REVISED
GROUNDWATER RESOURCES AND ANTICIPATED WATER DEMAND FOR A PROPOSED PHOTOVOLTAIC SOLAR FACILITY - RAMONA

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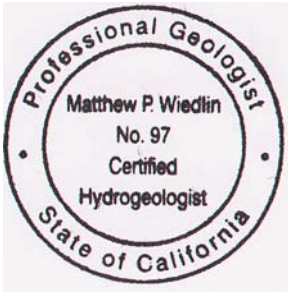

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INTRODUCTION

The development and operation of a photovoltaic (PV) solar facility to be located on San Diego Gas and Electric (SDG&E) owned property in Ramona, California has been proposed (MUP-14-013). This document addresses recent and proposed groundwater use for the property. The property, APN 284-340-35, is located at the intersection of Creelman Lane and Ashley Road (Figure 1). Based on the assessment of past groundwater usage, anticipated water usage, and San Diego County's default assessment of groundwater resources, which is based on their Groundwater Limitations Map (San Diego County, 2005), an assessment of how much of the proposed project's water requirements can be met with on-site groundwater resources has been developed. The assessment of groundwater resources is expected to be an underestimate of actual resources, therefore a larger annual sustainable groundwater supply is likely available. Characterization of the larger groundwater resource would require site specific testing and evaluation and are not within this project's scope of work.

The proposed facility at Creelman Lane would have an overall production capacity of approximately 4.0 Megawatts (MW) (alternating current – AC). Power produced at the site would supply power to the local community (Hinshaw, 2015a). The facility is expected to be constructed in one phase, comprised of four stages, on a 37.23±acre parcel to achieve the intended MW output. The development area would be limited to approximately 18.3 acres of the parcel and the remaining acreage would remain in its present undeveloped state (Figure 2). The proposed project design consists of approximately 17,520 mono-crystalline or poly-crystalline silicon cell PV solar modules.

Anticipated groundwater demand at the site includes water for temporary construction and grading and long term water demand for solar panel rinsing and landscape irrigation. Temporary and permanent water demand for the Ramona site and half the water demand for a second PV solar facility,located in Pala at the intersection of State Route 76 and Pala del Norte Road, are included as the potential full groundwater demand for the site. The proposed Pala facility is subject to a separate permit application process (Hinshaw, 2015b) and additionalwater supplies for Pala are being evaluated as part of that process.

The proposed facility at Creelman Lane is within the Ramona Water District service area. Existing fire hydrants at the southeast and southwest corners of the project site will provide adequate water volume and pressure for fire protection services (Hinshaw, 2015a).

The San Diego County Groundwater Ordinance provides a means to estimate a minimum sustainable groundwater yield from a property based on average annual rainfall. Per San Diego County's Groundwater Limitation Map (San Diego County Department of Planning and Land Use, 2004), the average rainfall for the site is between18 and 21 inches per year, based on a 30 year record of rainfall. Under Section 67.722 of the County Groundwater Ordinance, areas that are groundwater dependent and that average 18 to 21 inches of annual rainfall may have residential densities of 5 acres per residential unit without embarking on a site specific groundwater study. For the 37 acre project site, this condition implies that at a minimum, the parcel could sustain 7 homes, each assumed to use 0.5 acre-feet of water per year. Therefore, per the Groundwater Ordinance, a default groundwater resource of 3.5 acre-feet of water per year is assumed to be

available at the site.

RECENT GROUNDWATER USAGE

The following provides a description of recent Creelman Lane site operations. Based on that description an estimate of annual groundwater use is developed.

CURRENT SITE OPERATIONS

Based on dated aerial images on Google Earth, a palm tree nursery began operating at the site sometime between June 1996 and May 2002. According to the Project Description (Hinshaw, 2015a), the nursery signed a lease with the property owner, SDG&E, in 1998. Two wells and a 10,000 gallon water storage tank are present at the northwest corner of the parcel (Figure 2). Based on a well permit application approved on December 21, 1998 that was obtained from the San Diego County Department of Environmental Health, one well was likely completed in early 1999. No well log for that particular well was on file at DEH. The second well was completed in July 2005 to a total depth of 312 feet. The drilling contractor reported a well yield of 120 gpm based on an unspecified air lifting test. The static water level reported on the drilling log was 15 feet. During a July 2014 site visit the depth to water at the newer well was measured at 20 feet from the top of the well casing. The pump was not operating at the time of the measurement.

The palm tree nursery grows two types of trees, the Queen Palm and the Canary Island Date Palm (KTU+A, 2014). Analysis of an August 23, 2010 aerial image from Google Earth indicates that Queen Palm cover approximately 4.3 acres of land while the Canary Island Date Palms cover approximately 4.4 acres (Figure 3). Tree density is substantially greater for the Queen Palms. However when the digital area measurements taken from the aerial image for the Canary Island Date Palms were taken, a concerted effort to minimize the open areas between the trees was made (Figure 3) and the low density of trees was further accounted for by applying a plant density coefficient (k_d) in the irrigation requirement calculation (Equation 1). Additional aerial images taken on different dates show a similar tree coverage over time (Appendix A).

ESTIMATED TREE NURSERY GROUNDWATER DEMAND

An estimate of groundwater demand by the nursery was prepared using a crop coefficient and a potential evapo-transpirative (Eto) demand approach that accounted for rainfall to meet some of the Eto. The general equation used to calculate irrigation requirements is:

$$IR = A*((Eto-P_e)/12)*k_l*k_s*k_{mc} /I_e \qquad \text{(Equation 1)}$$

Where:

- IR = Irrigation Requirement (acre-feet per year)
- A = Area Irrigated (acres)
- Eto = Average Monthly Potential Evapo-transpiration (inches per month)
- P_e = Effective Rainfall (inches per month)
- k_s = Species Coefficient
- k_d = Plant Density Coefficient
- k_{mc} = Micro-Climate Coefficient
- I_e = Irrigation Efficiency

Monthly Eto data for the time period January 2003 through December 2013 was compiled from the California Irrigation Management System (CIMIS) station in Escondido (Table 1). Monthly rainfall data for the same time period measured at the Ramona Airport was also compiled (Table 2). Effective rainfall, that is, monthly rainfall that meets or partially meets the monthly Eto, was calculated (Table 3). An average monthly value for each data set was calculated from the 11 years of data that coincided with the time the nursery operated. These average monthly values were applied to Equation 1. While Eto and P_e changed for each month, A, k_l, k_d, $k_{mc,\ and}$ I_e, remained constant for the 12 monthly calculations that were applied to each type of palm tree (Table 4). Average annual Eto for the 2003 to 2013 time period is 54.6 inches (Table 1). Average annual rainfall for the same time period is 14.2 inches (Table 2). Average annual effective rainfall is 10.0 inches (Table 3), or 70 percent of total rainfall.

