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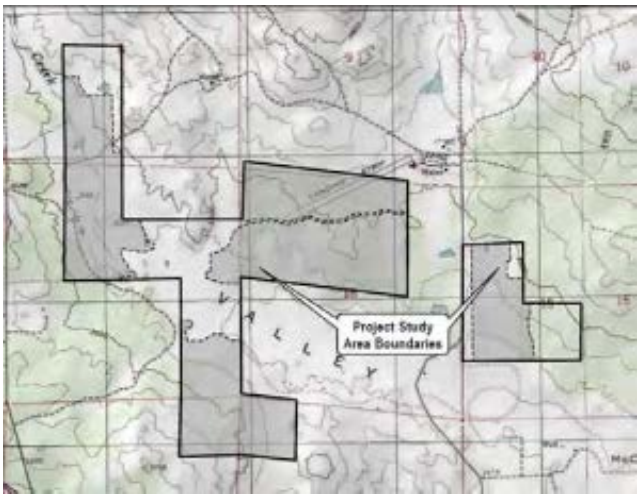
Fire Protection Plan
Rugged Solar Farm Project



Rugged Solar Farm Project Site

APNs 611-110-01-00, 611-100-02-00, 611-100-01-00, 611-090-04-00, 611-091-03-00, 611-090-02-00, 611-060-04-00, 611-091-07-00, 612-030-19-00, 611-091-09-00, and 612-030-01-00, MUP # 3300-12-007

Environmental Review Project Number 3910-120005

Prepared for:

County of San Diego

Project Proponent:

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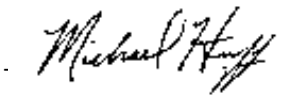

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EXECUTIVE SUMMARY

This Fire Protection Plan (FPP) is submitted pursuant to section 4903 of the County Consolidated Fire Code to address the adverse environmental effects that the proposed Rugged Solar Farm Project (Project) may have from wildland fire. It provides documentation that the project does not expose 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.

The proposed Project is a solar farm that would produce up to 80 megawatts (MW) of solar energy and would consist of approximately 3,588 concentrating photovoltaic (CPV) trackers on 765 acres in southeastern San Diego County, near the unincorporated community of Boulevard, California. The project includes the use of "moving" solar arrays that track the sun across the sky on a daily basis. Individual solar tracker dimensions are approximately 48 feet across by 25 feet tall and they are elevated above the ground on steel poles.

The Project will be constructed in an area of San Diego County which is statutorily designated by the California Department of Forestry and Fire Protection (CAL FIRE) as a Moderate and Very High Fire Hazard Severity Zone (CAL FIRE 2013). Fire hazard designations are based on topography, vegetation, and weather, amongst other factors that indicate the likelihood of wildfire occurrence. The project site is located in an area dominated by chaparral vegetation, which is a vegetation community that experiences occasional wildfire and can burn in an extreme manner under windy, dry conditions. The terrain on, and within the vicinity of the Project, is predominantly flat to gently rolling. The Project area, like all of inland San Diego County, is subject to seasonal weather conditions that can heighten the likelihood of fire ignition and spread. Based on the region's fuels, fire history, and expected fire behavior, a high-intensity fire can be expected to occur in the project area. Fire behavior in the project area can be extreme with intense heat, above average flame lengths, fast spread and spotting. The applicable fire codes and measures required by this FPP directly address the fire concerns associated with this Project's location.

Fire protection in the Project area is shared by several agencies, with the San Diego County Fire Authority (SDCFA) and CAL FIRE providing significant resources. The closest fire station is the Boulevard Volunteer Fire Department. CAL FIRE has the primary responsibility for wildfire protection within State Responsibility Areas (SRAs). Both SDCFA and CAL FIRE operate fire stations within a short driving distance of the project.

The project will introduce a solar facility, electrical transmission line and related activities into a rural setting that currently includes semi-disturbed and undisturbed wildland fuels. The Project may increase potential ignition sources in the area with the ongoing operation and

maintenance program, but will reduce the available wildland fuels and will result in a higher level of fire monitoring and awareness due to on-site personnel and security measures. The site is currently subject to ignition sources including nearby roads, including Interstate 8, a major electrical transmission line easement adjacent to McCain Valley Road associated with the Sunrise Powerlink, and ongoing ranching operations. The Project will include compliance with the San Diego County Consolidated Fire Code and will provide additional measures that enhance fire safety and protection.

Based on the project's conformance with applicable fire and building codes along with the additional measures identified in this FPP, the project would not result in a significant impact under CEQA.

1.0 INTRODUCTION

This Fire Protection Plan (FPP) has been prepared for the Rugged Solar Farm Project near the community of Boulevard, California. The purpose of the FPP is to assess the potential impacts resulting from wildland fire hazards and identify the measures necessary to adequately mitigate those impacts. As part of the assessment, this FPP has considered the property location, topography, geology (soils and slopes), combustible vegetation (fuel types), climatic conditions, and fire history. The plan addresses water supply, access (including secondary/emergency access where applicable), solar component and structure ignitability and ignition resistive features, fire protection systems and equipment, impacts to existing emergency services, defensible space, and vegetation management. The plan identifies and prioritizes areas for hazardous fuel reduction treatments and recommends the types and methods of treatment that will protect this project and its essential infrastructure. The plan recommends measures that the property owner will take to reduce the probability of ignition of equipment or structures throughout the project area addressed by this plan.

This FPP is consistent with the County Consolidated Fire Code (CCFC), which was certified as a package with the County Building Code by the State Board of Forestry to be consistent with California Code of Regulations, Title 14, Fire Safe Regulations. Since the project is within State Responsibility Area, Title 14 is applicable, but the certified CCFC is now used in lieu of Title 14. Further, the Project is consistent with the County Building and Electrical Codes and will employ all related California Public Utilities Commission (CPUC) regulations including the General Order 95: *Rules for Overhead Electric Line Construction*.

The purpose of this FPP is to analyze the project's various components and siting in a fire hazard area and to generate and memorialize the fire safety requirements of the Fire Authorities Having Jurisdiction (FAHJ). Recommendations of this FPP incorporate analysis and recommendations resulting from the Soitec Solar Portfolio Project Emergency Service Capabilities Assessment and Cumulative Impact Mitigation report (Dudek and Hunt 2013) which analyzed the cumulative impact of the Soitec projects, along with other foreseeable projects, on the area's emergency service resources and made recommendations for effectively mitigating identified impacts. Requirements and recommendations are based on site-specific characteristics and incorporate input from the project applicant and the SDCFA. This FPP incorporates all applicable fire safety regulations and requirements and documents in text a selection of these regulations that are most pertinent to the Project's unique facility and location.

1.1 Project Summary

1.1.1 Project Location

The 765-acre Rugged solar farm site is located north of I-8 to the east of Ribbonwood Road and primarily west of McCain Valley Road and includes the following APNs: 611-060-04, 611-090-02, 611-090-04, 611-091-03, 611-091-07 (portion), 611-100-07, 612-030-01, and 612-030-19, and a property (APN 611-110-01) located adjacent to and east of McCain Valley Road. As depicted in Figure 1-2, the Rugged solar farm includes two separate sites. A majority of the site is located west of McCain Valley Road and includes the central, northwest, and southern subareas. A smaller portion of the site is east of McCain Valley Road and comprises the eastern subarea. Existing land uses in the surrounding area include Rough Acres Ranch, public agency and tribal lands designated and planned for renewable energy development, and lands designated rural by the County of San Diego General Plan. Rough Acres Ranch consists of open and disturbed grazing lands, boulder outcrops, mixed vegetation coverage including grasslands and sparse chaparral vegetation, a large construction yard, a conference center, and several agricultural-supporting structures such as barns located adjacent to McCain Valley Road which support ranch operations. Public Agency Lands consist of the McCain Valley Conservation Camp (located south of Rough Acres Ranch) and undeveloped lands managed by the Bureau of Land Management (BLM) that are generally located north of Rough Acres Ranch as well as east of McCain Valley Road. The proposed 128-turbine Tule Wind Energy Project would be located north of the Rugged Solar Farm project on lands designated as available for wind energy development by the BLM and the proposed Jewel Valley Wind Project would be located on County jurisdictional land approximately 0.5 miles northwest of the Rugged Solar Farm site (the number of turbines associated with the Jewel Valley Wind Project has not been determined at this time). Development on rural lands surrounding the project site is relatively sparse and consists of scattered rural residences situated on large, chaparral-strewn lots bisected by narrow dirt roadways (rural residential development in the immediate area is generally located south and east of the project site).

The Project site (solar farm) will be constructed in areas of San Diego County which are determined to be in an area classified as Moderate and Very High Fire Hazard Severity Zones by California Department of Forestry and Fire Protection (CAL FIRE) (CAL FIRE 2013).

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FIGURE 1

Regional Map

FIRE PROTECTION PLAN - RUGGED SOLAR

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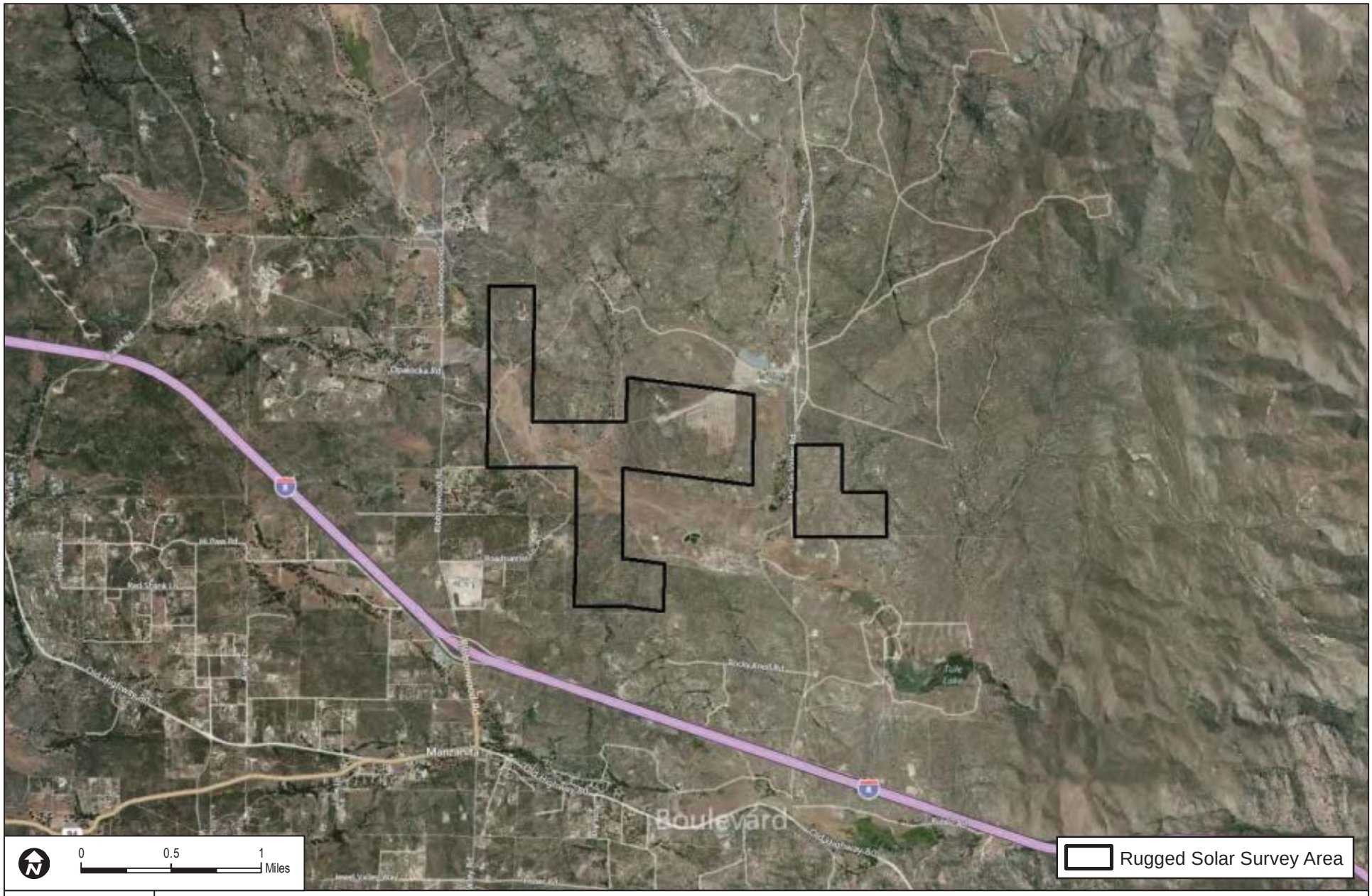

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SOURCE: AECOM 2013; Soitec 2013; SanGIS 2012; Bing Maps

FIGURE 2

Vicinity Map

FIRE PROTECTION PLAN - RUGGED SOLAR

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1.1.2 Project Description

The Project includes a Major Use Permit to authorize a Major Impact Services and Utility Pursuant to Sections 1350, 2705, and 2926 of the Zoning Ordinance. The Rugged Solar Energy Project would produce up to 80 MW of alternating current (AC) solar generating capacity. The Project would consist of approximately 3,588 concentrating photovoltaic (CPV) electric generation systems utilizing dual-axis tracking CPV trackers on 765 acres in southeastern San Diego County in the unincorporated community of Boulevard, California (see Figure 3, Site Plan). In addition to the CPV trackers and inverter transformer units, the Project includes the following primary components:

- A collection system linking the CPV trackers to the on-site Project substation composed of (i) 1,000-volt (V) direct current underground conductors leading to (ii) 34.5-kilovolt (kV) underground and overhead AC conductors.
- A 7,500-square-foot (sf) (60 feet by 125 feet) operations and maintenance (O&M) building. The O&M building would be used for storage, employee operations, and maintenances of equipment.
- A 2-acre on-site private collector substation site with a fenced pad area of 6,000 sf (60 feet by 100 feet) with maximum height of 35 feet and includes a 450-sf (15 feet by 30 feet) control house.
- 59 Inverter/Transformer enclosures. The dimensions of each inverter unit are 10 feet by 40 feet (400 sf each) with a total structure height of up to 12 feet. Three permanent on-site water wells for project construction, the O&M building and to facilitate washing of the CPV trackers.
- Two 20,000 gallon water storage tanks to be located at the O&M building and to be dedicated exclusively for fire suppression. The outlet on the tank for tracker washing and any other non-fire uses would be located at the midpoint on the tank making it impossible to draw the water level down below 10,000 gallons in each tank for non-fire suppression use.
- Three additional on-site 10,000 gallon water storage tanks to support tracker washing. Each of these three 10,000 gallon water storage tanks would include 10,000 gallons of water dedicated solely for fire suppression.
- A septic tank system and leach field for the O&M building.
- 6 foot perimeter fencing topped with an additional 1 foot of security barbed wire.

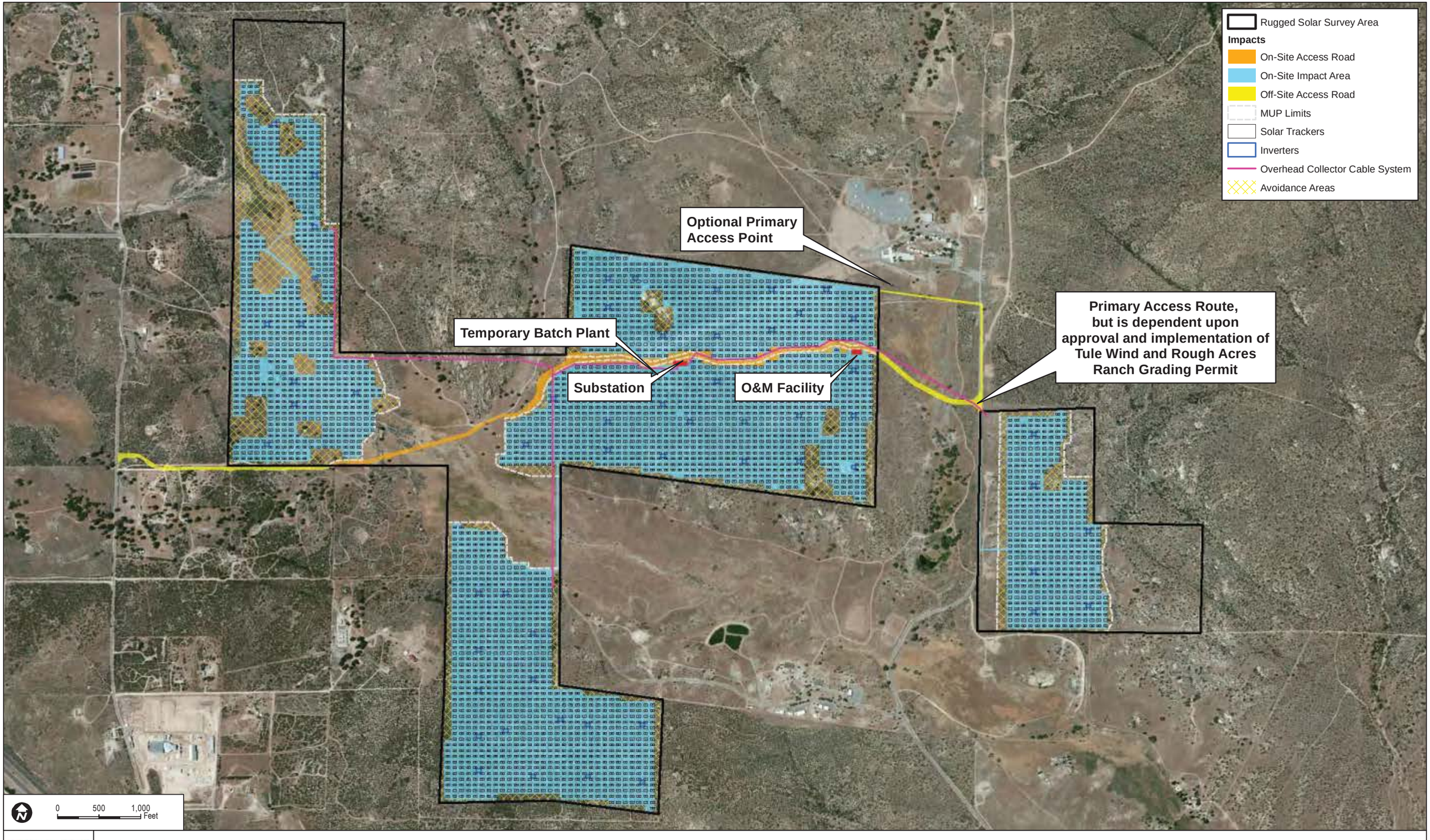
- Primary access to the Rugged site would be from Ribbonwood Road and McCain Valley Road. One roadway would be constructed off site from McCain Valley Road leading to the central subarea if Rough Acres Ranch Rd is not constructed per Rough Acres Ranch Major Use Permit (MUP) 3300-09-019. Access to the northwestsubarea would be provided via Ribbonwood Road. The central subarea would also include an access road leading south crossing Tule Creek to provide access to the southern subarea. The eastern subarea would be accessible via an access road leading from McCain Valley Road crossing beneath the Sunrise Powerlink.

Appendix A includes illustrations of individual project features. The Proposed Project includes a total installation of 3,588 CPV trackers installed in groups or "building blocks" composed of approximately 59 individual Soitec Concentrix™ CX S530 systems (includes dual-axis tracker), with any of the following inverter combinations: two 630-kW inverters, and either two 680-kW inverters or three 680-kW inverters; and either a 1.5- or 2.0-megavolt ampere (MVA) transformer.

Individual tracker dimensions are approximately 48 feet across by 25 feet tall. Each tracker would be mounted on a 28-inch steel mast, which would be supported by either: (1) inserting the mast into a hole up to 20 feet deep and encasing it in concrete, (2) vibrating the mast into the ground up to 20 feet deep, or (3) attaching the mast to a concrete foundation sized to adequately support the trackers based on wind loading and soil conditions at the site. In its most vertical position, the top of each tracker would be no more than 30feet above grade, and the lower edge would be no less than 1 foot above the ground. In its horizontal "stow" mode (for high winds), each tracker would have a minimum ground clearance of 13 feet, 6 inches. Solar panels would be mounted on the surface of each tracker.

A solar resource and meteorological measurement station may be installed on the site to inform the Supervisory Control and Data Acquisition (SCADA) system as part of the overall Project monitoring and equipment operation.

The Project would include the construction of a 6,000-sf (60 feet X 100 feet) private on-site collector substation that would be located within the central portion of the Project site. The substation site would be located approximately 0.5 mile west of the O&M building on the Project site. The purpose of the substation is to collect the energy received from the overhead and underground collector system and increase the voltage from 34.5 to69 kV. Once the voltage is stepped up to 69 kV, the power would be conveyed through a 35-foot-high dead-end structure that terminates the gen-tie within the on-site collector substation with the Tule gen-tie.



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SOURCE: AECOM 2012; Soitec 2012; SanGIS 2012; Bing Maps

FIGURE 3

Rugged Solar - Site Plan

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Power from the Rugged facility's private on-site substation would be delivered to the 69 kV bus at SDG&E's proposed Rebuilt Boulevard Substation via the Tule gen-tie, as adopted by the Board of Supervisors on August 8, 2012. The 138 kV gen-tie for the Tule Wind Energy project includes a 69 kV undersling line, which will be used to service the Rugged solar farm. Rugged Solar LLC and Tule Wind LLC have a joint-use agreement in place for use of the gen-tie line, associated transmission towers, and access road.

In addition to the substation, an O&M building is located at the north-central portion of the Project site approximately 0.5 mile east of the on-site private substation. The O&M building would be used for storage, employee operations, and maintenance of equipment. The O&M facility would consist of a 7,500-sf building. The building would include administrative and operational offices and meeting facilities, material storage and equipment warehouse, and lavatory facilities served by a private on-site septic system and groundwater well. The building would be surrounded by a disintegrated granite improved parking area and parking spaces. The building and parking areas would include security lighting designed to minimize light pollution and preserve dark skies, while enhancing safety, security, and functionality.

1.1.3 Construction Fire Prevention

This FPP is applicable to the ongoing operation and maintenance of the Project. This FPP is not intended to apply to the construction phases of the Project. A separate "Construction Fire Prevention Plan" document shall be prepared, reviewed and approved by San Diego County Fire Authority (SDCFA) and CAL FIRE a minimum of 45 days prior to construction activities associated with this Project. The document will address fire prevention measures that will be employed during the construction phase, identifying potential sources of ignition and detailing the measures, equipment, and training that will be provided to all site contractors. Example Construction Fire Prevention Plans are available for previously entitled San Diego County energy projects and they can be easily adapted for this project.

1.1.4 Environmental Setting

Dudek conducted a site evaluation on July 22, 2012. Appendix B provides photographs of the site and adjacent landscapes. The site inspection included an evaluation of vegetation/fuels, topography, and existing infrastructure and documented existing off-site conditions, including adjacent fuel types, topographic conditions, and surrounding land use types. The site evaluation was also used to confirm necessary fire behavior modeling input data.

1.1.4.1 Topography

The project area features relatively flat to gently sloping hills and is located at an elevation ranging from approximately 3,500–3,670 feet amsl. The primary hydrologic feature within the project area is Tule Creek, which is essentially a subsurface (or near surface) riverine feature that daylights during rain events. Tule Creek bisects the entire project area and flows in a northwest to southeast orientation. The project area generally is within the Peninsular Range and has a warm, dry climate consistent with the San Diego, high desert-transition area. Average temperatures range from approximately 33– 94°Farehnehit (F) with an average rainfall of less than 15 inches per year (as measured from the Campo measuring station) (WRCC 2013).

The topography ranges from low hills to steep mountains. Large boulders and rock outcrops of granite, quartz diorite, gabbro, basalt, and other rock types cover greater than 50% of the total area of this soil type.

Post project, the site's topography will be altered such that land beneath and adjacent to the individual trackers and other site structures will be relatively flat. There will still be changes in

1.1.4.2 Vegetation

Based on Dudek's site visit, and substantiated by the project's Biological Technical Report, (Dudek 2012), there are 23 vegetation communities on site, as summarized in Table 1 and their distribution on the site is illustrated in Appendix C. As indicated below, Big Sagebrush Scrub, Montane Buckwheat Scrub, Granitic Chamise Chaparral, Semi-Dessert Chaparral, and Non-Native Grassland dominate much of the project site, totaling just under 66% of the landscape, and the presence of chaparral corresponds with dominant vegetation off-the site, which represents the fuels that would spread wildfire toward or away from the Project.

Table 1
Rugged Solar Farm Project Vegetation Communities

Habitat Types/Vegetation Communities	Existing Acreage	% Coverage
Big Sagebrush Scrub*	82.5	10.80%
disturbed Big Sagebrush Scrub*	14.8	1.94%
Montane Buckwheat Scrub*	83.0	10.86%
disturbed Montane Buckwheat Scrub*	9.7	1.27%
Granitic Chamise Chaparral*	117.8	15.41%
Granitic Northern Mixed Chaparral*	11.3	1.48%
Red Shank Chaparral *	42.3	5.54%
Scrub Oak Chaparral *	66.6	8.71%
disturbed Scrub Oak Chaparral*	0.5	0.07%

Table 1
Rugged Solar Farm Project Vegetation Communities

Habitat Types/Vegetation Communities	Existing Acreage	% Coverage
Semi-Desert Chaparral *	112.6	14.73%
Semi-Desert Chaparral – Rock*	12.4	1.62%
disturbed Semi-Desert Chaparral*	1.8	0.24%
Coast Live Oak Woodland*	7.2	0.94%
Mixed Oak Woodland*	3.3	0.43%
Alkali Meadow*	14.5	1.90%
Disturbed Alkali Meadow*	4.6	0.59%
Disturbed Mulefat Scrub*	1.2	0.16%
Tamarisk Scrub*	4.8	0.63%
Non-Vegetated Channel	1.0	0.13%
Open Water	0.2	0.03%
Disturbed Habitat	64.2	8.40%
Non-Native Grassland*	106.9	14.00%
Urban/Developed	1.0	0.13%
Total	764.1	100%

Big Sagebrush Scrub

Big sagebrush scrub is characterized as being a moderately open shrubland consisting predominantly (greater than 50% absolute cover) of big sagebrush (*Artemisia tridentata* ssp. *tridentata*). It often occurs in or adjacent to the floodplain in the sandy transition to chaparral. This scrub community is relatively common on site, although it occurs in smaller, distinct patches. Some areas mapped as big sagebrush scrub include California buckwheat (*Eriogonum fasciculatum* var. *polifolium*), but at less than 15% absolute cover.

Granitic Chamise Chaparral

According to Holland (1986), chamise chaparral is strongly dominated by chamise (*Adenostoma fasciculatum)* and is adapted to repeated fire by stump sprouting. The herb layer is usually very sparse (Holland 1986). On site, chamise was observed at approximately 50–75% absolute cover, with a sparse herb layer of annual forbs comprising 5–15% absolute cover. Other woody shrubs include Zaca Lake manzanita (*Arctostaphylos glandulosa* ssp. *zacaensi*s), point-leaf manzanita (*Arctostaphylos pungens*), and cupleaf ceanothus (*Ceanothus perplexans*), which collectively comprise less than 15% absolute cover. Disturbed granitic chamise chaparral was also mapped on the ranch in areas where shrub cover is approximately 30–50%, and the remainder of the area is dominated by non-native grasses and forbs.

Granitic Northern Mixed Chaparral

Granitic northern mixed chaparral consists of broad-leaved sclerophyll shrubs that range from 2–4 meters (7–13 feet) in height and that form dense stands dominated by chamise, red shank, manzanita, and ceanothus (*Ceanothus* spp.). This community occurs inland of southern mixed chaparral in San Diego County and is indicated by desert ceanothus (*Ceanothus greggii*) and other codominants (chamise, scrub oak (*Quercus berberidifolia*), and other oak hybrids). Granitic northern mixed chaparral is underlain by granitic soils.

In the project area, this community was further classified as closed or open to indicate shrub density. Perennial species common to this community include chamise, sugar bush (*Rhus ovata*), scrub oak, Muller oak (*Quercus cornelius-mulleri*), holly-leaf redberry (*Rhamnus ilicifolia*), mountain mahogany (*Cercocarpus betuloides* var. *betuloides*), and Mojave yucca (*Yucca schidigera*). Herbaceous species include San Diego gilia (*Gilia diegensis*), popcorn flower, sandy-soil suncup (*Camissonia strigulosa*), desert beauty (*Linanthus bellus*), Lemmon's linanthus (*Linanthus lemmonnii*), chia (*Salvia columbariae*), and goldfields. Disturbed granitic northern mixed chaparral was also mapped on the ranch in areas where shrub cover is approximately 30–50% and the remainder of the area is dominated by non-native grasses and forbs.

