder Brush Facilities Fire Risk Rating

The estimated fire risk associated with the Boulder Brush Facilities is considered to be low to moderate during construction and decommissioning activities, based on the successful application of the FPP and this CFPP fire risk–reducing requirements. The risk of fires associated with transmission lines and electrical facilities is low to moderate.

The active construction phase results in higher potential for fires. Hot work, vegetation clearing, and other activities that may result in flame or heat sources can ignite vegetation, especially if non-native grasses have established and cured. Although there would be a potential for structural/equipment fires and wildfires, the risk is considered manageable as indicated by the low historic fire occurrence in existing wind energy and associated facilities.

7.3 Fire Risk Reduction Measures

The following measures would be employed, as appropriate, during the construction and decommissioning phases of the Boulder Brush Facilities to reduce the risk of ignitions. These measures would be enforced by the SSO and through ongoing worker safety training:

- Fire rules shall be posted on the Boulder Brush Facilities bulletin board at the contractor's field office in areas visible to consultants and contractors. This shall include the field offices of all contractors and subcontractors if more than one.
- Internal combustion engines used at the Boulder Brush Facilities during construction shall be equipped with spark arrestors that are in good working order.
- Once initial two-track roads have been cut and initial staking and/or fencing has been completed, light-duty trucks and cars shall be used only on roads where the roadway is cleared of vegetation. Mufflers on cars and light-duty trucks shall be maintained in good working order.
- During construction, the Boulder Brush Developer will provide at a minimum one pick-up truck outfitted with Type-6 Skid-Mounted Units, including fire pump, hose, and nozzle, that are staffed with personnel properly trained to use the equipment.
- During construction, the Boulder Brush Developer shall provide at least one and up to three water trucks each with a 4,000-gallon capacity. Each truck would be equipped with 50 feet of 0.25-inch fast response hose with fog nozzles. Any hose size greater than 1.5 inches shall use "national hose" couplings.
- A cache of shovels, Mcleods, and Pulaskis shall be available at staging sites. The amount of equipment shall be determined by consultation between SSO and SDCFA/CAL FIRE. Additionally, on-site pickup trucks would be equipped with first aid kits, fire extinguishers, and shovels. Contractor vehicles would be required to include the same basic equipment.
- Equipment parking areas and small stationary engine sites shall be cleared of extraneous flammable materials and provided with a gravel surface.
- The on-site contractor or Boulder Brush Developer shall restrict use of chainsaws, chippers, vegetation masticators, grinders, drill rigs, tractors, torches, and explosives during Red Flag Warnings. When the above tools are used, water tanks equipped with hoses, fire rakes, and axes shall be easily accessible to personnel.
- A fire watch (person responsible for monitoring for ignitions) shall be provided during hot work and shall monitor for a minimum of 30 minutes following completion of the hot work activities.

- Smoking shall not be in wildland areas and within 50 feet of combustible materials storage and shall be limited to paved areas or areas cleared of vegetation.
- Each Facility construction site (if construction occurs simultaneously at various locations) shall be equipped with fire extinguishers and firefighting equipment sufficient to extinguish small fires.
- The on-site contractor or Boulder Brush Developer shall coordinate with SDCFA/CAL FIRE to create a training component for emergency first responders to prepare for specialized emergency incidents that may occur on the Land within the Boulder Brush Boundary.
- Construction workers shall receive training on the evacuation plans and routes, proper use of firefighting equipment and procedures to be followed in the event of a fire. Training records shall be maintained and be available for review by the SDCFA/CAL FIRE.
- The Boulder Brush Facilities would be provided defensible space by an FMZ buffer around each gen-tie line pole, the high voltage substation the switchyard, and access roads. Prescribed FMZs would be maintained on at least an annual basis or more often, as needed. The high-voltage substation and switchyard would include contiguous FMZ of 50 feet starting from the perimeter fence. The high-voltage substation pad area will be free of vegetation around all electrical equipment. Each Off-Reservation gen-tie pole structure would include an FMZ having a radius of 20 feet from pole center. An area of 20 feet from each side of access roads inside the Boulder Brush Boundary shall be maintained clear of vegetation in accordance with the FMZ requirements outlined in Section 5.4.1.1 of the Boulder Brush Facilities FPP. An area of up to 20 feet (depending on the remaining width of available access easement after accounting for the width of the road) from each side of the paved access road outside of the Boulder Brush Boundary to the intersection at Opalocka Road shall be maintained clear of vegetation. These areas shall be maintained by the Boulder Brush Developer. Vertical clearance of 13 feet 6 inches shall also be maintained along all access roads.
- Ongoing fire patrols shall be implemented during RFW periods. The SSO shall be assigned as fire patrol to monitor work activities when an activity risk exists for fire compliance. The SSO shall verify proper tools and equipment are on site, assess any fire agency work restrictions, and serve as a lookout for fire starts, including staying behind (e.g., a fire watch) to make certain no residual fire exists. The SSO shall perform routine patrols of the Boulder Brush Facilities during the fire season equipped with a portable fire extinguisher and communications equipment. The SDCFA/CAL FIRE shall be notified of the name and contact information of the SSO in the event of any change.
- Remote monitoring of major electrical equipment (transformers and inverters) shall screen for unusual operating conditions. Higher than nominal temperatures, for example, could be

compared with other operational factors to indicate the potential for overheating which, under certain conditions, could precipitate a fire. Units could then be shut down or generation could be curtailed remotely until corrective actions are taken.

- Fires ignited on site shall be immediately reported to SDCFA/CAL FIRE.
- The engineering, procurement, and construction contracts for the Boulder Brush Facilities construction shall clearly state the fire safety requirements that are the responsibility of any person who enters the land within the Boulder Brush Boundary, as described in this CFPP.
- Upon completion of internal roadway network construction, light trucks and cars shall be used only on roads where the roadway is cleared of vegetation. Roads are to be kept free of ruts, drainages, wash boarding, and maintained in a hard compacted state to support fire engines.

7.4 Daily Fire Prevention Measures

To limit the risk of fires, site staff, employees, and contractors shall take the following precautions:

- Fire safety shall be a component of daily tailgate meetings. Foremen shall remind employees of fire safety, prevention, and emergency protocols on a daily basis.
- No smoking shall be allowed on site except in designated safe smoking areas that include cleared areas with no combustible vegetation or materials and approved cigarette butt receptacles (noncombustible containment of cigarette butts). Smoking inside closed vehicles at the Boulder Brush Facilities may be allowed in designated areas away from vegetation, at the discretion of the SSO.
- Combustible materials shall be stored in areas away from native vegetation. Whenever combustibles are being stored in the open air, the SSO shall be informed of the situation.
- Evacuation routes shall be maintained and free of obstructions. Unavoidable evacuation route blockages shall be coordinated such that a secondary route is identified and available.
- Disposal of combustible waste in accordance with applicable laws and regulations shall be required.
- Use and storage of flammable materials in areas away from ignition sources shall be required.
- Proper storage of chemicals such that incompatible (i.e., chemically reactive) substances would be separated appropriately shall be required.
- Performance of hot work (i.e., welding or working with an open flame or other ignition sources) in controlled areas under the supervision of a fire watch shall be required. Hot work permits are required and shall be reviewed and granted by the SSO for all hot work.

- Equipment shall be kept in good working order by inspecting electrical wiring and appliances regularly and maintaining motors and tools free of excessive dust and grease.
- Ensuring that heating units are safeguarded shall be required.
- Immediate reporting of fuel or petroleum leaks shall be required. The site mechanic shall ensure that leaks are repaired immediately upon notification.
- Immediate repair and cleanup of flammable liquid leaks shall be required.
- Extension cords shall not be relied on if wiring improvements are needed, and overloading of circuits with multiple pieces of equipment shall be prohibited.
- Turning off and unplugging electrical equipment when not in use.

7.4.1 Fire Prevention/Protection System Maintenance

The SSO (or trained specialist, when necessary) would ensure that fire suppression and related equipment is maintained according to manufacturer specifications. National Fire Protection Association guidelines would be implemented for specific equipment.

The following equipment is subject to ongoing maintenance, inspection, and testing procedures:

- Portable fire extinguishers
- Fire suppression systems
- "Type-6" skid-mounted unit on one pick-up truck during construction
- Fire alarm systems
- Water trucks and associated equipment
- Emergency backup generators/systems and the equipment they support

7.5 Hot Work

These requirements are primarily from California Fire Code (CFC) Chapter 26, Welding and other Hot Work, and National Fire Protection Association 51B, Fire Prevention During Welding, Cutting and other Hot Work. Hot work is defined in the CFC as operations involving cutting, welding, thermite welding, brazing, soldering, grinding, thermal spraying, thawing pipe, or other similar operations. Hot work areas are defined as the areas exposed to sparks, hot slag, radiant heat, or convective heat because of the hot work.

A Hot Work Permit for all hot work regardless of location would be obtained from the SSO, following guidelines from the fire agencies. The SSO would require hot work to be done in compliance with the requirements of National Fire Protection Association 51B and the Fire Code, Chapter 26.

Hot work would only be done in fire safe areas designated by the SSO and would comply with the following:

- All personnel involved in hot work would be trained in safe operation of the equipment by the SSO. This would include providing training at "tailgate safety meetings." Personnel would also be made aware of the risks involved and emergency procedures, such as how to transmit an alarm and who is responsible to call 9-1-1.
- Signage required in areas where workers may enter indicating "Caution: Hot Work in Progress; Stay Clear" would be posted on site.
- Hot work would not be done on any containers that contain or have contained flammable liquids, gases, or solids until containers have been thoroughly cleaned, purged, or inerted.
- A dry chemical fire extinguisher with a minimum rating of 4A-80 BC, a 5-gallon backpack pump fire extinguisher, and a 46-inch round point shovel would be readily accessible within 25 feet of a hot work area.
- The safety manager would inspect the hot work area before issuing a permit and would then make daily inspections.
- Welding and cutting would comply with 2016 CFC Chapter 35 – Welding and Hot Work.
- Electric arc hot work would comply with 2016 CFC Chapter 35 – Welding and Hot Work.
- Piping manifolds and hose systems for fuel gases and oxygen would comply with 2016 CFC Section 3509.
- Cylinder use and storage would comply with 2016 CFC Chapter 53, Compressed Gases.
- Equipment would be approved by a fire agency, including torches, manifolds, regulators, or pressure-reducing valves, and any acetylene generators.
- Personal protective clothing would be selected to minimize the potential for ignition, burning, trapping hot sparks, and electric shock.
- A fire watch will be in place for a minimum of 30 minutes as considered necessary by the SSO, following any hot work.
- Any ignitions would be immediately extinguished (as possible) by site personnel, and the fire department would be notified of the incident.

The SSO would have the responsibility to assure safe hot work operations and would have the authority to modify hot work activities associated with construction activities and to exceed the requirements in National Fire Protection Association 51B and 2016 CFC to the degree necessary to prevent fire ignition. Workers must be trained on the hot work information and criteria in this CFPP.

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8 RED FLAG WARNING PROTOCOL

Red Flag Warnings are issued by the National Weather Service and indicate that conditions are such (low humidity, high winds) that wildfire ignitions and spread may be facilitated. To ensure compliance with Red Flag Warnings restrictions, the National Weather Service website would be monitored at the Boulder Brush Facilities (http://www.srh.noaa.gov/ridge2/fire/briefing.php). During Red Flag Warnings, construction activities would be limited and precautions may be taken on site during periods of a Red Flag Warning, when conditions such as low humidity and high winds are present. Upon announcement of a Red Flag Warning, red flags will be prominently displayed at the entrance gate and main office, indicating to employees and contractors that restrictions are in place. Any "hot work" (work that could result in ignition sources or increase fire risk), grading, or any other work that could result in heat, flame, sparks, or may cause an ignition to vegetation would be prohibited during Red Flag Warning conditions. Areas may be evacuated where personnel may be exposed to higher risks. If vehicles are required to be used during Red Flag Warning conditions, vehicles shall remain only on designated access roads on the site.

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9 FIRE SAFETY BRIEFINGS, INSPECTIONS, AND TRAINING

9.1 Briefings and Inspections

The SSO would conduct routine, unannounced inspections a minimum of once weekly. The SSO would develop an inspection check list to document these inspections.

Prior to Boulder Brush Facilities construction, personnel would receive training on the contents of this CFPP, along with additional fire safety and fire prevention information provided by an informed SSO (or designee). As possible, firefighters from the local fire department would attend these meetings and provide input, which has a dual benefit of informing site personnel and providing Boulder Brush Facilities familiarity for the firefighters.

Site supervisors/foremen would be responsible for sharing CFPP content with consultants and construction personnel throughout the duration of the Boulder Brush Facilities. A review of the content of this CFPP would take place at a formal safety briefing at a minimum of once per month.

Each daily tailgate should include an assessment of the day's fire-related risks or hazards and the mitigation for each.

Compliance, including monitoring compliance, with this CFPP is mandatory. All levels of the Boulder Brush Facilities management have the authority to shut down any operation that presents an inappropriate amount of fire risk or hazard until it can be properly mitigated.

Violations of any of the requirements of this CFPP would be addressed by the SSO or other supervisory personnel immediately. Appropriate consequences for repeated or serious negligence in respect to this CFPP would be dealt with accordingly. All vegetation or structure fires, regardless of size, would be promptly reported to the SSO to determine if appropriate mitigation measures are being taken.

9.2 Training Requirements

9.2.1 Basic Fire Safety Training

The SSO and or site supervisors/foremen would present basic fire prevention training to employees upon employment and would maintain documentation of the training, which includes the following:

- Boulder Brush Facilities Fire Protection Plan
- Review of the Occupational Safety and Health Administration Fire Protection and Prevention (29 CFR 1926.24)

- Fire management, including wildfire prevention (43 CFR 9212.0 et seq.)
- Proper response and notification in the event of a fire
- Instruction on the use of portable fire extinguishers (as determined by company policy in the Emergency Action Plan), and hand tools, such as shovels, and recognition of potential fire hazards

The SSO would train persons entering the Boulder Brush Facilities on the fire hazards associated with the specific materials and processes to which they are exposed, and would maintain documentation of the training. Employees would receive this training at the following times:

- Upon first entering the Boulder Brush Facilities
- Annually during a pre-planned meeting
- When changes in work processes necessitate additional training
- Upon returning to the site after having been gone longer than 90 days

9.2.2 Site Supervisor Fire Safety Training

Prior to Boulder Brush Facilities construction, site supervisors would receive a minimum of 1 hour of training on wildland fire prevention and safety. This training would be provided by the SSO or qualified designee. This training would then be shared with construction personnel by the site supervisor or SSO.