Based on a landscape irrigation guidance document published by the University of California Cooperative Extension and the California Department of Water Resources (UCCE, 2000), values for k_l, k_d, and k_{mc} were derived for the two types of palms. The guide classifies the Queen Palm as having a moderate water requirement and the Canary Island Date Palm as having a lower water requirement. These classifications translate into species coefficient (k_s) values that range between 0.4 to 0.6 for the Queen Palm and 0.1 to 0.3 for the Canary Island Date Palm where the values represent a fraction of the Eto. The intermediate value in each range was selected to calculate irrigation requirements.

Plant density coefficient values are classified as low (0.5 to 0.9), average (1.0), and high (1.1 to 1.3) (UCCE, 2000). The Queen Palm k_d was assigned a value of 1.2 in recognition of the extremely close spacing of the trees. The Canary Island Date Palm k_d was assigned a minimum value of 0.5 in conformance with the low density plantings at the nursery.

Microclimate coefficient values are classified in a similar manner as plant density coefficients; low (0.5 to 0.9), average (1.0), and high (1.1 to 1.4) (UCCE, 2000). The site appears non-unique with respect to microclimate considerations and is therefore assigned a k_{mc} value of 1.0 (UCCE, 2000).

An irrigation efficiency for both types of palm trees was assumed to be 0.75, where 1.0 represents the unattainable feat of delivering exactly the amount of water the plant requires without loss from runoff, evaporation, or over spray. An irrigation efficiency of 0.75 represents a reasonably well designed and well managed irrigation system.

Applying these factors yields an average annual irrigation requirement of 12.9 acre-feet for the Queen Palms, 2.2 acre-feet for the Canary Island Date Palms (Table 4) and a total irrigation requirement of 15.1 acre-feet per year.

ANTICIPATED PROJECT WATER DEMAND

Temporary and long term project water demand estimates are presented using unit rates of water consumption that have been accepted by San Diego County at other solar energy permit applications. Temporary project water demand pertains to water needed during project construction for clearing brush, grading, and dust control. Long term project water demand pertains to water needed for the operation and maintenance of the project. Operation and maintenance requirements requiring water are solar panel rinsing, ongoing soil binding for dust control, and landscape irrigation.

Temporary and long term project water demand for the site includes not only water demand for the Creelman Lane facility but water demand for the Pala solar energy project located at the intersection of State Route 76 and Pala del Norte Road. These demands are presented separately.

CREELMAN LANE FACILITY, RAMONA

Temporary water demand at the Creelman Lane facility in Ramona is expected to require approximately 0.55 acre-feet of water (Table 5). This water will be required mostly during Stage 2 of the project when clearing, grubbing, and grading are planned. Per the project description (Hinshaw, 2015a), Stage 2 is expected to take approximately 90 days.

Long term project water demand for the Creelman lane facility is expected to initially require approximately 0.44 acre-feet per year and will decline to approximately 0.25 acre-feet per year during the third year of operation (Table 6).After the third year of operation for the proposed project, which corresponds to the last year of regular supplemental landscape irrigation, water demand would decrease to approximate 0.19 acre-feet and average this amount for the life of the project.

PALA DEL NORTE ROAD FACILITY, PALA

Temporary water demand at the Pala del Norte Road facility in Pala is expected to require approximately 0.41 acre-feet of water (Hinshaw, 2015b). Approximately half of that will be provided by Rainbow Municipal Water District (RMWD). However, one of the parcels at the Pala del Norte Road facility, APN 110-370-01, is not located within a water district and construction water for this parcel will be delivered by truck to the Pala facility usinga well at the Creelman Lane facility (Hinshaw, 2015b).

The Pala del Norte Road facility parcel that is outside RMWD's service area accounts for approximately 50 percent of the Pala project site (Independent Energy Solutions, 2015). Accordingly, about half of the temporary water demand, 0.21 acre-feet,may be provided by the Creelman Lane water wells for the Pala PV project (Table 7).

Like the Creelman Lane construction, thetemporary water demand will also be required mostly during Stage 2 of the project when clearing, grubbing, and grading are planned. Per the project description (Hinshaw, 2015b), Stage 2 is expected to take approximately 90 days.

Long term project water demand for operations and maintenance at the Pala facility is expected to

initially require approximately 0.19 acre-feet per year and will decline to approximately 0.11 acre-feet per year during the third year of operation (Table 8) (Hinshaw 2015b).After the third year of operation of the proposed project, which corresponds to the last year of regular supplemental landscape irrigation, water demand would decrease to approximate 0.09 acre-feet and average this amount for the life of the project.

COMBINED GROUNDWATER DEMAND

The combined groundwater demand at the Ramona facility to meet long term operation and maintenance requirements at the Ramona and Pala facilities is estimated to range between 0.63 acre-feet per year for the first year and 0.36 acre-feet per year for the third year and subsequent years (Tables 6 and 8).

Assuming that half of the Pala temporary construction water demand is to be met with groundwater from the Ramona facility, and that construction water demand for both the Ramona and Pala facilities occurs within the same calendar year as the first year of operation and maintenance for both the facilities, then the total groundwater demand at the Ramona facility for the first year may be as high as 1.39 acre-feet (Table 9).

DISCUSSION

The Creelman Lane nursery has been in operation for 13 to 16 years. During that time nursery irrigation requirements have been approximately 15.1 acre-feet per year. At the time of the completion of the second well in July 2005, the depth to groundwater at the site was 15 feet. In July of 2014 the depth to groundwater at the site was 20 feet. This indicates that groundwater production at the site has been sustainable and was supported by groundwater inflow to the site rather than from depletion of groundwater stored in the fractured rock aquifer. With an anticipated long term combined water demand from the two facilities of 0.36 acre-feet per year, the estimated groundwater production rate is approximately 2 percent of the current land use. Based on the history of groundwater use at the site, groundwater recharge and storage at the site are sufficient to meet the water demand for project construction and long term operation and maintenance for both facilities without inducing a long term groundwater overdraft condition.