Red Shank Chaparral

Red shank chaparral is composed of nearly pure stands of red shank (*Adenostoma sparsifolium*) (Holland 1986). It is similar to chamise chaparral but is typically taller and somewhat more open (Holland 1986). On site, red shank chaparral intergrades with chamise chaparral (37200) and scrub oak chaparral (37900). Red shank comprises approximately 50–75% absolute cover, with scrub oak occasionally present at less than 15% absolute cover. Like chamise chaparral, the herb layer in red shank chaparral is sparse. This vegetation community was found throughout the site.

Semi-Desert Chaparral (37400)

On site, areas mapped as semi-desert chaparral are very diverse, but no *Juniperus* species were observed. Dominant species include chamise, point-leaf manzanita, California buckwheat, and cholla (*Cylindropuntia* spp.) usually at 5–15% absolute cover each. Associated species within semi-desert chaparral on site include the following at usually 1–5% cover each: cupleaf ceanothus, big sagebrush, our Lord's candle (*Yucca whipplei*), Muller oak (*Quercus cornelius-mulleri*), cholla, birch-leaf mountain mahogany (*Cercocarpus betuloides* var. *betuloides*), interior goldenbush, sugar bush. Bromes and red-stem filaree (*Erodium cicutarium*) also occur in these areas at usually 5–15% cover. Bare ground was observed at roughly 5–15% absolute cover. Disturbed semi-desert chaparral was also mapped on the ranch in areas where shrub

cover is approximately 30–50%, and the remainder of the area is dominated by non-native grasses and forbs.

Scrub Oak Chaparral

Scrub oak chaparral is a dense, evergreen chaparral up to 20 feet tall (Holland 1986). On site, scrub oak chaparral is dominated by scrub oak at between 50–75% absolute cover. Red shank is commonly associated with this vegetation community, but occurs at less than 15% absolute cover. The herb layer is similar to that of chamise and red shank chaparral communities. Disturbed scrub oak chaparral also mapped on the ranch in areas where shrub cover is approximately 30–50%, and the remainder of the area is dominated by non-native grasses and forbs.

Montane Buckwheat Scrub

Montane buckwheat scrub is characterized by a nearly monoculture community of flat-topped buckwheat found at higher elevations in San Diego County. On site, areas mapped as montane buckwheat scrub are almost exclusively dominated by California buckwheat, which occurs at approximately 25–50% absolute cover, and has a well-developed herb layer, composed of annual brome grasses at approximately 25–50% absolute cover.

Coast Live Oak Woodland

Coast live oak woodland is an evergreen woodland dominated by coast live oak (*Quercus agrifolia* var. *oxyadenia*). The understory is typically made up of grassland, scrub, or chaparral species, and the community often intergrades with coastal sage scrub or mixed chaparral (Holland 1986). On-site, coast live oak woodland is an open woodland, with generally less than 40% cover of coast live oak. The understory is dominated by non-native grasses and annual forbs (see non-native grassland).

Mixed Oak

Mixed oak woodland is not described by Holland (1986) but is listed by Oberbauer et al. (2008). On site, mixed oak woodland communities may include coast live oak, Palmer's oak (*Quercus palmeri*), Muller oak, and desert scrub oak. Total shrub and tree cover is less than 40% in this open woodland community. The understory is similar to that described for coast live oak woodland.

Alkali Meadow

Alkali meadow is a low-growing, dense or open association of grasses, sedges, and rushes on moist, alkaline soils. This community may intergrade with marsh communities in wetter settings or Great Basin scrub or non-native grassland in drier settings. On site, alkali meadow includes

Mexican rush (*Juncus mexicanus*), salt grass (*Distichlis spicata*), Mediterranean barley *(Hordeum marinum* ssp. *gussoneanum),* and seaside heliotrope (*Heliotropium curassavicum*). This community occurs in the floodplain of Tule Creek in the southern portion of the site.

Disturbed Mulefat Scrub

Mulefat scrub is an herbaceous riparian scrub dominated by mulefat (*Baccharis salicifolia*) that occurs along intermittent stream channels with generally coarse substrate and a moderate depth to the water table (Holland 1986). Frequent flooding and/or scouring apparently maintain this community in an early successional state. Disturbed mulefat scrub is mapped on site in the central portion of the site on Tule Creek where other wetland communities occur (i.e., alkali meadow and tamarisk scrub); it is mapped under the jurisdiction of U.S. Army Corps of Engineers (ACOE), Regional Water Quality Control Board (RWQCB), California Department of Fish and Wildlife (CDFW), and the County, and some polygons that are mapped under the jurisdiction of CDFW and the County only.

Tamarisk Scrub

According to Holland (1986), tamarisk scrub is a weedy, monoculture of any of several *Tamarix* species, usually supplanting native vegetation following a disturbance. This habitat is usually found in sandy or gravelly braided washes or intermittent streams. Common species according to Holland (1986) include narrowleaf willow (*Salix exigua*), salt grass (*Distichlis spicata*), and tamarisk (*Tamarix* sp.). Tamarisk often occupies jurisdictional wetlands. On site, tamarisk scrub is heavily invaded by tumble or Jim Hill mustard (*Sisymbrium altissimum*). Tamarisk scrub includes areas mapped under the jurisdiction of CDFW only.

Disturbed Southern Willow Scrub (63320)

Southern willow scrub has been described as a dense, broad-leafed, winter-deciduous riparian thicket dominated by several species of willow (*Salix* spp.). On site, there is a small patch of willows (*Salix lasiolepis*) growing near the proposed northern access road. It is not associated with any stream channels, and no hydrologic indicators were observed; therefore, it is not considered jurisdictional under federal, state, or local jurisdictions. It is disturbed with tamarisk.

Open Water

A small, on-site pond is mapped as open water. No streambeds or channels were mapped flowing into the pond, but there is a pipe outlet that apparently provides hydrology to the depressional area. It is presumed that this area is a historical upland area that artificially functions as a stock pond.

Non-Vegetated Channel

Non-vegetated channel refers to ephemeral stream channels that are barren or sparsely vegetated, but do exhibit an OHWM. The lack of vegetation may be due to the scouring effects of floods, or man-caused vegetation removal for flood control, access, sand mining, or other purposes. Non-vegetated channels are mapped in the northwestern project area under the jurisdiction of ACOE and RWQCB as non-wetland waters, and CDFW as streambed.

Non-Native Grassland

Non-native grasslands include a dense to sparse cover of annual grasses that die during the summer months, persisting as seeds. On-site, non-native grasslands include ripgut grass (*Bromus diandrus*), foxtail chess (*Bromus madritensis*), and Mediterranean barley and are heavily disturbed by long-term cattle grazing. Mediterranean barley is the dominant grass within the central portion of project area, proximate with Tule Creek, whereas the more upland sites support a mixture of grass species.

Disturbed Habitat

Disturbed land refers to areas that have been permanently altered by previous human activity that has eliminated all future biological value of the land for most species. The native or naturalized vegetation is no longer present, and the land lacks habitat value for sensitive wildlife, including potential raptor foraging. Disturbed habitat on site consists of graded pads and unpaved roads on the site. These roads are graded periodically, and no native vegetation remains. Disturbed habitat also includes highly disturbed areas in the central portions of the site that contain tumbleweed/Russian thistle (*Salsola tragus*) or Jim Hill mustard and red-stem filaree, which are exotic, invasive species, at greater than 75% cover.

Urban/Developed

Urban/developed areas on site consist of the buildings on the property, associated outbuildings, the surrounding yard and trees, and all paved roads on the property and adjacent to it. Some areas of ornamental plantings occur in this land cover, but no native vegetation remains.

The Project will include removal of most of the vegetation from the site and replacement with fuel modification areas comprised of consistent low growing, low fuel accumulation species.

1.1.4.3 Fuel Loads

The vegetation described above translates to fuel models used for fire behavior modeling, discussed in detail in Section 3 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 (leaf size, branching patterns), and overall fuel loading. For example, the native shrub species that compose the chaparral and coastal sage–chaparral scrub plant communities on site are considered to exhibit higher potential hazard based on such criteria.

Vegetation distribution on and adjacent this site is dominated by mixed and granitic chaparral. The importance of vegetative cover on fire suppression efforts is its role in affecting fire behavior. For example, while fires burning in chaparral fuel types may exhibit higher flame lengths than those burning grasslands, fire spread rates in grasslands are much more rapid than those in other chaparral fuel types. Fuel loads for the chaparral vegetation dominating the site is estimated to be 8.6 tons/acre. Other on-site fuels, including buckwheat and sagebrush vegetation types, have lower fuel loads, typically ranging from 4.0– 9.7 tons/acre. Off-site, adjacent fuels vary from disturbed in patches to the north, south, east and west as well as unbroken fuel beds in all directions that would represent the closest fuel sources once the site has been graded and the Project has been constructed.

1.1.4.4 Fire History

Regional fire history is an important component of a site-specific FPP. Fire history information can provide an understanding of fire frequency, fire type, most vulnerable project areas, and significant ignition sources, amongst others. Appendix D presents fire history for the Project vicinity. As presented, there have been several recorded wildfires in the vicinity of the project area. Fire history data was obtained from CAL FIRE's Fire and Resource Assessment Program (FRAP)[1] database. Based on recorded fire history for the area, 21 wildfires have burned within 2 miles of the Project site. The Project site has burned 4 times during the recorded fire history period, including un-named fires in 1944 and 1972, the 1974 Ribbonwood Fire, and the 1995 McCain Fire. Historic fires in the area are concentrated primarily in the In-Ko-Pah Mountains to the east and the Tecate Divide to the west, although some fire activity has occurred within the McCain Valley.

Based on an analysis of the fire history data within 3 miles of the Project site, the average interval between wildfires on was calculated at 3.4 years with intervals ranging between 0 (multiple fires in the same year) and 14 years. Based on this analysis, it is expected that the region would be subject to wildfire occurrence approximately every 3– 4 years, with the realistic possibility of shorter interval occurrences.

[1] CAL FIRE – Fire and Resource Assessment Program (http://frap.cdf.ca.gov/).

1.1.4.5 Climate

The Project is located in an area with seasonal fluctuations in temperatures and rainfall. During the wet winter months, the average daily high temperature is approximately 62.7° Fahrenheit (F) and the average daily low temperature is approximately 33.4°F. Average precipitation during this period ranges from 2.06–3.04 inches per month, with an average rainfall of 2.6 inches. During the dry summer months, the average daily high temperature is approximately 91°F and the average daily low temperature is approximately 50°F. Average precipitation during this period ranges from 0.06–0.51 inch, with an average of 0.30 inch per month. Average annual rainfall accumulation (October 1–September 30) is 14.82 inches per year (WRCC 2013).

The climate in the project area is typified by hot, dry summers and wet winters. Precipitation typically occurs between December and March. The prevailing wind is an onshore flow with fall winds (Santa Ana Winds) from the northeast that may gust to 50 miles per hour (mph) or higher. The project area's climate, as with that of Southern California, has a large influence on the fire risk as drying vegetation (fuel moisture for 1-hour fuels of less than 5% is possible) during the summer months becomes fuel available to advancing flames should an ignition be realized. Extreme conditions, used in fire modeling for this site, include 95°F temperatures in summer and wind gusts of 50 mph during the fall. Relative humidity of less than 10% is possible during fire season.

1.1.4.6 Current Land Use

The Project is located nearest the unincorporated community of Boulevard, approximately 50 miles southeast of downtown San Diego, 15 miles west of the San Diego/Imperial County line, 5 miles south of Interstate 8, and directly bordering the U.S./Mexico international border. Existing land uses in the study area consist of relatively large-lot modest rural residences and ranches interspersed with undeveloped, chaparral and boulder strewn lands. Public agency lands are also prevalent in the area as are tribal lands (for example, the Campo and Kummeyaay Indian Reservation are located approximately 3 miles west of the proposed project site and BLM managed lands associated with McCain Valley are located 1 mile north of the proposed project. Overall, development in the area is somewhat sparse due to the topography and density of local vegetation as well due to the remote location of the area. The local landscape is a mixture of large-lot rural residences, dirt access roads and undeveloped natural areas with dense vegetation, rolling to moderately steep terrain and rock outcroppings. The 500 kV Sunrise Power Link project is located between the eastern and central building blocks, which consists of lattice steel towers. The site has been previously disturbed for agricultural purposes and cattle grazing activities continue on site. The entire study area is fenced through locked gates and dirt roads that traverse the study area.

1.1.4.7 Proposed Land Use

The Project would include removal of existing vegetation and structures from the project site, grading to create flat pad areas and construction of solar facilities. The Project is planned to provide approximately 80 MW's of CPV generation to be constructed on the 765-acre site. The Project land use would include solar arrays, access roads, water tanks, overhead and underground electrical transmission lines, a perimeter chain link fence, and related infrastructure for a solar farm, as described herein.

2.0 DETERMINATION OF PROJECT 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 guidelines:

Would the project 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 Project sites 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 Project (Dudek and Hunt 2013). The Project would include non-combustible solar array construction, operation and maintenance structures, and related infrastructure. The site will be largely converted from readily ignited wildland chaparral fuels to ignition resistant facilities and equipment. The Project would not include full-time inhabitants, but would include increased human activity during construction and for ongoing Project operation and maintenance.

The types of potential ignition sources that currently exist in the area include vehicle and roadway, electrical transmission line, and machinery associated with rural residential, amongst others. The project would introduce potential ignition sources, but would also include conversion of ignitable fuels to lower flammability landscape, strategic fuel modification throughout the site, and include 24-hour surveillance, resulting in faster observation and reporting of fires. With the conversion of the site's fuels, the Project is expected to function as a fire break that results in reduced fire spread, flame lengths and fire intensity based on the lower fuel volume that will be maintained throughout the site. Fires from off site would not have continuous fuels across this site and would therefore be expected to burn around and/or over the site via spotting. Burning vegetation embers may land on Project structures, but are not likely to result in ignition based on ember decay rates and the types of non-combustible and ignition resistant materials that will be used on site. Ignition resistant materials of glass, steel, aluminum and decomposed granite will provide resistance to ignitions from embers. Understory fuels will be maintained at roughly 6 inches, and in special fuel management areas, there will be no vegetation. Should ignitions in the ground cover occur from embers, it is expected to produce a fast moving, but low intensity fire through the highly compartmentalized fuel modification areas beneath the CPV trackers. Each tracker would include a vegetation free area around its support pole.

The Project would comply with applicable fire codes and would include a layered fire protection system designed to current codes and inclusive of site-specific measures that will result in a Project that is less susceptible to wildfire than surrounding landscapes. Further, the facility will provide specific measures to reduce the likelihood of fire igniting on the site from necessary maintenance operations as well as measures to aid responding firefighters to the facility through direct site safety designs, apparatus and training methods. The inclusion of measures provided through fair-share funding to the SDCFA in the Project's Fire Services Agreement (apparatus, staffing, and structure defensibility – see PDF-PS-1) results in effective mitigation of potential fire impacts. On-site personnel would be able to temporarily remain on site during a wildfire and there will be no permanent, habitable structures where people would remain overnight. Therefore, the project will not expose people or structures to a significant risk of loss, injury or death involving wildland fires.

PDF-PS-1 To ensure that the Proposed Project would not impact fire and emergency response capabilities in the area, the each project will contribute the following equipment and funds towards local fire and emergency response capabilities per project:

- One Type VI Fire Engines for a total one-time estimated cost of $190,000; actual costs may be more at the time of the execution of the agreement.
- Annual funding towards one Type VI Fire Engine Replacement for a total cost of $19,000, with an annual escalator percentage to be determined.
- Annual funding towards one Type VI Fire Engine Maintenance Vehicle cost of $9,000, with an annual escalator percentage to be determined.
- Annual funding for one Paramedic staff, total annual cost of $30,000 with an annual escalator percentage to be determined.
- Annual funding of the San Diego County Fire Authority Defensible Space Grant Program, at $50/megawatt (MW) per final design of executed project. Additional projects would include additional contributions at $50/MW.

Would the project result in inadequate emergency access?

The Project includes fire access throughout the facility and is consistent with the Consolidated County Fire Code. Fire apparatus access to the habitable component of the project (O&M structure will be 20 feet wide and supportive of fire apparatus. All other site roads/driveways will be 12 feet wide, spaced 600 feet (300-foot hose pull distance to all site features) and will be passable by the anticipated Type VI and/or Type III engines that would

be responding to the facility. Fire access on the Project site will be improved from its current condition which provides only limited access on dirt/gravel roads. The on-site roadways are designed as looped access throughout the project and conformance with road surface, width, turning radius, and vertical clearance Code requirements for emergency access. On-site roadways also include 20-foot-wide perimeter access roads. Therefore, emergency access is considered adequate for this type of facility.

Would the project 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 Project is projected to add an estimated fewer than 1.6 calls per year to the Boulevard and CAL FIRE White Star Fire Stations. The addition of 1.6 calls/year to a rural fire station that currently responds to approximately 7–10 calls per week is considered insignificant and will not require the construction of additional Fire Station facilities based on that increase alone. However, the project will be part of a cumulative impact from several renewable energy projects in the area that combined could cause service level decline. As such, the Project will enter into a Fire Services Agreement, providing fair-share funding to be used to augment existing fire emergency response capabilities of the local Fire Response Resources and off-set cumulative impacts of the Project and other renewable energy projects that are expected to be built in the area. The funding will provide for apparatus and equipment as well as staffing enhancements, as selected by the area's fire authorities and as recommended by the area's Fire Resource Capability Report (Dudek & Hunt 2013). The result is maintained or enhanced fire service ratios and response times to the existing condition.

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

The project will be served by private well and sufficient water supplies will be available to serve the project from existing entitlements and resources. The Project will enhance existing wells and provide plumbing and on-site water storage tanks. The tanks will be placed strategically throughout the site and at the O&M building. The improved water situation on the site will provide enough water for O&M building functions, CPV tracker cleaning and maintenance and firefighting needs, with firefighting water reserved (not used for other purposes). Therefore, the Project does not require expanded entitlements.

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

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3.0 ANTICIPATED FIRE BEHAVIOR

3.1 Fire Behavior Modeling

Following field data collection efforts and available data analysis, fire behavior modeling was conducted to document the type and intensity of fire that would be expected on this site given characteristic site features such as topography, vegetation, and weather. Results are provided below and a more detailed presentation of the modeling inputs and results are provided in Appendix E.

3.1.1 Fire Behavior Modeling Inputs

Fire behavior modeling conducted in support of this FPP utilized the guidelines and standards presented by the County of San Diego, Department of Planning and Land Use (San Diego County 2010). These guidelines identify acceptable fire weather inputs for extreme 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.

To evaluate potential fire behavior for the solar farm, Dudek utilized the BehavePlus (v. 5.0.5) fire behavior modeling software package to determine fuel moisture values and expected fire behavior for the site. The temperature, relative humidity, and wind speed data for the Desert weather zone (SANGIS 2013) were utilized for this FPP based on the project location. Reference fuel moistures were calculated in BehavePlus and were based on site-specific topographic data inputs. Fire behavior for the site was calculated using worst-case fuels, topography, and weather and included an assessment of potential fire burning cross-slope (5% slope) in chaparral fuel beds (Fuel Model SH5) with Summer (18 mph), Santa Ana (24 mph), and Peak (56 mph) sustained wind speeds. Tables 2 and 3 summarize the fire behavior model inputs utilized for this FPP.

Table 2
BehavePlus Fine Dead Fuel Moisture Calculation

Variable	Value
Dry Bulb Temperature	90 -109 deg. F
Relative Humidity	5 - 9 %
Reference Fuel Moisture	1 %
Month	Feb Mar Apr Aug Sep Oct
Time of Day	16:00 - 17:59
Elevation Difference	Level (within 1,000 ft.)
Slope	0 - 30%

Table 2
BehavePlus Fine Dead Fuel Moisture Calculation

Variable	Value
Aspect	West
Fuel Shading	Exposed (< 50% shading)
Fuel Moisture Correction	2 %
Fine Dead Fuel Moisture	3 %

Table 3
BehavePlus Fire Behavior Modeling Inputs

Variables	Scenario 1 (Santa Ana)	Scenario 2 (On-shore)
Fuel Model	SH5	SH5
1h Moisture	3%	3%
10h Moisture	4%	4%
100h Moisture	5%	5%
Live Herbaceous Moisture	30%	30%
Live Woody Moisture	60%	60%
20-foot Wind Speed (upslope)	24, 56*	18
Wind Adjustment Factor	0.4	0.5
Slope Steepness	5%	5%

*includes Santa Ana (24 mph) and peak (56 mph) sustained wind speeds

3.1.2 Fire Behavior Modeling Results

Three fire behavior variables were selected as outputs from the BehavePlus analysis conducted for the project site, 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, 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 results of fire behavior modeling efforts are presented in Table 4. A graphical illustration is displayed in Figure 4.

Table 4
BehavePlus Fire Behavior Modeling Results

Fire Behavior Variable	Summer (18 mph Winds)	Santa Ana (24 mph Winds)	Peak (56 mph Winds)
Flame Length (feet)	25.0	29.2	46.2
Fireline Intensity (Btu/feet/s)	6,210	8,690	23,567
Surface Rate of Spread (mph)	2.2	3.1	8.5

As presented, wildfire behavior in chaparral fuel beds on and adjacent the Project is expected to be of moderate to high intensity during extreme, Santa Ana weather conditions with maximum sustained wind speeds of 56 mph and low fuel moistures. Chaparral fuels are predominant on site and in the area immediately surrounding the project site, which would be the fuels affecting the constructed Project. Based on the observed fuel beds east and west of the project site, a relatively high-intensity fire can be expected during extreme weather conditions, with flame lengths reaching approximately 46 feet and peak intensity of over 23,000 Btu/ft/s.

This type of fire would be relatively short-duration as vegetative fuels are consumed rapidly. As such, there would not be a sustained source of heat and or flame associated with site-adjacent wildland fuels. Further, the solar farm site's fuels would be converted and reduced to ground cover on most of the Project area. The post-project fuel modification areas would provide a significant reduction in the potential for fire ignition as well as the flame length, spread rate, and intensity of fires should ignition occur. The solar farm site may be compared to a large fuel break once completed. Adjacent native and undisturbed fuels would readily carry fire, especially during portions of the year where vegetation moisture content falls and warm temperatures, low humidity and high winds become common. The site will be largely free of combustible vegetation with only a ground cover of maintained vegetation adjacent and beneath the solar trackers. Flying embers from off-site fire may inundate the Project area during wind-driven fire events. The modified fuel areas and construction type and materials for all project features will resist ignition from ember showers. Ignition of the ground cover could result in a fast moving, but lower intensity fire that burns in a patchy manner on the site due to the highly compartmentalized fuel modification areas beneath the CPV trackers.

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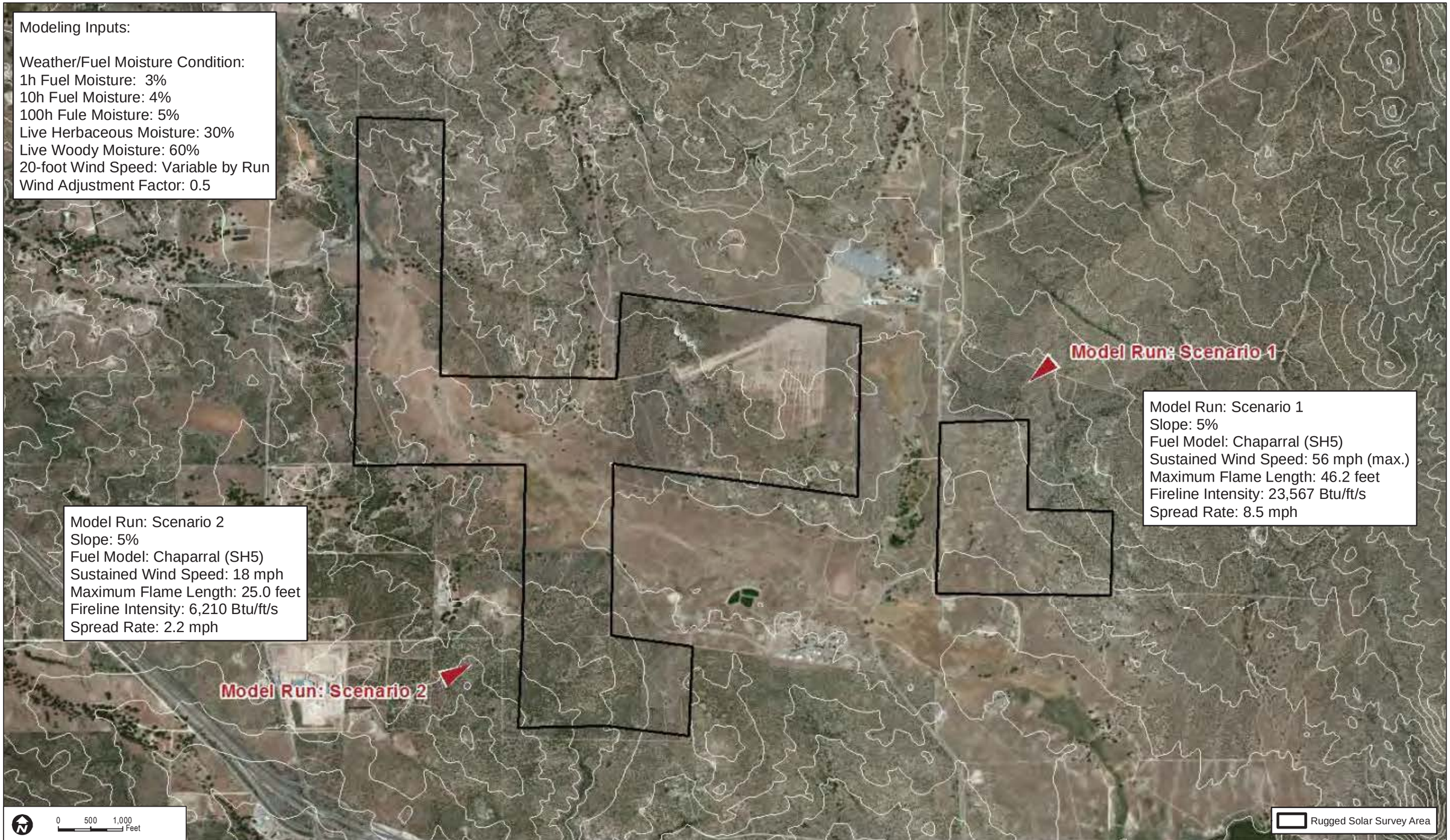

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SOURCE: Soitec 2012; SanGIS 2012; Bing Maps

FIGURE 4

Rugged Solar - BehavePlus Analysis Map

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FIRE PROTECTION PLAN - RUGGED SOLAR

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4.0 ANALYSIS OF PROJECT EFFECTS

4.1 Adequate Emergency Services

4.1.1 Emergency Response

The project site is located within San Diego County Fire Authority jurisdiction and State Responsibility Area (SRA) lands provided primary wildland fire protection by SDCFA and CAL FIRE. The Boulevard Volunteer Fire Station, staffed 24/7 with volunteer (stipend) firefighters would provide initial response. The CAL FIRE Whitestar Station (Station 28) is also nearby and would respond with additional resources. The Boulevard Station is between 2 and 6 miles from the most remote areas of the project, depending on which of the Project areas are involved. Travel time would to these areas is approximately 2.6 and 10.3 minutes, well within the County General Plan's allowable 20+ minutes for this area's zoning.

The White Star station is located at 1684 Tierra Del Sol Road in Boulevard and it is approximately 5–7 miles from the Project's most remote areas. These distances correspond with an approximate 8.6–12-minute travel time. It is a full-time station staffed 24/7 by career firefighters and paid volunteers, through 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 White Star station is wildfire protection. 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 provided in Appendix F.

The San Diego County Fire Authority is initiating the process to construct a new fire station near the existing Boulevard station and co-locate at that station with CAL FIRE. It is not known when that station will be operational, but it will provide additional firefighting resources within a short distance to the Project. In addition to these responding fire stations, 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 (FPD), County Service Areas (CSA) 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 project area, fire services generally consist of volunteer departments that operate on a seasonal staffing basis. Additional departments and agencies providing fire services in the project area are as follows:

- **Boulevard Volunteer Fire and Rescue Department**. Located at 39223 Highway 94 in Boulevard, the Boulevard Volunteer Fire and Rescue Department is an all-volunteer fire department that protects an approximately 99-square-mile area in eastern San Diego County. The Department has approximately 27 volunteers consisting of fire fighters, officers, and probationary employees. The Department provides services including firefighting, hazardous material response, advanced life support medical service, vehicle extrication, and search and rescue (Boulevard Volunteer Fire and Rescue Department 2013). The Department's operations are now financed by SDCFA CSA 135 (CSA 111 that formally included this area has been formally dissolved)
- **San Diego Rural Fire Protection District**. With 14 stations and a service area of 720 miles, the San Diego Rural Fire Protection District (SDRFPD) also maintains a presence in eastern San Diego. Two SDRFPD stations are located in the vicinity of the proposed project: the Jacumba Station (1255 Jacumba Street), located approximately 8 miles east of the proposed project, and the Lake Morena Station (29690 Oak Drive), located approximately 12 miles northwest of the proposed project. The Jacumba station is an all-volunteer fire station, while the Lake Morena station is staffed 24 hours a day, 7 days a week, with paid firefighters (SDRFPD 2013).
- **California Department of Forestry and Fire Protection (CAL FIRE).** 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 the San Diego Rural Fire Protection District. CAL FIRE responds to wildland fires, structure fires, floods, hazardous material spills, swift water rescues, civil disturbances, earthquakes, and medical emergencies. CAL FIRE operates the CAL FIRE Whitestar Facility at 1684 Tierra Del Sol Road, located approximately two and three quarter's miles north of the proposed project (CAL FIRE 2011). CAL FIRE, in association with the California Department of Corrections and Rehabilitation, also jointly manages McCain Valley Camp (a prison 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 6 miles north of the proposed project (CAL FIRE 2011).