Each site supervisor would be trained on the following:

- Fire reporting
- Extinguishing of small fires to prevent them from growing into more serious threats
- Fire prevention
- Initial attack firefighting
- Identification of work activities that may result in a fire hazard

9.2.3 Communication

The ability to communicate with personnel working on the construction of the Boulder Brush Facilities is mandatory. Construction crews would be required to have a satellite phone, and/or radios that are operational within the area of work to report an emergency. Contact information for lead construction personnel would be provided to respective agencies. Communication

pathways and equipment would be tested and confirmed operational each day prior to initiating construction activities. Fires and medical emergencies would be immediately reported to the SDCFA/CAL FIRE.

Each on-site worker would carry at all times a laminated CFPP card listing 24-hour contact information, including telephone numbers for reporting an emergency and immediate steps to take if an incident occurs. Information on the CFPP card would be updated as needed and redistributed to workers before the initiation of any construction activities.

Additionally, the Boulder Brush Developer would prepare an Environmental Health and Safety Plan in compliance with OSHA requirements, which would include identification of potential construction-related hazards, required personal protective equipment, work zones, safety considerations for site construction activities, as well as protocols regarding communications, accident or incident reporting, emergency response, and emergency medical treatment. As such, the Boulder Brush Facilities would be in compliance with and Boulder Brush Developer staff and contractors would adhere to the emergency response procedures in the Environmental Health and Safety Plan.

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10 BOULDER BRUSH FACILITES PERSONNEL FIRE FIGHTING LIMITATIONS

Responding to fires within the Boulder Brush Boundary, whether structural, wildland, or other, is the responsibility of SDCFA and CAL FIRE. Because their response to the Boulder Brush Facilities may require several minutes or more, Boulder Brush Developer staff and contractors should provide only initial firefighting efforts and only if they have had appropriate training.

The following fire suppression guidelines are recommended:

- During construction, there will be, at a minimum, one pick-up trucks outfitted with Type-6 Skid-Mounted Units (including fire pump, hose, and approved nozzle) and personnel properly trained to utilize the equipment.
- No Boulder Brush Developer staff or contractor shall fight a fire beyond the incipient stage and the arrival of professional fire suppression personnel. Involvement in firefighting is voluntary and should only be attempted by trained, qualified individuals.

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11 REVIEW AND APPROVAL

The signatory reviewing officials are acknowledging that Boulder Brush LLC has established a CFPP when properly implemented, maintained, and enforced results in fire hazard and risk reduction for the Boulder Brush Facilities construction and decommissioning. Reviewing agencies do not accept any responsibility for Boulder Brush LLC interpretation or implementation of this CFPP prior to, during, or following construction and decommissioning of the Boulder Brush Facilities or for any resulting actions associated with these activities.

Reviewed by:

_____	_____
Boulder Brush Facilities SSO	Date
_____	_____
SDCFA	Date
_____	_____
CAL FIRE	Date

Approved by:

_____	_____
Boulder Brush Facilities Manager	Date

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12 REFERENCES

CAL FIRE (California Department of Forestry and Fire Protection). 2007. "San Diego County Fire Hazard Severity Zones in State Responsibility Area." Fire and Resource Assessment Program (FRAP). Adopted by CAL FIRE on November 7, 2007.

Dudek. 2018. "Draft Biological Resources Memorandum for SoDAR Metrological Testing Facilities." May 2018. SANGIS (San Diego Geographic Information Source). 2014. "Vegetation Mapping." San Diego Geographical Information System. Accessed August 2018. http://www.sangis.org/.

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APPENDIX A

Common Fire Ignition Sources and Fire Prevention Measures

APPENDIX A
Common Fire Ignition Sources and Fire Prevention Measures

ELECTRICAL FIRE HAZARDS

Electrical system failures and the misuse of electrical equipment are leading causes of workplace fires. Fires can result from loose ground connections, wiring with frayed insulation, or overloaded fuses, circuits, motors, or outlets.

To prevent electrical fires, employees shall:

1. Make sure that worn wires are replaced.
2. Use only appropriately rated fuses.
3. Never use extension cords as substitutes for wiring improvements.
4. Use only approved extension cords [i.e., those with the Underwriters Laboratory (UL) or Factory Mutual (FM) label].
5. Check cords and equipment in hazardous locations where the risk of fire is especially high.
6. Check electrical equipment to ensure that it is either properly grounded or double insulated.

Hot Works (Cutting, Welding, and Open Flame Work)

The Site Safety Officer (SSO) and supervising foremen shall ensure the following occurs when hot works will be performed:

1. A jobsite evaluation for fire hazards will be completed prior to work beginning.
2. A hot work permit will be obtained and all requirements of the permit will be observed.
3. Cutting and welding are done by authorized personnel in designated cutting and welding areas whenever possible.
4. Torches, regulators, pressure-reducing valves, and manifolds are UL listed or SDCFA Fire Marshal approved.
5. Oxygen-fuel gas systems are equipped with listed and/or approved backflow valves and pressure-relief devices.
6. Cutters, welders, and helpers are wearing eye protection and protective clothing as appropriate.
7. Cutting or welding is prohibited in areas where explosive atmospheres of gases, vapors, or dusts could develop from residues.
8. Small tanks, piping, or containers that cannot be entered are cleaned, purged, and tested before cutting or welding on them begins.
9. A fire watch has been identified and situated at the hot work site.

Flammable and Combustible Materials

The SSO shall regularly evaluate the presence of combustible materials at all jobsite locations.

Certain types of substances can ignite at relatively low temperatures or pose a risk of explosion if ignited. Such substances obviously require special care and handling. The following summary provides general information about combustible types and how risk can be reduced.

Class A Combustibles

These include common combustible materials (wood, paper, cloth, rubber, vegetation and plastics).

Class A combustible safe handling procedures:

- Dispose of waste daily in proper, metal receptacles with tight fitting covers.
- Keep work areas clean and free of accumulated fuels that could lead to ignition and fire spread.
- Maintain a safe distance between combustibles and ignition sources, such as hot plates, soldering irons, or other heat- or spark-producing devices.
- Store paper supplies in metal cabinets.
- Store rags in metal bins with self-closing lids.
- Do not store excessive amounts of combustibles on site.
- Make frequent inspections to anticipate fires before they start.
- Maintain extinguishers at Facilities. Water, multi-purpose dry chemical, and halon 1211 are approved fire extinguishing agents for Class A combustibles.

Class B Combustibles

These include flammable and combustible liquids (oils, greases, tars, oil-based paints, and lacquers), flammable gases, and flammable aerosols.

Class B combustibles safe handling procedures:

- Use only approved pumps, taking suction from the top, to dispense liquids from tanks, drums, barrels, or similar containers (or use approved self-closing valves or faucets).
- Do not dispense Class B flammable liquids into containers unless the nozzle and container are electrically interconnected by contact or by a bonding wire. Either the tank or container must be grounded.

- Store, handle, and use Class B combustibles only in approved locations where vapors are prevented from reaching ignition sources such as heating or electric equipment, open flames, or mechanical or electric sparks.
- Do not use a flammable liquid as a cleaning agent inside a building or tool van (the only exception is in a closed machine approved for cleaning with flammable liquids).
- Do not use, handle, or store Class B combustibles near areas normally used as exits.
- Do not weld, cut, grind, or use unsafe electrical appliances or equipment near Class B combustibles. Do not generate heat, allow an open flame, or smoke near Class B combustibles.
- Water should not be used to extinguish Class B fires caused by flammable liquids. Water can cause the burning liquid to spread, making the fire worse. To extinguish a fire caused by flammable liquids, exclude air around the burning liquid. The following fire-extinguishing agents are approved for Class B combustibles: carbon dioxide, multi-purpose dry chemical, Halon 1301, and Halon 1211.

Fuel Storage Refueling Area

Class B fuel storage shall be maintained per NFPA requirements and provide the following life safety appliances:

- Fuel tanks shall be grounded.
- Secondary containment shall be designed and installed to accommodate the capacity of the largest tank.
- At least four 30-pound Class BC dry chemical fire extinguishers shall be maintained within immediate access to storage/refueling area.
- No smoking signs shall be posted on each tank and smoking prohibited within 20 ft. of the storage/refueling area.
- NFPA/DOT placards designating the hazard and product contained within shall be posted on each tank.
- All engines shall be shut off during refueling operations.
- No portable electrical generators shall be operated with the storage area.

Vegetated Area Risk Reduction

The Boulder Brush Corridor includes and is surrounded by chaparral brush and other naturally occurring vegetated areas. These natural fuels may be prone to ignition from activities occurring

within the Boulder Brush Corridor and require strict application of measures to minimize the likelihood of ignition and fire spread.

- All site vehicles used during construction, operation and maintenance, and decommissioning shall be equipped with a first-aid kit, 10 pound, 4A:80 BC dry chemical fire extinguisher, 5 gallons of water or a 5-gallon water backpack, and a 46-inch round point shovel (employee vehicles are not required to include this equipment)
- All internal combustion engines used within the Boulder Brush Corridor shall be equipped with spark arresters that function as intended by the manufacturer.
- All machinery with an internal combustion engine will be equipped with a fire extinguisher;
- All vehicles equipped with catalytic converters will not park or be operated in vegetated areas unless on a designated roadway.
- Mufflers and catalytic converters on all vehicles will be maintained in good working order.
- When it is necessary for overland travel in native fuel areas, the travel route or place of operation shall be wetted down with a water truck, and a fire watch will monitor the area during and for up to one hour following the overland travel.
- No hot work is to be performed within or immediately adjacent natural vegetated areas unless specifically approved by the SSO and all precautions have been taken, including a fire watch, fire extinguisher, water truck, shovels, etc. are in place.
- Equipment parking areas and small stationary engine sites (e.g., generators) shall be cleared of all extraneous flammable materials including a setback from vegetated areas of at least 30 feet.
- Restrict use of chainsaws, chippers, vegetation masticators, grinders, drill rigs, tractors, torches, and explosives to outside of the official fire season. When the above tools are used, water tanks equipped with hoses, fire rakes, and axes shall easily accessible to personnel.

STORAGE OF FLAMMABLE AND COMBUSTIBLE LIQUIDS AND FUELING

Storage, use, handling, and dispensing of flammable and combustible liquids shall comply with the applicable sections 3404, 3405, and 3406 of California Fire Code (CFC) Chapter 34. The Maximum Allowable Quantities (MAQ) of flammable and combustible materials shall not exceed those in CFC Chapter 34. Flammable and combustible liquids and the fueling of vehicles and equipment shall only be done in the approved fueling areas. Approved, UL-listed containers or tanks, which comply with CFC Chapter 34, will be provided for storage and dispensing. Tanks and containers shall be labeled as required in CFC Chapter 34. Dispensing shall be done in an approved manner per CFC Chapter 34 using approved devices and hoses with approved shut offs, such approvals are Underwriters Laboratories (UL) or Factory Mutual Global (FM Global), or fire agency equivalent. Approved fire

extinguishers with a rating of not less than 4A:80 BC shall be provided within 50 feet of the storage/refueling area. Approved grounding and bonding will be provided for dispensing of flammable liquids. The storage and dispensing area shall have spill control and secondary containment to contain the contents of the largest container. No combustibles shall be stored in the same location as flammable or combustible liquids. All containers shall be labeled as to contents. Safety instructions and No Smoking signs shall be posted. No open flames are allowed. Vehicle or equipment motors shall be shut off prior to fueling. Any fueling of vehicles using CNG or other gases shall comply with the CFC. Gasoline shall not be stored, used, or dispensed, unless required for small equipment.

Mobile fuel or lube oil trucks shall comply with the following:

- Be in good repair and comply with the spark arrestor rules;
- Have appropriate warning signs and decals;
- Use proper bonding and grounding equipment;
- Shut off all internal combustion engines prior to refueling;
- Allow engines to cool down sufficiently as to not ignite spilled fuel;
- Be equipped a 10 pound, 4A:80 BC dry chemical fire extinguisher (or equivalent);
- Have one 46-inch round point shovel;
- Contain a metal can with lid for storage of rags;
- Have a suitable spill kit on truck;
- Be equipped with contractor radio and have cell phone;
- Equipment operators should stay in immediate area but stay off vehicle during refueling;
- Be trained in procedure for reporting emergencies;
    - No dispensing (dispensing includes re-fueling) of flammable and combustible liquids within 25 feet of any open flame or ignition source;
    - No dispensing of flammable and combustible liquids within 15 feet of buildings, property lines, or combustible storage, per CFC 3406.5.4.5;
- No smoking within 25 feet of dispensing of flammable and combustible liquids – no smoking at all on Red Flag Warning days.

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APPENDIX B

Representative Site Photographs

Appendix B

Representative Photographs of Land and Fuel Types within Boulder Brush Boundary

Photograph 1

Photograph 2

Photographs #1 and #2 (facing to the west) show the typical fuel types (semi-desert chaparral) and fuel loading in the northeastern portion of the Boulder Brush Boundary. Both photographs illustrate the gentle to moderately sloped terrain with many rock outcroppings. This fuel type (Sh2) was modeled in BehavePlus Fire Scenarios for the northeastern corner of Boulder Brush Boundary.

Photograph 3

Photograph 4

This denser, chaparral-covered slopes in photographs #3 and #4 is the terrain and fuel type (Sh5) modeled in BehavePlus Fire Scenarios.

Photograph 5

Photograph 6

Panoramic views of the vegetation and terrain within the Boulder Brush Boundary. Photograph #5 is looking south towards the central portion of the property. A view, looking west, of the northern portion of the property is presented in photograph #6. Note rocky and gentle to moderately sloped terrain throughout the central to south half of the Boulder Brush Boundary.

APPENDIX C

BehavePlus Fire Behavior Analysis

APPENDIX C
Boulder Brush Facilities
BehavePlus Fire Behavior Analysis

BEHAVEPLUS FIRE BEHAVIOR MODELING

Fire behavior modeling has been used by researchers for approximately 50+ years to predict how a fire will move through a given landscape (Linn 2003). The models have had varied complexities and applications throughout the years. One model has become the most widely used as the industry standard for predicting fire behavior on a given landscape. That model, known as "BEHAVE," was developed by the U.S. Government (USDA Forest Service, Rocky Mountain Research Station) and has been in use since 1984. Since that time, it has undergone continued research, improvements, and refinement. The current version of BehavePlus software, includes the latest updates incorporating years of research and testing. Numerous studies have been completed testing the validity of the fire behavior models' ability to predict fire behavior given site specific inputs. One of the most successful ways the model has been improved has been through post-wildfire modeling (Alexander 1998; Andrews 1980; Brown 1972, 1982; Bushey 1985; Grabner 1996; Grabner et al. 1994, 2001; Lawson 1972; Marsden-Smedley and Catchpole 1995; McAlpine and Xanthopoulos 1989; Rothermel and Rinehart 1983; Sneeuwjagt and Frandsen 1977). In this type of study, Behave is used to model fire behavior based on pre-fire conditions in an area that recently burned. Real-world fire behavior, documented during the wildfire, can then be compared to the prediction results of Behave and refinements to the fuel models incorporated, retested, and so on.