For temporary water demand, the following analyses assume that construction demand at the Pala and Ramona facilities will not occur simultaneously. Assuming the Creelman Lane construction water requirement of0.55acre-feet of water will be required over a concentrated 20 day period within the 90-day Stage 2 construction schedule (Hinshaw, 2015a & 2015b),thenthe water demand over an 8-hour work day is equivalent to an average of 18 gpm. This short term construction water demand could be met with temporary on-site water storage and the ability to pump 24 hours a day at a combined pumping rate of 6 gpm. Based on the Palm Tree nursery irrigation requirements, it is very likely that the well that was completed in 2005 can meet this short term demand by itself. If construction schedules for the facilities have the potential to overlap, it is recommended that both water wells be subjected to production tests to properly manage temporary demand with well yield.

Groundwater quality at the site is unknown. However, based on other studies in the area, salinity

is likely to be somewhat elevated, though evidently the palm tree nursery successfully managed. Elevated salinity will require a slightly higher volume of incoming water for mobile reverse osmosis and de-ionization treatment. Water demand estimates incorporate this consideration (Tables 6& 8).

CONCLUSIONS

Long term existing land use at the site has required approximately 15.1 acre-feet of groundwater per year. The combined water demand of the Ramona and Pala facilities has a maximum potential one-time peak of 1.39 acre-feet per year and a long term demand of 0.36 acre-feet per year. Therefore the existing land use has demonstrated that on-site groundwater resources can easily meet the water requirements for both the Ramona and Pala proposed solar facilities without creating a groundwater overdraft condition.

In addition to the site specific information that indicates that more than adequate groundwater resources are available at the site for the proposed project, the default groundwater assessment of groundwater resources that is defined in the County Groundwater Ordinance indicates that the site can sustain a minimum of 3.5 acre-feet of groundwater use per year. This is more than twice the temporary maximum peak demand of 1.39 acre-feet for both facilities combined (Table 9). The default assessment of 3.5 acre-feet per year is also nearly 10 times greater than the combined anticipated long term demand for both facilities of 0.36 acre-feet per year (Table 6 & 8).

The use of local supplies for this non potable application reduces the County's need for imported water and provides cost savings for the applicant. Additionally, approval of the project will reduce on-site groundwater demand at the Creelman Lane property and make more groundwater available for surrounding properties. Because the proven available groundwater resource is over40 times greater than the expected long term water demand for the project, it is recommended that groundwater monitoring and reporting not be required as a condition of approval for the project.

REFERENCES

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TABLES

TABLE 1
Potential Evapo-Transpiration (Eto)
CIMIS Station 153, Escondido, California

	January	February	March	April	May	June	July	August	September	October	November	December	Total
2003	3.00	2.53	4.46	4.95	5.55	5.17	6.85	6.96	5.41	4.07	2.59	2.07	53.61
2004	2.26	2.76	4.58	5.19	6.94	6.42	7.49	6.74	5.82	3.36	2.42	2.31	56.29
2005	1.87	1.91	3.73	5.00	5.99	6.02	7.33	6.65	5.33	3.67	2.92	2.10	52.52
2006	2.78	3.19	3.36	4.09	5.72	6.65	6.91	6.66	5.57	3.91	2.87	2.62	54.33
2007	2.75	2.46	4.73	4.60	6.02	7.13	7.40	6.95	5.25	4.70	2.42	2.19	56.60
2008	2.27	2.66	3.93	5.37	5.69	7.33	7.15	6.54	5.57	4.97	2.93	1.74	56.15
2009	2.81	2.47	4.08	5.16	5.83	5.46	6.67	5.64	5.57	4.00	2.89	1.85	52.43
2010	2.14	2.52	4.38	5.15	6.66	6.92	7.02	7.42	5.71	2.99	2.94	1.64	55.49
2011	2.66	2.83	3.83	5.06	6.10	6.83	7.27	7.09	4.89	3.96	2.62	2.29	55.43
2012	2.61	2.80	3.98	4.81	6.24	7.00	6.84	6.50	5.25	3.83	2.49	1.54	53.89
2013	2.43	2.86	4.35	5.16	6.36	6.84	6.07	6.20	5.21	3.84	2.41	2.45	54.18
Average	2.51	2.64	4.13	4.96	6.10	6.52	7.00	6.67	5.42	3.94	2.68	2.07	54.63

Eto reported in inches. CIMIS = California Irrigation Management System

TABLE 2
Monthly Rainfall
Ramona Airport

	January	February	March	April	May	June	July	August	September	October	November	December	Total
2003	0.53	5.27	2.54	1.96	1.02	0.03	0	0.1	0	0	0.32	0.63	12.4
2004	0.37	2.78	0.43	0.96	0	0	0	0.02	0	5.82	1.61	3.88	15.87
2005	6.54	7.25	2.26	1.4	0.26	0.02	0.41	0.11	0.17	1.32	0.11	0.39	20.24
2006	1.27	1.97	3.53	1.74	0.39	0.13	0.37	0.19	0.24	0.2	0.17	1.01	11.21
2007	0.59	2.76	0.48	0.66	0.02	0.02	0.02	0.05	0.06	0.19	2.56	1.22	8.63
2008	5.78	3.94	0.09	0.08	0.75	0.02	0.01	0.02	0	0.12	1.97	5	17.78
2009	0.15	4.15	0.13	0.62	0.02	0.04	0	0.01	0.04	0.1	0.79	4.79	10.84
2010	7.16	3.08	0.38	2.13	0.02	0.02	0.02	0.01	0.19	3.27	2.3	9.22	27.8
2011	1.07	4.81	2.34	0.56	0.51	0.09	0.07	0.01	0.22	0.48	3.25	0.58	13.99
2012	0.65	2.11	2.43	1.55	0.21	0	0.04	0.08	0.03	0.75	0.62	2.13	10.6
2013	1.6	0.96	1.41	0.06	0.47	0	0.08	0.01	0	1.62	0.21	0.67	7.09
Average	2.34	3.55	1.46	1.07	0.33	0.03	0.09	0.06	0.09	1.26	1.26	2.68	14.22

Rainfall reported in inches.

