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March 25, 2013

Christine Stora
Compliance Project Manager
Siting, Transmission and Environmental Protection Division
California Energy Commission
1516 Ninth Street, MS-2000
Sacramento, CA 95814-5512

Subject: **PALEN SOLAR HOLDINGS, LLC'S RESPONSE TO CEC STAFF DATA REQUEST SET 1 (1-18)**
PALEN SOLAR ELECTRIC GENERATING SYSTEM
DOCKET NO. (09-AFC-7C)

Dear Ms. Stora,

On behalf of Palen Solar Holdings, LLC, enclosed for filing with the California Energy Commission are ten (10) hard copies and ten (10) compact disks of **PALEN SOLAR HOLDINGS, LLC'S RESPONSE TO CEC STAFF DATA REQUEST SET 1 (1-18)**, for the Palen Solar Electric Generating System (09-AFC-7C).

Sincerely,

Scott A. Galati
Counsel to Palen Solar Holdings, LLC

RESPONSE TO CEC STAFF DATA REQUEST SET 1 (1-18)

In support of the

PETITION TO AMEND

for the

PALEN SOLAR ELECTRIC GENERATING SYSTEM

(09-AFC-7C)

Submitted to the:

California Energy Commission

Submitted by:

PALEN SOLAR HOLDINGS, LLC

Prepared by:

centerline

MARCH 2013

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ATTACHMENTS

INTRODUCTION

Attached are Palen Solar Holding, LLC's (PSH) responses to California Energy Commission (CEC) Staff Data Request Set No. 1 (1-18) for the Palen Solar Electric Generating System (PSEGS or Modified Project) Petition for Amendment (09-AFC-7C). Staff issued Data Request Set No. 1 (1-18) to PSH on March 1, 2013.

The Data Responses are grouped by individual discipline or topic area. Within each discipline area, the responses are presented in the same order as Staff presented them and are keyed to the Data Request numbers (1-18). Additional tables, figures, or documents submitted in response to a data request (e.g., supporting data, stand-alone documents such as plans, folding graphics, etc.) are found at the end of a discipline-specific section and are not sequentially page-numbered consistently with the remainder of the document, although they may have their own internal page numbering system.

For context the text of the Background and Data Request precede each Data Response.

BIOLOGICAL RESOURCES (1-5)

BACKGROUND: BIOLOGICAL RESOURCE SURVEYS

Many documented occurrences of special-status wildlife species occur within the approved project's disturbance area. In the December 2012 Petition to Amend (Petition), the project owner states that the biological resource surveys performed for the approved project are sufficient for the modified project. However, the Petition identifies two new areas of impact for the re-routing of the generation tie-line near the western end of the route and around the newly constructed Red Bluff Substation and a new extension of the existing Southern California Gas (SoCal Gas) distribution system to the project boundary for natural gas delivery. According to the Petition, the modified generation tie-line route was previously surveyed by the Desert Sunlight Project (currently under construction) and the Eagle Mountain Pumped Storage Project. The project owner intends to file these survey results under separate cover, but staff has not yet received them. Because these projects were not reviewed by the California Energy Commission, the surveys may not have followed recommended protocols or staff's Recommended Biological Resources Field Survey Guidelines for Large Solar Projects (April 2009) (see Attachment 1). In addition, surveys may not be recent enough to be acceptable. Survey data for desert tortoise are only valid for one year. Staff is concerned that if the survey data the project owner is planning to submit is not acceptable and the necessary surveys are not initiated soon, the survey window for desert tortoise and burrowing owl will be missed for this year. Biological resource survey results for any areas not surveyed for the approved project are necessary for staff to analyze the potential impacts of the modified project.

Data Request 1. *Please conduct vegetation community mapping for any new project features of the modified project that have not been previously mapped following the survey protocols utilized for the approved project and include the 1,000-foot buffer along linear features per the Siting Regulations. This includes mapping along the modified generation tie-line route, the new gas pipeline, and any other areas not previously surveyed. Please provide a report summarizing the results of vegetation community mapping which includes survey protocols utilized, methods, and results as well as impact analysis and mitigation recommendations once surveys are complete. Please provide maps and the electronic files (raw GPS data and metadata) for vegetation communities mapped and include the boundary of the biological resource survey area. Please provide the names and qualifications of personnel who will be conducting the surveys prior to conducting surveys.*

Data Response 1. <u>Subject: Vegetation Mapping on New Project Features</u>

Attached are the vegetation mapping from earlier surveys, which covered the new transmission line alignment and gas pipeline corridor:

1. The Palen Solar Power Project (PSPP) 2010 surveys, entitled "2010-06-15 Applicants Spring 2010 Survey Results Corrected Preliminary Impact Calculations Bio Resources TN-57156" (docketed June 15, 2010). Attachment DR1-1.
2. PSPP 2009 surveys, entitled "Figures For Palen DR BIO 122909." Attachment DR1-2.
3. Desert Sunlight FEIS – Vegetation communities in Appendix H. (Source: BLM. 2011. Desert Sunlight Solar Farm Project California Desert Conservation Area Plan Amendment and Final Environmental Impact Statement. Vol. IV, Appendices H-L. Palm Springs-South Coast Field Office.) Attachment DR1-3.