Fire behavior modeling includes a high level of analysis and information detail to arrive at reasonably accurate representations of how wildfire would move through available fuels on a given site. Fire behavior calculations are based on site-specific fuel characteristics supported by fire science research that analyzes heat transfer related to specific fire behavior. To objectively predict flame lengths, spread rates, and fireline intensities, the BehavePlus 5.0.5 fire behavior modeling system was applied using predominant fuel characteristics, slope percentages, and two representative fuel models observed on site.

Predicting wildland fire behavior is not an exact science. As such, the movement of a fire will likely never be fully predictable, especially considering the variations in weather and the limits of weather forecasting. Nevertheless, practiced and experienced judgment, coupled with a validated fire behavior modeling system, results in useful and accurate fire prevention planning information.

To be used effectively, the basic assumptions and limitations of BehavePlus must be understood.

- First, it must be realized that the fire model describes fire behavior only in the flaming front. The primary driving force in the predictive calculations is dead fuels less than one-quarter inch in diameter. These are the fine fuels that carry fire. Fuels greater than one inch have little effect while fuels greater than three inches have no effect on fire behavior.

- Second, the model bases calculations and descriptions on a wildfire spreading through surface fuels that are within six feet of the ground and contiguous to the ground. Surface fuels are often classified as grass, brush, litter, or slash.
- Third, the software assumes that weather and topography are uniform. However, because wildfires almost always burn under non-uniform conditions, length of projection period and choice of fuel model must be carefully considered to obtain useful predictions.
- Fourth, the BehavePlus fire behavior computer modeling system was not intended for determining sufficient fuel modification zone widths. However, it does provide the average length of the flames, which is a key element for determining "defensible space" distances for minimizing structure ignition.

Although BehavePlus has some limitations, it can still provide valuable fire behavior predictions which can be used as a tool in the decision-making process. In order to make reliable estimates of fire behavior, one must understand the relationship of fuels to the fire environment and be able to recognize the variations in these fuels. Natural fuels are made up of the various components of vegetation, both live and dead, that occur on a site. The type and quantity will depend upon the soil, climate, geographic features, and the fire history of the site. The major fuel groups of grass, shrub, trees, and slash are defined by their constituent types and quantities of litter and duff layers, dead woody material, grasses and forbs, shrubs, regeneration, and trees. Fire behavior can be predicted largely by analyzing the characteristics of these fuels. Fire behavior is affected by seven principal fuel characteristics: fuel loading, size and shape, compactness, horizontal continuity, vertical arrangement, moisture content, and chemical properties.

The seven fuel characteristics help define the 13 standard fire behavior fuel models (Anderson 1982) and the five custom fuel models developed for Southern California (Weise 1997). According to the model classifications, fuel models used in BehavePlus have been classified into four groups, based upon fuel loading (tons/acre), fuel height, and surface to volume ratio. Observation of the fuels in the field (on site) determines which fuel models should be applied in BehavePlus. The following describes the distribution of fuel models among general vegetation types for the standard 13 fuel models and the custom Southern California fuel models:

- Grasses Fuel Models 1 through 3
- Brush Fuel Models 4 through 7, SCAL 14 through 18
- Timber Fuel Models 8 through 10
- Logging Slash Fuel Models 11 through 13

In addition, the aforementioned fuel characteristics were utilized in the recent development of 40 new fire behavior fuel models (Scott and Burgan 2005) developed for use in BehavePlus modeling efforts. These new models attempt to improve the accuracy of the standard 13 fuel models outside of severe fire season conditions, and to allow for the simulation of fuel treatment prescriptions. The following describes the distribution of fuel models among general vegetation types for the new 40 fuel models:

- Non-Burnable Models NB1, NB2, NB3, NB8, NB9
- Grass Models GR1 through GR9
- Grass-shrub Models GS1 through GS4
- Shrub Models SH1 through SH9
- Timber-understory Models TU1 through TU5
- Timber litter Models TL1 through TL9
- Slash blowdown Models SB1 through SB4

BehavePlus software was used in the development of the Boulder Brush Facilities Fire Protection Plan (FPP) in order to evaluate potential fire behavior for fuel types within the Boulder Brush Boundary. Existing site conditions were evaluated, and local weather data was incorporated into the BehavePlus modeling runs.

BEHAVEPLUS FUEL MODEL INPUTS

Dudek utilized BehavePlus version 5.0.5 software to evaluate fire behavior potential for the facilites site. Five fire scenarios were evaluated, including two summer, onshore weather conditions and two more extreme fall, offshore weather conditions. BehavePlus software requires site-specific variables for surface fire spread analysis, including fuel type, fuel moisture, wind speed, and slope data. The output variables used in this analysis include flame length (feet), rate of spread (feet/minute), fireline intensity (BTU/feet/second), and spotting distance (miles). The following provides a description of the input variables used in processing the BehavePlus models. In addition, data sources are cited and any assumptions made during the modeling process are described.

Vegetation/Fuel Models

To support the fire behavior modeling efforts conducted for this FPP, Dudek Fire Protection Planners analyzed fourteen vegetation types observed on and adjacent to the site. Vegetation types were derived from vegetation mapping surveys and data (SANGIS 2014, Dudek 2018) for the land within the Boulder Brush Boundary. Based on vegetation mapping data, the fourteen vegetation types were classified into six aforementioned numeric fuel models. It is these fuels that

would have the potential to affect the structures from a radiant and convective heat perspective as well as from direct flame impingement. Therefore, the fuel model assignments summarized in Table 1 were used in the fire behavior modeling effort presented herein.

Table 1
Fuel Model Assignments and Characteristics

Fuel Model	Vegetation Description	Location	Fuel Bed Depth (Feet)
Gr1	Freshwater Marsh; Freshwater Seep; Wet Montane Meadow	Valley areas	<1/2 feet
Gr4	Valley and Foothill Grassland; Wildflower Field	Valley areas	2.0 feet
Gs2	Open Coast Live Oak Woodland	Southwestern portion of property	1.5 feet
Sh2	Flat-topped Buckwheat; Semi-Desert Chaparral; Southern Riparian Scrub; Southern Arroyo Willow Riparian Forest	Throughout the property	<3.0 feet
Sh5	Chamise Chaparral; Granitic Chamise Chaparral; Granitic Northern Mixed Chaparral; Montane Buckwheat Scrub; Red Shank Chaparral; Sagebrush Scrub; Upper Sonoran Subshrub Scrub	Throughout the Property	6.0 ft

Topography

Slope is a measure of angle in degrees from horizontal and can be presented in units of degrees or percent. Slope is important in fire behavior analysis as it affects the exposure of fuel beds. Additionally, fire burning uphill spreads faster than those burning on flat terrain or downhill as uphill vegetation is pre-heated and dried in advance of the flaming front, resulting in faster ignition rates. Slope values ranging from 2% to 15% were measured for this site from U.S. Geological Survey (USGS) topographic maps.

Weather

The County of San Diego, Department of Planning and Land Use (County of San Diego 2010) developed guidelines to identify acceptable fire behavior modeling weather inputs for fire conditions during summer months and Santa Ana fire weather patterns. The County analyzed and processed fire weather from Remote Automated Weather Stations (RAWS) between April 15 to December 31 in order to represent the general limits of the fire season. Data provided by the County's analysis included temperature, relative humidity, and sustained wind speed and is categorized by weather zone, including Maritime, Coastal, Transitional, Interior, and Desert.

As identified in the County's guidelines, Dudek utilized the Fine Dead Fuel Moisture (FDFM) tool within BehavePlus (v. 5.0.5) fire behavior modeling software package to determine potential fuel

moisture values to be input into the BehavePlus runs. The temperature, relative humidity, and wind speed data for the Interior (County of San Diego 2010) weather zone were utilized for this FPP based on the Boulder Brush Facilities' location. Reference fuel moistures were calculated in the FDFM tool and were based on site-specific topographic data inputs. Table 2 summarizes the FDFM inputs and the resulting fine dead fuel moisture values.

Table 2
BehavePlus Fine Dead Fuel Moisture Calculations

Variable	Summer Weather	Extreme (Peak) Weather
Dry Bulb Temperature	90–109 deg. F	90–109 deg. F
Relative Humidity	5– 9 %	5– 9 %
Reference Fuel Moisture	1%	1 %
Month	Feb Mar Apr Aug Sept Oct	May June July
Time of Day	12:00– 13:59	12:00–13:59
Elevation Difference	Level (within 1,000 ft.)	Level (within 1,000 ft.)
Slope	0–30%	0–30%
Aspect	West	East/Northeast
Fuel Shading	Exposed (<50% shading)	Exposed (< 50% shading)
Fuel Moisture Correction	1 %	0 %
Fine Dead Fuel Moisture	2 %	1 %

BEHAVEPLUS FIRE BEHAVIOR ANALYSIS

Based on slope and fuel conditions, five different fire scenarios were evaluated within the Bouldr Brush Boundary. Scenarios to the east and southeast were selected based on the strong likelihood of fire approaching from both directions during a Santa Ana wind-driven fire event. Scenarios on the west and southwest were selected to evaluate fire behavior potential during a summer fire occurring during typical on-shore wind flow patterns. The fire behavior modeling input variables are presented in Table 3. The weather variables presented in Table 3 are based on the calculated FDFM (Table 2) and the wind speed values identified in the County of San Diego standards. Locations for each modeling run are presented graphically in Figure 5 of the FPP.

Table 3
Variables Used for Fire Behavior Analysis

Variable	Summer Weather Conditions (Sea Breeze)	Peak Weather Condition (offshore/Santa Ana Conditions)
1h Moisture	2%	1%
10h Moisture	4%	2%
100h Moisture	6%	4%
Live Herbaceous Moisture	50%	30%

Table 3
Variables Used for Fire Behavior Analysis

Variable	Summer Weather Conditions (Sea Breeze)	Peak Weather Condition (offshore/Santa Ana Conditions)
Live Woody Moisture	80%	50%
20-foot Wind Speed (upslope/downslope)	18 mph (maximum sustained winds)	56 mph (maximum sustained winds)
Wind Direction	225°	45°
Wind Adjustment Factor (BehavePlus)	0.6	0.6

FIRE BEHAVIOR MODELING RESULTS

Three fire behavior variables were selected as outputs from the BehavePlus analysis conducted for the Boulder Brush Facilities, and include flame length (feet), rate of spread (mph), and fireline intensity (BTU/feet/second). The aforementioned fire behavior variables are an important component in understanding fire risk and fire agency response capabilities. Flame length, the length of the flame of a spreading surface fire within the flaming front, is measured from midway in the active flaming combustion zone to the average tip of the flames (Andrews, Bevins, and Seli 2004). It is a somewhat subjective and non-scientific measure of fire behavior, but is extremely important to fireline personnel in evaluating fireline intensity and is worth considering as an important fire variable (Rothermel 1983). Fireline intensity is a measure of heat output from the flaming front, and also affects the potential for a surface fire to transition to a crown fire. Fire spread rate represents the speed at which the fire progresses through surface fuels and is another important variable in initial attack and fire suppression efforts. The information in Table 4 presents an interpretation of these fire behavior variables as related to fire suppression efforts for surface fires. The results of fire behavior modeling efforts are presented in Table 5.

Table 4
Fire Suppression Interpretation

Flame Length (ft)	Fireline Intensity (Btu/ft/s)	Interpretations
Under 4 feet	Under 100 BTU/ft/s	Fires can generally be attacked at the head or flanks by persons using hand tools. Hand line should hold the fire.
4 to 8 feet	100–500 BTU/ft/s	Fires are too intense for direct attack on the head by persons using hand tools. Hand line cannot be relied on to hold the fire. Equipment such as dozers, pumpers, and retardant aircraft can be effective.
8 to 11 feet	500–1000 BTU/ft/s	Fires may present serious control problems -- torching out, crowning, and spotting. Control efforts at the fire head will probably be ineffective.
Over 11 feet	Over 1000 BTU/ft/s	Crowning, spotting, and major fire runs are probable. Control efforts at head of fire are ineffective.

Source: BehavePlus 5.0.5 fire behavior modeling program (Andrews, Bevins, and Seli 2004)

Table 5
BehavePlus Fire Behavior Modeling Results

Fuel Models	Flame Length (feet)	Spread Rate (mph)	Fireline Intensity (Btu/ft/s)	Spot Fire[1] (miles)
Scenario 1: Chaparral-scrub;10% average slope, 56 mph maximum winds				
Granitic Northern Mixed Chaparral (Sh5)	63.6	14.3	47,230	3.4
Upper Sonoran Subshrub Scrub (Sh5)	63.6	14.3	47,230	3.4
Semi-desert Chaparral (Sh2)	23.8	2.3	5,600	1.8
Scenario 2: Chaparal-scrub;10% average slope, 56 mph maximum winds				
Granitic Northern Mixed Chaparral (Sh5)	63.5	14.3	47,120	3.4
Red Shank Chaparral (Sh5)	63.5	14.3	47,120	3.4
Semi-desert Chaparral (Sh2)	23.8	2.3	5,588	1.7
Scenario 3: Chaparral-scrub-riparian scrub-open oak woodland-marsh;10% average slope, 56 mph maximum winds				
Granitic Northern Mixed Chaparral (Sh5)	63.6	14.3	47,249	3.4
Red Shank Chaparral (Sh5)	63.6	14.3	47,249	3.4
Semi-desert Chaparral (Sh2)	23.8	2.3	5,602	1.7
Flat-topped Buckwheat (Sh2)	23.8	2.3	5,602	1.7
Coast Live Oak Woodland (Gs2)	30.2	9.6	9,392	2.0
Freshwater Marsh (Gr1)	4.0	0.7	115	0.4
Southern Riparian Scrub (Sh2)	23.8	2.3	5,602	1.7
Scenario 4: Chaparral-scrub-grassland- oak woodland;10% average slope, Summer weather (18 mph)				
Granitic Northern Mixed Chaparral (Sh5)	25.9	2.4	6,717	0.8
Red Shank Chaparral (Sh5)	25.9	2.4	6,717	0.8
Flat-topped Buckwheat (Sh2)	9.1	0.3	693	0.4
Coast Live Oak Woodland (Gs2)	10.5	1.2	948	0.4
Freshwater Seep (Gr1)	2.9	0.4	59	0.2
Valley and Foothill Grassland (Gr4)	19.8	4.3	3,737	0.7
Scenario 5: Chaparral-scrub-grassland- oak woodland;10% average slope, Summer weather (18 mph)				
Granitic Northern Mixed Chaparral (Sh5)	26.0	2.4	6,777	0.8
Semi-desert Chaparral (Sh2)	9.2	0.3	700	0.4
Sagebrush Scrub (Sh5)	26.0	2.4	6,777	0.8
Coast Live Oak Woodland (Gs2)	10.6	1.2	956	0.4
Freshwater Seep (Gr1)	2.9	0.4	59	0.2
Valley and Foothill Grassland (Gr4)	19.9	4.4	3,769	0.7

[1] Spotting distance from wind-driven surface fire.