TABLE 3
Monthly Effective Rainfall

	January	February	March	April	May	June	July	August	September	October	November	December	Total
2003	0.53	2.53	2.54	1.96	1.02	0.03	0.00	0.10	0.00	0.00	0.32	0.63	9.66
2004	0.37	2.76	0.43	0.96	0.00	0.00	0.00	0.02	0.00	3.36	1.61	2.31	11.82
2005	1.87	1.91	2.26	1.40	0.26	0.02	0.41	0.11	0.17	1.32	0.11	0.39	10.23
2006	1.27	1.97	3.36	1.74	0.39	0.13	0.37	0.19	0.24	0.20	0.17	1.01	11.04
2007	0.59	2.46	0.48	0.66	0.02	0.02	0.02	0.05	0.06	0.19	2.42	1.22	8.19
2008	2.27	2.66	0.09	0.08	0.75	0.02	0.01	0.02	0.00	0.12	1.97	1.74	9.73
2009	0.15	2.47	0.13	0.62	0.02	0.04	0.00	0.01	0.04	0.10	0.79	1.85	6.22
2010	2.14	2.52	0.38	2.13	0.02	0.02	0.02	0.01	0.19	2.99	2.30	1.64	14.36
2011	1.07	2.83	2.34	0.56	0.51	0.09	0.07	0.01	0.22	0.48	2.62	0.58	11.38
2012	0.65	2.11	2.43	1.55	0.21	0.00	0.04	0.08	0.03	0.75	0.62	1.54	10.01
2013	1.60	0.96	1.41	0.06	0.47	0.00	0.08	0.01	0.00	1.62	0.21	0.67	7.09
Average	1.14	2.29	1.44	1.07	0.33	0.03	0.09	0.06	0.09	1.01	1.19	1.23	9.98

Effective rainfall measured in inches.

TABLE 4
Estimated Irrigation Requirements For Existing Palm Tree Nursery

Tree Type	Acreage	k_s	k_d	k_{mc}	I_e	Irrigation Requirement (acre-feet)												
						Jan	**Feb**	**Mar**	**Apr**	**May**	**June**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Yearly Total**
Queen Palm	4.3	0.5	1.2	1.0	0.75	0.4	0.1	0.8	1.1	1.7	1.9	2.0	1.9	1.5	0.8	0.4	0.2	**12.9**
Canary Island Date Palm	4.4	0.2	0.5	1.0	0.75	0.1	0.0	0.1	0.2	0.3	0.3	0.3	0.3	0.3	0.1	0.1	0.0	**2.2**
Total Estimated Irrigation Demand						0.5	0.1	0.9	1.3	1.9	2.2	2.3	2.2	1.8	1.0	0.5	0.3	**15.1**

*Irrigation Requirement = (Acreage*ks*kd*kmc((Eto-Effective Rainfall)/12)/irrigation efficiency. Ks = species coefficient, kd = pland density coefficient, kmc = microclimate coefficient, I_e = Irrigation efficiency*

TABLE 5
TOTAL ESTIMATED WATER DEMAND FOR PROJECT CONSTRUCTION
CREELMAN LANE FACILITY
RAMONA, CALIFORNIA

Activity	Estimated Rate of Water Demand	Area Affected	Total Estimated Water Used (Gallons)
Brushing/Clearing	4,000 gal/acre	18.8 acres	75,200
Grading	30 gal/cubic yard	2,608 cubic yards	78,240
Dust Control	3,300 gal/acre	1.67 acres	5,511
Soil Binding (Fire Roads)	3,300 gal/acre	2.4 acres	7,920
Soil Binding (Land)	825 gal/acre	15.6 acres	12,870
Total Construction Water	**---**	**---**	**179,741 gallons or 0.55 acre-feet**

Notes: One acre-foot (AF) = 325,851 gallons.

TABLE 6
TOTAL ANNUAL ESTIMATED WATER DEMAND FOR OPERATION & MAINTENANCE
CREELMAN LANE FACILITY
RAMONA, CALIFORNIA

Activity	Total Estimated Water Demand	Size/Unit	Total Estimated Water Used Per Event	Estimated Water Demand
Soil Binding / Dust Control	825 gallons/acre	18.8 acres	15,510 gallons	15,510 gal/yr or 0.05 acre-feet/yr
Panel Washing				
Single Rack Axis System	0.5 gal/modules[1]	17,520 modules	8,760 gal/event	35,040 gal/yr
Reverse Osmosis Water Req.	0.15 gal/modules	17,520 modules	2,628 gal/event	10,512 gal/yr
Combined Total			11,388 gal/event	45,552 gal/yr or 0.14 acre-feet/yr
Landscape Irrigation[2]				
1st Year	82,000 gallons			82,000 gal/yr
2nd Year	41,000 gallons			41,000 gal/yr
3rd Year	20,500 gallons			20,500 gal/yr
Total Annual Estimated Water Demand; O&M				
1st Year				**143,062 gal/yr or 0.44 acre-feet/yr**
2nd Year				**102,062 gal/yr or 0.31 acre-feet/yr**
3rd Year				**81,562 gal/yr or 0.25 acre-feet/yr**

Notes: One acre-foot (AF) = 325,851 gallons. Assumed modules will be washed four times per year.
[1] Approximately one gallon of water per 30 square feet of panel.
[2] Project Description, MUP -14-013; Prepared by Hinshaw 2015a

TABLE 7
50 PERCENT ESTIMATED TEMPORARY WATER DEMAND FOR CONSTRUCTION
PALA DEL NORTE ROAD, PALA, CA FACILITY

Activity	Estimated Rate of Water Demand	Area Affected	Estimated Water Used (Gallons)
Brushing/clearing	4,000 gal/acre	5 acres	20,000
Grading	30 gal/cubic yard	1,380 cubic yards	41,400
Soil Binding (Internal Fire Road)	3,300 gal/acre	0.7 acres	2,310
Soil Binding (Land)	825 gal/acre	4.3 acres	3,548
Total construction water	--	--	67,258 (0.21 acre-feet)

Notes: One acre-foot (AF) = 325,851 gallons. Table modified from Hinshaw 2015 Table 3.