4.1.1.1 Emergency Service Level

Using San Diego County fire agencies' estimate of 82 annual calls per 1,000 population, the project's estimated maximum ongoing 20 on-site personnel (there will be some variation throughout the year with a higher number of persons during the construction phases), would generate up to 1.6 calls per year (less than 0.16 call per month), most of which would be expected to be medical-related. These estimates are likely overly conservative due to the fact that there will not be staff on site during nighttime hours and County statistics represent calls from dense urban areas where medical related calls are much higher than would be anticipated from the Project.

Service level requirements are not expected to be significantly impacted with the increase of less than 2 calls per year for a station (Boulevard Fire Station) that currently responds to fewer than 2 calls per day in its primary service area. 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. Rural stations with volunteers are likely considered busy at a lower number than 10. Therefore, the project is not expected to cause a decline in the emergency response times.

Response to the project from nearby fire stations will be within the acceptable time frame as designated in the County General Plan. The Project site is within the Boulevard Subregional Planning Area, Mountain Empire Subregional Plan of San Diego County's General Plan; the land use category Rural Lands (RL-80) Development Area. Based on this category, maximum travel time is greater than 20 minutes. Response from Boulevard Fire Department is calculated at less than 11 minutes. Therefore, the project complies with the General Plan for response travel time. The Project would construct a facility that is very different from the residential units that could be constructed on the site. The intent of the 20 minute travel time is that very-low rural densities mitigates the risk associated with wildfires by reducing the number of people potentially exposed to wildfire hazard. The Project would include roughly five persons, roughly the same as two dwelling unit populations, on the entire 474 acre site. Therefore, the Project meets the intent of the RL80 land use category, even though it has a more aggressive footprint than would the allowable rural land use designation.

4.1.1.2 Response Personnel Training

Studies (Grant 2010) indicate that solar facility fire data is lacking, but it is clear that electrical fires occur relatively regularly and solar component fires can and do occur, although at much lower levels and typically related to roof-top solar arrays, at least to date. The same studies evaluated what measures provide the best results for improving response capabilities and firefighter safety. Among 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, this FPP requires the Project to implement the following measures:

- Conduct training sessions with local fire station personnel
- Create a customized video training CD with SDCFA and CAL FIRE input that will 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 Project

4.2 Fire Access

4.2.1 Fire and Maintenance Access Roads for Solar Facility

Under provisions of a separate Major Use Permit (MUP), Rough Acres Ranch Road will be constructed from McCain Valley Road to Ribbonwood Road, it will be improved with asphalt concrete pavement to a width of 28 feet and graded to a width of 32 feet.

Primary access to the site varies by the portion of the Project being accessed. The easternmost Project area as well as the O&M building is accessed directly off McCain Valley Road, which is 26 feet wide, paved surface over 30 feet clear. McCain Valley Road trends north-south on the east side of the Project. To the south, it connects directly to Interstate 8 and with Old Highway 80 just south of I-8 where McCain Valley Road terminates. To the north, McCain Valley Road becomes less improved before terminating within a remote area. Access to the westernmost Project areas is provided off of Ribbonwood Road via Roadrunner Lane and a driveway to the north of Roadrunner Road. Ribbonwood Road trends north-south on the west side of the Project. To the south it connects directly with Interstate 8, and south of that, becomes SR-94/Jewel Valley Road. All access ways would be controlled by a security gate at the perimeter fence-line of the Project.

There are five total vehicular access gates leading into the project. Secondary access is provided for the primary cluster of solar trackers. The easternmost cluster of trackers includes one ingress/egress. Secondary access is required for development projects that include an increase in the number of people beyond a threshold that could impact the ability to evacuate those people while providing suitable ingress for emergency personnel. This project will include fewer than 10 people on site at any given time and will include no overnight accommodations, so no staff will be sleeping at the site.

There are two different types of roads for the project that will be improved to different standards: fire access roads and driveways. All roads designated for fire access, including the driveways, will include design to support imposed loads of 50,000 pounds and all other drivable surfaces will be treated with a permeable nontoxic soil binding agent in order to reduce fugitive dust and to reduce erosion. Figure 3 provides detailed road locations.

Fire Access Roads (Fire): The on-site Fire Access Roads would be constructed to a minimum width of 20 feet improved designed, constructed, and maintained to support the imposed loads of fire apparatus (not less than 50,000 lbs.) and would be provided with an approved surface so as to provide all-weather driving capabilities. An access controlled gate would be installed at the substation driveway which would be constructed off an improved existing roadway with direct access to McCain Valley Road.

These roads occur to the O&M structure and traverse the perimeter of the Project, except where environmental constraints occur. In these areas, a special fuel management area (no vegetation, landscape fabric covered with drivable rock) is provided.

North-south Driveways: Driveways will include 12 feet wide improved surfaces designed, constructed, and maintained to support the imposed load of fire apparatus (not less than 50,000 lbs.). Driveways will be provided such that all site appliances (tracker panels, inverters, and other non-habitable features) are within 300 feet of a driveway. This results in a 600 foot spacing interval for most driveways on the Rugged Solar project site.

Service Roads: Graded dirt service roads will occur throughout the site along the west side of the rows of trackers except where there would be an access road or driveway that would facilitate access to trackers and inverters. Service roads will be capable of supporting typical maintenance vehicles and some types of fire apparatus (such as Type VI engines). These roads will be treated with a soil binding agent designed to minimize degradation of surface over time. Service roads would be clearly marked to indicate that they will not support imposed loads of 50,000 pounds, as appropriate.

Deadends

Road distance thresholds specified under Section 503.1.3 of the Consolidated Fire Code restrict maximum dead end road lengths for varying parcel size. The project is zoned RL80 with a minimum allowable parcel size of 80 acres. Parcels of this size are allowed a maximum dead-end road length of 5,280 feet according to Section 503.1.3. The distance from the site entrance where there exists the opportunity to egress in two separate directions, to the most remote portion of the Project is less than 5,280 feet. Additionally, the Project's circulatory driveways/roadways will

include numerous opportunities for fire engine turn-around, thus meeting Code requirements. Further, the intent of the dead end road length requirements is for evacuation of civilians from a wildfire emergency as well as fire department access. The Project includes very low numbers of on-site staff (roughly 5) so that evacuation during an emergency would not impede fire access. The distance from the site access to the O&M building, where staff would spend the majority of their time, is roughly 1,200 linear feet along a 20-foot-wide roadway that includes gated access to the north and south (Figure 3).

Vertical clearance

Minimum vertical clearance of 13 feet 6 inches will be maintained for most of the Project's Fire Access Roads driving surface when CPV trackers are in the "safe" horizontal position. There may be CPV tracker positions where 11 feet is the maximum that can be achieved, including in areas with elevation changes and sloped roadways. However, in these areas there is enough room on the drivable portion of the roadway that engine clearance will not be impeded and the CPV trackers can be placed in vertical mode, resulting in unimpeded vertical access along roadways.

Grade

Road grades will not exceed 10%, complying with the Consolidated Fire Code for the proposed decomposed granite aggregate road surface.

Surface

All internal fire access road surfaces and driveways will be improved all-weather surfaces capable of supporting travel by minimum 50,000-pound apparatus.

Gates

The gate at the entrance to this project shall be equipped with an approved emergency key-operated switch overriding all function commands and opening the gate. The gate has a measured opening of 26 feet and will be installed in compliance with Section 503.5 and 503.6 of the CCFC and to the satisfaction of the Director of Public Works. The site will be completely fenced with a chain link and barbed wire fence. Gates on all other access roads will be provided chain link with fire-accessible padlock.

Pedestrian gates will be provided on each side (north, south, east and west) of the project's perimeter fence at spacing acceptable to the fire authority, and proposed at 750 feet intervals. Pedestrian gates will include chain-link and fire accessible padlocks.

4.2.2 Identification

Identification of roads and structures will comply with CCFC, Section 505 and Section. Additionally, an illuminated sign at the Project entrance will be provided that clearly indicates inverter and electrical grid layout, CPV Tracker "safe" mode switch location and entire site de-energizing disconnect switch identification and location. Lighting for the sign will be provided by a motion sensor-activation so the light is not on all night, every night. Additionally, the sign lettering will be reflective and the sign locate where vehicle headlights may provide adequate illumination.

4.3 Water

Once the project is operational, typical water usage will include CPV tracker washing, soil binding agent applications, and O&M building personnel usage. Table 5 provides details regarding the Project's estimated water usage:

Table 5
Total Estimated Water Use for Project Operation

Dust Suppression *(if required)*	
Number of gallons/acre[1]	3,300
Acres[2]	254
Water use/year (gallons)	838,200 (2.57) [3]
Panel Washing	
Washes/year	9
Number of trackers	3,588
Gallons/tracker/wash (maximum)	24
Total water use/year (gallons)	775,008 (2.38)
Total Potable Water Usage	
Amount of Potable Water usage per year [4]	125,664 (0.38)

1 Based on application of nontoxic permeable soil binding agent 3,300 gallons per acre annually.
2 Based on constructed degraded granite surfaces within the project site consisting of O&M building areas, substation, and fire and service roads.
3 One acre-foot = 325,851 gallons
4 Average monthly water usage is 10,472 gallons, according to the City of San Diego (2012). In addition to the water required for use by the facility, water must be available in conformance with Sec. 507.2.2 of the County of San Diego Consolidated Fire Code – Type of Water Supply, Table 507.2.2 Water Tank Requirements for firefighting purposes.

Project water will be stored in aboveground metal tanks complying with the requirements of the SDCFA. The tank installation, including all notes on the standard drawing, will be complied with (Appendix A). In addition the tanks shall comply with NFPA 22, Private Fire Protection Water

Tanks. The water capacity of each tank shall be 10,000– 20,000 gallons, which is up to twice the maximum required by the CCFC standard.

The capacity of the water tanks at the facility will be based upon the demand for the fire sprinkler system for the O&M building (estimated to be less than 20,000 gallons for a 40 minute supply to a rural non-residence structure per CCFC, Table 903.3.2), plus hand lines, plus a reasonable allocation for water supply for Fire Engines to generate firefighting foam for 15 minutes at an application density of 0.16 gpm/square foot from a hose line using a 3% 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 substation, transformer secondary containment, and O&M building, and distance of the O&M building from transformers. The actual size/quantity of the water tanks will be determined by the fire sprinkler contractor and the appropriate agencies, at time of detailed system design. These tanks will need to be on an elevated plane or have an approved pump for fire sprinkler supply. A procedure for ongoing inspection, maintenance and filling of tanks will be in place. The Project will provide up to two 20,000 gallon tanks at the O&M building and up to three additional 10,000 gallon tanks strategically placed throughout the Project site (Appendix G).

The tank and fire engine connection shall be located on the side of the fire access road(s). The width of the road at the water tank locations shall be at least 18 feet (travel width) plus an additional 10 foot width, for a distance of 50 feet, to allow for fire engine to park and connect to the tank, while leaving the road open. Tanks shall be labeled “Fire Water: (10,000 or 20,000) gallons using reflective paint.

Final location of the tanks will be approved by the FAHJ based on a tank location drawing to be submitted by the Project applicant. Drawings shall show tank location, road, and shall include the tank standard drawing and notes.

4.4 Ignition-Resistant Construction and Fire Protection Systems

Operations and Maintenance Building

The facility will not include residential development. A 7,500 square foot O&M building will be constructed on site. Other structures include inverter structures (appliances), water tanks, and substation control room. All structures will be of non-combustible construction or will comply with the ignition-resistive construction requirements: Wildland-Urban Interface areas of Chapter 7A of the County Building Code.

The O&M facility is the only new structure proposed that will include staff during business hours. The O&M building will include construction that provides fire prevention and protection. The facility construction, including walls, penetrations through walls, doors, vents, roof, glazing and any skylights, will comply with the County Building Code (CBC) Wildland Urban Interface construction standards in Section 92.1.704, and Chapter 7-A of the CBC, and the CFC.

The O&M structure will include a National Fire Protection Association (NFPA) 13 Automatic Fire Sprinkler System. The Fire Sprinkler system will be supervised by an off-site 24/7 alarm monitoring company. Supervision to a SDCFA approved remote alarm monitoring company may be required based on number of sprinkler heads. Twenty heads requires electrical supervision of all valves in system, pumps, water tank level, etc. CFC Section 903.4.

The O&M building will be located in the eastern portion of the tracker grouping just west of McCain Valley Road. The building will be amongst tracker rows with 100 feet of setback (50 feet no vegetation, rock surface for parking, and 50 feet of 6-inch high, maintained fuels. Various occupancies in the building, as classified by the CBC, will have the required fire separations and will comply with the CFC and CBC for the type of occupancy and activities therein; for example, storage, or maintenance shop.

The SCADA monitoring system will have an emergency power source at the O&M building, in addition to 24/7 monitoring at an off-site location. Both on-site staff and off-site staff will have the emergency contact information for the fire agencies, and will coordinate to make sure that the fire agencies will be called in the event of a fire or medical emergency.

The building will have smoke detectors, which are supervised and activate an alarm on exterior of building, and are supervised to an off-site location. Alarms may not be transmitted to the off-site 24/7 alarm monitoring company, so as to avoid false calls to 911 resulting in an unnecessary response.

The building will have a KNOX key box on exterior by main door for use by firefighters.

Substation

A 2-acre on-site private collector substation site with a pad area of 6000 sf (60 feet by 100 feet) with maximum height of 35 feet and includes a 450 sf (15 feet by 30 feet) control house. The substation control room will be of non-combustible construction. Substation transformers will utilize fire walls for exposure protection and will have secondary containment to control any oil that could be released. The size of the containment must be adequate to contain the total amount of oil plus firefighting water for 15 minutes. NFPA 850 recommends 10 minutes however, per NFPA 11, foam delivery from hand lines assumes an

application time frame of 15 minutes. Firefighting foam concentrate will be stored at the O&M building for use by firefighters. Typically a 3% Aqueous Film Forming Foam (AFFF) concentrate is used, and the application rate is 0.16 gpm/sq. ft. for 15 minutes from a firefighter hose line. In concept, the needed gpm flow rate for the hose lines is 250 gpm. This is subject to detailed design and size of the containment.

As an additional fire protection measure, portable carbon dioxide (CO2) fire extinguishers will be mounted at the inverter enclosures and medium voltage transformer units throughout the site.

4.5 Defensible Space and Vegetation Management

The Project will be provided defensible space by setting back all CPV trackers a minimum 50-feet from property boundaries and modifying the natural fuels by removing and replacing the landscape plantings with a mix of low growing ground cover plants or, in the case of perimeter areas, drivable surfaces and vegetation free areas.

The site's structures, including the O&M Building, inverter appliances and control room at the substation site will include minimum 100 feet wide Fuel Management Zones in all directions. The entire site will include modified fuels with fire access roadways and service roads compartmentalizing the low-growing (less than 6-inch) planted areas beneath all CPV solar trackers. No off-site clearing is required or authorized, as required fuel modification can be accommodated on site.

Combustible vegetation within the Project area shall be limited to approved species and shall be maintained at a height of no more than 6 inches. None of the plants on the prohibited plant list (Appendix H) shall be allowed on site.

Special Fuel Management Areas will include removal of vegetation, placement of landscape fabric and rock topping to prohibit vegetation growth. These areas will be maintained free of vegetation and are provided in distinct locations, as described below.

Prescribed Defensible Space (site-wide fuel management zones) will be maintained on at least an annual basis or more often, as needed, by the applicant or current Project owner. Planting used in the defensible space will consist of low-growing ground cover selected from the SDCFA desirable plant list. The planting list and spacing will be reviewed and approved by the SDCFA Fire Marshal and included on submitted Landscape Plans.

4.5.1 Fuel Modification

Project fuel modification will include one zone (opposed to multiple zones) that consists of non-irrigated, low growing ground cover. Because this site will utilize non-combustible construction and one habitable structure (O&M building), the proposed fuel modification

areas will provide adequate setback for the potential short duration wildfire that may be realized in the adjacent wildland fuels.

A 50 feet wide fuel modification area (cleared area with special fuel modification prohibiting plant growth of 18 feet outside perimeter fence and 20 feet perimeter road inside fence with 12 feet of cleared, vegetation free area) will be provided at the perimeter of the project between the solar trackers and the off-site wildland fuels. The worst-case predicted flame lengths are roughly 46 feet. A rule of thumb standard for residential development is a minimum of two times the flame lengths for structure setback. The O&M structure, inverter structures, and substation area on this site are interior, from 200 (O&M building) to more than 1,000 feet (Substation and most inverters) set back from off-site fuels. The outermost rows of CPV trackers could be exposed to short-duration wildfire, but would not be expected to include consistent, focused heat exposure from the off-site vegetative fuels. Damage to the perimeter trackers is not expected, and they are not considered likely to continue fire spread.

4.5.1.1 Fuel Modification Requirements

The following recommendations are provided for fuel modification, which are proposed to occur throughout the site from perimeter fence to interior preserve area boundaries, including beneath all solar arrays. There would be no fuel modification zone markers in the field except at the interior environmental "no-impact" areas (Appendix H), as the remainder of the site would be maintained to the same level. These environmentally sensitive areas will be undeveloped and include either wetlands, oak trees or both.

Site Wide Low-Flammability Zone

Fuel modification is applicable site wide outside of the on-site preserve areas (Appendix H). As such, the existing vegetation will be removed and the site will be replanted with low-growing, desirable ground cover. The following specifications apply to the fuel modification area:

- Non-combustible surface (pavement, concrete, decomposed granite, etc.) is acceptable, or:
- Cleared of all existing native vegetation and replanted with drought tolerant native or low flammability species. This area will be maintained to 6 inches or less.
- Ground cover, less than 6 inches high
- Removal of all dead, dying, and dried (low fuel moisture) vegetation
- Refer to Appendix I customized fuel modification plant list for potential plants that may be suitable for the site-wide low-flammability zone

- Refer to Appendix H for Prohibited Plants that will not be allowed on site. Trees are not recommended on the site or its perimeter other than the existing native oak trees that will be provided preservation
- 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.

Special Fuel Management Areas

Special fuel management areas will include clearance of all vegetation, placement of landscape fabric to inhibit the growth of vegetation, then topped with a rock material. The amount of special fuel management area provided varies with the application, as follows:

1. Tracker Pole Base – a 36-inch circular area around the base of tracker poles will be provided with special fuel management.
2. Inverters – where inverters are not positioned along an internal fire access road or driveway, they will be provided with a 10 feet wide special fuel management area on all sides
3. Perimeter area outside fence – an 18 feet wide area outside the perimeter fence will be cleared and provided with landscape fabric and topped with rock material.
4. In some perimeter locations where perimeter fire access cannot be provided to within 300 feet from the outermost row of trackers (primarily based on road layout constraints on odd shaped sites and environmental constraints), the perimeter special fuel management area will be extended from the perimeter fence to the fire roadway.

4.5.1.2 Other Vegetation Management

Electrical Transmission Line Vegetation Management

In addition to the Project site fuel modification requirements, the selected interconnection transmission line will require standard vegetation clearance at the off-site locations. 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, 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 project);
- 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 § 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 § 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 0–8 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.

Pre-Construction Vegetation Management

Since the Project will be constructed in multiple phases:

- Fuel reduction work must be completed on the first phase and a minimum 50 feet of fuel reduction on the adjacent succeeding phases must be completed before commencement of construction.
- Fuel modification must be maintained on the perimeter and throughout Phase 1, including areas on succeeding Phases that are necessary for achievement of the 50 feet of modified fuels on Phase 1's perimeter CVP trackers and inverters.
- Fuel modification of 100 feet must be provided around all structures built during Phase 1 including O&M building, inverters, and substation/control room.

Environmentally Sensitive Areas/Riparian Area

Fuel modification within several environmentally sensitive areas associated with wetlands and oak trees is not required. These preserved areas are provided a minimum 50 feet fuel modification zone setback between this environmentally sensitive area and the closest solar tracker or other site feature.

Undesirable Plants

Certain plants are considered to be undesirable 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 H) are unacceptable from a fire safety standpoint, and shall not be planted on the site. The area retained outside of the Project footprint

in the western portion of the project that includes terrain not desirable for grading includes non-native pine and eucalyptus trees as well as undesirable native plant species. These trees and flammable plants shall be removed and any subsequent sprouting or volunteering of trees or undesirable plant materials will be removed on an annual basis.

4.5.1.3 Fuel Modification Area Vegetation Maintenance

All fuel modification area vegetation management shall be completed annually by May 15 of each year and more often as needed for fire safety, as determined by the SDCFA. Project applicant or current owner shall be responsible for all vegetation management throughout the facility and Project site, in compliance with the requirements detailed herein. The Project applicant or current owner 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 Project site.

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

As a further means of ensuring the fuel modification area is maintained per this FPP, the Project owner shall obtain an inspection and report from a SDCFA-authorized Wildland Fire Safety Inspector by June 1st of each year, certifying that vegetation management activities throughout the project site have been performed pursuant to this plan. This effort further ensures vegetation maintenance and compliance with no impact on the SDCFA.

4.6 Cumulative Impact Analysis

This and other projects may have a cumulative impact on the ability of local agencies to protect residents from wildfires. This project and other development in the area will increase the population and/or activities and ignition sources in the Boulevard 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 Project and its proposed Solar Trackers along with substantial other solar and/or wind projects in the greater Boulevard 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 Project, the project contributes to the cumulative impact on fire services, when considered with

other anticipated projects in the area. The cumulative impact results in a situation where response capabilities may erode and service levels may decline. In response, the Project has developed a fire services agreement that results in significant funding to be used toward firefighting and emergency medical response augments, improvements, and additions so that the SDCFA and area firefighting agencies will be able to perform their mission into the future at levels consistent with the General Plan. A Fire Service Agreement will be entered into with SDCFA and will provide for funding on a MW basis to be used for Type VI fire engine acquisition and operation, establishment of a paramedic assessment engine company on an existing area fire engine (either Pine Valley or Lake Moreno), and annual funding for homeowner assistance through a fuel modification grant program managed by SDCFA. The requirements described in this FPP, including ignition-resistive construction, fire protection systems, pre-planning, education and training, and fuel modification/vegetation management, are designed to aid firefighting personnel such that the Project is defensible and on-site personnel are protected and impacts to the fire authority are mitigated.

5.0 MITIGATION MEASURES AND DESIGN CONSIDERATIONS

As presented in this FPP, the proposed Project provides customized measures that address the identified potential fire hazards on the site. The measures are independently established, but will work together to result in reduced fire threat and heightened fire protection. Appendix G provides a Fire Safety Site Plan indicating the locations of important site safety features including roads, water tanks, inverters, and fuel modification areas. The provided measures include both required and Project-volunteered items, as follows:

1. Fuel Modification throughout the Project site from boundaries inward, including beneath CPV trackers with restrictions on plant species, heights, densities, and locations. Implementation of vegetation management standards for electrical transmission line/interconnect to Boulevard substation.
2. Special Fuel Management Areas will augment the site's fuel modification by creating areas void of vegetation, such as cleared areas outside the perimeter fence, areas where perimeter roads are inside the outer tracker rows, around tracker poles (36 inches), and around inverters (10 feet). These areas will be treated with placement of landscape fabric topped with rock material and provided ongoing maintenance to exclude vegetation growth.
3. 20-foot-wide perimeter fire apparatus access road and primary access to O&M structure; 12-foot-wide driveways within 300 feet of all other on-site appliances (inverters, trackers, etc.), turnouts/turnarounds along 12-foot-wide roads at inverters and every 600 feet if no inverter. Special fuel management areas where perimeter road cannot be provided due to terrain or environmental constraints.
4. Participation in a Fire Service Agreement for funding firefighting resources on a MW basis. Funding will provide for a Type VI fire engine, funding for a paramedic on one of the area's engines (either Pine Valley or Lake Moreno), and for annual funding of $50/MW to a focused homeowner fuel modification grant program managed by SDCFA.
5. Project funded annual fuel modification inspections to ensure compliance with this FPP.
6. Motion sensor illuminated (and/or reflective) signage at entrance with inverter and electrical grid disconnect and isolation information and identification.
7. Ability of first responders to put the trackers in the horizontal stow "safe" position by flipping a switch/switches (located at the main gate near the directory), which will provide the greatest clearance from ground level to the tracker assembly of a minimum of 11 feet for some CPV trackers and 13 feet 6 inches for most CPV trackers of overhead clearance. Back-up power will be provided to ensure this feature

works when needed. Ability to place the CPV trackers in the vertical position to enable unimpeded site access on fire access roads.

8. Ability of first responders to de-energize the entire project site from one location.
9. Training program for local fire agencies including preparation of a technical training video with SDCFA input and customized for this facility that can be easily viewed by new firefighters who rotate through the local fire stations.
10. Fire Safety Technical Report for Responding Firefighters (Appendix J)
11. Preparation of a construction fire prevention plan reviewed by SDCFA no less than 45 days prior to construction to be implemented by all contractors working on any phase of this project.
12. Portable carbon dioxide (CO_2) fire extinguishers mounted at the inverters and medium voltage transformer units
13. Two 20,000-gallon water tanks and three 10,000-gallon water tanks
14. System contact information with local fire agencies/stations to assist responding firefighters during an emergency
15. Committed on-going maintenance of all facility components for the life of the project
16. Consistent placarding and labeling of all components for fire safety/response

Alternative mitigation measures may be included, such as staffing, equipment, and other elements that are identified in the Soitec Solar Portfolio Project Emergency Service Capabilities Assessment and Cumulative Impact Mitigation study.

6.0 CONCLUSION

This FPP is submitted in support of an application for project entitlement of the Rugged Solar Project. It is submitted 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, fuel management/modification, and landscaping requirements of San Diego County. This FPP documents required fire safety features required by applicable codes and recommends additional measures that will enhance the site's fire safety and reduce potential impacts to insignificant without lessening health, life, or fire safety.

Fire and Building Codes and other local, county, and state regulations in effect at the time of each Project phase's building permit application supersede these recommendations unless the FPP recommendation is more restrictive.

The Project provides fire access, on-site water, structures built to ignition resistant standards, fuel modification and vegetation management on the non-paved or built portions of the site, along with measures providing on-site foam concentrate, fire fighter training materials, and measures for fire protection during construction. The site fuel modification is based on fire behavior modeling representing the fire environment and the type of fire that would be anticipated at this site. The fuel modification areas will be maintained and inspected annually by a SDCFA-approved, Project-funded wildland fire inspector, removing all dead and dying materials and maintaining appropriate horizontal and vertical spacing. In addition, plants that establish or are introduced to the fuel modification area that are not on the approved plant list will be removed.

In addition, the project will participate in a development services agreement which has been created specifically to mitigate all future development impacts 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 mitigation requirements, the construction of a Solar Facility that is defensible from wildfire and, in turn, does not represent significant threat of ignition source 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 mitigating actions identified in this report are designed to reduce the likelihood that fire would impinge upon the proposed structures. There are no guarantees that fire will not occur in the area or that fire will 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 mitigating fuel modification requirements provided in this FPP will accomplish the goal of this FPP to assist firefighters in their efforts to defend these structures and reduce the associated risk.