SUMMARY

Based on the fire behavior modeling results presented herein, the maximum flame lengths anticipated in untreated, chaparral fuels could reach 63.6 feet in height with rapid rates of spread (14.3 mph) under extreme weather conditions, represented by Santa Ana winds blowing at

maximum winds of 56 mph. Embers could be generated from a surface fire resulting in ignition of receptive fuel beds 3.4 miles downwind.

Fires burning in from the southwest or west and pushed by ocean breezes exhibit less severe fire behavior. Under typical summer weather conditions, a chaparral fire could have flame lengths ranging from 9 to 26 feet in height and spread rates up to 2.4 mph. The maximum flame lengths anticipated in oak woodlands/forests or grasslands could reach up to 10.6 to 19.9 feet, respectively. Spotting distances, where airborne embers can ignite new fires downwind of the initial fire, range from 0.2 to 0.8 mile.

It should be noted that the results presented in Table 5 depict values based on inputs to the BehavePlus software. The fuels models used in this analysis are dynamic models that were designed by the U.S. Forest Service to more accurately represent southern California fuel beds. Changes in slope, weather, or pockets of different fuel types are not accounted for in this analysis. Model results should be used as a basis for planning only, as actual fire behavior for a given location will be affected by many factors, including unique weather patterns, small-scale topographic variations, or changing vegetation patterns.

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APPENDIX D

Project Facility Availability Form – Fire

County of San Diego, Planning & Development Services
PROJECT FACILITY AVAILABILITY - FIRE
ZONING DIVISION

F

Please type or use pen

GM Gabrych Family Partnership LP, et al — 760-521-6913
Owner's Name — Phone

2006 Old Highway 395
Owner's Mailing Address — Street

Fallbrook, CA 92028
City — State — Zip

ORG _____
ACCT _____
ACT _____
TASK _____
DATE _____ AMT $ _____
DISTRICT CASHIER'S USE ONLY

SECTION 1. PROJECT DESCRIPTION — TO BE COMPLETED BY APPLICANT

A.
- ☐ Major Subdivision (TM)
- ☐ Minor Subdivision (TPM)
- ☐ Boundary Adjustment
- ☐ Rezone (Reclassification) from _____ to _____ zone.
- ☒ Major Use Permit (MUP), purpose: PDS2019-MUP-19-002
- ☐ Time Extension...Case No. _____
- ☐ Expired Map...Case No. _____
- ☐ Other _____
- ☐ Specific Plan or Specific Plan Amendment
- ☐ Certificate of Compliance: _____

B.
- ☐ Residential . . . . . Total number of dwelling units _____
- ☐ Commercial . . . . . Gross floor area _____
- ☐ Industrial . . . . . Gross floor area _____
- ☒ Other . . . . . Gross floor area N/A

C. Total Project acreage 2000 Total lots N/A Smallest proposed lot N/A

Assessor's Parcel Number(s)
(Add extra if necessary)

528-220-02; 528-220-03	529-050-01; 529-060-01
529-090-02; 529-090-03	529-100-02; 529-100-03
529-100-01; 529-120-01	529-120-03; 611-050-05
529-130-01; 611-010-01; 611-010-03	611-050-04; 611-010-02; 611-020-01

Thomas Guide. Page _____ Grid _____

Ribbonwood Road
Project address — Street

Boulevard Planning Area 91905
Community Planning Area/Subregion — Zip

OWNER/APPLICANT AGREES TO COMPLETE ALL CONDITIONS REQUIRED BY THE DISTRICT.

Applicant's Signature: _____ Date: 10/4/19

Address: 11455 El Camino Real, Suite 160, San Diego, CA 92130 Phone: 858-764-3737

(On completion of above, present to the district that provides fire protection to complete Section 2 and 3 below.)

SECTION 2: FACILITY AVAILABILITY — TO BE COMPLETED BY DISTRICT

District Name: SDCFA STA#47 40080 Ribbonwood, Blvd, CA 91905

Indicate the location and distance of the primary fire station that will serve the proposed project:

A.
- ☒ Project is in the District and eligible for service.
- ☐ Project is not in the District but is within its Sphere of Influence boundary, owner must apply for annexation.
- ☐ Project is not in the District and not within its Sphere of Influence boundary.
- ☐ Project is not located entirely within the District and a potential boundary issue exists with the _____ District.

B. ☒ Based on the capacity and capability of the District's existing and planned facilities, fire protection facilities are currently adequate or will be adequate to serve the proposed project. The expected emergency travel time to the proposed project is 12 minutes.
- ☐ Fire protection facilities are not expected to be adequate to serve the proposed development within the next five years.

C.
- ☐ District conditions are attached. Number of sheets attached: _____
- ☒ District will submit conditions at a later date.

SECTION 3. FUELBREAK REQUIREMENTS

Note: The fuelbreak requirements prescribed by the fire district for the proposed project do not authorize any clearing prior to project approval by Planning & Development Services.

- ☒ Within the proposed project 100 feet of clearing will be required around all structures.
- ☒ The proposed project is located in a hazardous wildland fire area, and additional fuelbreak requirements may apply. Environmental mitigation requirements should be coordinated with the fire district to ensure that these requirements will not pose fire hazards.

This Project Facility Availability Form is valid until final discretionary action is taken pursuant to the application for the proposed project or until it is withdrawn, unless a shorter expiration date is otherwise noted.

Authorized Signature — HERMAN REDDICK, DIRECTOR *Print Name and Title* — 858-974-5813 *Phone* — 11/5/19 *Date*

On completion of Section 2 and 3 by the District, applicant is to submit this form with application to:
Planning & Development Services – Zoning Counter, 5510 Overland Ave. Suite 110, San Diego, CA 92123

APPENDICES E-1 AND E-2

Project Facility Availability Forms - Water
(Jacumba CSD and Padre Dam WMD)

County of San Diego, Planning & Development Services
PROJECT FACILITY AVAILABILITY - WATER
ZONING DIVISION

Please type or use pen

GM Gabrych Family Partnership LP, et al 760-521-6913
Owner's Name Phone

2006 Old Highway 395
Owner's Mailing Address Street

Fallbrook, CA 92028
City State Zip

ORG_____ **W**
ACCT_____
ACT_____
TASK_____
DATE_____ AMT $_____
DISTRICT CASHIER'S USE ONLY

SECTION 1. PROJECT DESCRIPTION — TO BE COMPLETED BY APPLICANT

A.
- ☐ Major Subdivision (TM)
- ☐ Minor Subdivision (TPM)
- ☐ Boundary Adjustment
- ☐ Rezone (Reclassification) from_____ to_____ zone.
- ☒ Major Use Permit (MUP), purpose: Campo Wind Project PDS2019-MUP-19-002
- ☐ Time Extension...Case No._____
- ☐ Expired Map...Case No._____
- ☐ Other_____
- ☐ Specific Plan or Specific Plan Amendment
- ☐ Certificate of Compliance:_____

B.
- ☐ Residential . . . . . Total number of dwelling units_____
- ☐ Commercial. . . . . Gross floor area_____
- ☐ Industrial . . . . . Gross floor area_____
- ☒ Other . . . . . Gross floor area N/A - Wind Energy Facility

C. ☒ Total Project acreage 4,200 Total number of lots N/A

D. Is the project proposing the use of groundwater? ☒ Yes ☐ No
Is the project proposing the use of reclaimed water? ☒ Yes ☐ No

Assessor's Parcel Number(s)
(Add extra if necessary)

528-220-02; 528-220-03	529-050-01; 529-060-01
529-090-02; 529-090-03	529-100-02; 529-100-03; 529-100-01
529-120-01; 529-120-03; 611-050-05	529-130-01; 611-010-01; 611-050-04
611-010-02; 611-010-03; 611-020-01	and Tribal Lands (land within Campo Reservation)

Thomas Guide Page _____ Grid _____

Ribbonwood Road
Project address Street

Boulevard Planning Area 91905
Community Planning Area/Subregion Zip

Owner/Applicant agrees to pay all necessary construction costs, dedicate all district required easements to extend service to the project and COMPLETE ALL CONDITIONS REQUIRED BY THE DISTRICT.

Applicant's Signature: [signature] Date: 9/20/19

Address: 11455 El Camino Real, Suite 160, San Deigo, CA 92130 Phone: 858-764-3737

(On completion of above, present to the district that provides water protection to complete Section 2 below.)

SECTION 2: FACILITY AVAILABILITY — TO BE COMPLETED BY DISTRICT

District Name: JaCumba Community Service District Service area JaCumba Hot Springs

A.
- ☐ Project is in the district.
- ☐ Project is not in the district but is within its Sphere of Influence boundary, owner must apply for annexation.
- ☑ Project is not in the district and is not within its Sphere of Influence boundary.
- ☐ The project is not located entirely within the district and a potential boundary issue exists with the _____ District.

B. ☐ Facilities to serve the project ☐ ARE ☐ ARE NOT reasonably expected to be available within the next 5 years based on the capital facility plans of the district. Explain in space below or on attached_____. (Number of sheets)

☐ Project will not be served for the following reason(s):_____

C.
- ☐ **District conditions are attached. Number of sheets attached:**_____
- ☐ **District has specific water reclamation conditions which are attached. Number of sheets attached:**_____
- ☐ **District will submit conditions at a later date.**

D. ☐ **How far will the pipeline(s) have to be extended to serve the project?**_____

This Project Facility Availability Form is valid until final discretionary action is taken pursuant to the application for the proposed project or until it is withdrawn, unless a shorter expiration date is otherwise noted.

Authorized Signature: [signature] Print Name Emilio Gonzalez

Print Title Field Operations Manager Phone 619-766-4359 Date 10/16/19

NOTE: THIS DOCUMENT IS NOT A COMMITMENT OF SERVICE OR FACILITIES BY THE DISTRICT
On completion of Section 2 and 3 by the District, applicant is to submit this form with application to:
Planning & Development Services – Zoning Counter, 5510 Overland Ave, Suite 110, San Diego, CA 92123

County of San Diego, Planning & Development Services
PROJECT FACILITY AVAILABILITY - WATER
ZONING DIVISION

Please type or use pen

GM Gabrych Family Partnership LP, et al 760-521-6913
Owner's Name Phone

2006 Old Highway 395
Owner's Mailing Address Street

Fallbrook, CA 92028
City State Zip

ORG_____
ACCT_____
ACT_____
TASK_____
DATE_____

W

AMT $_____

DISTRICT CASHIER'S USE ONLY

SECTION 1. PROJECT DESCRIPTION — TO BE COMPLETED BY APPLICANT

A.
- ☐ Major Subdivision (TM)
- ☐ Minor Subdivision (TPM)
- ☐ Boundary Adjustment
- ☐ Rezone (Reclassification) from_____ to _____ zone.
- ☒ Major Use Permit (MUP), purpose: Campo Wind Project PDS2019-MUP-19-002
- ☐ Time Extension...Case No._____
- ☐ Expired Map...Case No._____
- ☐ Other_____
- ☐ Specific Plan or Specific Plan Amendment
- ☐ Certificate of Compliance:_____

B.
- ☐ Residential . . . . . Total number of dwelling units_____
- ☐ Commercial. . . . . Gross floor area_____
- ☐ Industrial . . . . . Gross floor area_____
- ☒ Other . . . . . Gross floor area N/A - Wind Energy Facility

C. ☒ Total Project acreage 4,200 Total number of lots N/A

D. Is the project proposing the use of groundwater? ☒ Yes ☐ No
Is the project proposing the use of reclaimed water? ☒ Yes ☐ No

Assessor's Parcel Number(s)
(Add extra if necessary)

528-220-02; 528-220-03	529-050-01; 529-060-01
529-090-02; 529-090-03	529-100-02; 529-100-03; 529-100-01
529-120-01; 529-120-03; 611-050-05	529-130-01; 611-010-01; 611-050-04
611-010-02; 611-010-03; 611-020-01	and Tribal Lands (land within Campo Reservation)

Thomas Guide Page _____ Grid _____

Ribbonwood Road
Project address Street

Boulevard Planning Area 91905
Community Planning Area/Subregion Zip

Owner/Applicant agrees to pay all necessary construction costs, dedicate all district required easements to extend service to the project and COMPLETE ALL CONDITIONS REQUIRED BY THE DISTRICT

Applicant's Signature:_____ Date: 9/20/19

Address: 11455 El Camino Real, Suite 160, San Deigo, CA 92130 Phone: 858-764-3737

(On completion of above, present to the district that provides water protection to complete Section 2 below.)

SECTION 2: FACILITY AVAILABILITY — TO BE COMPLETED BY DISTRICT

District Name: PADRE DAM MWD *EXPIRES 11/12/2020 Service area OUT OF DISTRICT

A.
- ☐ Project is in the district.
- ☐ Project is not in the district but is within its Sphere of Influence boundary, owner must apply for annexation.
- ☒ Project is not in the district and is not within its Sphere of Influence boundary.
- ☐ The project is not located entirely within the district and a potential boundary issue exists with the _____ District.

B. ☒ Facilities to serve the project ☒ ARE ☐ ARE NOT reasonably expected to be available within the next 5 years based on the capital facility plans of the district. Explain in space below or on attached_____. (Number of sheets)

☐ Project will not be served for the following reason(s):_____

C. ☒ **District conditions are attached. Number of sheets attached:** 1
☐ **District has specific water reclamation conditions which are attached. Number of sheets attached:**_____
☐ **District will submit conditions at a later date.**

D. ☐ **How far will the pipeline(s) have to be extended to serve the project?**_____

This Project Facility Availability Form is valid until final discretionary action is taken pursuant to the application for the proposed project or until it is withdrawn, unless a shorter expiration date is otherwise noted.