TABLE 8
TOTAL ANNUAL ESTIMATED WATER DEMAND FOR OPERATION & MAINTENANCE
PALA DEL NORTE ROAD FACILITY
PALA, CALIFORNIA

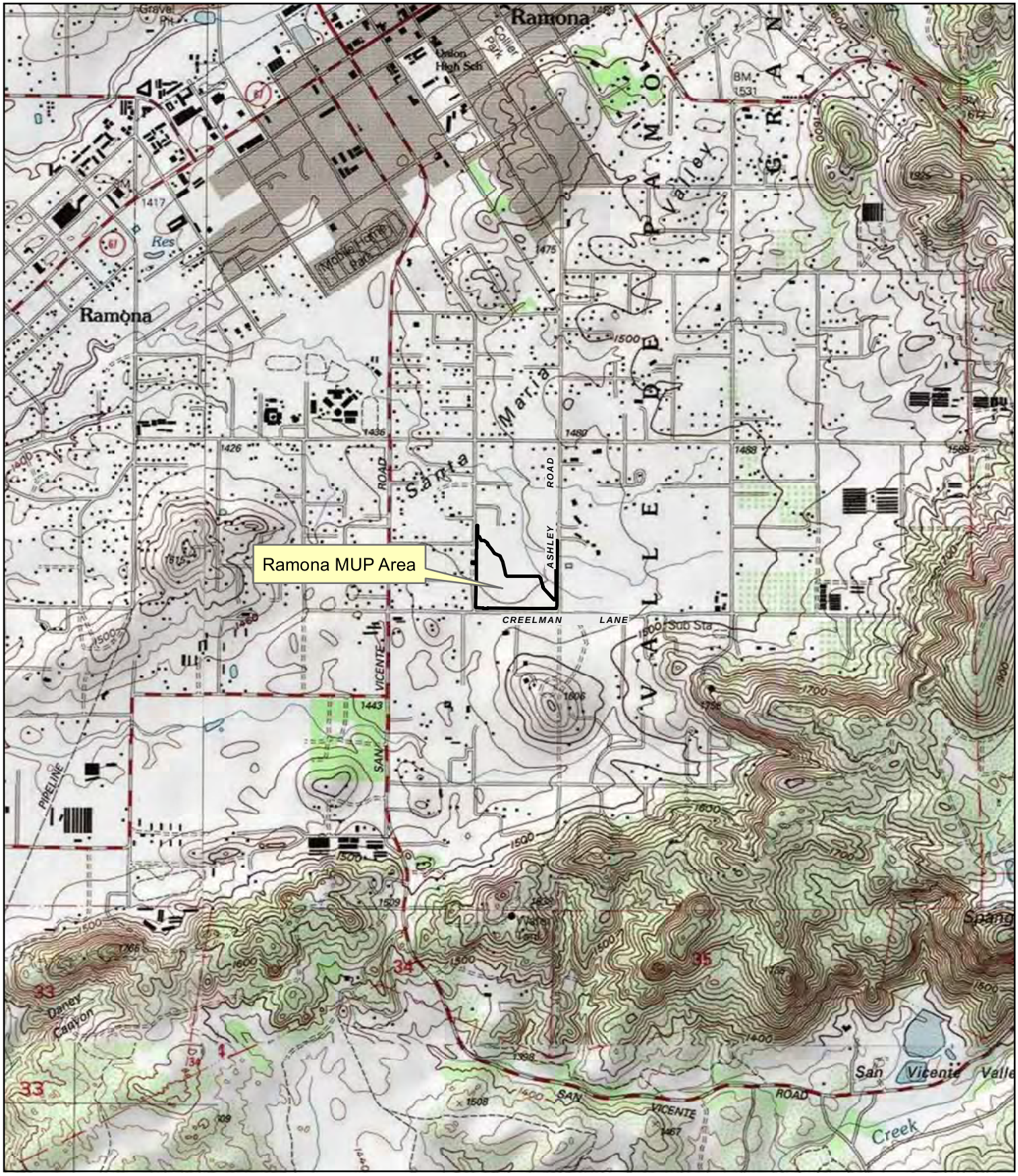
Activity	Total Estimated Water Demand	Size/Unit	Total Estimated Water Used Per Event	Estimated Water Demand
Soil Binding / Dust Control	825 gallons/acre	9.9 acres	8,168 gallons	8,168 gal/yr or 0.025 acre-feet/yr
Panel Washing				
Single Rack Axis System	0.5 gal/modules[1]	7,660 modules	3,830 gal/event	15,320 gal/yr
Reverse Osmosis Water Req.	0.15 gal/modules	7,660 modules	1,149 gal/event	4,596 gal/yr
Combined Total			4,979 gal/event	19,916 gal/yr or 0.061 acre-feet/yr
Landscape Irrigation[2]				
1st Year	33,685 gallons			33,685 gal/yr
2nd Year	16,843 gallons			16,843 gal/yr
3rd Year	8,421 gallons			8,421 gal/yr
Total Annual Estimated Water Demand; O&M				
1st Year				**61,769 gal/yr or 0.19 acre-feet/yr**
2nd Year				**44,927 gal/yr or 0.14 acre-feet/yr**
3rd Year				**36,505 gal/yr or 0.11 acre-feet/yr**

Notes: One acre-foot (AF) = 325,851 gallons. Assumed modules will be washed four times per year.
[1] Approximately one gallon of water per 30 square feet of panel.
[2]Project Description, MUP -14-013; Prepared by Hinshaw 2015a

TABLE 9
POTENTIAL PEAK GROUNDWATER DEMAND AT RAMONA FACILITY

Class of Water Demand	Quantity (acre-feet)
Ramona Facility, Temporary Construction Water Demand	0.55
Ramona Facility, Long Term Operations & Maintenance Water Demand, First Year of Operations	0.44
Pala Facility, Temporary Construction 50% of Water Demand	0.21
Pala Facility, Long Term Operations & Maintenance Water Demand, First Year of Operations	0.19
Total, Potential Peak Groundwater Demand	**1.39**

FIGURES



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Local Vicinity Map

IES/SDG&E Solar Energy Project – Ramona
(County Record ID PDS-2013-MPA-13-009)
Source: USGS 7.5' Ramona, CA Quadrangle

Graphic Source: Merkel & Associates, Inc.