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7.0 LIST OF PREPARERS

Project Manager:

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

GIS:

Andrew Greis
GIS Analyst
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Fire Behavior Modeling:

Scott Eckardt
Registered Professional Forester; Certified Wildland Fire Manager
Dudek

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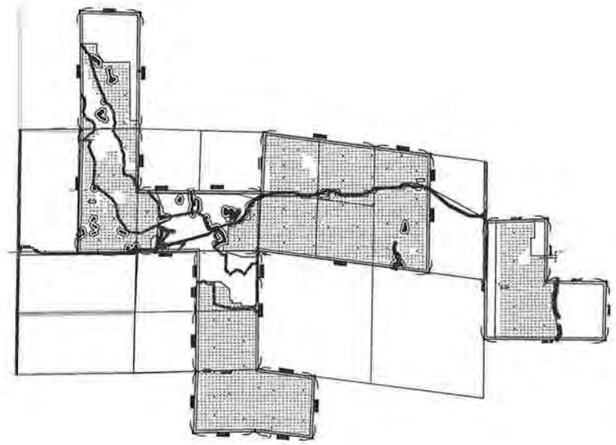
APPENDIX A

Rugged Solar Farm Project Features

RUGGED SOLAR LLC

RUGGED SOLAR PROJECT
PLOT PLAN



GENERAL NOTES:

1. Each tracker assembly is approximately 43.5 FT wide with a maximum non-constructed height of 30 ft and spaced across roughly 59 FT North to South, 22 FT East to West.
2. Each access route will be from an improved driveway that shall be designed in accordance with County of San Diego Design Standard DS-15 and equipped with an emergency Key-operated override switch.
3. All no-build does the change in grade, along the property boundary, shall not exceed 10%.
4. Detailed cross sections of the roads are provided on the preliminary grading plan.
5. All construction equipment are listed on the preliminary grading plan.
6. Turnaround shall be designed in accordance with County of San Diego Design Standard DS-06 for a county emergency fire apparatus.
7. The project site is not located in a designated flood plain therefore areas of inundation are not shown.
8. Temporary and Permanent BMPs are shown on the preliminary grading plan.
9. All coordinates shown are state plane coordinates based on NAD83, Zone 6 (2007.00 epoch).
10. All dimensions are shown in Decimal Feet.
11. The solar related facilities (panels, electrical connectors, transformer-inverter platform, CAM battery, emergency generator, fencing, internal access and walkways, etc.) shown on the plot plans may be relocated, (exclusive of the road, space areas & undeveloped buffer development), with the administrative approval of the director of public works, in conformance with the intent and conditions of the permit's approval. Transformer-inverter platform locations can be relocated internally and without requirement of minor deviation.

SIGHT DISTANCE:

To be submitted under separate cover

ABBREVIATIONS:

AC	Alternating Current
ADT	Average Daily Trips
BB	Building Block
BMP	Best Management Practice
CEQA	California Environmental Quality Act
CPV	Concentrating Photovoltaic
CUA	County Fire Authority
DPW	County of San Diego, Department of Public Works and Land Usage
DS	Design Standard
EIR	Environmental Impact Report
EOP	Edge of Pavement
FT	Feet
kV	Kilovolts
kW	Kilowatts
MAX	Maximum
MOU	Memorandum of Understanding
MPA	Major Use Permit Application
MUP	Major Use Permit
MW	Megawatts
NTS	Not to Scale
PL	Property Lines
QTY	Quantity
RI	Rural Land
ROW	Right of Way
RPO	Resource Protection Ordinance
SQFT	Square Feet

OWNER INFORMATION

Name	Wakefield & Beyer Foundation W, Administrator	Rugged Solar	Santa Clara Partners Joint Venture	Rugged Solar Development Joint Venture
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State	CA	CA	CA	CA
Zip	91914	91905	92020	92020
Phone	(619) 448-8844	(619) 766-8576	(619) 448-0424	(619) 448-0424
Name & Signature	[illegible]	[illegible]	[illegible]	[illegible]

SHEET INDEX

PARCEL ZONING SETBACK SCHEDULE

APN	SETBACK SCHEDULE DESIGNATION
[illegible]	E
[illegible]	E
[illegible]	E
[illegible]	E
[illegible]	E
[illegible]	E
[illegible]	E
[illegible]	E
[illegible]	E

RESERVED FOR COUNTY STAMPS

AECOM

DESIGNER

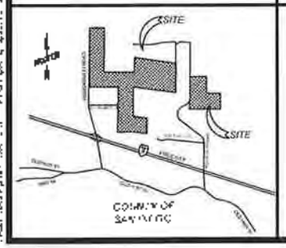
AECOM
AECOM TECHNICAL SERVICES, INC.
440 Stevens Avenue, Suite 250
Solana Beach, CA 92075
858.947.7144 tel 858.947.7145 fax
www.aecom.com

CLIENT

Soitec

Soitec Solar Development, LLC
[illegible]

VICINITY MAP



OWNER INFORMATION

Name: SLT [illegible] ARS/09
Address:
City:
State:
Zip:
Phone:
Fax:
Email:

CONTACT INFORMATION

Name: Pat Brown
Address: 16550 VIA E Spello
City: San Diego
State: CA
Zip: 92127
Phone: (858) 668-4000
Fax:
Email: patrick.brown@soitec.com

PARCEL INFORMATION

[illegible]

SITE ADDRESS:
North of I-8, east of Tavern Road on both sides of McCain Valley Road.

I [illegible] THAT I HAVE READ THE [illegible] AND KNOW THE CONTENT THEREOF. I DECLARE UNDER PENALTY OF PERJURY THAT THE MATTERS SET FORTH IN THE [illegible] ARE TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE. THE ABOVE IS A PROJECT PROPOSED.

OWNER'S SIGNATURE REQUIRED _____ DATE _____

PROJECT INFORMATION

EXISTING:
Rolling, rugged land with two detached land sections made up of many parcels. Altered & randomly populated by boulders. The site is minimally developed with unpaved roads.

PROPOSED:
Approximately 88 Megawatt (MW) project consisting of approximately 474 acres and the construction and operation of approximately 3588 Concentrated Photovoltaic (CPV) trackers configured into 61 1.36 MW Building Blocks (BB) in conjunction with 58 inverters with associated inverters and transformers.

PLOT PLAN INFORMATION

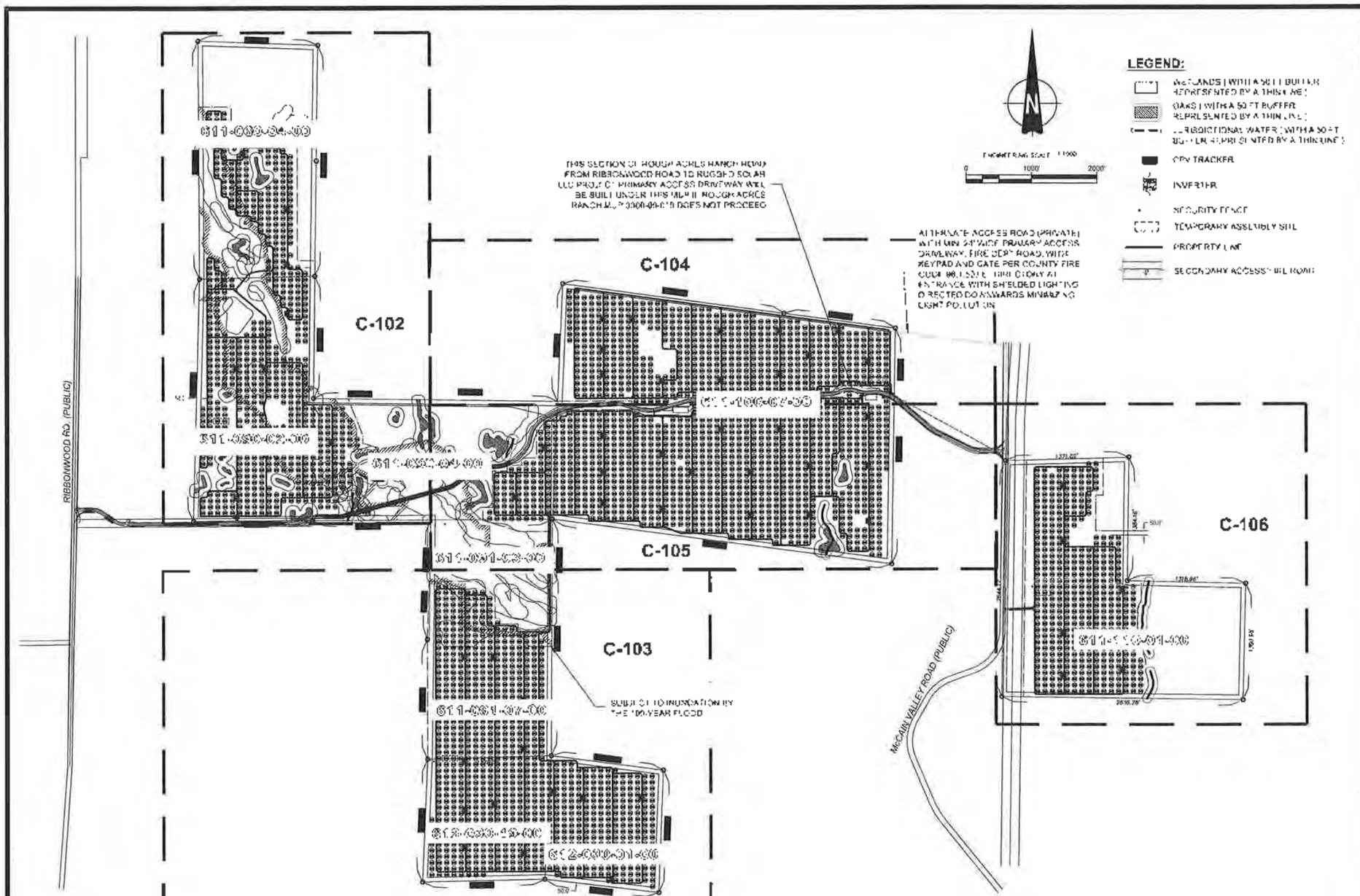
CPV System Summary

Approx. Number of Trackers:	3588
Trackers per BB:	58
Number of BB:	61
Total AC Capacity (MWs):	Approx. 88 MW
Inverter Sizes AC Capacity (MWs):	1.36 to 2.0
No. of 1.36 MW Inverter Skids:	61
Total Lot Size (Acres):	765
Estimated Disturbed Acreage:	474
Coverage Ratio:	40%

SHEET TITLE

LEGEND, SYMBOLS, ABBEREVIATIONS & NOTE

SHEET NUMBER	REV.
C-100	0



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AECOM TECHNICAL SERVICES, INC
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Solana Beach, CA 92075
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www.aecom.com

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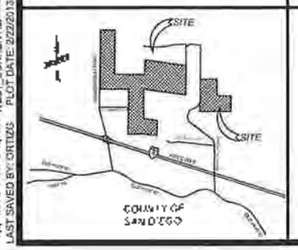
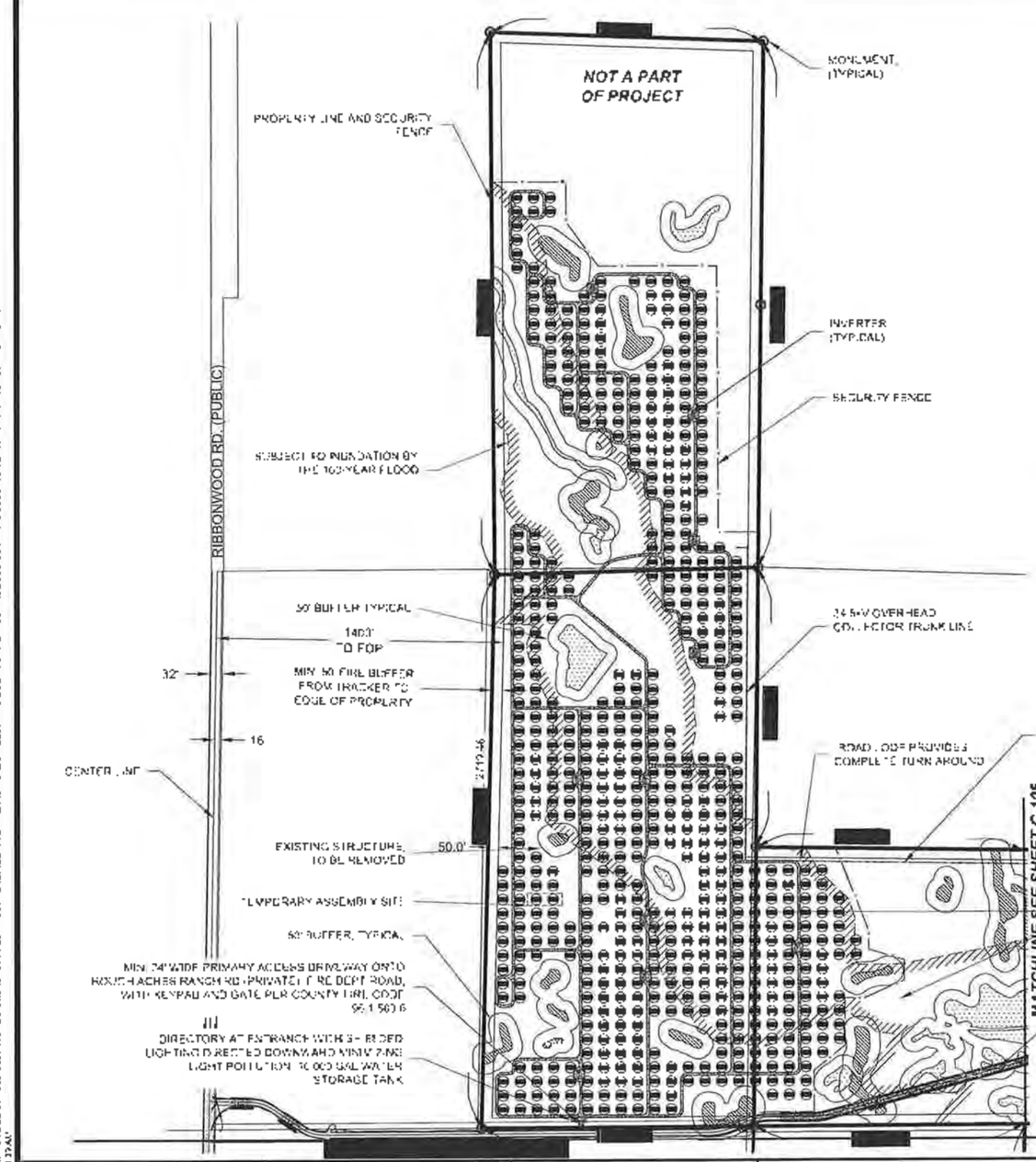
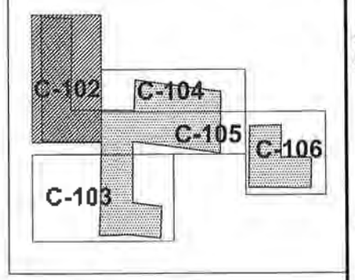
VICINITY MAP	OWNER INFORMATION	CONTACT INFORMATION	PARCEL INFORMATION	PROJECT INFORMATION	PLOT PLAN INFORMATION	SHEET TITLE
	NAME: SLR TAB 1 LLC D 100 ADDRESS: CITY: STATE: ZIP: PHONE: FAX: EMAIL:	NAME: Patrick Brown ADDRESS: 16550 Via Esprillo CITY: San Diego STATE: CA ZIP: 92127 PHONE: (858) 746-9006 FAX: EMAIL: patrick.brown@soitec.com	LOCATION: Rolling, sloped land with two detached land sections made up of dusty (unpaved) dirt land is randomly populated by boulders. The site is minimally developed with unpaved roads PROPOSED Approximately 84 MegaWatt (MW) project located on approximately 474 acres and includes construction and operation of approximately 3568 Concentrated Photovoltaic (CPV) trackers configured into 61 (1.36 MW) Building Blocks (BB) each consisting of 58 trackers with associated inverters and transformers	CPV System Summary Approx. Number of Trackers: 3568 Trackers per BB: 56 Number of BB: 61 Total AC Capacity (MWs): Approx. 84 MW Inverter Sizing AC Capacity (MWs): 1.36 to 2.0 No. of 1.36 MW Inverter Skids: 61 Total Tier Size (Acres): 765 Estimated Disturbed Acreage: 474 Coverage Ratio: 20%	PLOT PLAN SHEET MAP

SHEET NUMBER	REV.
C-101	0

FILE NAME: P:\PROJECTS\SOLAR\SOITEC\SLR TAB 1 LLC\SOLAR - SLR TAB 1 LLC\CAD\PRODUCTION\CPV\PRELIMINARY\SOLAR - SLR TAB 1 LLC - PLOT PLAN.DWG
LAST SAVED BY: ORTIZIS PLOT DATE: 2/22/2013 9:39:49 AM





PLOT PLAN KEY MAP

LEGEND:

- WETLANDS (WITH A 50 FT BUFFER REPRESENTED BY A THIN LINE)
- OAKS (WITH A 50 FT BUFFER REPRESENTED BY A THIN LINE)
- JURISDICTIONAL WATERS (WITH A 50 FT BUFFER REPRESENTED BY A THIN LINE)
- CPV TRACKER
- INVERTER
- SECURITY FENCE
- TEMPORARY ASSEMBLY SITE
- PROPERTY LINE
- SECONDARY ACCESS/FIRE ROAD
- 24.5kV OVERHEAD COLLECTOR TRUNK LINE

AECOM

DESIGNER

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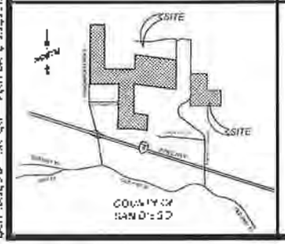
707.542.7144 tel 858.542.7145 fax
www.aecom.com

CLIENT

Soitec

Soitec Solar Development LLC
[illegible]
San Diego, CA 92121

VICINITY MAP



OWNER INFORMATION

NAME: SEE TABLE ATC 100
ADDRESS:
CITY:
STATE:
ZIP:
PHONE:
FAX:
EMAIL:

CONTACT INFORMATION

NAME: Kyle Brown
ADDRESS: 16910 Via Esprillo
CITY: San Diego
STATE: CA
ZIP: 92127
PHONE: (858) 799-9005
FAX:
EMAIL: kyle.brown@soitec.com

PARCEL INFORMATION

[illegible]

SITE ADDRESS:
North of Intersection of Ribbonwood Road and Rough Acres Ranch Road

[illegible]

PROJECT INFORMATION

EXISTING:
Rolling, rugged land with hill dotted land sections made up of many parcels. All land is currently populated by boulders. The site is primarily developed with undeveloped land.

PROPOSED:
Approximately 84 Megawatt (MW) project located on approximately 474 acres and including construction and operation of approximately 3588 Concentrated Photovoltaic (CPV) trackers, configured into 61 (1.38 MW) Building Blocks (BB) each consisting of 58 trackers with associated inverters and transformers.

PLOT PLAN INFORMATION

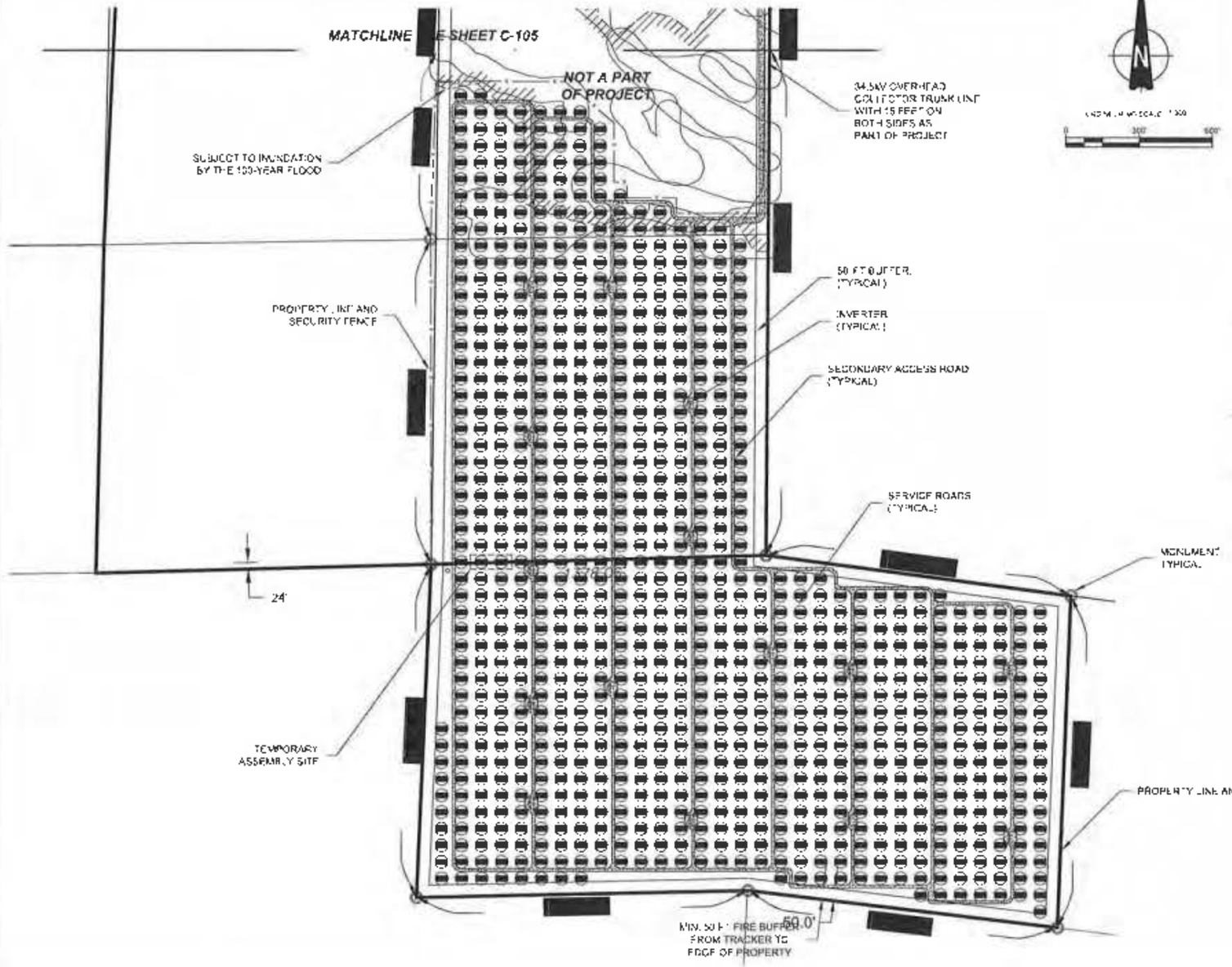
CPV System Summary

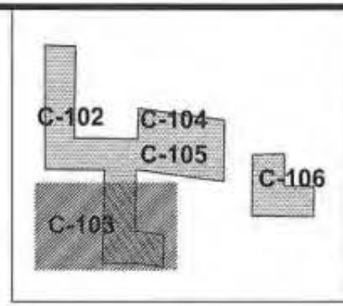
Approx. Number of Trackers:	3588
Tracker per BB:	58
Number of BB:	61
Total AC Capacity (MWac):	Approx. 84 MW
Inverter Size AC Capacity (MWac):	1.35 to 2.0
No. of 1.38 MW Inverter Skids:	61
Total Lot Size (Acres):	705
Estimated Disturbed Acreage:	474
Coverage Ratio:	20%

SHEET TITLE

PLOT PLAN (NORTH WEST)

SHEET NUMBER	REV.
C-102	0





PLOT PLAN KEY MAP

LEGEND:

- WETLANDS (WITH A 50 FT BUFFER REPRESENTED BY A THIN LINE)
- OAKS (WITH A 50 FT BUFFER REPRESENTED BY A THIN LINE)
- JURISDICTIONAL WATER (WITH A 50 FT BUFFER REPRESENTED BY A THIN LINE)
- CPV TRACKER
- INVERTER
- SECURITY FENCE
- TEMPORARY ASSEMBLY SITE
- PROPERTY LINE
- SECONDARY ACCESS ROAD
- 34.5kV OVERHEAD COLLECTOR TRUNK LINE

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DESIGNER

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AECOM TECHNICAL SERVICES, INC.
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858.947.7144 tel 858.947.7145 fax
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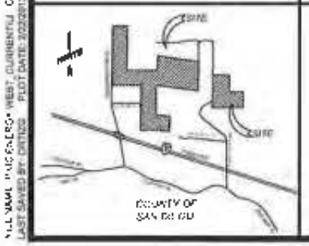
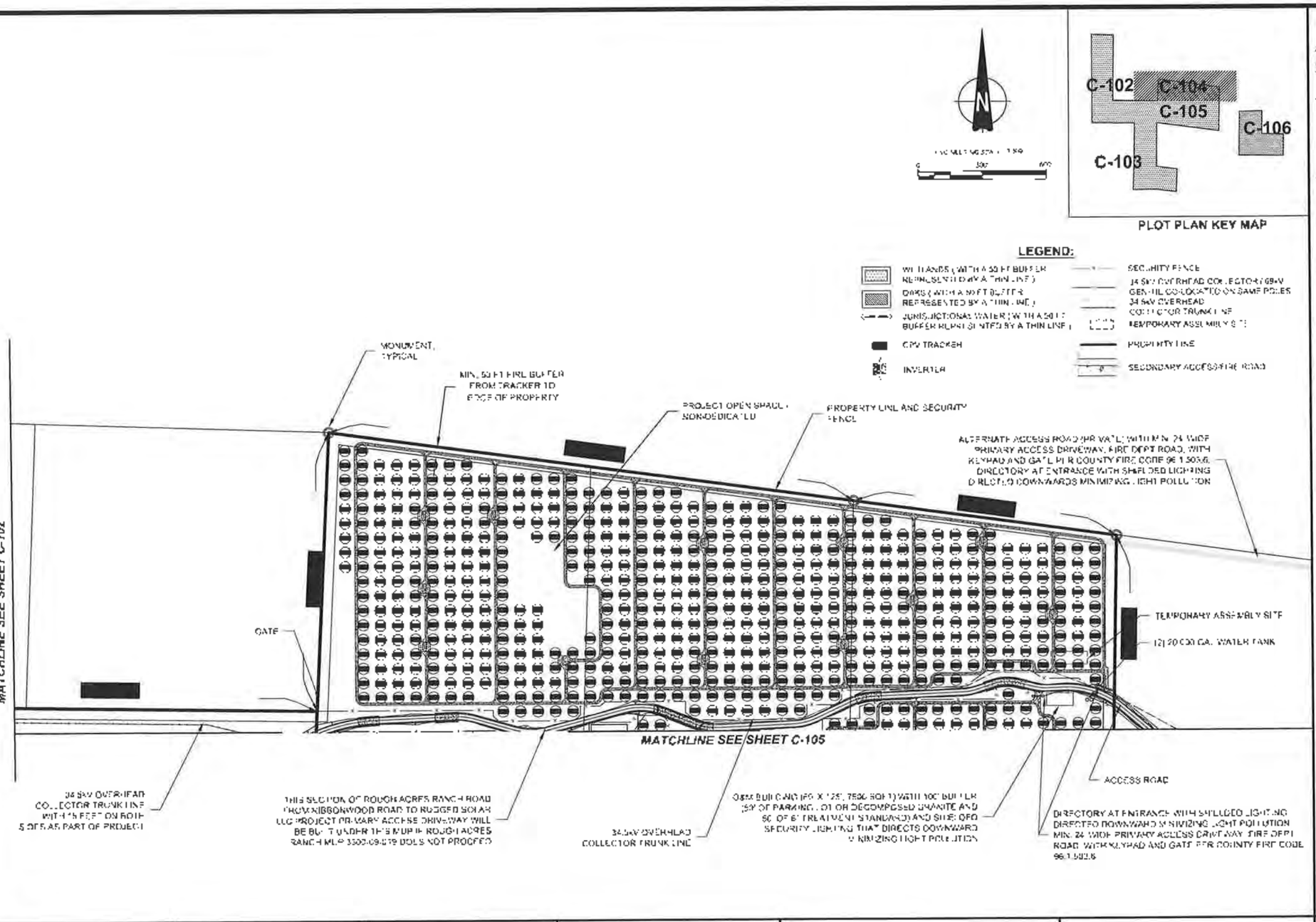
CLIENT

Soitec

Soitec Solar Development, LLC
[illegible]
San Diego, CA 92130

VICINITY MAP	OWNER INFORMATION	CONTACT INFORMATION	PARCEL INFORMATION	PROJECT INFORMATION	PLOT PLAN INFORMATION	SHEET TITLE
	NAME: SEE TABLE AT C-100 ADDRESS: CITY: STATE: ZIP: PHONE: FAX: EMAIL:	NAME: Pat Brown ADDRESS: 17590 Via Triste CITY: San Diego STATE: CA ZIP: 92127 PHONE: (858) 746-9000 FAX: EMAIL: pbrown@soitec.com	[illegible] APN: 641-060-03, 641-060-04, 641-070-03, 641-100-10 SITE ADDRESS: North of I-8, east of Rockwood Road on both sides of McCain Valley Road OWNER'S CERTIFICATION: I CERTIFY THAT I HAVE READ AND UNDERSTAND THE OBLIGATIONS OF THE PERMIT AND THAT THE STATEMENTS AND INFORMATION CONTAINED IN THIS APPLICATION ARE TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE. OWNER SIGNATURE _____ DATE _____	EXISTING: Rolling, rugged, and rich with undisturbed land features made up of many parcels. At times, it is randomly populated by boulders. The site is minimally developed with unpaved roads PROPOSED: Approximately 54 Megawatt (MW) project located on approximately 474 acres and includes construction and operation of approximately 35584 Concentrator Photovoltaic (CPV) trackers configured into 61 1.36 MW Building Blocks (BB) each consisting of 58 trackers with associated inverters and transformers	CPV System Summary Approx. Number of Trackers: 3598 Trackers per BB: 58 Number of BB: 61 Total AC Capacity (MWac): Approx. 54 MW Inverter Sold AC Capacity (MWac): 1.25 to 2.0 No. of 1.36 MW Inverter Skids: 61 Total Lot Size (Acres): 765 Estimated Disturbed Acreage: 474 Coverage Ratio: 20%	PLOT PLAN SOUTH SHEET NUMBER: C-103 REV.: 0