In addition, vegetation will be re-mapped during Spring 2013 surveys to verify changes since the original mapping. Surveys will be conducted by qualified botanists familiar with the area and species (Attachment DR2-1).

Data Request 2. *Please conduct special status wildlife species surveys for any new project features of the modified project. This includes along the modified generation tie-line, the new gas pipeline, and any other areas not previously surveyed. Surveys for general special status wildlife species should follow the survey guidelines developed for the approved project (Biological Resources Technical Report (EDAW AECOM 2009) and include the 1,000-foot buffer along linear features, per the Siting Regulations (Appendix B). However, survey methods for desert tortoise and burrowing owl have been updated since the project was approved. Surveys for desert tortoise should follow the desert tortoise protocol Preparing for Any Action That May Occur Within the Range of the Mojave Desert Tortoise (Gopherus agassizii) (USFWS 2010) (http://www.fws.gov/ventura/species_information/protocols_guidelines/docs/dt/DT%20Preproject%20Survey%20Protocol_2010%20Field%20Season.pdf) and surveys for burrowing owl should follow the newly revised survey methods in the Staff Report on Burrowing Owl Mitigation (CDFW 2012) (http://www.dfg.ca.gov/wildlife/nongame/docs/BUOWStaffReport.pdf).*

Please provide a report which includes all required information from the survey protocols, methods, and results as well as impact analysis and mitigation recommendations once surveys are complete. Please provide maps and the electronic files (raw GPS data and metadata) and CNDDB field forms for any special-status wildlife species detected and include the

boundary of the biological resource survey area. Please provide the names and qualifications of personnel who will be conducting the surveys prior to conducting surveys.

Data Response 2. <u>Subject: Wildlife Surveys and Rare Plant/Sensitive Community Surveys on New Linear Segments</u>

1.1 PROPOSED FOCUSED WILDLIFE SURVEYS

Based on the results of a desktop review and results of the field surveys conducted todate, surveys will be completed for the species in Table 1 on new linear features. Surveys will adhere to standardized protocols for all relevant species for which there are protocols, as well as to biologically sound approaches for the remaining species. Surveys will also incorporate NECO Plan requirements. The NECO Plan has specifically identified situations for which surveys must be completed for projects in the NECO planning area:

- Special-status plants – Survey in all mapped ranges
- Special-status wildlife – Survey at all known locations
- Bats – Identify all significant roosts within one mile
- Prairie falcon and golden eagle - Identify all eyries within 0.25 miles
- Burrowing owl – Identify presence and locations
- Crissal thrasher - Identify presence
- Couch's spadefoot – Identify all ephemeral impoundment areas
- Natural and artificial water sources – Identify presence within 0.25 miles

Due to the minimal survey area, and the fact that it has been surveyed previously, surveyors will conduct surveys for all special-status species and wildlife species listed in Table 1 concurrently with desert tortoise surveys, unless species-specific survey methods are otherwise outlined below. Special-status plants will be surveyed separately from the wildlife survey. Survey methods for each taxon or taxa group are described below.

Table 1 Plant & Wildlife Table. Special-status and other target plant and wildlife species observed or potentially occurring within the PSEGS. Species included are those known from Imperial County, eastern San Bernardino County, and Riverside County east of the central Coachella Valley, in habitats that occur on or could be indirectly affected by Project activities.