Figure 1

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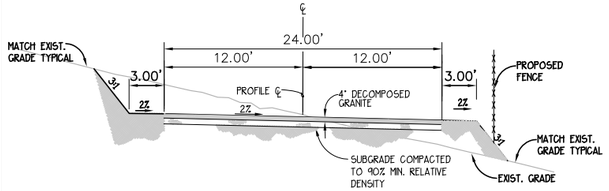
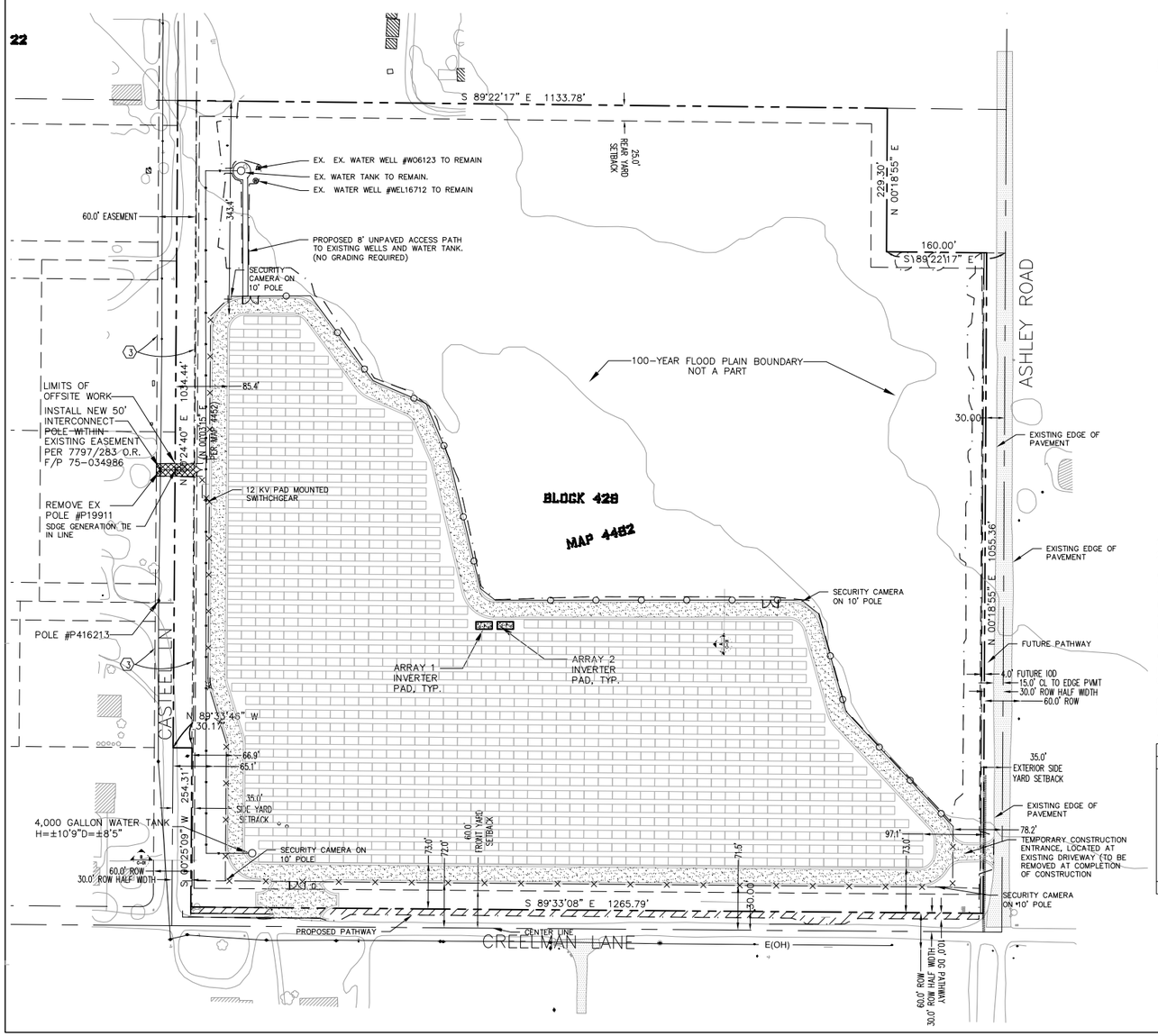
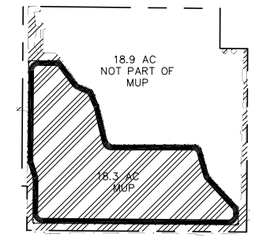