Authorized Signature:_____ Print Name THOMAS MARTIN

Print Title ENG. TECH / PROJECT MGR Phone 619-258-4638 Date 11/12/2019

NOTE: THIS DOCUMENT IS NOT A COMMITMENT OF SERVICE OR FACILITIES BY THE DISTRICT
On completion of Section 2 and 3 by the District, applicant is to submit this form with application to:
Planning & Development Services – Zoning Counter, 5510 Overland Ave, Suite 110, San Diego, CA 92123

PADRE DAM
Municipal Water District

9300 Fanita Parkway, Santee
619-258-4635

WATER AVAILABILITY ATTACHMENT
CONDITIONS OF APPROVAL

PROJECT NAME GM Gabrych Boulder Planning FOR Construction Recycled Water Use - Out of District

A.P.N. (s)

The main project site consists of the following Assessor Parcel Numbers (APNs):

· 528-220-02-00	611-020-01-00
· 528-220-03-00	529-050-01-00
· 529-090-02-00	529-060-01-00
· 529-090-03-00	529-100-02-00
· 529-120-01-00	529-100-01-00
· 529-120-03-00	529-130-01-00
· 611-050-05-00	611-010-01-00
· 611-010-02-00	611-050-04-00
· 611-010-03-00	Campo Reservation

FACILITIES

The proposed project is outside of Padre Dam's sphere of influence and service area. However Padre Dam would be able to serve Recycled water for construction.

SPECIAL CONDITIONS

[X] Abide by the rules governing the use of recycled water established by the California Department of Health Services in the Code of Regulations, Title 22 and 17.

[X] An authorized representative must attend Recycled Water Supervisor Training and meet with Padre Dam Recycled Water Technician prior to start of work.

[X] Obtain approval from the City of Santee for trucks carrying recycled water within the City.

[X] Recycled water use for construction purposes only, including grading and dust suppression. Recycled water cannot be used on the solar panels for cleaning.

[X] Construction equipment must meet PDMWD requirements for carrying recycled water as noted in Water Agency Standards.

[X] Drop tanks, water trucks, hoses, etc. should be disinfected with a chlorine solution before use with other than recycled water. Modified street sweepers designed for duel source filling of water and recycled water are exempt.

[X] Do not connect the recycled water system with any potable water system.

[X] When using recycled water for construction sites the following safety precautions shall be observed:
- Do not drink recycled water.
- Wash your hands before eating or drinking.
- Do not spray anyone with recycled water.
- Do not wash or rinse down equipment using recycled water.

[X] Developer would be restricted to a maximum of 100,000 Gallons per day

Note:
Approval for recycled water use for construction purposes is based on recycled water availability during the winter months of November through March. Requests for out of District recycled water during the remainder of the year will be considered by Padre Dam MWD based on seasonal circumstances and approved on a case by case basis when surplus recycled water is available.

APPENDIX F

Prohibited Plant List

APPENDIX F
Prohibited Plant List

Botanical Name	Common Name
Trees	
Abies species	fir
Acacia species (numerous)	acacia
Agonis juniperina	juniper myrtle
Araucaria species *(A. heterophylla, A. araucana, A. bidwillii)*	Araucaria (Norfolk Island pine, monkey puzzle tree, Bunya Bunya)
Callistemon species *(C. citrinus, C. rosea, C. viminalis)*	bottlebrush (lemon, rose, weeping)
Calocedrus decurrens	incense cedar
Casuarina cunninghamiana	river she-oak
Cedrus species *(C. atlantica, C. deodara)*	cedar (Atlas, Deodar)
Chamaecyparis species (numerous)	false cypress
Cinnamomum camphora	camphor
Cryptomeria japonica	Japanese cryptomeria
Cupressocyparis leylandii	Leyland cypress
Cupressus species *(C. forbesii, C. glabra, C. sempervirens,)*	cypress (Tecate, Arizona, Italian, others)
Eucalyptus species (numerous)	eucalyptus
Juniperus species (numerous)	juniper
Larix species *(L. decidua, L. occidentalis, L. kaempferi)*	larch (European, Japanese, western)
Leptospermum species *(L. laevigatum, L. petersonii)*	tea tree (Australian, tea)
Lithocarpus densiflorus	tan oak
Melaleuca species *(M. linariifolia, M. nesophila, M. quinquenervia)*	melaleuca (flaxleaf, pink, Cajeput tree)
Olea europaea	olive
Picea (numerous)	spruce
Palm species (numerous)	palm
Pinus species *(P. brutia, P. canariensis, P. eldarica, P. halepensis, P. pinea, P. radiata, numerous others)*	pine (Calabrian, Canary Island, Mondell, Aleppo, Italian Stone, Monterey)
Platycladus orientalis	oriental arborvitae
Podocarpus species *(P. gracilior, P. macrophyllus, P. latifolius)*	fern pine (fern, yew, podocarpus)
Pseudotsuga menziesii	Douglas fir
Schinus species (S. molle, S. terebinthifolius)	pepper (California and Brazilian)
Tamarix species *(T. Africana, T. aphylla, T. chinensis, T. parviflora)*	tamarix (tamarisk, athel tree, salt cedar, tamarisk)
Taxodium species *(T. ascendens, T. distichum, T. mucronatum)*	cypress (pond, bald, monarch, Montezuma)
Taxus species *(T. baccata, T. brevifolia, T. cuspidata)*	yew (English, western, Japanese)
Thuja species (*T. occidentalis, T. plicata)*	arborvitae/red cedar
Tsuga species *(T. heterophylla, T. mertensiana)*	hemlock (western, mountain)
Groundcovers, Shrubs, and Vines	
Acacia species	acacia
Adenostoma fasciculatum	chamise
Adenostoma sparsifolium	red shanks
Agropyron repens	quackgrass
Anthemis cotula	mayweed
Arbutus menziesii	madrone

Botanical Name	Common Name
Arctostaphylos species	manzanita
Arundo donax	giant reed
Artemisia species *(A. abrotanum, A. absinthium, A. californica, A. caucasica, A. dracunculus, A. tridentata, A. pycnocephala)*	sagebrush (southernwood, wormwood, California, silver, true tarrangon, big, sandhill)
Atriplex species (numerous)	saltbush
Avena fatua	wild oat
Baccharis pilularis	coyote bush[6]
Bambusa species	bamboo
Bougainvillea species	bougainvillea
Brassica species *(B. campestris, B. nigra, B. rapa)*	mustard (field, black, yellow)
Bromus rubens	foxtail, red brome
Cardaria draba	hoary cress
Carpobrotus species	ice plant, Hottentot fig
Castanopsis chrysophylla	giant chinkapin
Cirsium vulgare	wild artichoke
Conyza bonariensis	horseweed
Coprosma pumila	prostrate coprosma
Cortaderia selloana	pampas grass
Cytisus scoparius	Scotch broom
Dodonaea viscosa	hopseed bush
Eriodictyon californicum	yerba santa
Eriogonum species *(E. fasciculatum)*	buckwheat (California)
Fremontodendron species	flannel bush
Hedera species *(H. canariensis, H. helix)*	ivy (Algerian, English)
Heterotheca grandiflora	telegraph plant
Hordeum leporinum	wild barley
Juniperus species	juniper
Lactuca serriola	prickly lettuce
Larix species (numerous)	larch
Larrea tridentata	creosote bush
Lolium multiflorum	ryegrass
Lonicera japonica	Japanese honeysuckle
Mahonia species	mahonia
Mimulus aurantiacus	sticky monkeyflower
Miscanthus species	eulalie grass
Muhlenbergia species	deer grass
Nicotiana species *(N. bigelovii, N. glauca)*	tobacco (Indian, tree)
Pennisetum setaceum	fountain grass
Perovskia atriplicifolia	Russian sage
Phoradendron species	mistletoe
Pickeringia montana	chaparral pea
Rhus species *(R. diversiloba, R. laurina, R. lentii)*	sumac (poison oak, laurel, pink flowering)
Ricinus communis	castor bean

Botanical Name	Common Name
Rosmarinus species	rosemary
Salvia species (numerous)	sage
Salsola australis	Russian thistle
Solanum xantii	purple nightshade (toxic)
Silybum marianum	milk-thistle
Thuja species	arborvitae
Urtica urens	burning nettle
Vinca major	periwinkle
Rhus lentii	pink flowering sumac

- For the purpose of using this list as a guide in selecting plant material, it is stipulated that all plant material will burn under various conditions.
- The absence of a particular plant, shrub, groundcover, or tree, from this list does not necessarily mean it is fire resistive.
- All vegetation used in Vegetation Management Zones and elsewhere in this development shall be subject to approval of the San Diego County Fire Marshal.
- Additional plants that are considered undesirable due to their invasiveness nature are detailed on the California Invasive Plant Council's Web site at www.cal-ipc.org/ip/inventory/index.php.
- Landscape architects may submit proposals for use of certain vegetation on a project specific basis. They shall also submit justifications as to the fire resistivity of the proposed vegetation.

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APPENDIX G

Potential Plant List for Fuel Modification Zones

APPENDIX G
Potential Plant List for Fuel Modification Zones

Botanical Name	Common Name
Achillea spp.	yarrow – only species growing under 12 inches height
Baccharis pilularis	dwarf coyote bush – only in areas over 100 feet from gen-tie line structures
Cerastium tomentosum	snow in summer
Dudleya brittonii	Britton's dudleya
Dudleya pulverulenta	chalk lettuce
Eschscholzia californica	California poppy
Helianthemum spp.	sunrose
L*asthenia californica glabrata*	California goldfields
Trifolium fragiferum verbena	strawberry clover
Trifolium fragiferum rigida	white clover
Viguiera laciniata	goldeneye
Satureja douglasii	yerba buena
Sisyrinchium bellum	blue-eyed grass
Sisyrinchium californicum	yellow-eyed grass

- For the purpose of using this list as a guide in selecting plant material, it is stipulated that all plant material will burn under various conditions.
- The absence of a particular plant, shrub, groundcover, or tree, from this list does not necessarily mean it is not fire resistive.
- All vegetation used in Vegetation Management Zones and elsewhere in this Project shall be subject to approval of the San Diego County Fire Marshal.
- Plants that are considered undesirable due to their invasiveness nature should not be utilized in the fuel modification area plantings. The California Invasive Plant Council's Web site at www.cal-ipc.org/ip/inventory/index.php provides a listing of invasive plants.
- Landscape architects may submit proposals for use of certain vegetation not included on this list. They shall also submit justifications as to the fire resistivity of the proposed vegetation.

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APPENDIX H

Boulder Brush Facilities
Technical Report for Fire Personnel

Boulder Brush Facilities
Technical Report for Fire Personnel

Prepared for:

Boulder Brush LLC
11455 El Camino Real, Suite 160
San Diego, California 92130

For submittal to:

County of San Diego
Planning and Development Services
5510 Overland Avenue, Suite 310
San Diego, California 92123

Prepared by:

DUDEK
605 Third Street
Encinitas, California 92024

DECEMBER 2019

Printed on 30% post-consumer recycled material.

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FIGURES

TABLES

1 INTRODUCTION

The safety of fire fighters and other emergency first responder personnel depends on understanding and properly handling potential hazards associated with energized facilities through adequate training and preparation. This technical report for the Campo Wind Project with Boulder Brush Facilities (Project) provides basic facility information for responding firefighters. It is important that firefighters who may respond to this or any energy facility understand the potential risks associated with their electricity producing components and what strategies, tools and equipment, and precautions are required for safely responding to emergencies. This technical report summarizes facilities features and readers should refer to the Boulder Brush Facilities Major Use Permit application for a complete facilities description.

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2 BACKGROUND

2.1 Boulder Brush Facilities Location

The Boulder Brush Facilities would be located within a corridor of approximately 320 acres of land (Boulder Brush Corridor) within the approximately 2,000 acres of Private Lease land inside the Boulder Brush Boundary (Figure 1). The Boulder Brush Facilities would be located approximately 5 miles north/northeast of the Community of Boulevard and 2.5 miles north of Interstate (I) 8. Figure 2 illustrates the location of the Boulder Brush Facilities. Primary access to the Boulder Brush Facilities would be provided from I-8 with local access provided via Ribbonwood Road. The land within the Boulder Brush Boundary lies within Section 36 of Township 16 South, Range 6 East, Sections 5, 6, and 7 of Township 17 South, Range 7 East, as well as in Sections 19, 20, 29, 30, 31, and 32 of Township 16 South, Range 7 East on the U.S. Geographical Survey, 7.5-minute, Live Oak Springs and Sombrero Peak, California, quadrangle maps.

2.2 Boulder Brush Facilities Description

The Boulder Brush Facilities to be approved under a Major Use Permit (MUP) would consist of the following components:

- Off-Reservation gen-tie line (approximately 3.5 miles)
- High-voltage substation
- 500-kilovolt (kV) switchyard and connection to the existing SDG&E Sunrise Powerlink
- Access roads
- Three 10,000-gallon water tanks
- Defensible space (fuel modification zones)

Maps of the Boulder Brush Facilities are included in Figures 3 and 4. As indicated in Figure 3, primary access to the Boulder Brush Facilities would be provided by Ribbonwood Road from I-8. Please refer to the MUP application for a complete facilities description.