PLOT PLAN KEY MAP

LEGEND:

- WETLANDS (WITH A 50 FT BUFFER REPRESENTED BY A THIN LINE)
- OASIS (WITH A 50 FT BUFFER REPRESENTED BY A THIN LINE)
- JURISDICTIONAL WATER (WITH A 50 FT BUFFER REPRESENTED BY A THIN LINE)
- CPV TRACKER
- INVERTER
- SECURITY FENCE
- 34.5kV OVERHEAD COLLECTOR TRUNKLINE
- GEN-TIE CO-LOCATED ON SAME POLES
- 34.5kV OVERHEAD COLLECTOR TRUNKLINE
- TEMPORARY ASSEMBLY SITE
- PROPERTY LINE
- SECONDARY ACCESS/FIRE ROAD

AECOM

DESIGNER

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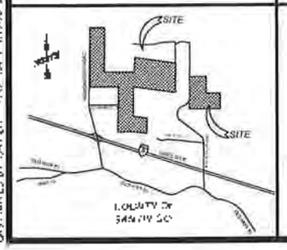
440 Stevens Avenue, Suite 250
Solana Beach, CA 92075
858.947.2144 tel 858.947.7145 fax
www.aecom.com

CLIENT

Soitec

Soitec Solar Development, LLC
[illegible]

VICINITY MAP	OWNER INFORMATION	CONTACT INFORMATION	PARCEL INFORMATION	PROJECT INFORMATION	PLOT PLAN INFORMATION	SHEET TITLE
	NAME: SEE TAB 1 ATTACHMENT ADDRESS: CITY: STATE: ZIP: PHONE: FAX: EMAIL:	NAME: Pat Moore ADDRESS: 16550 West Bernardo CITY: San Diego STATE: CA ZIP: 92127 PHONE: (858) 748-9800 FAX: EMAIL: pmoore@sw-dsd.com	[illegible] SITE ADDRESS: North of I-8 east of Ribbonwood Road on both sides of McCain Valley Road. I HEREBY CERTIFY THAT THE FACTS, STATEMENTS AND INFORMATION PRESENTED IN THIS APPLICATION ARE TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF. SIGNATURE OF APPLICANT / AGENT FOR APPLICANT DATE	EXISTING: Rolling, rugged and wild land scrubland and sections made up of many parcels. All lands are currently populated by boulders. The site is surrounded by undeveloped land. PROPOSED: Approximately 84 Megawatt (MW) project located on approximately 414 acres and includes construction and operation of approximately 358,548 Concentrated Photovoltaic (CPV) trackers comprised of 6P (1.36 MW) building blocks (BB), each consisting of 56 trackers with associated inverters and transformers.	CPV System Summary: Approx. Number of Trackers: 25,984 Trackers per BB: 56 Number of BB: 464 Total AC Capacity (MWs): Approx. 84 MW Inverter Size AC Capacity (MWs): 1.36 to 2.0 No. of 1.36 MW Inverter Skids: 61 Total Lot Size (Acres): 755 Estimated Disturbed Acreage: 414 Coverage Ratio: 29%	PLOT PLAN CENTER TOP SHEET NUMBER: C-104 REV.: 0

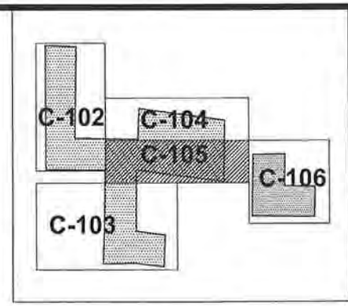
LEGEND:

- WETLANDS (WITH A 50 FT BUFFER REPRESENTED BY A THIN LINE)
- OAKS (WITH A 50 FT BUFFER REPRESENTED BY A THIN LINE)
- JURISDICTIONAL WATERS (WITH A 50 FT BUFFER REPRESENTED BY A THIN LINE)
- CPV TRACKER
- INVERTER
- SECURITY FENCE
- TEMPORARY ASSEMBLY SITE
- PROPERTY LINE
- SECONDARY ACCESS/FIRE ROAD
- SERVICE ROAD
- 34.5kV OVERHEAD COLLECTOR TRUNK LINE

N

SHOWN IN NOSCALE 1" = 300'

0 300' 600'



PLOT PLAN KEY MAP

34.5kV OVERHEAD COLLECTOR TRUNK LINE

PRIVATE ON-SITE SUBSTATION (80' X 120' (9600 SQFT) WITH 50' BUFFER AND SHIELDED LIGHTING DIRECTED DOWNWARD, MINIMIZING LIGHT POLLUTION. LIGHTING ALSO AT CONTROL HOUSE DOOR.

TEMPORARY BATCH PLANT AND ROCK CRUSHING FACILITY (UP TO 10 ACRES)

34.5kV OVERHEAD COLLECTOR TRUNK LINE

THIS SECTION OF ROUGH ACRES RANCH ROAD FROM RIBBONWOOD ROAD TO RUGGED SOLAR LLC PROJECT PRIMARY ACCESS DRIVEWAY WILL BE BUILT UNDER THIS YOUTH ROUGH ACRES RANCH GDP (3600-99-019) DOES NOT PROCEED

MATCHLINE SEE SHEET C-104

NOT A PART OF PROJECT

MATCHLINE SEE SHEET C-102

MIN. 50' FIRE BUFFER FROM TRACKER TO EDGE OF PROPERTY

32'

1300' TO EOP

16'

CENTERLINE

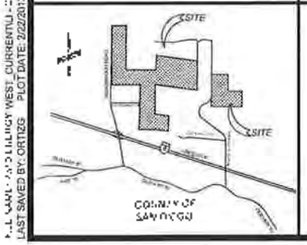
34.5kV OVERHEAD COLLECTOR TRUNK LINE

MATCHLINE SEE SHEET C-103

SUBJECT TO INUNDATION BY THE 100-YEAR FLOOD

50' BUFFER TYPICAL

2644.17'

VICINITY MAP	OWNER INFORMATION	CONTACT INFORMATION	PARCEL INFORMATION	PROJECT INFORMATION	PLOT PLAN INFORMATION	SHEET TITLE
	NAME: SEE TABLE AT C-100 ADDRESS: CITY: STATE: ZIP: PHONE: FAX: EMAIL:	NAME: Participant ADDRESS: 16550 Via Esprillo CITY: San Diego STATE: CA ZIP: 92127 PHONE: (858) 748-9600 FAX: EMAIL: patrick.brown@soitec.com	APN: 671-030-06-00 671-040-14-00 671-040-15-00 671-040-16-00 671-040-17-00 671-040-20-00 671-040-21-00 671-040-22-00 671-040-23-00 671-100-10-00 SITE ADDRESS: North of I-8, east of Old Highway 80 and on both sides of McCain Valley Road. PROPERTY OWNER: SEE TABLE A1.0 - PROPERTIES OWNED BY SUNRISE POWERLINK LLC (SPRING NOTES AND THAT ARE NOT PART OF THE PROJECT) APPLICANT'S SIGNATURE BOARD DATE	EXISTING: Rolling, rugged and with no detached land services made up of many parcels. Actual is relatively populated by boulders. The site is minimally developed with unpaved roads. PROPOSED: Approximately 84 Megawatt (MW) project located on approximately 474 acres and includes construction and operation of approximately 3568 Concentrated Photovoltaic (CPV) trackers configured into 61 (1.38 MW Building Blocks (BB) each consisting of 58 trackers with associated inverters and transformers.	CPV System Summary Approx. Number of Trackers: 3568 Trackers per BB: 58 Number of BB: 61 Total AC Capacity (MWs): Approx. 84 MW Inverter Sets AC Capacity (MWs): 1.38 to 2.3 No. of 1.38 MW Inverter Skids: 61 Total Lot Size (Acres): 760 Estimated Disturbed Acreage: 474 Coverage Ratio: 20%	PLOT PLAN CENTER BOTTOM SHEET NUMBER: C-105 REV.: 0

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www.aecom.com

CLIENT

Soitec

Soitec Solar Development LLC
[illegible]

FILE NAME: P:\SOLITRON WEST_CURRENT\U - DOCUMENTATION\MAP - BC\100\C100.DWG LAYOUT: C-105 PRELIMINARY ENGINEERING PLANS - PLOT PLAN CENTER BOTTOM
LAST SAVED BY: ORTIZG PLOT DATE: 2/22/2013 10:08:16 AM

OF PROJECT)

EXISTING WATER WELL, NTS

1763.3' TO LOP

"C0" GEN-TIE ROW

32'

PROPERTY LINE

PRE-EXISTING DRIVEWAY PART OF SDG&E TRANSMISSION CORRIDOR

MCCAIN VALLEY ROAD

ROAD CENTER LINE

50'

MIN. 24' WIDE PRIVATE ACCESS DRIVEWAY (PRIVATE), FIRE DEPT ROAD, WITH KEYPAD AND GATE PER COUNTY FIRE CODE 96.1.503.6 D REGISTRY AT ENTRANCE WITH SHIELDED LIGHTING DIRECTED DOWNWARD MINIMIZING LIGHT POLLUTION.

2644.17'

10,000 GAL WATER STORAGE TANK

TEMPORARY ASSEMBLY SITE

ROAD CENTER LINE

EXISTING WATER WELL, NTS

1371.89'

SECURITY FENCE

1384.16'

MONUMENT, TYPICAL

50 FT BUFFER, TYPICAL

MIN. 50' FIRE BUFFER FROM TRACKER TO EDGE OF PROPERTY

1319.66'

APN 611-110-01-00

NOT A PART OF PROJECT

1303.05'

7638.78'

ENGINEERING SCALE 1:100

1" 200' 400'

PLOT PLAN KEY MAP

C-102 C-104 C-105 C-106 C-103

LEGEND:

- WETLANDS (WITH A 50 FT BUFFER REPRESENTED BY A THIN LINE)
- OAKS (WITH A 50 FT BUFFER REPRESENTED BY A THIN LINE)
- JURISDICTIONAL WATER (WITH A 50 FT BUFFER REPRESENTED BY A THIN LINE)
- CPV TRACKER
- INVERTER
- SECURITY FENCE
- 34.5kV OVERHEAD COLLECTOR (69kV GEN-TIE CO-LOCATED ON SAME POLES)
- 34.5kV OVERHEAD COLLECTOR TRUNK LINE
- TEMPORARY ASSEMBLY SITE
- PROPERTY LINE
- SECONDARY ACCESS/EMERGENCY ROAD

AECOM

DESIGNER

AECOM

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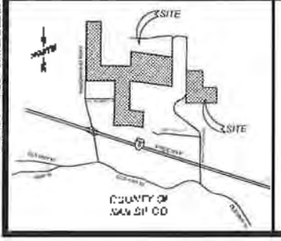
www.aecom.com

CLIENT

Soitec

Soitec Solar Development, LLC

VICINITY MAP	OWNER INFORMATION	CONTACT INFORMATION	PARCEL INFORMATION	PROJECT INFORMATION	PLOT PLAN INFORMATION	SHEET TITLE
	Name: SDSR 1 MCCAIN VALLEY, LLC Address: City: State: Zip: Phone: Fax: Email:	Name: Patrick Brown Address: 15050 Avenue of Science City: San Diego State: CA Zip: 92128 Phone: (858) 748-3000 Fax: Email: patrick.brown@soitec.com	APN: 611-110-01-00 APN: 611-090-05-00, APN: 611-090-06-00, APN: 611-090-07-00, APN: 611-090-08-00, APN: 611-090-09-00, APN: 611-090-10-00, APN: 611-090-11-00, APN: 611-090-12-00, APN: 611-090-13-00, APN: 611-090-14-00, APN: 611-090-15-00, APN: 611-090-16-00, APN: 611-090-17-00, APN: 611-090-18-00, APN: 611-090-19-00, APN: 611-090-20-00 Site Address: None at the time of application submittal. Located north and south of Rabbitwood Road on both sides of McCain Valley Road. I/We hereby certify that all the information and representations made in this application are true and correct to the best of my knowledge. I/We understand that the application is required to be signed by the owner of the property which is the subject of this application. If the property is not owned by the applicant, then each owner must sign the application or attach a separate sheet that shows that either one of the owners or some other person is empowered to sign. Signature of Owner(s) or Authorized Agent(s) Required Date	LEGAL DESCRIPTION: Parcel 1 of Parcel Map No. 21110, in the County of San Diego, State of California, filed in the Office of the County Recorder of San Diego County, December 31, 1974. EXISTING Rolling rugged land with two detached mesa sections made up of hilly terrain. All land is currently populated by boulders. The site is minimally developed with undefined roads. PROPOSED Approximately 54 Megawatt (MW) project known as approximately 474 acres and includes construction and operation of approximately 3568 Concentrated Photovoltaic (CPV) trackers configured into 61 (1.36 MW) Building Blocks (BB) each consisting of 58 trackers with associated inverters and transformers.	CPV System Summary Approx. Number of Trackers: 3568 Trackers per BB: 58 Number of BB: 61 Total AC Capacity (MWs): Approx. 84 MW Inverter Skid AC Capacity (MWs): 1.36 to 2.0 No. of 1.36 MW Inverter Skids: 61 Total Lot Size (Acres): 765 Estimated Disturbed Acreage: 474 Coverage Ratio: 25%	PLOT PLAN EAST SHEET NUMBER: C-106 REV.: 0

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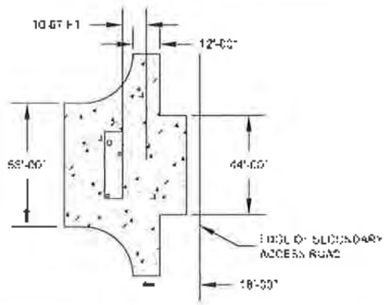
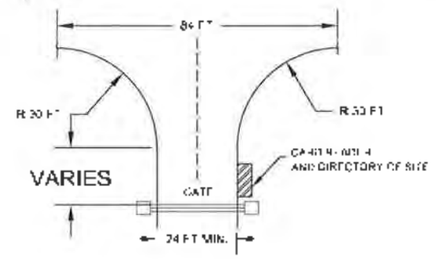
LAST SAVED BY: ORTIZ, ... PLOT DATE: 2/22/2013 10:05:51 AM



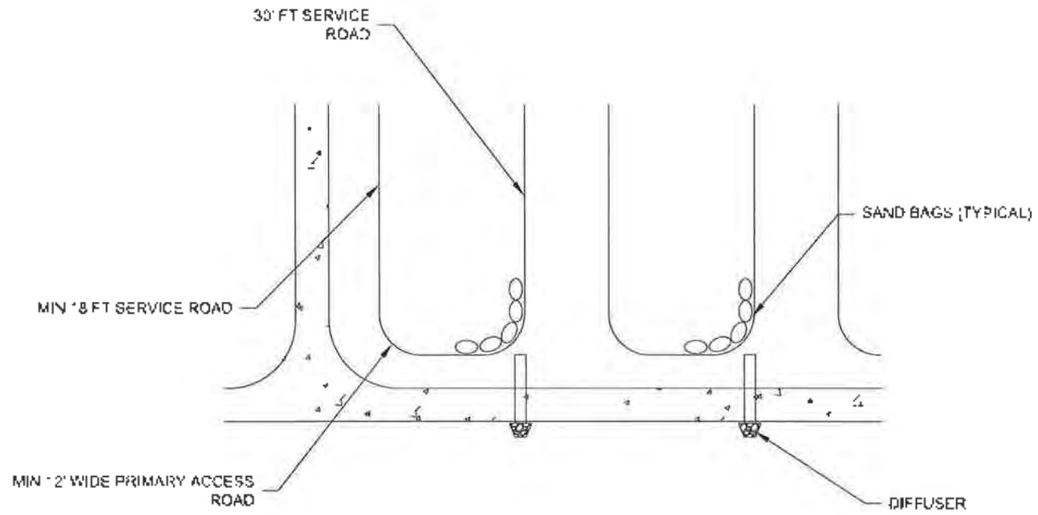
1 | DETAIL - DECOMPOSED GRANITE PAD

SEE DETAIL 1 FOR MATERIAL COMPACTION NTS



2 | DETAIL - ENTRANCE

NTS



3 | DETAIL - ROAD LAYOUT

NTS

AECOM

DESIGNER

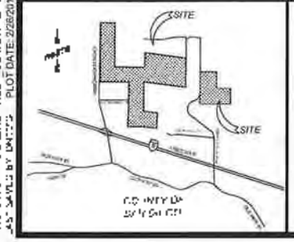
AECOM

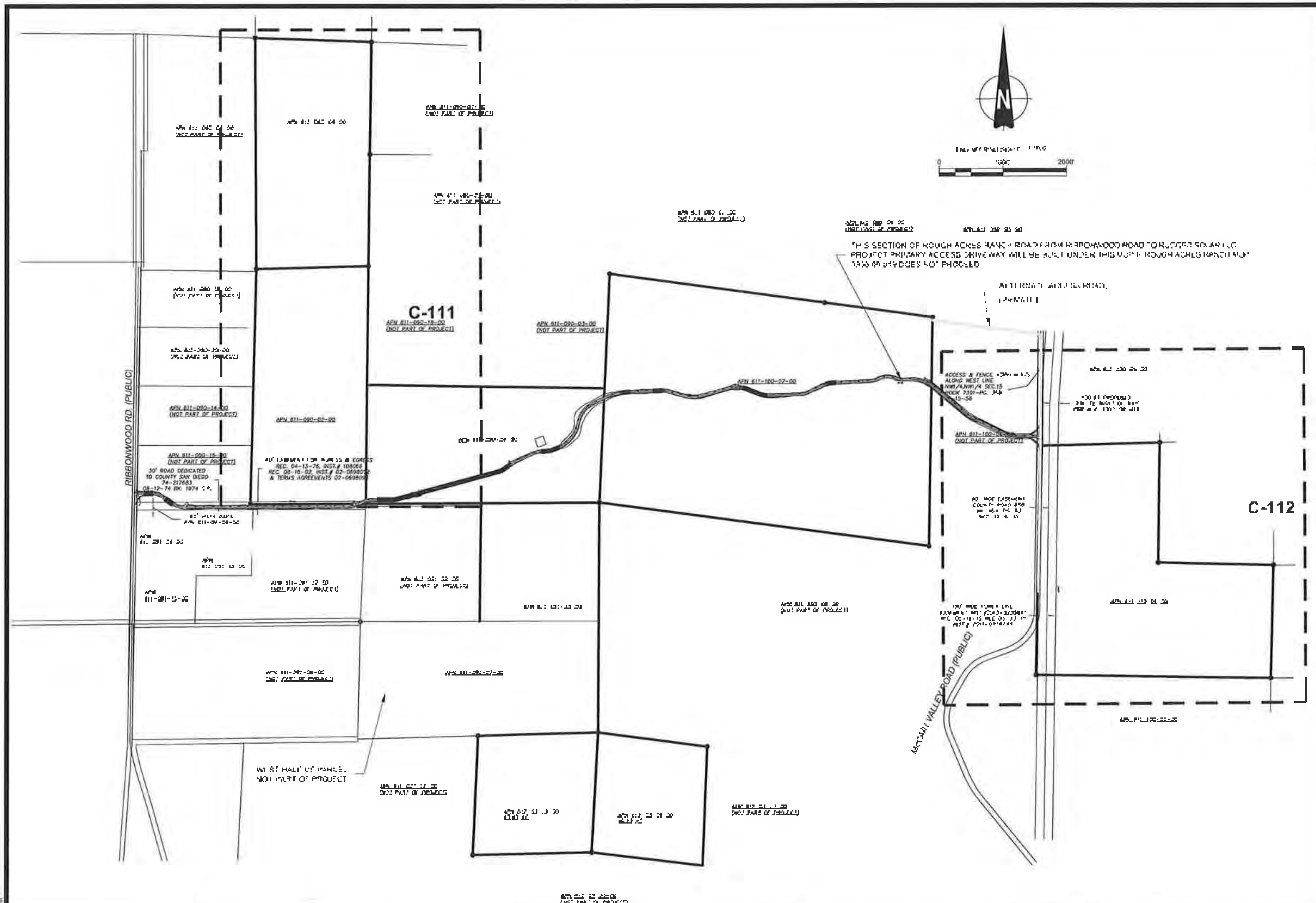
AECOM TECHNICAL SERVICES, INC.
440 Stevens Avenue Suite 250
Solana Beach, CA 92075
858.847.7144 tel 858.847.7145 fax
www.aecom.com

CLIENT

Soitec

Soitec Solar Development, LLC

VICINITY MAP	OWNER INFORMATION	CONTACT INFORMATION	PARCEL INFORMATION	PROJECT INFORMATION	PLOT PLAN INFORMATION	SHEET TITLE
	Name: SEE TABLE ABOVE Address: City: State: ZIP: Phone: Fax: Email:	Name: Pat Brown Address: 16550 Via Esprillo City: San Diego State: CA ZIP: 92127 Phone: (858) 748-9000 Fax: Email: patrick.brown@soitec.com	APN: 1090040000 1090040400 1090040500 1090040600 1090040700 1090040800 1090040900 1090041000 1090041100 1090041200 Site Address: North of I-8, east of Harbison Road on both sides of McGarr Valley Road. UTILITY INSTALLATION, GRADING, REGRADING AND BEST MANAGEMENT PRACTICES (BMP) NOTES ARE THAT I AM THE RESPONSIBLE PARTY FOR THE PROPOSED PROJECT. (U.S. Soil Conservation Service Owner) Date	EXISTING: Rolling, rugged land with two detached land sections made up of many parcels. All land is currently populated by boulders. The site is currently developed with unpaved roads. PROPOSED: Approximately 84 Megawatt (MWac) project located on approximately 474 acres, and includes construction and operation of approximately 3588 Concentrated Photovoltaic (CPV) trackers, configured into 61 1.38 MW Building Blocks (BB) each consisting of 58 trackers with associated inverters and Tie Line/Work.	Approx. Number of Trackers: 3588 Trackers per BB: 58 Number of BB: 61 Total AC Capacity (MWac): Approx. 84 MW Inverter Sized AC Capacity (MWac): 1.38 to 2.0 No. of 1.38 MW Inverter Skids: 61 Total Lot Size (Acres): 785 Estimated Disturbed Acreage: 474 Coverage Ratio: 60%	ROAD DETAIL SHEET NUMBER: C-107 REV.: 0



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DESIGNER

AECOM

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VICINITY MAP	OWNER INFORMATION	CONTACT INFORMATION	PARCEL INFORMATION
		State: CA Phone: (858) 746-9000	

PROJECT INFORMATION	PLOT PLAN INFORMATION
EXISTING	CPV System Summary
PROPOSED	Number of BB: 61

SHEET TITLE	
EASEMENT PLAN SHEET MAP	
SHEET NUMBER	**REV.**
C-110	0

PLOT PLAN KEY MAP

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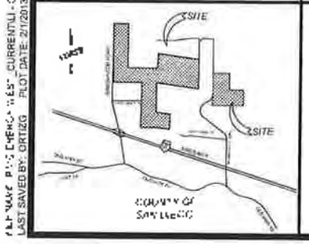
AECOM
AECOM TECHNICAL SERVICES, INC
401 Shiverly Avenue, Suite 250
Solana Beach, CA 92075
858.947.7144 tel 858.947.7145 fax
www.aecom.com

CLIENT

Soitec

Soitec Solar Development, LLC
[illegible]
San Diego, CA 92130

VICINITY MAP



OWNER INFORMATION

Name: [illegible]
Address:
City:
State:
ZIP:
Phone:
FAX:
Email:

CONTACT INFORMATION

Name: Pat Brown
Address: 1800 Hwy 1, Suite 860
City: San Diego
State: CA
ZIP: 92101
Phone: (858) 793-9300
FAX:
Email: Patrick.Brown@soitec.com

PARCEL INFORMATION

APN 611-060-03-00 (79 ACRES)
APN 611-060-02-00 (82 ACRES)
TOTAL: 161 ACRES

SITE ADDRESS:
North of, & west of, Ribbonwood Road, between a point south of McCain Valley Road

I/WE AFFIRM THAT I HAVE AUTHORITY TO SUBMIT THIS APPLICATION AND GRANT PERMISSION TO PERFORM THE WORK AND/OR USE AS SET FORTH ON THE PLOT PLAN SUBMITTED.

OWNER/AUTHORIZED REQUESTER — DATE

PROJECT INFORMATION

EXISTING
Rolling, rugged land with two undeveloped land sectors made up of many parcels. All land is currently undeveloped by humans. The site is currently developed with unpaved roads.

PROPOSED
Approximately 84 Megawatt (MW) project located on approximately 430 acres. It includes construction and operation of approximately 3568 Concentrated Photovoltaic (CPV) trackers configured as 6° (1.26 MW) Building Blocks (BB) each consisting of 56 trackers with associated inverters and transformers.