A TYPICAL SECTION - PERIMETER FIRE ACCESS ROAD

NTS





MAJOR USE AREA

30' FUEL MODIFICATION ZONE

LIMITS OF MAJOR USE PERMIT AREA & FUEL MODIFICATION ZONE

NOT TO SCALE

NOTES

1. GROSS AREA: 37.2 ACRES
2. MUP AREA: 18.3 ACRES
3. LOT COVERAGE: 19.5%; FAR: 0.005
4. TOPOGRAPHIC SOURCE: SIERRA SURVEYING, 2013
5. ASSOCIATED REQUESTS: NONE
6. THE APPROVAL OF THIS MAJOR USE PERMIT (MUP) AUTHORIZES THE FOLLOWING: CONSTRUCTION, OPERATION, AND MAINTENANCE OF UNMANNED PHOTOVOLTAIC SOLAR FACILITY PURSUANT TO SECTION 6952, OF THE SAN DIEGO COUNTY ZONING ORDINANCE.
7. PRELIMINARY GRADING PROPOSED. SEE PRELIMINARY GRADING PLAN. THIS PLAN IS PROVIDED TO ALLOW FULL AND ADEQUATE DISCRETIONARY REVIEW OF A PROPOSED DEVELOPMENT PROJECT. THE PROPERTY OWNER ACKNOWLEDGES THAT ACCEPTANCE OR APPROVAL OF THIS PLAN DOES NOT CONSTITUTE AN APPROVAL TO PERFORM ANY GRADING SHOWN THEREON, AND AGREES TO OBTAIN VALID GRADING PERMIT BEFORE COMMENCING SUCH ACTIVITY, IF REQUIRED.
8. ALL PROPOSED STRUCTURES TO BE CONSTRUCTED OF NON-COMBUSTIBLE MATERIALS (CONCRETE, BLOCK, METAL) OR SIMILAR.
9. LIGHTING FOR MAINTENANCE AND SECURITY PROPOSES ONLY. SHIELDED AND MOTION SENSOR LIGHTING LOCATED AT GATES AND SHALL CONFORM TO COUNTY OF SAN DIEGO OUTDOOR LIGHTING REQUIREMENTS.
10. PHASING – THE PROJECT WILL BE CONSTRUCTED IN ONE PHASE.
11. ALL DISTURBED AREAS WOULD BE COVERED WITH PERMEABLE DUST / EROSION CONTROL AGENT.
12. NO PUBLIC SIGNAGE PROPOSED, ONLY SMALL DIRECTIONAL AND SAFETY SIGNAGE ARE PROPOSED ONSITE.
13. ALL EXISTING STRUCTURES TO REMAIN.
14. THE SOLAR RELATED FACILITIES (PANELS, RACKING, ELECTRICAL CONNECTIONS, INVERTER STRUCTURES, FENCING AND INTERNAL ACCESS, ETC.) SHOWN ON THIS PLOT PLAN MAY BE RELOCATED. RECONFIGURED, AND / OR RESIZED WITHIN THE SOLAR FACILITY DEVELOPMENT AREA WITH THE ADMINISTRATIVE APPROVAL OF THE DIRECTOR OF PDS WHEN FOUND IN CONFORMANCE WITH THE INTENT AND CONDITIONS OF PERMIT'S APPROVAL.
15. WATER DISTRICT: RAMONA MUNICIPAL WATER DISTRICT
16. FIRE DISTRICT: RAMONA FIRE PROTECTION DISTRICT
17. GENERAL PLAN: PUBLIC SEMI-PUBLIC LANDS
18. POINT OF INTERCONNECT – CASTEEL LANE ROW/ROAD PURPOSES AND UTILITY LINE EASEMENT
19. SEE PRELIMINARY GRADING PLAN SHEET C-02 FOR STREET SECTIONS
20. THE TEMPORARY PRIVACY SCREEN LANDSCAPE FABRIC WILL BE PLACED ALONG THE OUTSIDE PERIMETER OF THE CHAIN LINK FENCE AND WILL BE REMOVED AFTER THE 5 YEAR LANDSCAPE ESTABLISHMENT PERIOD.
21. COLOR OF INVERTER WILL BE NON-REFLECTIVE FLAT WHITE, SWITCHGEAR WILL BE A LIGHT EARTH TONE AND THE WATER TANK WILL BE DARK GREEN.
22. SECURITY CAMERAS WILL BE SHIELDED FROM VIEW AND WILL BE ANGLED TO ONLY MONITOR THE PROPERTY TO THE SITE BOUNDARY
23. ALL EXISTING PALMS ON PROPERTY WILL BE REMOVED.
24. SLATS (GREEN PLASTIC) WILL BE PLACED ALONG THE NORTHERN CHAIN-LINK FENCE AND WILL REMAIN FOR THE LIFE OF THE FACILITY.
25. SOLAR PANELS WILL HAVE AN ANTI-REFLECTIVE COATING.
26. BERMS HAVE BEEN ADDED ALONG CREELMAN LANE FOR ADDITIONAL SCREENING OF THE PROPERTY. REFER TO SHEET C-02 PRELIMINARY GRADING PLAN FOR BERM PLACEMENT.

ASSESSOR PARCEL NUMBER

284-340-35 = 37.2 GROSS ACRES

GENERAL NOTES

THE CONTRACTOR SHALL ARRANGE FOR A PRIVATE UNDERGROUND UTILITY LOCATOR PRIOR TO EXCAVATION AND SHALL ARRANGE FOR AND COORDINATE SHUT DOWN, DISCONNECTION AND CAPPING OF EXISTING UTILITIES WITH THE APPROPRIATE UTILITY OWNERS PRIOR TO COMMENCING THE WORK.

GRADING QUANTITIES

INCLUDES ONSITE AND OFFSITE WORK
CUT 2608 CY FILL 2608 CY IMPORT 0 CY

OFFSITE WORK ONLY CUT 0 CY FILL 210 CY IMPORT FROM MUP AREA 210 CY

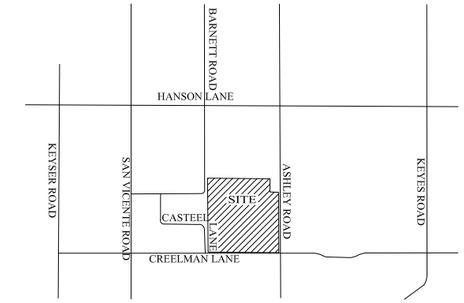
ZONING

USE REGULATIONS		A70
NEIGHBORHOOD REGULATIONS		M
DEVELOPMENT REGULATIONS	DENSITY	–
	LOT SIZE	4AC
	BUILDING TYPE	C
	MAXIMUM FLOOR AREA	–
	FLOOR AREA RATIO	–
	HEIGHT	G
	LOT COVERAGE	–
	SETBACK	C
	OPEN SPACE	–
SPECIAL AREA AND REGULATIONS		D2.POR F

EXISTING EASEMENTS*

#	DESCRIPTION	DISPOSITION
3	ROAD PURPOSES AND UTILITY LINES	TO REMAIN

* BASED ON DATA FROM PRELIMINARY TITLE REPORT BY CHICAGO TITLE COMPANY DATED APRIL 18, 2013.



VICINITY MAP

(T.B. 1172-H2)

N.T.S.

LEGEND

DESCRIPTION	SYMBOL
EXISTING ASPHALT ROAD	
PROPOSED CONCRETE INVERTER PAD	
PROPOSED 24' DG FIRE ACCESS ROAD ALL WEATHER	
PROPOSED PATHWAY	
PROPOSED 8' CHAIN LINK FENCE WITH TEMP. PRIVACY SCREEN LANDSCAPE FABRIC	— x —
PROPOSED 8' CHAIN LINK FENCE WITH PERMANENT GREEN PLASTIC SLATS	
EXISTING FENCE	
16 MODULE SUB ARRAY PANEL SHADE STRUCTURE	
EXISTING POWER POLE	
EXISTING FIRE HYDRANT	
EXISTING WELL (2)	
EXISTING PROPERTY LINE	
EXISTING EASEMENT	
MUP LIMITS	
BUILDING SET BACK LINE	
EXISTING OVERHEAD POWER	E(OH)
PROPOSED UNDRGROUND INTERCONNECT LINE	E
PROPOSED 3' FIELD FENCE	
DOUBLE ACCESS GATE	
PROPROSED WATER LINE	W
EXISTING WATER LINE (APPROX. LOCATION)	W
RELINQUISH ACCESS RIGHTS	