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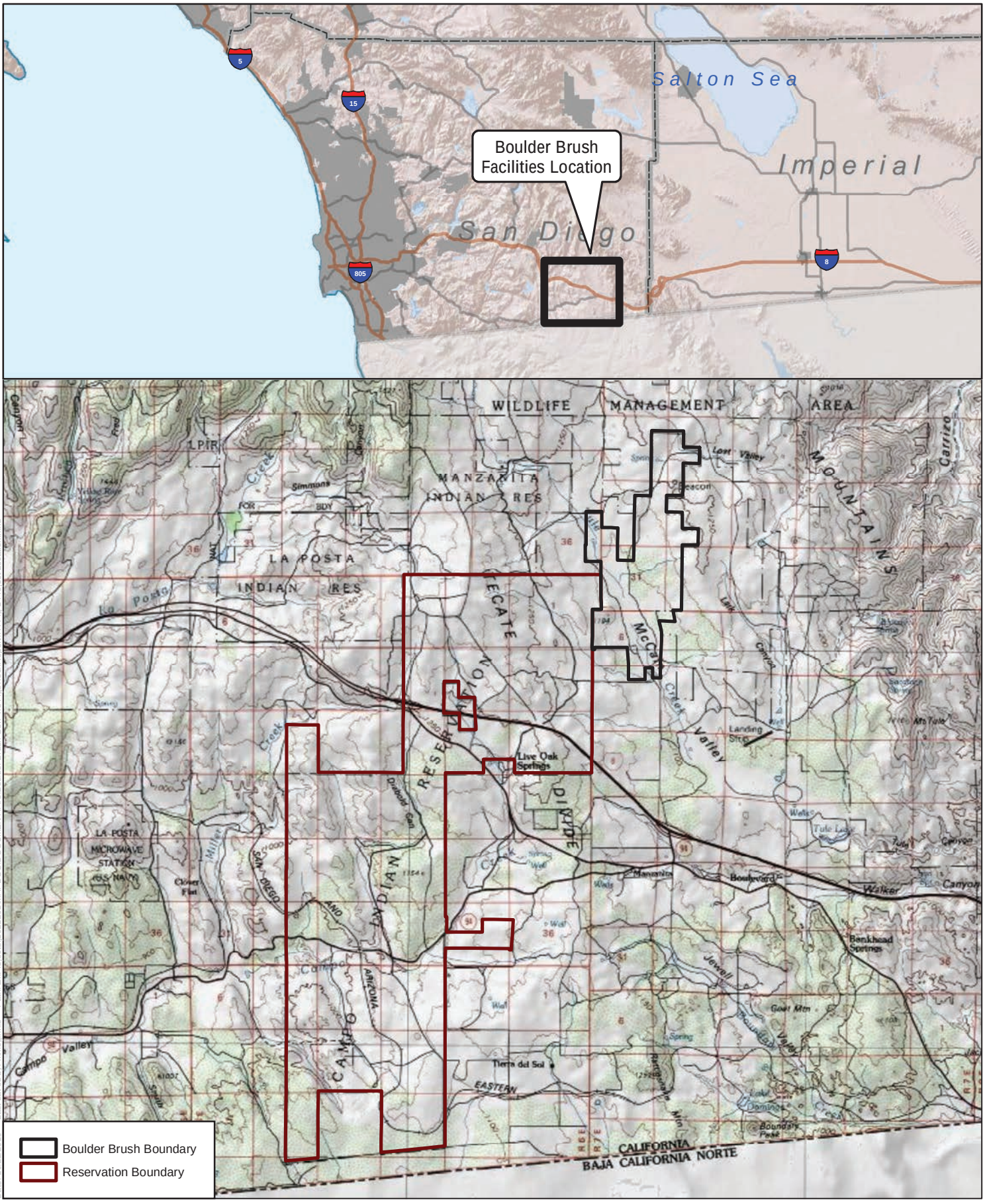

SOURCE: USGS 7.5 Minute Series, Live Oak Springs and Sombrero Peak Quadrangles

DUDEK

0 5,000 10,000 Feet

FIGURE 1

Boulder Brush Boundary

Boulder Brush Facilities Technical Report for Fire Personnel

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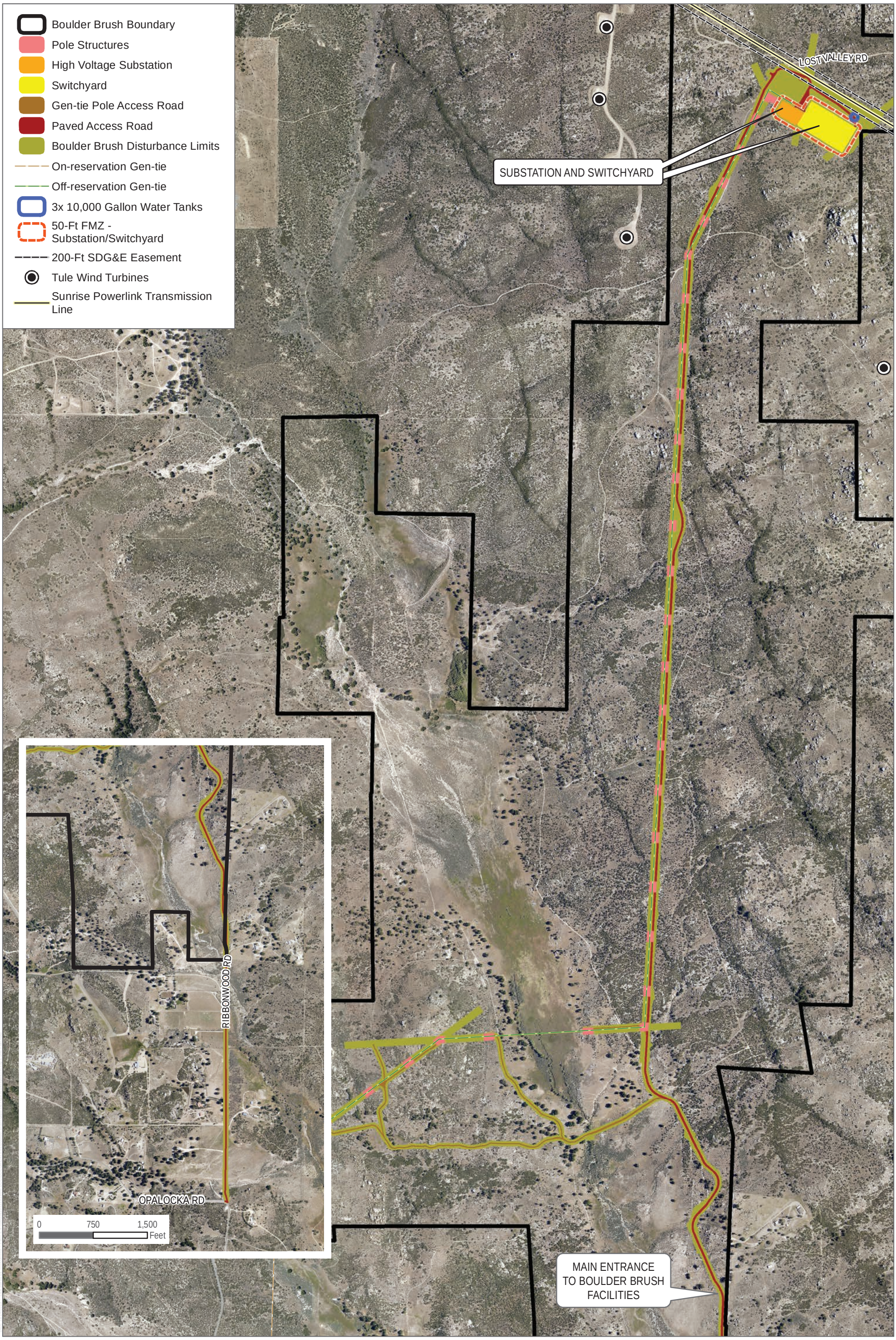

SOURCE: SANGIS 2017

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0 600 1,200 Feet

FIGURE 2

Boulder Brush Facilities Location

Boulder Brush Facilities Technical Report for Fire Personnel

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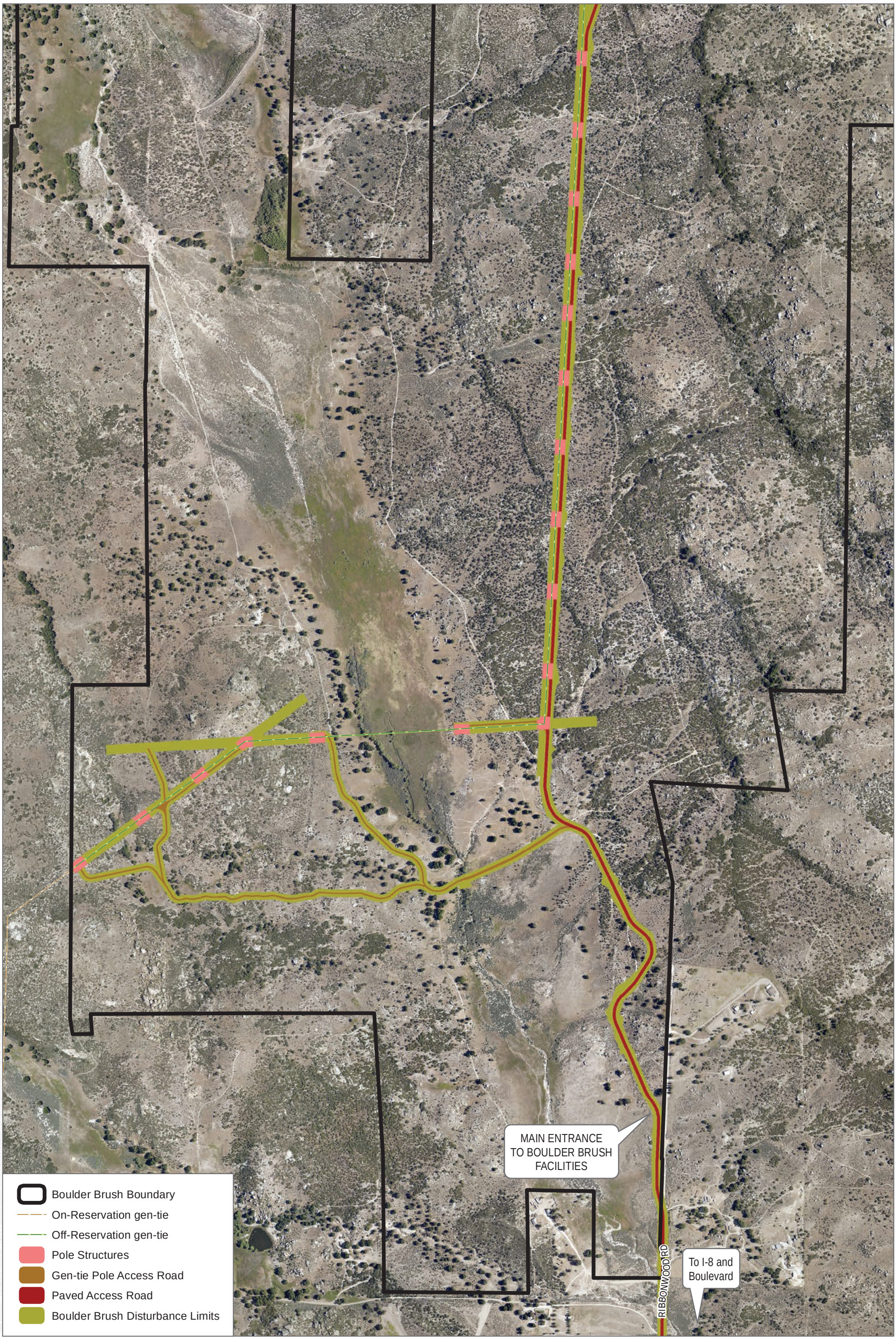

SOURCE: SANGIS 2017

DUDEK

0 500 1,000 Feet

FIGURE 3

Fire Safety Plan - South Half

Boulder Brush Facilities Technical Report for Fire Personnel

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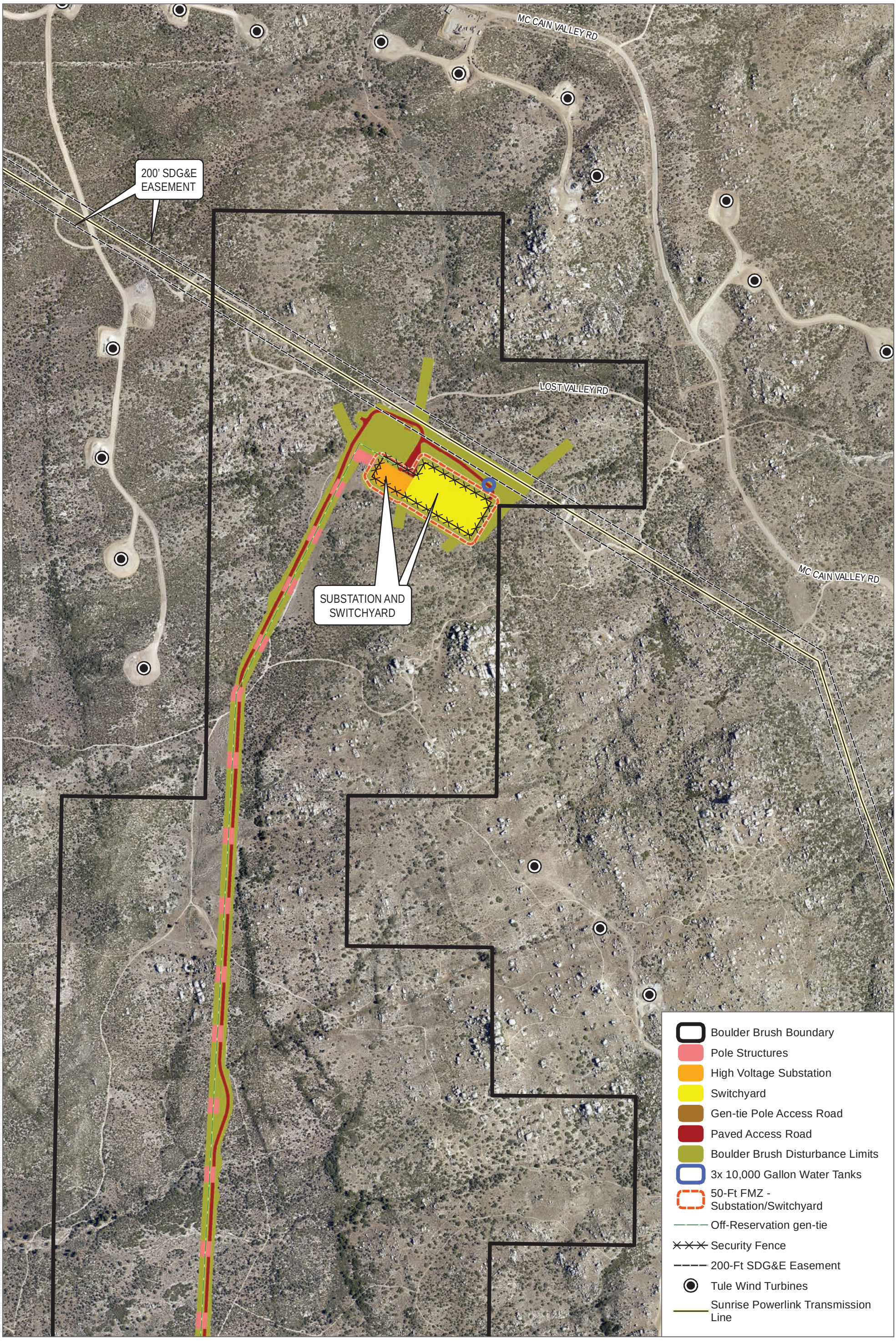

SOURCE: AERIAL-SANGIS 2017

DUDEK

0 400 800 Feet

FIGURE 4

Fire Safety Plan - North Half

Boulder Brush Facilities Technical Report for Fire Personnel

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3 BOULDER BRUSH FACILITIES COMPONENTS

3.1 Off-Reservation Gen-Tie Line

Approximately 3.5 miles of the approximately 8.5-mile-long, overhead 230 kV gen-tie line that would transmit the electricity from the Campo Wind Facilities to the Off-Reservation high-voltage substation and switchyard would be constructed within the Boulder Brush Corridor on private land. This segment of the gen-tie line would require approximately 32 steel pole structures that, in addition to the transmission wires, would accommodate a fiber-optic ground wire attachment for lightning protection and internal communications. The height of the steel pole structures would vary by location, up to a maximum height of 150 feet.

3.2 High-Voltage Substation

A high-voltage substation would be constructed within the Boulder Brush Corridor and located adjacent to the proposed 500-kV switchyard at the northern portion of the Boulder Brush Boundary. This high-voltage substation would receive the electric energy transmitted from the Campo Wind Facilities along the 230 kV gen-tie line and convert it up to the 500 kV voltage via a 230 kV to 500 kV transformer before transmitting it onward to the adjacent switchyard.