PLOT PLAN INFORMATION

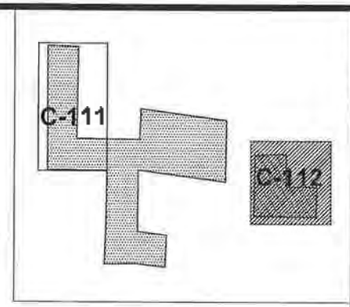
CPV System Summary	
Approx. Number of Trackers:	3568
Trackers per BB:	56
Number of BB:	81
Total AC Capacity (MWac):	Approx. 84 MW
Inverter Size & AC Capacity (MWac):	1.26 to 2.0
No. of 1.26 MW Inverter Skids:	81
Total Lot Size (Acres):	765
Est. mated Disturbed Acreage:	474
Coverage Ratio:	20%

SHEET TITLE

EASEMENT PLAN (NORTH WEST)

SHEET NUMBER	REV.
C-111	0

FILE NAME: P:\2_ENERGY\1_WEST_CURRENT\LLC\CPV\PRO SOLAR - 60709\CPV\2D TECH\24-151 PRELIM\24-151 PRELIM_EASEMENT PLAN.DWG
LAST SAVED BY: DRTEZG PLOT DATE: 2/1/2025 2:31:29 PM



PLOT PLAN KEY MAP

AECOM

DESIGNER

AECOM
AECOM TECHNICAL SERVICES, INC.
440 Stevens Avenue, Suite 250
Solana Beach, CA 92075
858.847.7144 tel 858.847.7145 fax
www.aecom.com

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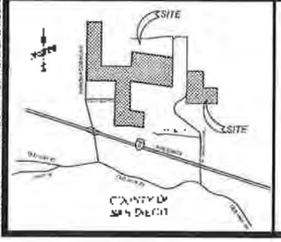
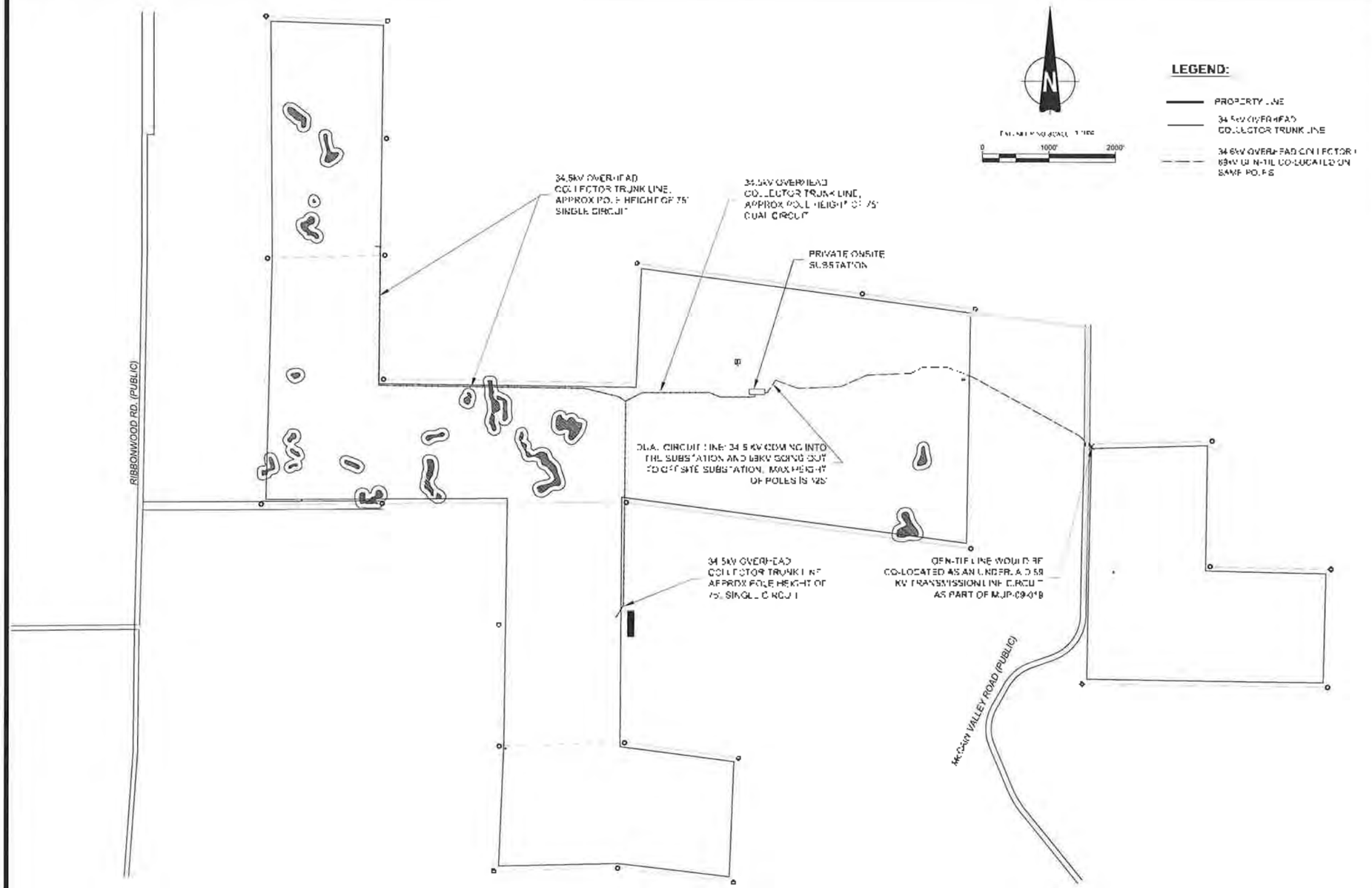
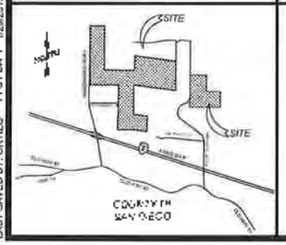
Soitec Solar Development LLC

VICINITY MAP	OWNER INFORMATION	CONTACT INFORMATION	PARCEL INFORMATION	PROJECT INFORMATION	PLOT PLAN INFORMATION	SHEET TITLE
	NAME SEE ABLE AT C-110 ADDRESS CITY STATE ZIP PHONE FAX EMAIL	NAME Pat Brown COMPANY 16550 W Bernardo CITY San Diego STATE CA ZIP 92127 PHONE (858) 749-0400 FAX EMAIL patrick.brown@soitec.com	[illegible] SEE SHEET C-110 FOR ADDITIONAL PARCEL INFORMATION SITE ADDRESS: Northeast of Kalbaugh Road and East of McCain Valley Road. [illegible] SIGNATURE OF PROJECT APPLICANT OR AUTHORIZED AGENT DATE	PROPOSED Approximately 84 Megawatt (MW) project located on approximately 474 acres and includes the installation and operation of approx. Twenty 3658 Concentrated Photovoltaic (CPV) trackers configured in (1) 35 MW Building Blocks (BB) each consisting of 58 trackers with associated inverters and transformers.	CPV System Summary Approx. Number of Trackers: 3658 Tracker per BB: 58 Number of BB: 61 Total AC Capacity (MWac): Approx. 84 MW Inverter Sized AC Capacity (MWac): 1.35 to 2.0 No. of 1.35 MW Inverter Skids: 61 Total Lot Size (Acres): 765 Estimated Disturbed Acreage: 474 Coverage Ratio: 20%	EASEMENT PLAN EAST

SHEET NUMBER	REV.
C-112	0



VICINITY MAP



OWNER INFORMATION

NAME: [illegible]

CONTACT INFORMATION

NAME: Pat Brown
ADDRESS: 16550 W Bernardo
CITY: San Diego
STATE: CA
ZIP: 92127
PHONE: (858) 444-9600
FAX:
EMAIL: patrick.brown@soitec.com

PARCEL INFORMATION

APN: 611-290-04-00, 611-290-05-00, 611-290-06-00, 611-290-07-00, 611-110-01-00

SITE ADDRESS:
North of I-8, east of Ribbonwood Road, on both sides of McCain Valley Road

[illegible]

[illegible]

NAME/SIGNATURE/TITLE/DATE

PROJECT INFORMATION

EXISTING
Relatively rugged land with two detached land sections made up of many parcels. All lands undeveloped by roads. The site is currently developed with irrigated crops.

PROPOSED
Approximately 54 Megawatt (MW) project located on approximately 474 acres and includes construction and operation of approximately 3585 Concentrated Photovoltaic (CPV) trackers configured into (1.36 MW) Building Blocks (BB), each consisting of 58 trackers with associated inverters and transformers.

PLOT PLAN INFORMATION

CPV System Summary	
Approx. Number of Trackers:	3598
Trackers per BB:	58
Number of BB:	61
Total AC Capacity (MWs):	Approx. 84 MW
Inverter Sized AC Capacity (MWs):	1.36 to 2.0
No. of 1.36 MW Inverter Skids:	61
Total Lot Size (Acres):	765
Estimated Disturbed Acreage:	474
Coverage Ratio:	20%

SHEET TITLE

PLOT PLAN
34.5 KV OVERHEAD

SHEET NUMBER	REV.
C-120	0

AECOM

DESIGNER

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AECOM TECHNICAL SERVICES, INC.
440 Stevens Avenue, Suite 200
Solana Beach, CA 92075
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www.aecom.com

CLIENT

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Soitec Solar Development LLC
[illegible]

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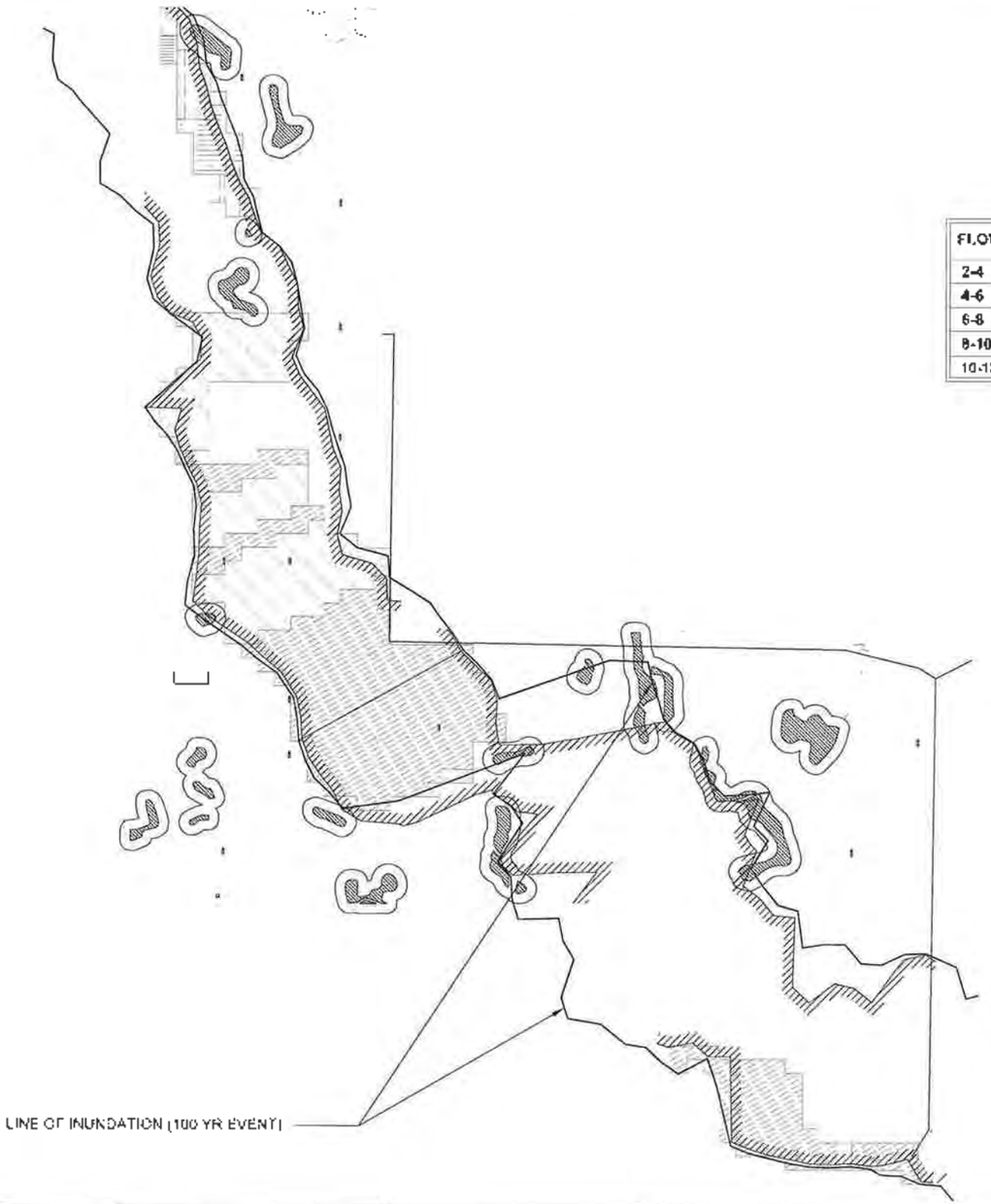
LAST SAVED BY: ORTIZG 1/29/2013 [illegible]



FLOW DEPTHS (FT)	CORRESPONDING NUMBER OF CPV SYSTEMS	SEE NOTES.
2-4	262	1
4-6	103	2
6-8	4	3
8-10	17	3
10-12	13	3

NOTES:

1. FOR AREAS WHERE FLOW DEPTH IS 2-4 FT, THE TRACKER CONTROL UNIT (TCU; AND AIR DRYING UNIT (ADU) WILL BE MOUNTED ON THE TRACKER AT LEAST 4 FEET ABOVE GROUND AND THE TRACKER MAST HEIGHT WILL BE RAISED BY 4 FEET. TOP OF TRACKER SHALL NOT EXCEED 32 FEET ABOVE GRADE

2. FOR AREAS WHERE FLOW DEPTH IS 4-6 FT, THE TCU AND ADU WILL BE MOUNTED ON THE TRACKER AT LEAST 6 FEET ABOVE GROUND AND THE TRACKER MAST HEIGHT WILL BE RAISED BY 6 FEET. TOP OF TRACKER SHALL NOT EXCEED 36 FEET ABOVE GRADE

3. FOR AREAS WHERE FLOW DEPTH IS GREATER THAN 6 FEET, THE TRACKER MAST HEIGHT SHOULD BE RAISED TO THE UPPER LIMIT OF THE FLOW DEPTH FOR THAT AREA, THE TCU AND ADU SHALL BE MOUNTED ON THE TRACKER AT LEAST TO THE HEIGHT OF THE UPPER LIMIT OF THE FLOW DEPTH ;TOP OF TRACKER SHALL NOT EXCEED 40 FEET ABOVE GRADE; OR SAID ELECTRONIC BOXES SHALL BE WATERPROOF AND THE TRACKER PLACED IN STOW MODE DURING AN EXTREME FLOOD EVENT. TOP OF TRACKER SHALL NOT EXCEED 28 FEET ABOVE GRADE

AECOM
DESIGNER
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www.aecom.com

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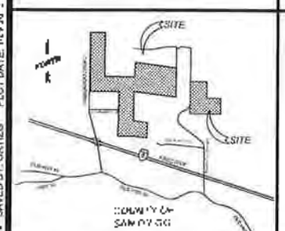
Soitec Solar Development, LLC

VICINITY MAP	OWNER INFORMATION	CONTACT INFORMATION	PARCEL INFORMATION	PROJECT INFORMATION	PLOT PLAN INFORMATION	SHEET TITLE
	OWNER: SEE TABLE AT C-102 ADDRESS: CITY: STATE: ZIP: PHONE: FAX: EMAIL:	NAME: Pat Brown ADDRESS: 10600 Vista Espada CITY: San Diego STATE: CA ZIP: 92127 PHONE: (858) 765-0005 FAX: EMAIL: patrick.brown@soitec.com	[illegible]	EXISTING: Rolling, rugged land with five detached and sections made up of many parcels. All areas randomly populated by boulders. The site is heavily developed with unpaved roads. PROPOSED: Approximately 86 Megawatt (MW) project located on approximately 474 acres and includes construction and operation of approximately 3588 Concentrated Photovoltaic (CPV) trackers configured into 61 (1.36 MW) Building Blocks (BB) which consist of 59 BB trackers with associated inverters and transformers.	CPV System Summary Approx. Number of Trackers: 3588 Tracker per BB: 59 Number of BB: 61 Total AC Capacity (MW): Approx. 86 MW Inverter Size AC Capacity (MW): ~ 1.36 to 2.0 No. of 1.36 MW Inverter Skids: 61 Total Lot Size (Acres): 765 Fenced and Disturbed Acreage: 474 Coverage Ratio: 20%	FLOOD PLAIN AND TRACKER CONSTRUCTION SHEET NUMBER: C-121 REV.: 0 DRLD 3043 REV 03/15/2011 BUILDING PLOT PLAN TEMPLATE

INVERTER DIMENSION

INVERTER RATING (MW)	DIMENSION (FT)		
	"A"	"B"	"C"
1.36	25	10	12
2.00	40	10	12

REV	ITEM	QTY	DESCRIPTION
	1	1	[illegible]
	2		[illegible]
	3		[illegible]
	4	1	[illegible]
	5	1	[illegible]
	6	1	[illegible]
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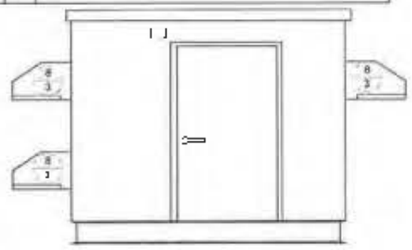
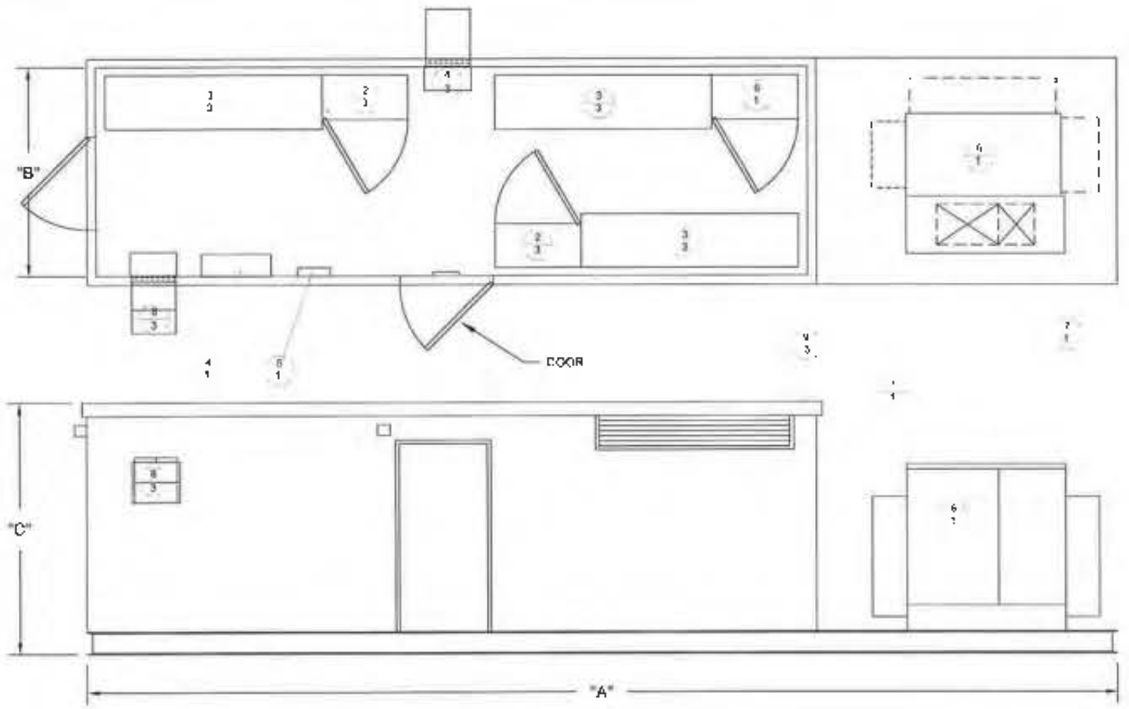
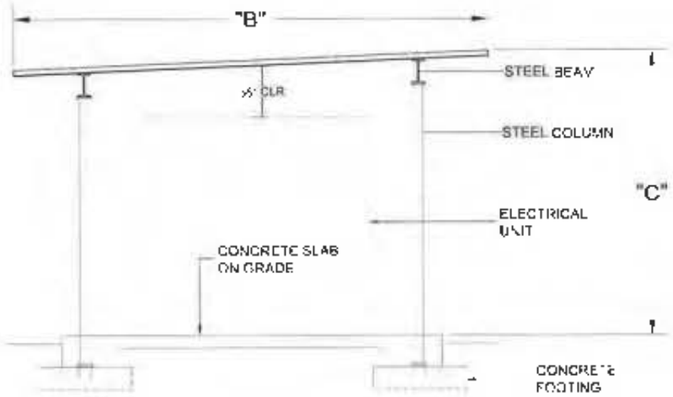
	8	3	[illegible]
	9	3	[illegible]







OPEN INVERTER ON SKID WITH SUN SHADE

Scale: NA

VICINITY MAP	OWNER INFORMATION	CONTACT INFORMATION	PARCEL INFORMATION	PROJECT INFORMATION	PLOT PLAN INFORMATION
	[illegible]	[illegible]	[illegible]	(EXISTING) Rolling, rugged land with scattered vegetation, made up of many parcels, A1 and is randomly populated by boulders. The site is privately developed with unpaved roads PROPOSED: Approximately 84 Megawatt (MW) project, across an approximately 474 acres and includes construction and operation of approximately 3588 Concentrated Photovoltaic (CPV) trackers configured into 61 (1.36 MW) building Blocks (Bs) each consisting of 58 trackers with associated Inverters and Transformers	CPV System Summary Approx. Number of Trackers: 3588 Trackers per BB: 58 Number of BB: 61 Total AC Capacity (MWs): Approx. 84 MW Inverter Skid AC Capacity (MWs): 1.36 to 2.0 No. of 1.36 MW Inverter Skids: 61 Total Lot Size (Acres): 765 Estimated Disturbed Acreage: 474 Coverage Ratio: 20%

SHEET TITLE	
1.36 / 2.0 MW INVERTER BOX DESIGN	
SHEET NUMBER	REV.
C-130	0

AECOM
DESIGNER
AECOM
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440 Stevens Avenue, Suite 210
Solana Beach, CA 92075
858.947.7144 tel 858.947.7145 fax
www.aecom.com

CLIENT
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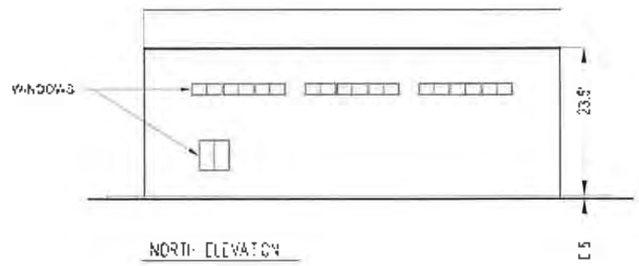
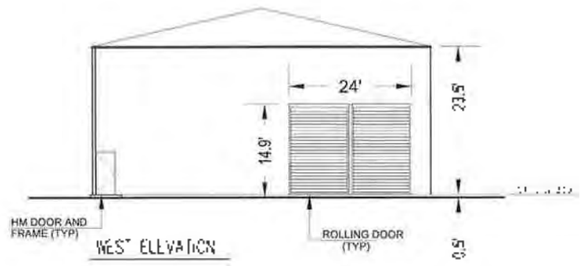
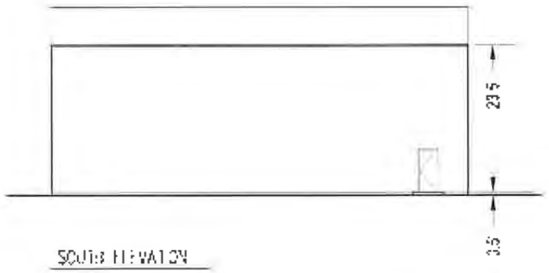
Soitec Solar Development, LLC



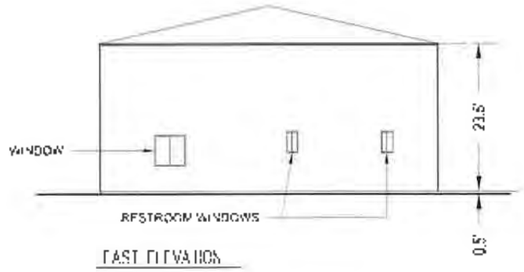
NORTH ELEVATION



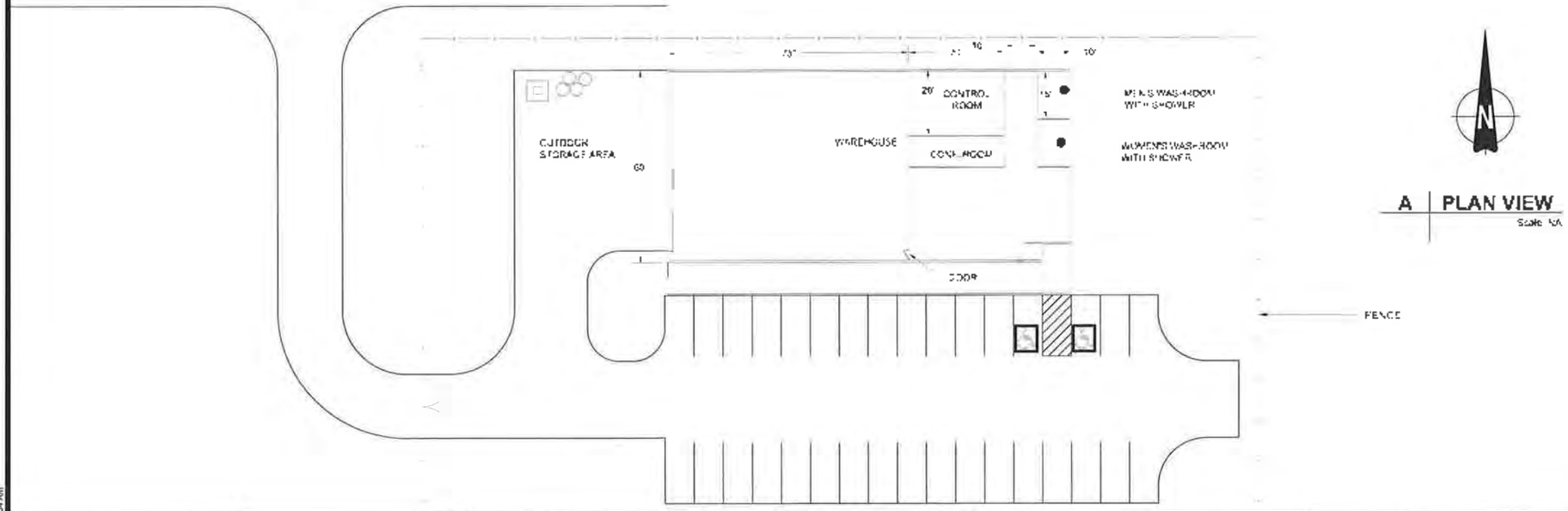
WEST ELEVATION



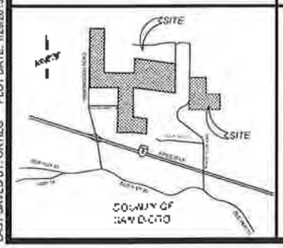
SOUTH ELEVATION

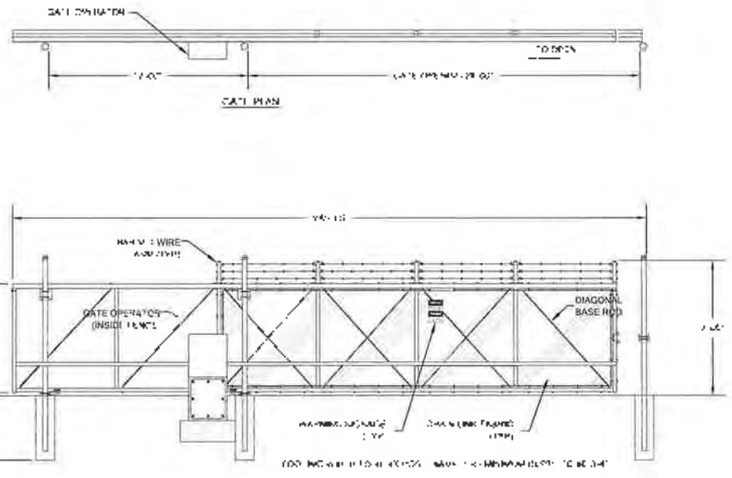


EAST ELEVATION

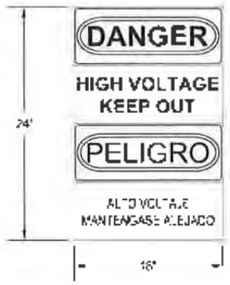


A | PLAN VIEW
Scale: NA

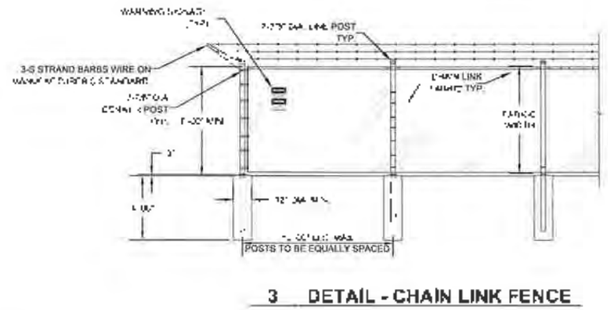
VICINITY MAP	OWNER INFORMATION	CONTACT INFORMATION	PARCEL INFORMATION	PROJECT INFORMATION	PLOT PLAN INFORMATION	SHEET TITLE
	NAME: SEE TABLE AT C-100 ADDRESS: CITY: STATE: ZIP: PHONE: FAX: EMAIL:	NAME: Matt Brown ADDRESS: 16520 West Bernardo CITY: San Diego STATE: CA ZIP: 92127 PHONE: (858) 748-9635 FAX: EMAIL: matthew.brown@aecom.com	[illegible] APN 611-040-03-00 AND 611-040-04-00 AND 611-060-02-00, 611-060-50 AND 611-060-00 SITE ADDRESS: North of I-8 west of Old Highway 80 and on both sides of Dunaway Valley Road. I HEREBY CERTIFY THAT I HAVE STUDIED REGULATIONS AND BEST MANAGEMENT PRACTICES, I HAVE VISITED AND INSPECTED THE SITE AND AM FAMILIAR WITH THE CONDITIONS OF THE PROPOSED PROJECT. SIGNATURE OF APPLICANT OR REQUIRED AGENT — DATE	EXISTING: Rolling, rugged land with few disturbed dirt sections made up of many parcels. All land is currently undivided by boulders. The site is currently developed with unpaved roads. PROPOSED: Approximately 84 Megawatt (MW) project located on approximately 474 acres and includes construction and operation of approximately 3560 Concentrated Photovoltaic (CPV) trackers configured into 61 1.38 MW, Building Blocks (BB) each consisting of 58 trackers with associated inverters and Transformers.	CPV System Summary Approx. Number of Trackers: 3588 Trackers per BB: 58 Number of BB: 61 Total AC Capacity (MWac): Approx. 84 MW Inverter Skid AC Capacity (MW): 1.38 to 2.0 No. of 1.38 MW Inverter Skids: 61 Total Lot Size (Acres): 755 Estimated Disturbed Acreage: 474 Coverage Ratio: 28%	O & M BUILDING SHEET NUMBER: C-131 REV.: 0