APPLICANT

INDEPENDENT ENERGY SOLUTIONS, INC
1090 JOSHUA WAY
VISTA, CA 92081
CONTACT: ERIC JOHNSTON
760-752-9706

OWNER

SAN DIEGO GAS & ELECTRIC
8315 CENTURY PARK COURT
SAN DIEGO, CA 92123
CONTACT: JOE FRANI
858-654-8731

SHEET INDEX

C-01 – TITLE SHEET/PLOT PLAN
C-02 – PRELIMINARY GRADING PLAN
C-03 – COUNTY CONDITION NOTES
C-04 – ELEVATIONS AND SECTIONS
C-05 – ELEVATIONS AND SECTIONS

1" = 100' 100 0 100 200 scale feet

BergerABAM
10525 Vista Sorrento Parkway, Suite 350
San Diego, California 92121-2745
(858) 500-4500 Fax: (858) 500-4501

COUNTY PROJECT NUMBER: PDS2014-MUP-14-013

Drawn by	ES
Checked by	MM
Date	03/07/14
Commission No.	

No.	DATE	BY	REMARKS
1	08/18/14	MM	COUNTY COMMENTS
2	03/13/15	MM	COUNTY COMMENTS
3	05/15/15	MM	COUNTY COMMENTS
4			

IES/SDG&E SOLAR ENERGY PROJECT - RAMONA

TITLE SHEET/PLOT PLAN

Sheet Number C-01

1 of 5

Last Saved by: Mike.magee on: May 11, 2015 10:37 AM File: Q:\SanDiego\2013\A13.0324\CADD\Dwgs\A13.0324.00 Plot Plan - CREELMAN\A13.0324.00 C.01Plot Plan - CREELMAN.dwg

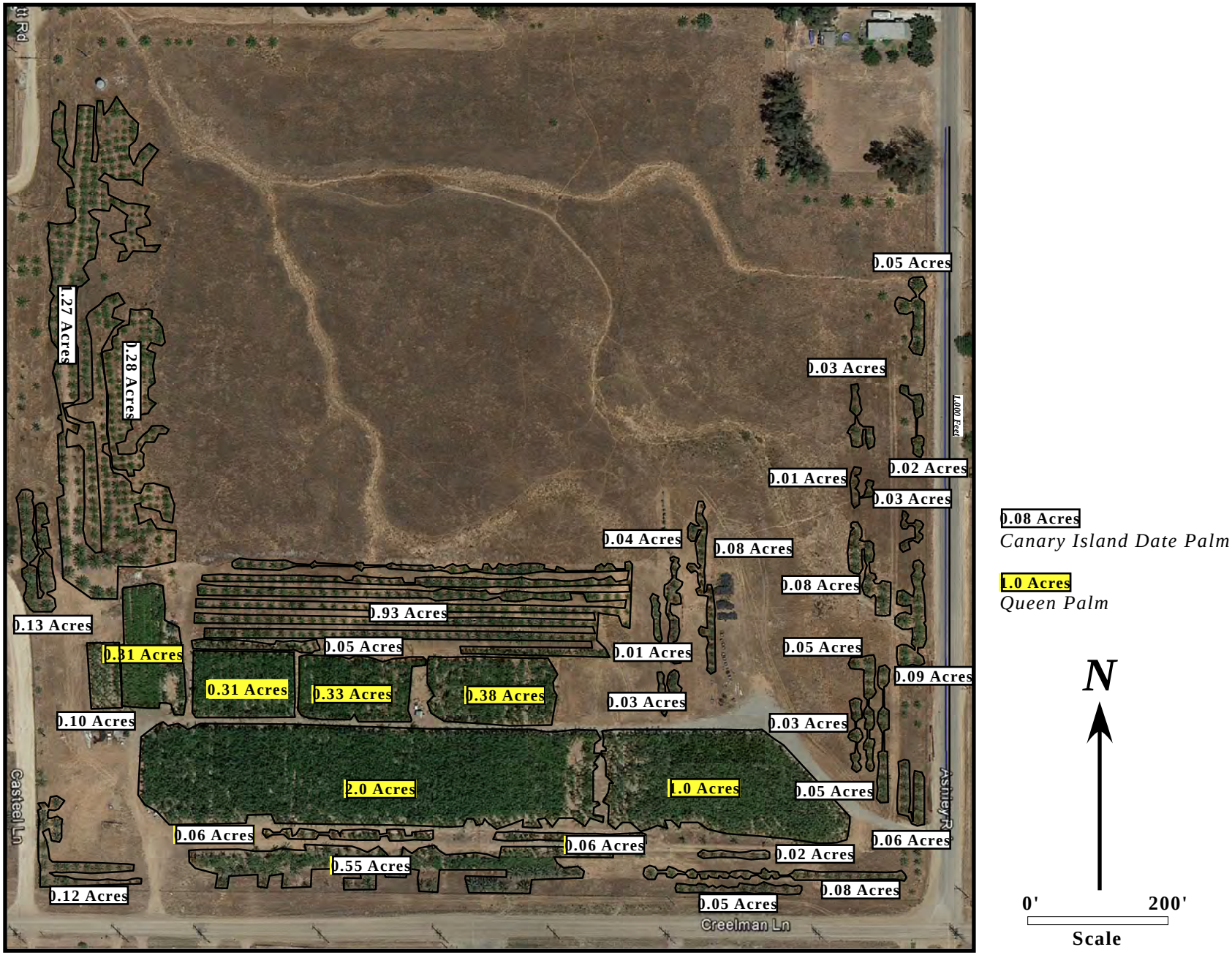


FIGURE 3 PALM TREE ACREAGE, AUGUST 2010

Wiedlin & Associates, Inc.
Applications in Groundwater Science

APPENDIX A
PALM TREE NURSERY AERIAL IMAGES
2002 - 2013

P.O. Box 910462 San Diego, CA 92191-0462 Ph 858 259-6732

Barnett Rd
Casteel Ln
Creelman Ln
Ashley Rd
Google earth

Barnett Rd
Casteel Ln
Ashley Rd
Creelman Ln
Google earth

Barnett Rd
Casteel Ln
Ashley Rd
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