The high-voltage substation would require a fenced-in footprint of approximately 220 feet by 320 feet (1.6 acres). An additional approximately 1.0-acre area of disturbance would be required for site grading and clearing around the perimeter of the fenced-in footprint. The total disturbed area associated with the high-voltage substation would be approximately 2.5 acres. The cleared area surrounding the high-voltage substation and the area inside the high-voltage substation fence would be covered with gravel. An 8-foot-tall security fence consisting of 6-foot-tall chain-link fencing topped with an additional 2 feet of security wire would be installed around the perimeter of the high-voltage substation site. The high-voltage substation would include a contiguous fuel modification zone from 50 feet outside the perimeter fence (approximately 100 feed from the electrical components). The high-voltage substation pad area would be free of vegetation around all electrical equipment. The high-voltage substation fence and the gravel area within the fence would be grounded. (refer to the Boulder Brush Fire Protection Plan (July 2019) for fuel modification zone details).

3.3 500 kV Switchyard and Connection to the Existing SDG&E Sunrise Powerlink

A new 500 kV switchyard would be constructed within the Boulder Brush Corridor adjacent to the proposed high-voltage substation (See Section 3.2). Upon completion, this approximately 16-acre parcel and the switchyard would be transferred to SDG&E, who would then own, operate, and

maintain the switchyard. The switchyard would interconnect the Project to the existing Sunrise Powerlink by a ring bus design with three 500 kV breakers, a control house, and a fenced-in graveled area. The connection to the Sunrise Powerlink would be made through incoming and outgoing connection lines, to be constructed by SDG&E, that would effectively route the power through the ring bus. The Project's point of interconnection would be at an open position on that same bus within the switchyard. Upon completion, the switchyard and an approximately 16-acres of land underneath it would be transferred to SDG&E, who would then own, operate, and maintain the switchyard.

The switchyard would require a fenced-in footprint of approximately 400 feet by 750 feet (6.9 acres). An additional approximately 9.5 acres of disturbed area would be required for the access road, incoming/outgoing connection lines, 0.6-acre retention pond, a 50-foot fuel modification zone around the perimeter of the switchyard, and site grading and clearing. Up to 30-feet tall fencing would be installed around the perimeter of the switchyard, in accordance with SDG&E requirements. Therefore, the total disturbance area for the switchyard and in/out lines would be approximately 16 acres.

3.4 Fire Access

Primary access to the Boulder Brush Facilities would be provided from I-8, with local access provided via Ribbonwood Road which is currently paved up to the intersection of Opalocka Road.. The Boulder Brush Developer would grade and pave the unpaved section of Ribbonwood Road to a minimum of 20 feet (maximum 30 feet width).

An approximately 1-mile segment of Ribbonwood Road outside the Boulder Brush Boundary would be widened to 30 feet and paved. This 30-foot paved road would continue on site for approximately 4 miles up to the high-voltage substation and switchyard site. The off-site and on-site segments of this improved roadway would be privately maintained. An approximately 20-foot wide fuel modification zone would be maintained on either side of the 30-foot wide access road for the Boulder Brush Facilities. The access roads leading to the approximately 32 gen-tie pole structures would be 16-foot wide decomposed granite (DG). Access to the gen-tie line poles would consist of 16 feet wide decomposed granite (DG). The new, paved access route to the high-voltage substation and switchyard would be designed, constructed, and maintained to support the imposed loads of fire apparatus (not less than 75,000 lbs.) so as to provide all-weather driving capabilities. Road distance thresholds specified under Section 503.1.3 of the County Consolidated Fire Code restrict maximum dead-end road lengths for varying parcel size (County of San Diego 2017). The road to the high-voltage substation and switchyard would provide opportunities for fire engine turn-around, thus meeting County Fire Code requirements.

3.5 Water Availability for Firefighting Purposes

Three (3) 10,000 gallon water tanks dedicated for firefighting purposes during operations would be installed adjacent to the northeast entrance to the switchyard. Two Fire Department Connections (FDC) would be located in the vicinity, one within approximately 150 to 250 feet of both the west entrance to the switchyard and the entrance to the high-voltage substation, and the other near the tanks by the north entrance to the switchyard. These FDCs would be connected to the water tanks by an underground water pipe. Water will be stored in aboveground tanks complying with the requirements of the SDCFA and with NFPA 22, Private Fire Protection Water Tanks. A procedure for ongoing inspection, maintenance, and filling of tanks will be in place. Water needed for filling the water tanks would be provided by an off-site water purveyor. The tanks and fire engine connections shall be located on the side of the fire access road(s). The width of the road at the water tank location shall provide 30 feet of travel width, to allow for fire engine to park and connect to the tank, while leaving the road open. The tanks shall each be labeled "Fire Water: 10,000 gallons" using reflective paint.

The capacity of the three 10,000-gallon water tanks will be based upon the demand for hand lines, plus a reasonable allocation for water supply for Fire Engines to generate firefighting foam for at least 15 minutes at an application density of 0.16 gpm/sq. ft. from a hose line using a 3% Aqueous Film-Forming Foam (AFFF) concentrate, for use on an oil fire in transformer containment. A conceptual estimate at this point, prior to detailed design, is 250 gpm for 15 minutes (3,750 gallons of water) plus 112.5 gallons of foam concentrate for oil firefighting. The actual amount of stored water is to be determined upon detailed design of the high-voltage substation and switchyard.

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4 ANALYSIS

4.1 First Responder Training

The Boulder Brush Facilities will be similar to existing facilities and is not anticipated to result in unfamiliar technology requiring special training.

This Technical Report supplements the 2019 Boulder Brush Facilities Fire Protection Plan (FPP), which evaluates and recommends actions for the Boulder Brush Facilities to ensure it does not unnecessarily expose people or structures to fire risks and hazards. The FPP identifies and prioritizes the measures necessary to adequately mitigate those impacts. It considers the property location, topography, geology, combustible vegetation (fuel types), climatic conditions and fire history. Additionally, the FPP considers water supply, access, structure ignitability and fire resistive building materials, fire protection equipment, impacts to existing emergency services, defensible space and vegetation management.

The primary purpose of this Technical Report is to identify pre-suppression actions that would reduce risk directly associated with the Off-Reservation gen-tie line, switchyard and high-voltage substation on portions of privately owned land, actions that would protect and enhance the safety of fire suppression resources, and actions that could protect the gen-tie line and high-voltage substation from ignition caused by other sources.

The safety of firefighters and other emergency first responder personnel depends on understanding and properly handling these hazards through adequate training and preparation. SDCFA and California Department and Fire Protection (CAL FIRE) firefighters receive the necessary training required to respond to the various types of emergency incidents they may face. Electrical firefighting and emergency response are not new to responding firefighters. There are existing above ground transmission lines and energy producing facilities that have led to firefighter training in best response strategies.

The goal of this report is to assemble core principle and best practice information for fire fighters, fire ground incident commanders, and other emergency first responders to assist in their decision-making process for any emergencies at the Boulder Brush Facilities.

4.2 Gen-Tie Line and High-Voltage Substation Effect on Fire Risk

The primary objective of this report is to identify the potential hazards resulting from the installation, operation and maintenance of the gen-tie line and high-voltage substation and switchyard, as well as from natural conditions that could result in risk of fire. These hazards include

several operations and activities associated with the Boulder Brush Facilities that could elevate the probability of ignition. These potential sources of fire risk could include the following:

1. Construction activities;
2. Operations and maintenance activities; and
3. Vegetation contacting overhead transmission line that could cause an ignition, especially when excessive electrical load demands cause line sag. *This potential issue is not considered likely given the height of the proposed Off-Reservation gen-tie line and the low growing nature of the vegetation in the Boulder Brush Corridor.*

4.2.1 Construction of Boulder Brush Facilities

The following items have been identified as potential risks of fire ignition associated with particular construction activities within the Boulder Brush Corridor:

1. Vegetation clearing for construction of access roads, gen-tie line structure locations, and the high-voltage substation and switchyard sites;
2. Off-road vehicle use could cause an ignition (e.g., catalytic converter, faulty brakes, etc.);
3. Idling or parked vehicles and equipment in areas of grass and other vegetation;
4. Hot work activities conducted during a Red Flag Warning[1];
5. Construction waste that has accumulated on site associated with electrical equipment could create a fire hazard and shall be contained within metal containers; and
6. Operation of generators, pumps, or other equipment capable of producing sparks or exhaust heat to cause ignition.

4.2.2 Operations and Maintenance Activities

4.2.2.1 High-Voltage Substation

During operation, the high-voltage substation will be unmanned. All monitoring and control functions will be performed remotely. Routine operation and maintenance (O&M) will require a single pickup truck visiting the high-voltage substation several times a week for switching, as well as construction and maintenance trucks visiting the substation several times a year for equipment maintenance. Maintenance activities will include equipment testing, equipment monitoring and

[1] The National Weather Service may issue Red Flag Warnings (RFW) at any time when humidity and wind conditions meet pre-determined thresholds that would promote fire ignition and spread. Because the majority of acreage burned in California occurs during RFW weather conditions, certain construction activities, such as hot work, would be limited to low fire hazard, non-hot work, until the RFW has been lifted.

repair, and emergency and routine procedures for service continuity. Regular inspection of fuel modification zones around the perimeter of the high-voltage substation will be conducted.

Lighting will be installed inside the high-voltage substation fenced areas for the purpose of emergency repair work. Since nighttime maintenance activities are not expected to occur more than once per year, the safety lighting inside the fence would normally be turned off.

4.2.2.2 Off-Reservation Gen-Tie Line

During operations, the Off-Reservation gen-tie line will be regularly inspected, maintained, and repaired. O&M activities will involve both routine preventive maintenance and emergency procedures to maintain service continuity. Aerial and ground inspections of the facilities will be performed. Aboveground components would be inspected annually, at a minimum, for corrosion, equipment misalignment, loose fittings, and other common mechanical problems. Regular inspection of fuel modification zones along the entirety of the Off-Reservation gen-tie line length will be conducted.

4.2.3 Potential Hazards to Responding Firefighters

Among the potential hazards during O&M activities to responding firefighters are:

1. Firefighting crews should consider that all electrical components must always be considered energized. Crews should fight the fire as they would any other electrical fire and use a water spray for ordinary combustibles or vegetation located outside the substation facility or dry chemical extinguishers (or other suppression technology for energized equipment) on any electrical wiring and any high-voltage substation components.
2. Depending on the level of damage to the Boulder Brush Facilities during a fire incident, the electrical connection to ground may have been lost and create an extremely hazardous situation, especially if pooling of water occurs.
3. The use of electrical conductive tools is hazardous.
4. Care must be taken to avoid unnecessary contact with potentially energized components until they can be isolated and confirmed de-energized.
5. Burning transformers and wire insulation may produce toxic vapors. Firefighters should wear full personal protection equipment (PPE) and Self Contained Breathing Apparatus (SCBA) due to the potential for toxic or hazardous inhalation that may be produced by these burning components. Crews should work upwind of the smoke plume, whenever possible.

6. Vegetation contacting overhead gen-tie line that could cause an ignition, especially when excessive electrical load demands cause line sag. This potential issue is not considered likely given the separation between transmission lines and height of vegetation. All gen-tie line structures will be metal. The base of the gen-tie lines' pole structures will also be permanently cleared for a 20-foot radius around the riser pole, per CPUC General Order No. 95, Section 3, Rule 35: Vegetation Management.
7. Firefighters should never cut the wiring in a high-voltage substation or gen-tie line. Specialized tools may be required for disconnecting the wiring. Electrical components should not be disassembled, damaged or removed by firefighters until all of the substation components are isolated or de-energized. Firefighters should limit their activities to containment of the fire until it can be confirmed that the Boulder Brush Facilities are isolated or de-energized.
8. At any incident where electrical components are present, the Incident Command (IC) must designate a "Utilities Group" early to aid in locating and disabling all of the electrical facility components. This can greatly decrease the electric shock hazard to all crews operating on the fire ground. Firefighters must remember that all electrical components must be considered HOT.
9. At the conclusion of an incident, demobilization and termination efforts should be directed at leaving the property in the safest condition possible. An overall focused size-up and risk-benefit analysis should be conducted.
10. Along with a structural stability assessment, hazard identification and the marking of any potentially energized areas should be a priority. A qualified high-voltage technician should be called to the incident to de-energize any electrical component that has been compromised or creates a hazard. Transferring scene safety and security to an appropriate local, municipal authority may be an option if the fire department is unable to quickly secure the assistance of a qualified high-voltage technician or electrician. All hazards should be appropriately marked or barricaded. The contact information for qualified high-voltage technician who will serve as the emergency contact will be provided to SDCFA and the local fire station prior to the facilities being brought on-line.

4.3 Boulder Brush Facilities Fuels Management

The Boulder Brush Facilities are in a Very High Fire Hazard Severity Zone. The FPP documents recommendations to protect the Boulder Brush Facilities from a wildfire from and to minimize the likelihood that a fire originating at a facility spreads off site. Any wind or topography driven wildfire and especially those burning under a northeast (*Santa Ana*) wind pattern creates a wildland fire hazard scenario, especially for wildland fires starting northeast of the Boulder Brush Facilities. In

addition, a typical fire day with a southwest wind would also create a high wildland fire hazard. However, the proposed vegetative fuel modification treatments and the use of metal pole structures will lower the risk for potential loss of Boulder Brush Facilities. The high-voltage substation and switchyard would include contiguous FMZ of 50 feet starting from the perimeter fence. The high-voltage substation pad area will be free of vegetation around all electrical equipment. Each Off-Reservation gen-tie pole structure would include an FMZ having a radius of 20 feet from pole center.

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5 SAFETY HAZARDS OF TRANSMISSION LINES AND ELECTRICAL FACILITIES

5.1 Falls

Due to the height of gen-tie lines, potential hazards exist while working on gen-tie lines during the installation of the gen-tie pole structures and equipment or doing maintenance on the transmission line. When possible, employees should perform maintenance work from the ground. According to the Occupational Safety and Health Administration (OSHA) general industry standard any "time a worker is at a height of four feet or more, the worker is at risk and needs to be protected" (OSHA, 2008). Fall protection, such as a safety harness and self-retracting lifelines, should be used when an employee is above the 4-foot threshold (API, 2008). To minimize the chance of falling when working high above the ground, employees need to make sure their harness and fall prevention equipment is being used correctly, is properly inspected and maintained, and any slack in the line should be minimized so that if a fall does take place, the amount of injury encountered will be far less.