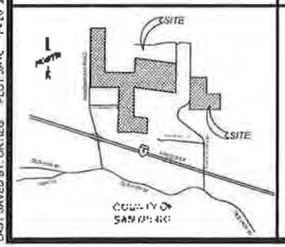
1 DETAIL - GATE

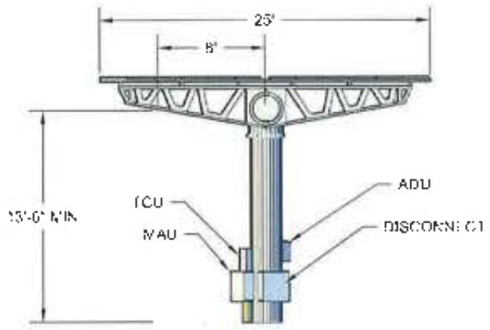


2 WARNING SIGNAGE



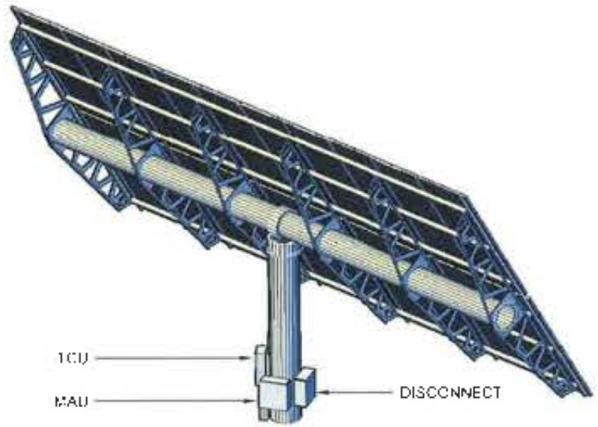
3 DETAIL - CHAIN LINK FENCE

VICINITY MAP	OWNER INFORMATION	CONTACT INFORMATION	PARCEL INFORMATION	PROJECT INFORMATION	PLOT PLAN INFORMATION	SHEET TITLE
	NAME: SEE TABLE AT C-100 ADDRESS: CITY: STATE: ZIP: PHONE: FAX: EMAIL:	NAME: Pat Brown ADDRESS: 10600 Wat Rapids CITY: San Diego STATE: CA ZIP: 92127 PHONE: (858) 749-9000 FAX: EMAIL: patrick.brown@aecom.com	Site Address: North of I-8, east of Rockwood Road on both sides of Melita = Valley Road SIGNATURE OF PERSON RESPONSIBLE FOR PREPARATION OF PLOT PLAN DATE	EXISTING Rolling sloped land with two detached land sections made up of many parcels. All land is currently possessed by its owners. The site is minimally developed with unpaved roads. PROPOSED Approximately 84 Megawatt (MW) project located on approximately 474 acres and includes construction and operation of approximately 3568 Concentrated Photovoltaic (CPV) trackers configured into 61 (1.36 MW) Building Blocks (BB) each consisting of 58 trackers with associated inverters and transformers.	CPV System Summary Approx. Number of Trackers: 3568 Trackers per BB: 58 Number of BB: 61 Total AC Capacity (MWac): Approx. 84 MW Inverter Sz @ AC Capacity (MW): 1.36 to 2.0 No. of 1.36 MW Inverter Skids: 61 Tracker Lot Size (Acres): 765 Estimated Disturbed Acreage: 474 Coverage Ratio: 20%	FENCE ELEVATION DETAIL SHEET NUMBER: C-132 REV.: 0



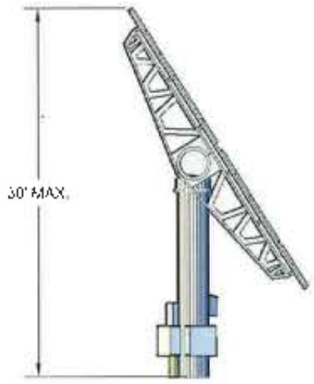
1 STOW MODE VIEW

Scale: NTS



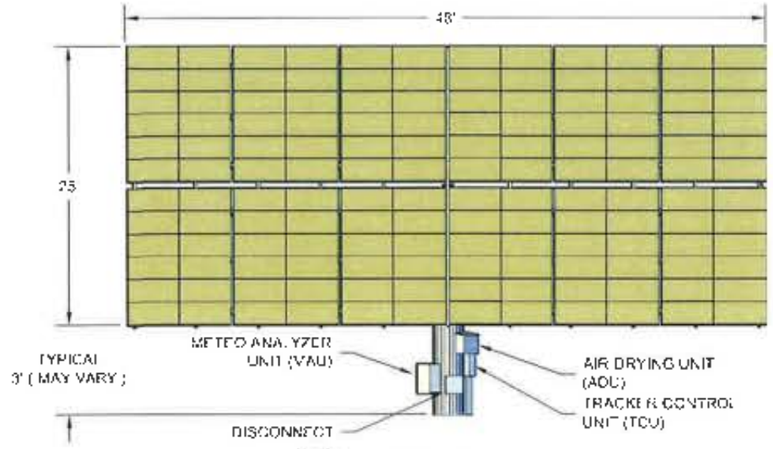
2 ISOMETRIC VIEW

Scale: NTS



3 SIDE VIEW

Scale: NTS



4 FRONT VIEW

Scale: NTS

DESIGNER

AECOM

AECOM TECHNICAL SERVICES, INC.
401 West A Street, Suite 1200
San Diego, CA 92101
619.610.7600 tel 619.610.7601 fax
www.aecom.com

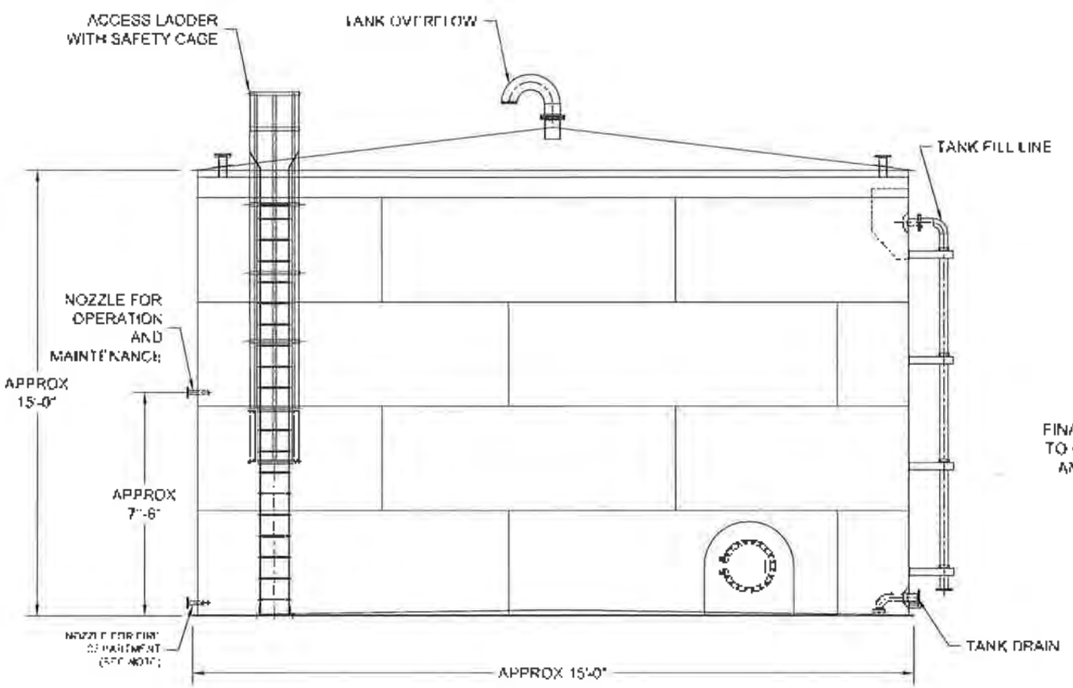
CLIENT

Soitec

Soitec Solar Development, LLC
[illegible]

VICINITY MAP	OWNER INFORMATION	CONTACT INFORMATION	PARCEL INFORMATION	PROJECT INFORMATION	PLOT PLAN INFORMATION	SHEET TITLE
	[illegible]	[illegible]	[illegible]	EXISTING Existing topsoil and with low density rural residential uses. Site is also used for some grazing. Natural vegetation consists of shrubland, grassland, and riparian habitat. The site is currently undeveloped with unpaved roads. PROPOSED Approximately 84 Megawatt (MW) project consists of approximately 474 permanent installations of 3 solar modules supported by 3998 Galvanized Precision Pile (GPP) foundations configured in 1 (1.36 MW) Building Block. Balance of system equipment includes associated inverters and transformers.	Grid System Summary Average Annual Production: 3988 Trackers per MB: 59 Number of MB: 8 Total AC Capacity (MWac): Approx. 84 MW Number of 1.36 MW Inverter Blocks: 61 No. of 1.36 MW Inverter Blocks: 61 Total Site Size (Acres): 705 Estimated Grading Average: 4% Coverage Ratio: 20%	TRACKER ELEVATION DETAIL

SHEET NUMBER	REV.
C-133	0

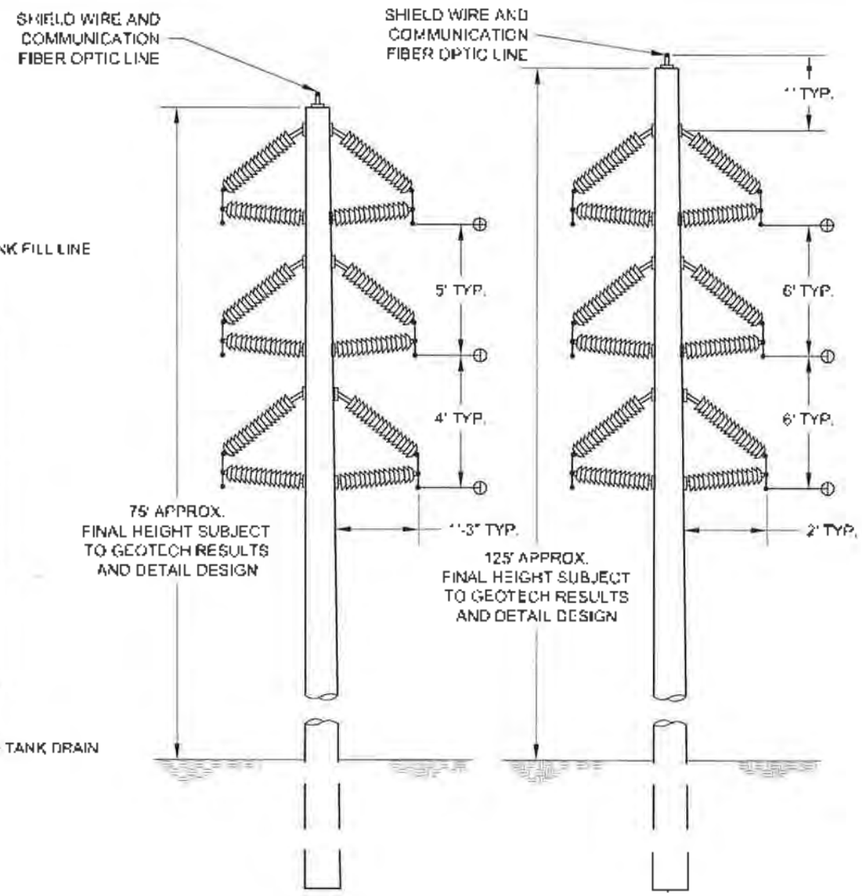


NOTE:

IN ACCORDANCE WITH SECTION 507.2.2 IN TITLE 9, DIVISION 6, CHAPTER 1 OF THE SAN DIEGO COUNTY CODE:

1. THE SUPPLY OUTLET SHALL BE AT LEAST 4 INCHES IN DIAMETER FROM THE BASE OF THE TANK TO THE POINT OF OUTLET AT THE FIRE DEPARTMENT CONNECTION. THE FIRE DEPARTMENT CONNECTION SHALL BE AT LEAST ONE 4-INCH NATIONAL STANDARD THREAD (MALE), REDUCE TO ONE 2½ INCH NATIONAL STANDARD THREAD (MALE). ADDITIONAL OUTLETS MAY BE REQUIRED.
2. THE LOCATION OF THE FIRE DEPARTMENT OUTLET TO BE DETERMINED ON THE PLOT PLAN WHEN SUBMITTED TO THE FIRE DEPARTMENT. CONSIDERATION WILL BE GIVEN TO TOPOGRAPHY, ELEVATIONS, AND DISTANCE FROM STRUCTURES, DRIVEWAY ACCESS, PREVAILING WINDS, ETC.
3. THE OUTLET SHALL BE LOCATED ADJACENT TO THE FIRE ACCESS ROAD.

WATER TANK



34.5 KV OVERHEAD, DUAL CIRCUIT

34.5 KV / 69 KV OVERHEAD

AECOM

DESIGNER

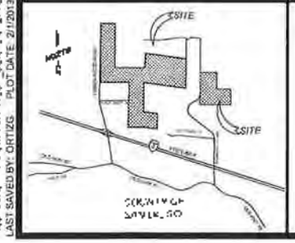
AECOM

AECOM TECHNICAL SERVICES, INC.
440 Stevens Avenue, Suite 250
Solana Beach, CA 92075
858.947.7145 tel 858.947.7145 fax
www.aecom.com

CLIENT

Soitec

Soitec Solar Development, LLC

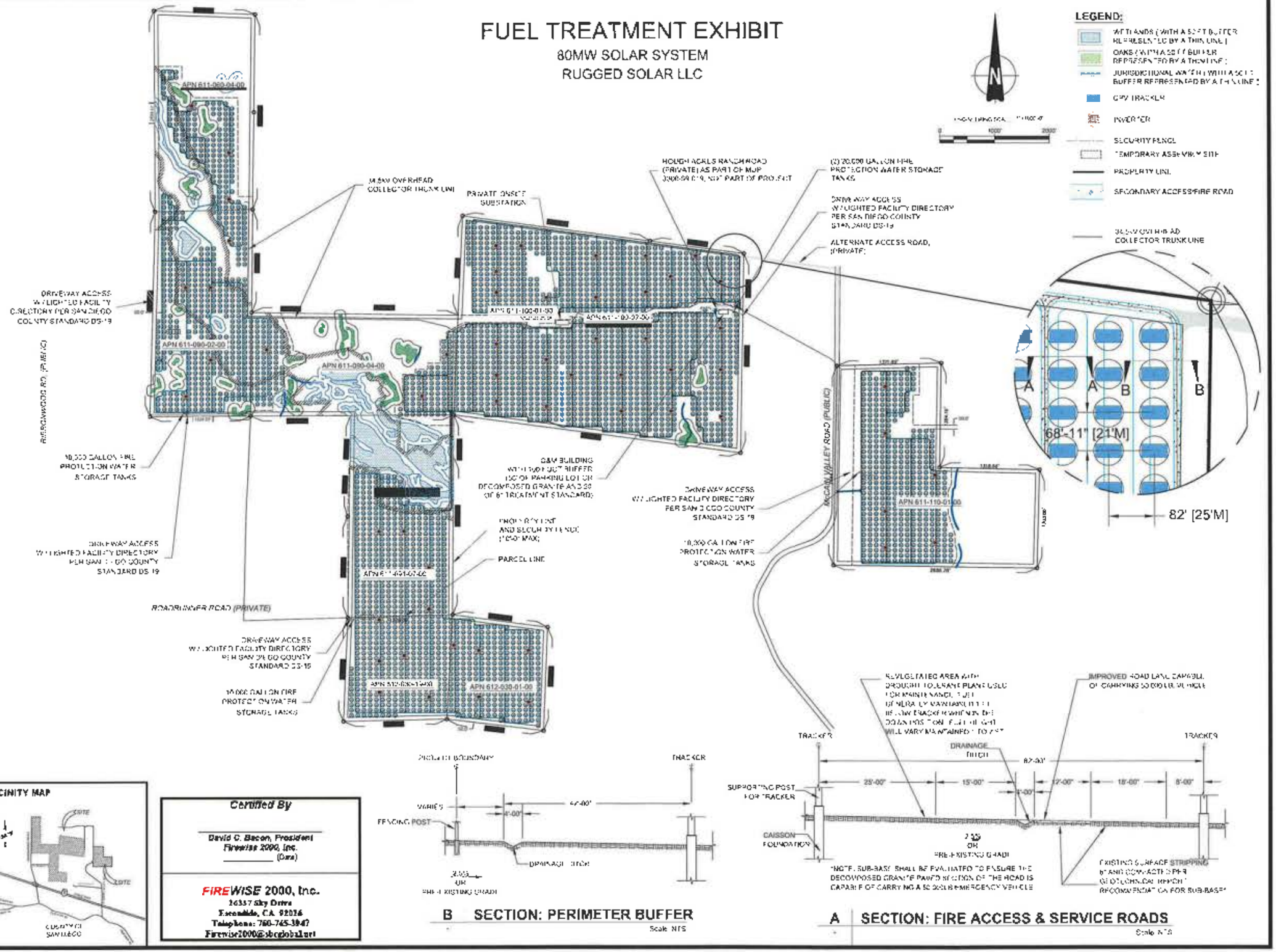
VICINITY MAP	OWNER INFORMATION	CONTACT INFORMATION	PARCEL INFORMATION	PROJECT INFORMATION	PLOT PLAN INFORMATION	SHEET TITLE
	Name: SDT TABLE ABOVE Address: City: State: Zip: Phone: Fax: Email:	Name: Kat Brown Address: 16550 Via Esprillo City: San Diego State: CA Zip: 92127 Phone: (858) 756-4900 Fax: Email: Caitlin.Taylor@aecom.com	APN: [illegible] Area: 61.09 Ac (2,661,000 SF) [illegible] Zoning: [illegible] Site Address: Northeast of the intersection of Highway [illegible] and McCain Valley Road. [illegible] AUTHORIZED AGENT DATE	EXISTING Rolling, rugged land with two dedicated land sections made up of many parcels. All land is currently operated by Iberdrola. The site is currently undeveloped with unpaved roads. PROPOSED Approximately 85 Megawatt (MW) project located on approximately 474 acres and includes construction and operation of approximately 3585 Concentrated Photovoltaic (CPV) modules configured on 61 (1.36 MW) Binding Blocks (BB) each consisting of 58 trackers with associated inverters and transformers.	CPV System Summary Approx. Number of Trackers: 3558 Trackers per BB: 58 Number of BB: 61 VAC AC Capacity (MWs): Approx. 85 MW Inverter Skid AC Capacity (MWs): 1.36 to 2.0 No. of 1.36 MW Inverter Skids: 61 Total Lot Size (Acres): 765 Estimated Disturbed Acreage: 474 Coverage Ratio: 20%	WATER TANK & 34.5kV / 69kV OVERHEAD ELEVATION DETAL SHEET NUMBER: C-134 REV.: 0

PLOT SAVED BY: ORTIZ, ERIC ON 2/1/2013 2:42:20 PM

FUEL TREATMENT EXHIBIT

80MW SOLAR SYSTEM

RUGGED SOLAR LLC



B SECTION: PERIMETER BUFFER

Scale: NTS

A SECTION: FIRE ACCESS & SERVICE ROADS

Scale: NTS

VICINITY MAP

Certified By

David C. Bacon, President
Firewise 2000, Inc.
_____ (Date)

FIREWISE 2000, Inc.
26337 Sky Drive
Escondido, CA 92026
Telephone: 760-745-3047
Firewise2000@sbcglobal.net

APPENDIX B

Photograph Log

APPENDIX B
Photograph Log

Photo 1: View of the northern limits of the project site adjacent to McCain Valley Road. A fence associated with the staging area for the Sunrise Powerlink can be seen in the distance along with structures associated with Rough Acres Ranch.

Photo 2: A view of the project site looking southwest from the northern limits of the property.

Photo 3: Looking northward towards rock outcroppings along the northern property limits adjacent to Tule Creek.

Photo 4: The 500 kV Southwest Powerlink is located between the central and eastern building blocks along McCain Valley Road.

Photo 5: View of Tule Creek looking west towards the Kumeyaay Wind Farm.

Photo 6: The project site is actively being utilized for cattle grazing as seen here in this photo.

Photo 7: View of the central portion of the site and Coast Live Oak Woodland habitat.

Photo 8: View of the northwestern building block looking north towards McCain Valley.

Photo 9: View of Tule Creek and the southern building block looking southwest towards the Kumeyaay Wind Farm.

Photo 10: Large rock outcroppings located in the northwest portion of the project site.

Photo 11: View of the central portion of the project site looking west towards the Kumeyaay Wind Farm.

Photo 12: View of the southern limits of the project site looking north towards McCain Valley Road.

Photo 13: View of the building block located east of McCain Valley road.

Photo 14: View of the southern project limits located adjacent to private lands.

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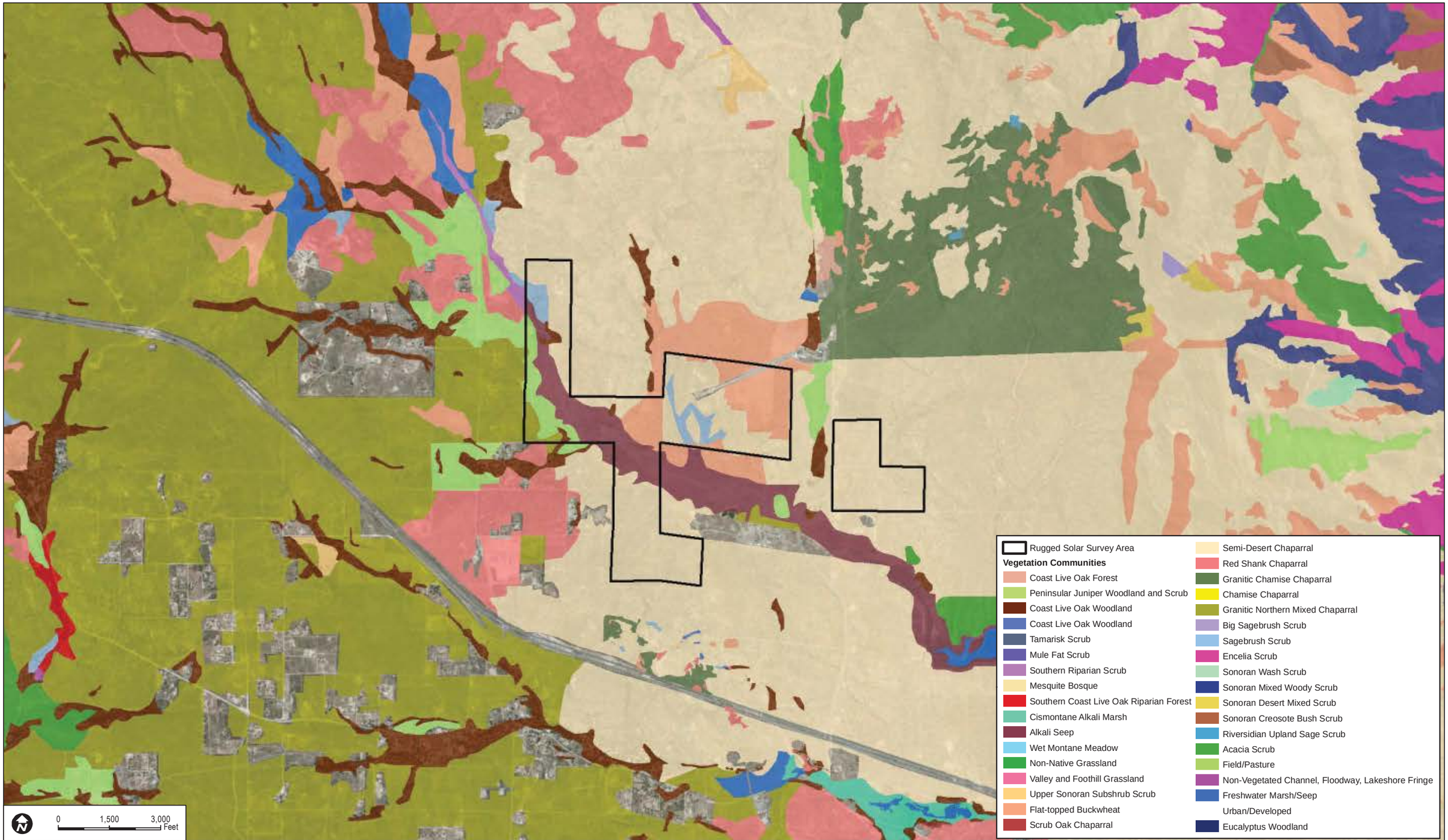
APPENDIX C

Site Vegetation Map



DUDEK

7122

SOURCE: SanGIS 2012; AECOM 2013; Soitec 2013; Bing Maps

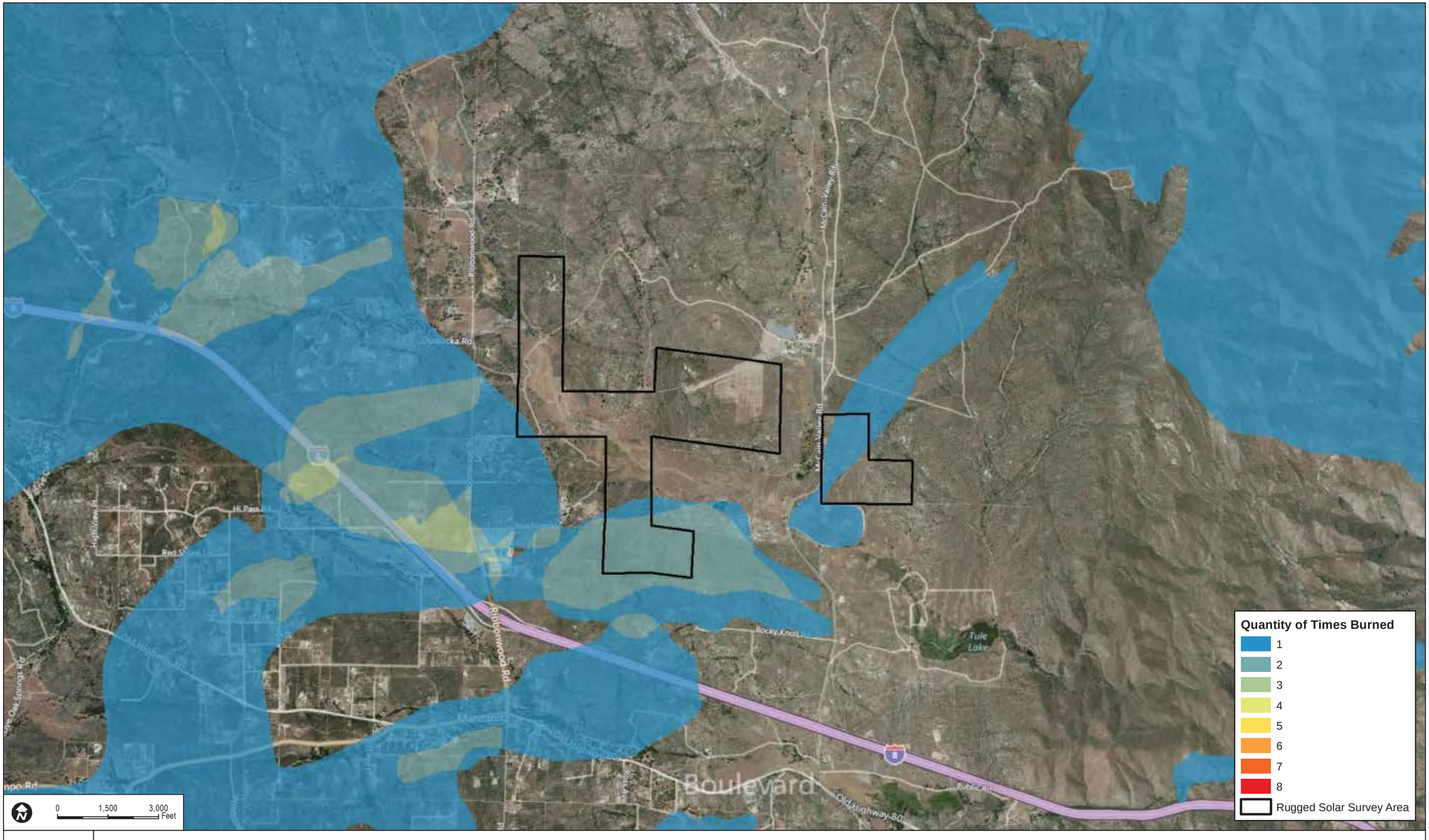
APPENDIX C

Site Vegetation Map

FIRE PROTECTION PLAN - RUGGED SOLAR

APPENDIX D

Fire History Exhibit



DUDEK

7122

SOURCE: SanGIS 2012; AECOM 2013; Soitec 2013; USGS 2012; Bing Maps

APPENDIX D

Fire History Map

FIRE PROTECTION PLAN - RUGGED SOLAR

APPENDIX E

BehavePlus Fire Behavior Analysis

APPENDIX E
BehavePlus Fire Behavior Analysis

BehavePlus Fire Behavior Modeling

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 extreme weather variables for the 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 more recent custom fuel models developed for southern California (Weise and Regelbrugge 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 Fire Behavior Modeling Inputs

Vegetation/Fuels

To support the fire behavior modeling efforts conducted for this Fire Protection Plan, a fuel model was identified for the site to represent the mixed chaparral vegetation surrounding the site. While other vegetation types are located in the area and on site, mixed chaparral fuels represent the most significant wildfire threat for the proposed project. The mixed chaparral cover on and adjacent to the site was classified as Fuel Model SH5.