Another common example of a fall risk is while using a ladder. When ladders are used to access elevated equipment, they should be secured and supervised at all times. Once the ladder is no longer needed, it should be removed.

5.2 Fires and Burns

A fire could start in a number of locations along the transmission line or in the high-voltage substation and switchyard sites. Workers should be trained to know exactly what to do and how to escape in a fire emergency. (OSHA 2007)

5.3 Electrical

According to OSHA, workers are potentially exposed to a variety of serious electrical hazards including arc flashes, electrical burns, and electric shock. Workers need to pay attention the overhead line connecting the high-voltage substation and switchyard to the Sunrise Powerlink and need to stay at least 35 feet away when using tools and equipment that can contact the line (OSHA 2010). With lines with voltages lower than 500 kV, the required distance is lower as presented in Table 1. Employees are covered by the *Electric power generation, transmission, and distribution* standards and, therefore, are required to implement the safe work practices and worker training requirements of OSHA's Electric Power Generation, Transmission, and Distribution Standard 29 Code of Federal Regulations (CFR) 1910.269 (OSHA 2007).

Table 1
Overhead Line Minimum Approach Distances

Power Line Voltages (kV)	OSHA Minimum Clearance Distance (feet)
up to 50	10
Over 50 to 200	15
Over 200 to 350	20
Over 350 to 500	25
Over 500 to 750	35

Source: OSHA 1926.1408 Table A.

5.4 Lockout/Tagout

According to OSHA standard 29 CFR 1910.147, lockout/tagout refers to the specific "practices and procedures to safeguard employees from the unexpected energization or startup of machinery and equipment, or the release of hazardous energy during service or maintenance activities" (OSHA 2007). Before an employee services a piece of electrical equipment, the power supply should be turned off and the employee should place a padlock on the power supply. The padlock serves to prevent someone else from accidently re-energizing the equipment being serviced. The lock should have a tag on it identifying the individual who locked out the equipment. Once a piece of equipment has been locked out, the only individual with the authority to unlock that piece of equipment is the person who initially locked it out.

Employees should follow this practice every time they service any electrical or electrically powered equipment. OSHA estimates that compliance with lockout/tagout procedures prevents an estimated 120 fatalities and 50,000 injuries each year in the United States (OSHA 2007).

5.5 Confined Space Areas

"Confined space" is defined by OSHA as "having a limited or restricted means of entry or exit; large enough to bodily enter and perform tasks; and lastly, not designed for continuous occupancy." Confined spaces are widely recognized as a common hazard. Confined spaces include, but are not limited to, tanks, pits, silos, underground vaults, storage bins, and manholes. When entering a confined space area, it is important to have an additional person observing outside the confined area. There should be a continuous supply of fresh, ventilated air due to the presence of biogas. Biogas includes constituents of carbon dioxide, methane, and hydrogen sulfide, all which present the potential for both asphyxiation (possibility of passing out) and fire or explosion in confined spaces. A confined space area should never be entered if there is an unconscious person and all precautions have not been taken into account. These precautions include wearing a SCBA.

5.6 Machine Guarding

If not safeguarded properly, workers may be exposed to hazards of moving parts of the machines and sever workplace injuries such as crushed fingers, amputations, burns, or blindness may occur. Therefore, workers should make sure that rotating parts and points of operation of machines are properly guarded prior to using them (OSHA 2007).

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6 EFFECTS OF ELECTRICITY ON THE HUMAN BODY

6.1 Physiological Effects

Electricity flowing through the human body can shock, cause involuntary muscle reaction, paralyze muscles, burn tissues and organs, or kill. The typical effects of various electric currents flowing through the body on the average 150-pound male and 115-pound female body are given in Table 2.

Burns. Although a current may not pass through vital organs or nerve centers, internal electrical burns can still occur. These burns, which are a result of heat generated by current flowing in tissues, can be either at the skin surface and/or in deeper layers (muscles, bones, etc.). Typically, tissues damaged from this type of electrical burn heal slowly.

Burns caused by electric arcs are similar to burns from high-temperature sources. The temperature of an electric arc, which is in the range of 4,000–35,000°F, can melt all known materials, vaporize metal in close proximity, and burn flesh and ignite clothing at distances up to 10 ft. from the arc.

Table 2
Effects of Electric Current on the Human Body (Ref. 1)

Effect/feeling	Direct current (mA)		Alternating current (mA) 60 Hz		Alternating current (mA) 10,000 Hz		Incident severity
	150 lb	*115 lb*	*150 lb*	*115 lb*	*150 lb*	*115 lb*	
Slight sensation	1	0.6	0.4	0.3	7	5	None
Perception threshold	5.2	3.5	1.1	0.7	12	8	None
Shock not painful	9	6	1.8	1.2	17	11	None
Shock painful	62	41	9	6	55	37	Spasm, indirect injury
Muscle clamps source	76	51	16	10.5	75	50	Possibly fatal
Respiratory arrest	170	109	30	19	180	95	Frequently fatal
≥ 0.03-s vent. fibril.	1300	870	1000	670	1100	740	Probably fatal
≥ 3-s vent. fibril.	500	370	100	67	500	340	Probably fatal
≥ 5-s vent. fibril.	375	250	75	50	375	250	Probably fatal
Cardiac arrest	—	—	4000	4000	—	—	Possibly fatal
Organs burn	—	—	5000	5000	—	—	Fatal if it is a vital organ

Delayed Effects. Damage to internal tissues may not be apparent immediately after contact with the current. Internal tissue swelling and edema are also possible.

Critical Path. The critical path of electricity through the body is through the chest cavity. At levels noted in Table 2, current flowing from one hand to the other, from a hand to the opposite foot, or from the head to either foot will pass through the chest cavity paralyzing the respiratory or heart muscles, initiating ventricular fibrillation and/or burning vital organs.

6.2 Biological Effects of Electrical Hazards

Influential Variables. The effects of electric current on the human body can vary depending on the following:

1. Source characteristics (current, frequency, and voltage of all electric energy sources).
2. Body impedance and the current's pathway through the body.
3. How environmental conditions affect the body's contact resistance.
4. Duration of the contact.

Source Characteristics. An AC with a voltage potential greater than 550 V can puncture the skin and result in immediate contact with the inner body resistance. A 110-V shock may or may not result in a dangerous current, depending on the circuit path which may include the skin resistance. A shock greater than 600 V will always result in very dangerous current levels. The most severe result of an electrical shock is death.

Conditions for a serious (potentially lethal) shock across a critical path, such as the heart, are:

1. More than 30 V root mean square (rms), 42.4-V peak, or 60 V DC at a total impedance of less than 5000
2. 10 to 75 mA
3. More than 10 J

Conditions for a potentially lethal shock across the heart are:

1. More than 375 V at a total body impedance of less than 5000
2. More than 75 mA
3. More than 50 J

Frequency: The worst possible frequency for humans is 60 Hz, which is commonly used in utility power systems. Humans are about five times more sensitive to 60 Hz AC than to DC. At 60 Hz, humans are more than six times as sensitive to AC than at 5000 Hz—and the sensitivity appears

to decrease still further as the frequency increases. Above 100–200 kHz, sensations change from tingling to warmth, although serious burns can occur from higher radio-frequency energy. At much higher frequencies (e.g., above 1 MHz), the body again becomes sensitive to the effects of an alternating electric current, and contact with a conductor is no longer necessary; energy is transferred to the body by means of electromagnetic radiation (EMR).

Body Impedance: Three components constitute body impedance: internal body resistance and the two skin resistances at the contact points with two surfaces of different voltage potential. One-hand (or single-point) body contact with electrical circuits or equipment will prevent a person from completing a circuit between two surfaces of different voltage potential. Table 3 provides a listing of skin-contact resistances encountered under various conditions. It also shows the work area surfaces and wearing apparel effects on the total resistance from the electrical power source to ground. This table can be used to determine how electrical hazards could affect a worker in varying situations.

Table 3
Human Resistance (Q) for Various Skin-Contact Conditions

Body contact condition	Dry (Ω)	Wet (Ω)
Finger touch	40,000–1,000,000	4,000–15,000
Hand holding wire	15,000–50,000	3000–5000
Finger-thumb grasp	10,000–30,000	2000–5000
Hand holding a pliers	5,000–10,000	1000–3000
Palm touch	3000–8000	1000–2000
Hand around 1.5-inch pipe or drill handle	1000–3000	500–1500
Two hands around 1.5-inch pipe	500–1500	250–750
Hand immersed	—	200–500
Foot immersed	—	100–300

Life-Threatening Effects. Charles F. Dalziel, Ralph H. Lee, and others have established the following criteria for the lethal effects of electric shock:

1. Currents in excess of a human's "let-go" current (≥16 mA at 60 Hz) passing through the chest can produce collapse, unconsciousness, asphyxia, and even death (see also Table 2).
2. Currents (≥30 mA at 60 Hz) flowing through the nerve centers that control breathing can produce respiratory inhibition, which could last long after interruption of the current.
3. Cardiac arrest can be caused by a current greater than or equal to 1 A at 60 Hz flowing in the region of the heart.
4. Relatively high currents (0.25–1 A) can produce fatal damage to the central nervous system.

5. Currents greater than 5 A can produce deep body and organ burns, substantially raise body temperature, and cause immediate death.
6. Delayed reactions and even death can be caused by serious burns or other complications.

Source: Lawrence Livermore National Laboratory.

The complete document can be found at http://www.llnl.gov/es_and_h/hsm/doc_16.01/doc16-01.html.

7 INCIDENT RESPONSE RECOMMENDATIONS

Every emergency incident to which a fire department responds is unique. Despite the differences, however, there are common characteristics that allow fire service personnel to better understand the tasks that need to be performed and to prepare for their duties. This section provides a review of the common elements of most interest to fire fighters when handling emergencies involving electrical power systems.

7.1 Energized System Firefighting

If the electrical components become engulfed in fire, appropriate care should be exercised in firefighting response, and it should be attacked similarly to any piece of electrically energized equipment. Normally this would involve shutting down the power and applying water in a fog pattern on combustible materials or utilizing a dry chemical or foam, but it is critical to be aware that these materials could be energized.

Even with known shutdown steps taken to isolate electrical current, fire fighters should always treat all wiring and electrical components as if they are electrically energized.

Care should be taken throughout fire ground operations never to cut or damage any conduit or any electrical equipment, and they should be treated as energized at all times.

7.2 Respiratory Protection

Proper respiratory protection should be used during all fire ground operations that involve a potentially hazardous atmosphere. Similarly, these protective measures apply during post-fire activities, such as overhaul or fire investigations. Care should be taken during all fire ground operations to protect against respiratory exposure from products of combustion involving electrical or transformer systems. Under normal conditions the materials used for the substation/switchyard facilities are relatively inert and safe, but they can become dangerous when exposed to fire. If power components are involved in a fire, care should be taken to avoid exposure to the products of combustion due to the somewhat unusual materials involved. In addition to inhalation concerns, dermal exposure from system materials damaged by fire should also be handled with caution regardless of the type of power system.

Emergency responders are required to wear full respiratory protection (e.g., self-contained breathing apparatus) for any atmosphere that is possibly IDLH (immediately dangerous to life or health), and this should be the case when handling damaged equipment involved in fire unless proven otherwise.

7.3 Firefighting Strategic Mode

Following an assessment of a fire related situation, the choice of a strategic mode should be made by the IC following local jurisdiction Emergency Operation Manuals, SOPs and guides that would normally be used for Electrical Hazards. Tactics, like strategy, should also be based upon normal standard operating procedures for responding to an emergency incident for an electrical transformer facility.

1. **Strategy -** When a fire incident occurs in the vicinity of a Boulder Brush Facility, the following items must be considered when developing a strategy:
    a. Document fire conditions found on arrival – confirm fire location, type of fire, extents, potential threats
    b. Confirm whether a component of the gen-tie line or site facilities itself are burning or whether fire is confined to the surrounding vegetation
    c. Confirm whether anyone on site is threatened by the fire
    d. Confirm whether aerial firefighting resources are being used or should be ordered for wildfire and know potential limitations of its use on/near the gen-tie line and substation/switchyard site
    e. Document any threatened exposures, including wildland areas
    f. Locate water and additional resources available (High-voltage substation site includes three 10,000-gallon water tanks with firefighting water (Figure 4).

    Once the IC has completed a size-up, the IC should determine the strategy and assign tasks to the fire suppression resources assigned to the incident. Due to the potential hazards associated with the site, the IC must adjust the strategy and potentially rearrange the order of the tactics to deal specifically with the gen-tie line, and high-voltage substation facilities technology. If the IC chooses an offensive strategy it needs to be supported as it would under other fire operations with an emphasis on disabling all power sources to and from the site or remaining at a safe distance and limiting spread if energy is not confirmed disabled.

2. **Tactics –** Tactics will be based on the chosen strategy and fire department SOPs:
    a. Components are always hot! The single most critical message of emergency response personnel is to always consider site facilities and all their components as electrically energized.
    b. Isolation of the inverters and disconnection of the facility from the main electrical panel will be an important task. Assistance from a high-voltage technician is key for disabling

the facility and confirming that all of the hazards have been mitigated. An emergency response plan identifying all tasks and the parties responsible for providing the electrical isolation for emergency responders is required.

c. Another priority will be preventing fire spread and isolating it to its area of origin. This task may be difficult during a vegetation fire adjacent the site, especially if aerial resources are being used. Ground resources should be removed from the site until the air attack has concluded.

d. Dry chemical extinguishers should be used to contain or extinguish electrical fires. Water should be used to extinguish any ordinary combustibles near the facility, or if the volume of fire requires its use. If water is used, a 30º fog pattern from at least a 30-foot distance, at 100 psi is recommended.

e. Full Personal protective gear must be used due to the potential toxic inhalation hazard if oils are burning. Fire crews should position themselves upwind and out of any toxic atmosphere.

f. Ingress and egress will require that gates have an inside measurement of a minimum of 26 feet wide. The primary fire access will require a Knox Lock. Existing gates plus any future gates that may be installed on the access roads or fence lines must be equipped with an approved padlock, Knox key box ("Knox" padlock, or "Knox" weather resistant lock box, for use with a "Knox" sub-master key) or "Knox" box electronic access system.

g. During the overall fire suppression and mop-up phases of an on-site fire, firefighters should avoid all potential electrical hazards until there is confirmation that the facility no longer poses an electric shock hazard. Firefighters must avoid inadvertently damaging gen-tie line or substation components with their tools.

h. The IC will need the assistance from qualified high-voltage technician to confirm that all of the hazards have been mitigated before the incident is terminated and the scene is turned over to the owner or responsible party. The contact information for a high-voltage technician will be provided to the fire authority prior to facilities operation.

i. The tactical approach to a fire incident with electrical equipment must be stressed to all fire suppression personnel (i.e., stay clear).

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