Weather

Fire behavior modeling conducted in support of this FPP utilized the guidelines and standards presented by the County of San Diego, Department of Planning and Land Use (San Diego County 2010). These guidelines identify acceptable fire weather inputs for extreme 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.

To evaluate potential fire behavior for the project site, Dudek utilized the BehavePlus (v. 5.0.5) fire behavior modeling software package to determine fuel moisture values and expected fire behavior for the site. The temperature, relative humidity, and wind speed data for the Desert weather zone (SANGIS 2013) were utilized for this FPP based on the project location. Reference fuel moistures were calculated in BehavePlus and were based on site-specific topographic data inputs. Fire behavior for the site was calculated using worst-case fuels, topography, and weather and included an assessment of potential fire burning cross-slope (5% slope) in chaparral fuel beds (Fuel Model SH5) with Summer (18 mph), Santa Ana (24 mph), and Peak (56 mph) sustained wind speeds. Table 1 summarizes the fuel moisture calculations utilized for this FPP.

Table 1
BehavePlus Fine Dead Fuel Moisture Calculation

Variable	Value
Dry Bulb Temperature	90 -109 deg. F
Relative Humidity	5 - 9%
Reference Fuel Moisture	1%
Month	Feb Mar Apr Aug Sep Oct
Time of Day	16:00 - 17:59
Elevation Difference	Level (within 1,000 ft.)

Table 1
BehavePlus Fine Dead Fuel Moisture Calculation

Variable	Value
Slope	0 - 30%
Aspect	West
Fuel Shading	Exposed (< 50% shading)
Fuel Moisture Correction	2%
Fine Dead Fuel Moisture	3%

Topography

The topography of the site is discussed in greater detail in the FPP. 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 down hill as uphill vegetation is pre-heated and dried in advance of the flaming front, resulting in faster ignition rates. Slope values for this site were measured from site topographic maps and are presented in units of percent.

The modeling locations on the west and east sides of the project site represent the maximum slope (5%) and are aligned with anticipated on-shore and Santa Ana winds (an approximately east-west alignment). These sites were selected based on the strong likelihood of fire approaching from the west during a late-season on-shore wind-driven fire and from the east during a Santa Ana wind-driven fire event. The fire behavior modeling input variables for the project site are presented in Table 2. Locations for each modeling run are presented graphically in Figure 4 of the FPP.

Table 2
BehavePlus Fire Behavior Modeling Inputs

Variables	Scenario 1 (Santa Ana)	Scenario 2 (On-shore)
Fuel Model	SH5	SH5
1h Moisture	3%	3%
10h Moisture	4%	4%
100h Moisture	5%	5%
Live Herbaceous Moisture	30%	30%
Live Woody Moisture	60%	60%
20-foot Wind Speed (upslope)	24, 56*	18
Wind Adjustment Factor	0.4	0.5
Slope Steepness	5%	5%

*includes Santa Ana (24 mph) and peak (56 mph) sustained wind speeds

BehavePlus Fire Behavior Modeling Results

Three fire behavior variables were selected as outputs from the BehavePlus analysis conducted for the project site, 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, 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 3 presents an interpretation of these fire behavior variables as related to fire suppression efforts. The results of fire behavior modeling efforts are presented in Table 4 and identification of modeling run locations is presented graphically in Figure 4 of the FPP.

Table 3
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.

Table 4
BehavePlus Fire Behavior Modeling Results

Fire Behavior Variable	Summer (18 mph Winds)	Santa Ana (24 mph Winds)	Peak (56 mph Winds)
Flame Length (feet)	25.0	29.2	46.2
Fireline Intensity (Btu/ft/s)	6,210	8,690	23,567
Surface Rate of Spread (mph)	2.2	3.1	8.5

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APPENDIX F

Fire Facility Availability Form

COUNTY OF SAN DIEGO
DEPARTMENT OF PLANNING AND LAND USE: Zoning
PROJECT FACILITY AVAILABILITY FORM, Fire

F

Please type or use pen

Tierra del Sol Solar Farm LLC. 858-638-0995
Owner's Name Phone

4250 Executive Square Suite #770
Owner's Mailing Address Street

San Diego CA 92037
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) ☐ Specific Plan or Specific Plan Amendment
☐ Minor Subdivision (TPM) ☐ Certificate of Compliance:_____
☐ Boundary Adjustment
☒ Rezone (Reclassification) from Remove A to Designator zone.
☒ Major Use Permit (MUP), purpose: 60 MW Solar Farm
☐ Time Extension...Case No._____
☐ Expired Map...Case No._____
☐ Other_____

B. ☐ Residential . . . . . Total number of dwelling units_____
☐ Commercial . . . . . Gross floor area_____
☐ Industrial . . . . . Gross floor area_____
☒ Other . . . . . Gross floor area NA 420 Acres Development

C. Total Project acreage 420 Total lots 1 Smallest proposed lot NA

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

658-120-03-00	658-090-31-00
658-090-55-00	658-120-02-00
658-090-54-00	

Thomas Bros. Page _____ Grid _____
Tierra del Sol Road Boulevard
Project address Street
Mountain Empire, Boulevard 91905
Community Planning Area/Subregion Zip

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

Applicant's Signature: _____ Attorney-in-fact, Tierra del Sol Solar Farm LLC. Date: 6-11-2012

Address: 4250 Executive Square Suite #770 San Diego, CA 92037 Phone: 858-638-0995

(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 San Diego County Fire Authority

Indicate the location and distance of the primary fire station that will serve the proposed project: 39912 Ribbonwood Rd., 5.9 miles

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 10.65 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 the Department of Planning and Land Use.

☒ Within the proposed project 30 ~~100~~ 50 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.

JAMES PINE, FIRE MARSHAL 858.495.5991 7/18/12
Authorized signature *Print name and title* *Phone* *Date*

On completion of Section 2 and 3 by the District, applicant is to submit this form with application to: Zoning Counter, Department of Planning and Land Use, 5201 Ruffin Road, Suite B, San Diego, CA 92123

SDC DPLU RCVD 06-15-12
REZ12-005
P12-010

DPLU-399F (12/09)

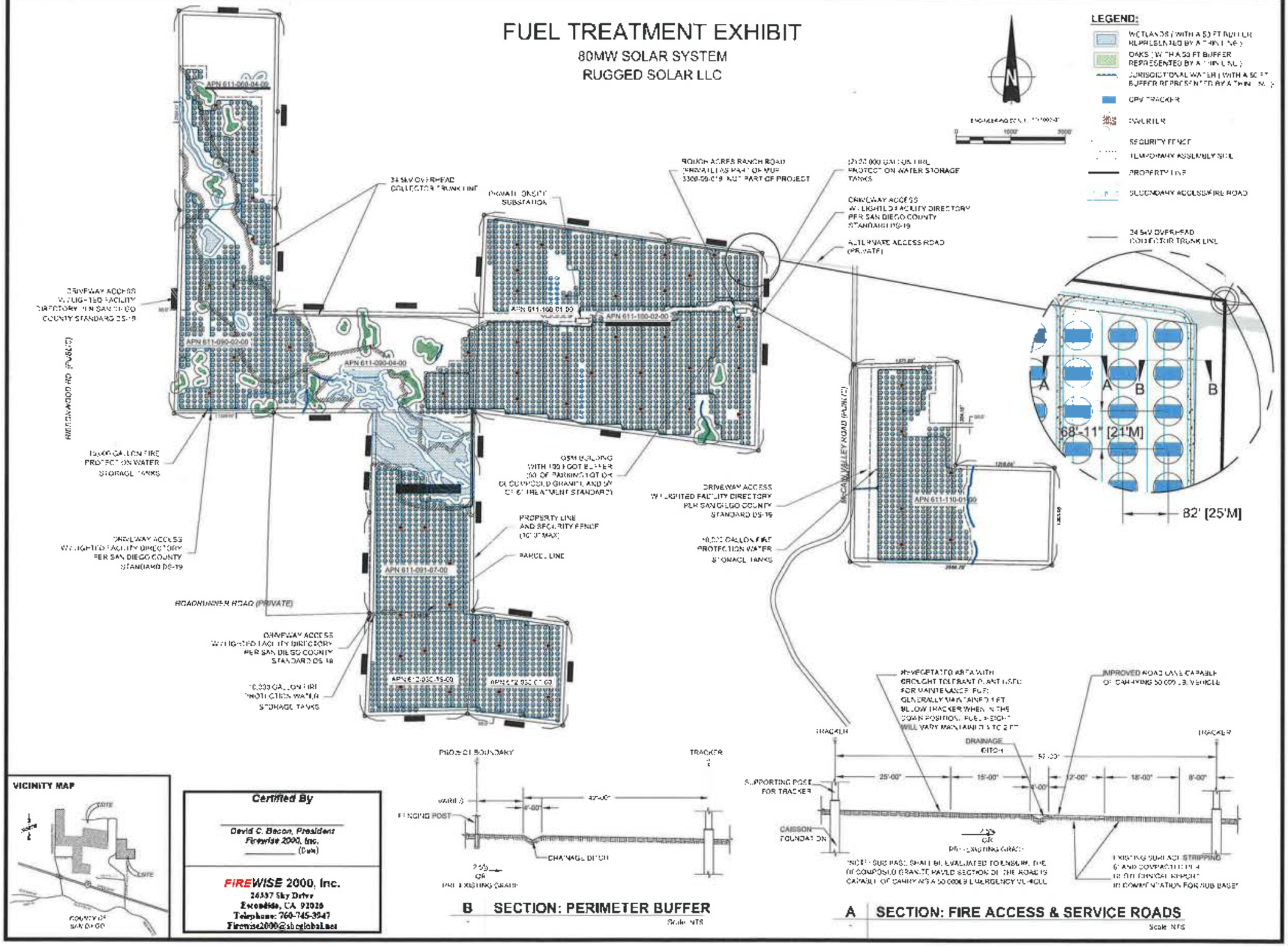
APPENDIX G

Fire Safety Site Plan

FUEL TREATMENT EXHIBIT

80MW SOLAR SYSTEM

RUGGED SOLAR LLC



VICINITY MAP

Certified By

David C. Bacon, President
Firewise 2000, Inc.
(Date)

***FIREWISE* 2000, Inc.**
26367 Sky Drive
Escondido, CA 92026
Telephone: 760-745-3947
Firewise2000@sbcglobal.net

B SECTION: PERIMETER BUFFER
Scale: NTS

A SECTION: FIRE ACCESS & SERVICE ROADS
Scale: NTS

APPENDIX H

Prohibited Plant List

APPENDIX H
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, Weeiping)
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. fobesii, 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. nesophylla, M. quinqenervia)*	Melaleuca (Flaxleaf, Pink, Cajeput Tree)
Olea europea	Olive
Picea (numerous)	Spruce
Palm species (numerous)	Palm
Pinus species *(P. brutia, P. canariensis, P. eldarica, P. halopensis, P. pinea, P. radiate, 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. terebenthifolius)*	Pepper (California and Brazilian)
Tamarix species *(T. Africana, T. apylla, 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 & Vines	
Acacia species	Acacia
Adenostoma fasciculatum	Chamise
Adenostoma sparsifolium	Red Shanks

Botanical Name	Common Name
Agropyron repens	Quackgrass
Anthemis cotula	Mayweed
Arbutus menziesii	Madrone
Arctostaphylos species	Manzanita
Arundo donax	Giant Reed
Artemesia species *(A. abrotanium, A. absinthium, A. californica, A. caucasia, A. dracunulus, A. tridentate, A. pynocephala)*	Sagebrush (Southernwood, Wormwood, California, Silver, True tarrangon, Big, Sandhill)
Atriplex species (numerous)	Saltbush
Auena fatua	Wild Oat
Baccharis pilularis	Coyote Bush
Bambusa species	Bamboo
Bougainvillea species	Bougainvillea
Brassica species *(B. campestris, B. nigra, B. rapa)*	Mustard (Field, Black, Yellow)
Bromus rubens	Foxtail, Red brome
Cardera draba	Noary 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
Dodonea viscose	Hopseed Bush
Eriodyctyon 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
Muehlenbergia species	Deer Grass
Nicotania species *(N. bigelevil, N. glauca)*	Tobacco (Indian, Tree)
Pennisetum setaceum	Fountain Grass
Perronskia Atriplicifloria	Russian Sage

Botanical Name	Common Name
Phoradendrom species	Mistletoe
Pickeringia montana	Chaparral Pea
Rhus species *(R. diversiloba, R. laurina, R. lentii)*	Sumac (Poison oak, Laurel, Pink Flowering)
Ricinus communis	Castor Bean
Rosmarinus species	Rosemary
Salvia species (numerous)	Sage
Sacsola austails	Russian Thistle
Solanium Xantii	Purple Nightshade (toxic)
Sylibum marianum	Milk Thistle
Thuja species	Arborvitae
Urtica urens	Burning Nettle
Vinca major	Periwnkle
Rhus Lentii	Pink Flowering Sumac

Notes:

1. 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.
2. The absence of a particular plant, shrub, groundcover, or tree, from this list does not necessarily mean it is fire resistive.
3. All vegetation used in Vegetation Management Zones and elsewhere in this development shall be subject to approval of the Fire Marshal.
4. 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.
5. 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 I

Potential Plant List for Fuel Modification Areas

APPENDIX I
Potential Plant List for Fuel Modification Areas

Botanical Name	Common Name
Trees	
Achillea spp.	Yarrow – only species growing under 12 inches height
Baccharis pilularis	Dwarf coyote bush – only in areas over 50 feet from structures/CPV trackers
Cerastium tomentosum	Snow in Summer
Coprosma kirkii	Tequila sunrise – only prostrate varieties
Cotoneaster spp	Cotoneaster – only species growing to less than 12 inches height
Dudleya brittonii	Britton's dudleya
Dudleya pulverulenta	Chalk lettuce
Eschscholzia californica	California poppy
Gazania spp	Gazania
Helianthemum spp	Sunrose*
L*asthenia californica glabrata*	California goldfields
Trifolium frageriferum Verbena	Strawberry clover
Trifolium frageriferum rigida	White clover
Viguiera laciniata	Goldeneye
Vinca minor	Dwarf periwinkle
Satureja douglasii	Yerba buena
Sisyrinchium bellum	Blue-eyed grass*
Sisyrinchium californicum	Yellow-eyed grass*

Notes:

1. 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.
2. The absence of a particular plant, shrub, groundcover, or tree, from this list does not necessarily mean it is not fire resistive.
3. All vegetation used in Vegetation Management Zones and elsewhere in this development shall be subject to approval of the Fire Marshal.
4. 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.
5. 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.

*Project area is outside preferred Zone

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APPENDIX J

Solar Facility Fire Hazard Technical Report

Concentrating Photovoltaic ("CPV") Solar Farm
Technical Report

Printed on 30% post-consumer recycled material.

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1.0 INTRODUCTION

The Rugged Solar Farm LLC (the "Proposed Project") Concentrating Photovoltaic ("CPV") project proposes to install and operate a 60MW AC CPV electrical power generating facility. The Proposed Project provides San Diego Gas and Electric ("SDG&E") with renewable power in compliance with California's renewable portfolio standard requirements.

2.0 BACKGROUND

2.1 Project Location

The project is located in the community of Boulevard, adjacent to the US/Mexico border. The project site is located approximately 3.5 miles south of SR 94 along the US/Mexico border. The main project site consists of the following Assessor Parcel Numbers (APNs): 658-090-31; 658-090-55; 658-120-03; 658-090-54 and 658-120-02.

2.2 Proposed Project

The proposed Rugged Solar Farm Project (Project) would produce up to 60 megawatts (MW) of solar energy and would consist of approximately 2,529 concentrating photovoltaic (CPV) trackers on 420 acres in southeastern San Diego County near the unincorporated community of Boulevard, California. As proposed, the project will be developed in two phases. Phase One would include the construction and operation of 45 MWs (1,910 CPV trackers) on approximately 330 acres. Phase Two would consist of the construction and operation of 15 MWs (619 CPV trackers) on approximately 90 acres. The project includes a Major Use Permit (MUP) to authorize a Major Impact Utility Pursuant to Sections 1350, 2705, and 2926 of the Zoning Ordinance. The project may also require a Rezone to remove Special Area Designator "A" and ensure compliance with Section 5100 of the Zoning Ordinance.

Individual tracker dimensions are approximately 48 feet across by 25 feet tall. Each CPV Tracker unit would be mounted on a 28-inch steel mast (steel pole) which would be supported by either (i) extending it into the ground up to 20 feet and encasing it in concrete, or (ii) attaching it to a concrete foundation sized to be suitable to adequately support the CPV Tracker based on wind loading and soil conditions at the site. The preferred method would be to set the mast by vibratory pile driving methods depending upon soil conditions.

In its most vertical position and depending on foundation design, the top of each tracker would not exceed 30 feet above grade, and the lower edge would not be less than 1 foot above ground level. In its horizontal "stow" mode (for high winds), each tracker would have a minimum ground clearance of 13 feet 6 inches.

Power from the CPV system in each Building Block would be delivered from each tracker to a conversion station through a 1,000 volt DC underground collection system. The underground 1,000 V DC collection system construction footprint would include a trench of one to two feet in width and a depth of up to approximately four feet. It is anticipated that power from the CPV systems on site would be separated into three 34.5 kV underground collection circuits, each delivering approximately 20 MW of power to the Project substation.

Each 34.5 kV underground branch circuit associated with Phase I would connect to a 34.5 kV overhead trunk line on the project site for delivery to the Project substation. These two collection circuits for Phase I would be run overhead on an above ground trunk line adjacent to the south side of the Southwest Power Link right of way. This trunk line would be approximately 1.2 miles long and would have two 34.5 kV circuits and deliver a total of 45 MW. The above ground trunk line would utilize steel poles and would be approximately 50-75 feet high and spaced about 300-500 feet apart. The minimum ground clearance of the 34.5 kV lines would be 30 feet. The maximum hole dimensions for steel pole foundations would be 24 inches in diameter and approximately 20 feet deep. Phase 2 will connect to the Project substation entirely via one 34.5 kV underground branch circuit and the underground 34.5 kV collection system construction footprint would include a trench of three to four feet in width and a depth of up to approximately four feet. Base material would be installed in all trenches to (i) ensure adequate drainage, and (ii) to ensure sufficient thermal conductivity and electrical insulating characteristics below and above collection system cables.

The project will include construction of a 34.5/138 kV step-up substation site (located within the northeast corner of the project site and adjacent to the O&M annex site) would increase the voltage received from the overhead and underground collector system from 34.5 to 138 kV. Switching and transformer equipment as well as a control house and a parking area for utility vehicles would be located within the 3-acre substation site and for security purposes (and to allow for nighttime inspections) lighting would be installed near substation equipment, the control shelter, and on the entrance gates.

A 4-acre operations and maintenance (O&M) annex site would be located adjacent to the substation site and would house operations and maintenance supplies, telecommunications equipment and rest facilities all within a single-story building. It is anticipated that in-place tracker washing would occur every 6 to 8 weeks by mobile crews who will also be available for dispatch whenever on-site repairs or other maintenance are required. Tracker washing will be undertaken using a tanker truck and smaller “satellite” tracker washing trucks. On-site water storage tanks may be installed to facilitate washing.

Note to Reviewer: The Project Applicant is in the process of determining the alignment and right-of-way for the interconnection from the proposed project site to the Boulevard rebuilt substation. The ultimate alignment for the gen-tie will be provided in a subsequent submittal and environmental review completed in a subsequent submittal.

Project construction would consist of several phases including site preparation, development of staging areas and site access roads, solar CPV assembly and installation, and construction of electrical transmission facilities. After site preparation, initial project construction would include the development of the staging and assembly areas, and the grading of site access roads for initial CPV installation The Project would be constructed over a period of up to approximately 12 months, which includes both Phase I and II.

2.3 Solar Generation Technology

Each building block in its standard configuration is comprised of up to fifty-six (56) Soitec ConcentrixR CX-S530 dual-axis trackers. Power within each building block is delivered through a 1,000-volt (V) direct current (DC) underground collection system from the trackers to the pair of inverters. Each inverter pair would be equipped with a 350V to 34.5 kV step-up transformer.

Individual tracker dimensions are approximately 48 feet across by 28 feet tall. Each CPV tracker would be mounted on a 28-inch diameter steel mast (steel pole) which would be supported by either (i) extending it into the ground up to 20 feet, or (ii) attaching it to a concrete spread foot foundation. In its most vertical position and depending on mast height above ground, the top of each tracker would be approximately no more than 30 feet above grade, and the lower edge would be at least 1 foot above the ground (or 1 foot above flood elevation in areas that are subject to 100-year inundation). In its horizontal “stow” mode (for high winds), each tracker would have a minimum ground clearance of 13 feet 6 inches. Solar CPV modules would be mounted on and comprise, in the aggregate, the surface of each tracker. The dimensions, maximum height, and ground clearance for all trackers would be the same throughout the Project.

The schematic arrangement/number of CPV systems, inverter pads and structures, and internal access are shown in on the MUP Plot Plan to illustrate the general configuration of the proposed solar collection solar farm. However, this layout is subject to modification at final engineering design. Fire Protection design considerations are included on the FPP Fuel Treatment Exhibit.

3.0 ANALYSIS

This Technical Report supplements the project’s Fire Protection Plan (FPP) which evaluates and recommends actions for the Proposed Solar Project 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. It considers water supply, access, structure ignitability and fire resistive building materials, fire protection solar farms and 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 solar farm, actions that would protect and enhance the safety of fire suppression resources, and actions that could protect the solar farm from ignition caused by other sources.

Today's emergency responders face unexpected challenges as new uses of alternative energy increase. These renewable power sources save on the use of conventional fuels such as petroleum and other fossil fuels, but they also introduce unfamiliar hazards that require new firefighting strategies, procedures, and training.

The safety of firefighters and other emergency first responder personnel depends on understanding and properly handling these hazards through adequate training and preparation. 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 at emergencies involving solar power solar farms.

3.1 Solar Farm 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 Solar Farm as well as from natural conditions that could result in risk of fire. These hazards include several operations and activities associated with the solar farm that could elevate the probability of ignition. These could include the following:

1. Transmission lines contacting vegetation that could cause an ignition, especially when excessive electrical load demands cause line sag.
2. Maintenance activities such as welding or vegetation clearing along the lines that could cause an ignition.
3. Vehicles used by the solar farm operations that could cause an ignition (catalytic converter, faulty brakes, etc.)

4. Malfunctioning transformers at the inverters that could create an ignition. Among the potential hazards to responding firefighters are:
    a. During daylight hours, crews should consider all CPV solar farm modules and trackers energized and fight the fire as they would any other electrical fire. Crews should use dry chemical extinguishers on any potentially energized CPV component. Trackers and modules cannot be isolated during daylight hours and must always be considered energized.
    b. Depending on the level of damage to the solar farm during a fire incident, the connection to "ground" may have been lost and create an extremely hazardous situation, especially if pooling of water occurs.
    c. The use of electrical conductive tools is hazardous, since the modules and frames may still be energized.
    d. The inverters and DC combiner boxes could be located in the middle of the CPV layout or in between rows of trackers. The DC conduit/wiring to the combiner boxes may be running in between the rows. There could be a delay in locating the inverter or identifying other controls. Fire fighters should not step on modules and should be aware of the trip, slip and fall potential around CPV trackers, conduit and the modules themselves.
5. Firefighters must be cautious of water pooling when CPV solar farm could become energized.
6. Care must be taken to avoid unnecessary contact with potentially energized CPV components until they can be isolated and confirmed de-energized.
7. Burning CPV modules may produce toxic vapors. Firefighters should wear full PPE and 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 whenever possible.
8. Firefighters should never cut the wiring in a CPV solar farm. Specialized tools may be required for disconnecting the tracker wiring. Trackers, modules, and conduit should not be disassembled, damaged or removed by firefighters until all of the CPV solar farm's components are isolated or de-energized by a qualified CPV technician or electrician. Firefighters should limit their activities to containment of the fire until it can be confirmed that the solar farm is isolated or de-energized.
9. At any incident where CPV is present the IC must designate a "Utilities Group" early to aid in locating and disabling all of the CPV solar farm components. This can greatly decrease the electric shock hazard to all crews operating on the fire ground. Firefighters must remember that all CPV components must be considered "HOT" during day light.

Additionally, in large commercial solar farms, Firefighters must be aware that if a single building block or tracker is isolated, all of the others may remain energized. Care must be exercised when operating the other energized trackers.

10. 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.
11. Incidents involving CPV solar farms are unique in that components may remain energized within the facilities even after all utility supplied power has been de-energized. Along with a structural stability assessment, hazard identification and the marking of any potentially energized areas should be a priority. A qualified CPV technician or electrician should be called to the incident to de-energize any solar farm 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 CPV technician or electrician. All hazards should be appropriately marked or barricaded.
12. CPV solar farms are typically mounted atop a mast structure specifically designed to support the CPV tracker. The inverters and DC combiner boxes could be located at the end of a row of trackers or in between rows of trackers. The DC conduit/wiring to the combiner boxes may be running in between the rows of trackers.

3.2 Fuels Management to Protect Facilities from other Sources

The Proposed Project is in a very high fire hazard severity zone. The FPP for this Proposed Project documents recommendations to protect the facilities from fire from other sources. Any wind or topography driven wildfire and especially those burning under a northeast (Santa Ana) wind pattern creates a very high wildland fire hazard scenario, especially for wildland fires starting northeast of the development. In addition, a typical fire day with a southwest wind will create a high wildland wildfire hazard. However, the proposed fuel modification treatments and the use of building standards compatible with a solar operation will lower the risk for potential loss of solar structures to less than significant levels. Fuel treatment and setback will most normally eliminate direct fire impingement and radiant heat from around the perimeter of the structures.

4.0 CONCLUSIONS AND RECOMMENDATIONS

Following an assessment of a fire related situation, the choice of a strategic mode should be made by the Incident Commander (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 a CPV solar farm. Before going any further:

- Find the Directory for the Site as it has the location of key components.
- Find the Service Disconnects.
- Find the switch to put the Trackers in the Horizontal position.

4.1 Strategy

When a fire incident occurs in the vicinity of a CPV solar farm, the following items must be considered when developing a strategy:

a. Fire conditions found on arrival

b. Whether the CPV solar farm itself is burning or fire is confined to the surrounding vegetation

c. Are aerial firefighting resources being used or planned?

d. Threatened exposures including wild land areas

e. Water and additional resources available

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 hazards associated with CPV solar farms, the IC must adjust the strategy and potentially rearrange the order of the tactics to deal specifically with the CPV solar farm technology. If the IC chooses an offensive strategy it needs to be supported as any other fire operation with an emphasis on disabling all power sources to and from the CPV solar farm.

4.2 Tactics

Tactics will be based on the chosen strategy and Department SOPs:

a. "Components are always hot!" The single most critical message of emergency response personnel is to always consider photovoltaic generating plants and all their components as electrically energized. The inability to power-down photovoltaic panels exposed to sunlight makes this an obvious hazard during the daytime, but it is also a potential concern at nighttime for a solar farm that may be equipped with battery storage.

b. Isolation of the inverters and disconnection of the solar farm from the main electrical panel will be an important task. Assistance from a local CPV technician is key for disabling the CPV solar farm 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 further extension of the fire and isolating it to its area of origin. This task may be difficult during a vegetation fire, especially if aerial resources are being used within the tracker layout. 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 under or near the CPV solar farm, 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 PPE must be used due to the potential toxic inhalation hazard if panels 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 solar farm no longer poses an electric shock hazard. Firefighters must avoid inadvertently damaging CPV components with their tools.

h. The IC will need the assistance from local CPV 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.

i. The tactical approach to a fire incident with solar power equipment must be stressed to all fire suppression personnel (i.e., stay clear). Serious injury can occur with concentrated photovoltaics or any type of pv solar on a sunny day.

The following provides the potential effects and differences between alternating current (AC) and direct current (DC).

5.0 EFFECTS OF DC ELECTRICITY ON THE HUMAN BODY

5.1 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-lb male and 115-lb female body are given in Table 1.

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 or in deeper layers (muscles, bones, etc.), or both. 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 1
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 A-1, 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.

5.2 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 alternating current (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 10J

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 alternating current than to direct current. At 60 Hz, humans are more than six times as sensitive to alternating current 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 2 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 2
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-in. pipe or drill handle	1000–3000	500–1500
Two hands around 1.5-in. 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 1).

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.

6.0 REFERENCES

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