Species	Status[1]				Habitat
	Federal	State	CNDDB Rank[2]	CNPS[3]/Other	
Plants					
Abrams's Spurge (*Euphorbia abramsiana*)	---	---	G4/S2/3	2	Sandy sites in Mojavean and Sonoran Desert scrubs in eastern California; 0 to 3,000 feet
Algodones Dunes Sunflower (*Helianthus niveus tephrodes)*	---	E	G4T2/S1.2	1B	Desert dunes, especially Algodones Dunes
Angel Trumpets *(Acleisanthes longiflora)*	---	---	G5/S1	2	Sonoran Desert Scrub (limestone); mountains or base of mountains, 0-8,202 ft.
Darlington's Blazing Star *(Mentzelia puberula*)	---	---	G4/S2	2.2	Rocky, generally mountainous sites from the Ord Mts. to northern Baja California.
Arizona Cottontop *(Digitaria californica*)	---	---	G5/S1.3	2	Rocky Sonoran and Mojavean Desert Scrubs; three consortium records in California; 950 to 4,900 feet
Arizona Spurge (*Chamaesyce arizonica*)	---	---	G5/S1.3	2	Sandy flats in Sonoran Desert Scrub, below ~1,000 feet
Ayenia (*Ayenia compacta*)	---	---	G4/S3?	2	Sandy and gravelly washes and canyons in desert scrubs, 450 to 6,000 feet
Bitter Hymenoxys *(Hymenoxys odorata)*	---	---	G5/S2	2	Riparian scrub and Sonoran Desert Scrub, sandy flats near Colorado River, known only from the Colorado River alluvial plain, 150- 495 feet
California Ditaxis (*Ditaxis serrata* var. *californica*)	---	---	G5T2T3/S2	3	Sonoran Creosote Bush Scrub from 100 to 3,000 feet
California Satintail *(Imperata brevifolia*)	---	---	G2/S2.1	2	Wet springs, meadows, and flood plains in Chaparral, Coastal Scrub, Mojavean Desert Scrub; 0 - 1650 ft
Chaparral Sand Verbena (*Abronia villosa* var.*aurita*)	---	---	G5T3T4/S2	1B	Loose to aeolian sands; chaparral and coastal sage scrub; below 2,000 feet
Cove's Cassia (*Senna covesii)*	---	---	G5?/S1	2	Dry washes and slopes in Sonoran Desert Scrub, 1,600 to 1,900 feet
Crown of Thorns *(Koeberlinia spinosa tenuispina*)	---	---	G4T4/S2.2	2	Creosote Bush Scrub in Sonoran Desert; 500 to 1700 feet
Crucifixion Thorn (*Castela emoryi*)	---	---	G2G3/S2S3	2	Mojavean and Sonoran Desert Scrubs; typically associated with drainages

Desert Portulaca *(Portulaca halimoides)*	---	---	G5/S3	4	Sandy areas and flats in Joshua tree woodland and desert mountains; 3280-3937 ft
Desert Sand-parsley (*Ammoselinum giganteum*)	---	---	G2G3/SH	2	Sonoran Desert Scrub; known from one site near Hayfield Dry Lake at 1,200 feet
Desert Spike Moss (*Selaginella eremophila*)	---	---	G4/S2.2?	2	Shaded rocky habitats in the Sonoran Desert, to Arizona and northern Mexico; below 3,600 ft.
Desert Unicorn Plant (*Proboscidea althaeifolia*)	---	---	G5/S3.3	4	Sandy areas in Sonoran Desert Scrub throughout southeastern California, below 3,300 feet.
Dwarf Germander *(Teucrium cubense depressum)*	---	---	G4G5T3T4/S2	2	Sandy soils, washes, fields; below 1,300 feet
Flat-seeded Spurge (*Chamaesyce platysperma*)	BLM Sensitive	---	G3/S1.2?	1B	Sandy flats and dunes in Sonoran Desert Scrub; below 350 feet
Foxtail Cactus (*Coryphantha alversonii*)	---	---	G3/S3.2	4	Primarily rocky substrates between 250 and 4,000 feet in Creosote Bush Scrub
Glandular Ditaxis (*Ditaxis claryana*)	---	---	G4G5/S1	2	Sandy flats in Mojavean and Sonoran Creosote Bush Scrubs in Imperial, San Bernardino, and Riverside counties; below 1,500 feet
Graham's fishhook cactus (*Mammillaria grahamii* var. *grahamii)*	---	---	G4T4/S2	2	Sandy or rocky canyons, washes in creosote bush scrub; 1,000-2,970 ft.
Harwood's Milkvetch (*Astragalus insularis* var. *harwoodii*)	---	---	G5T3/S2.2?	2	Dunes and windblown sands below 1,200 feet, east and south of approximately Desert Center
Harwood's Phlox (*Eriastrum harwoodii*)	---	---	G2/S2	1B	Desert dunes below 7,000 feet., eastern Riverside, San Bernardino and San Diego Counties
Jackass Clover *(Wislizenia refracta* var. *refracta*)	—	—	G5T5?/S1.2?	2	Sandy washes, roadsides, flats; 1,900 to 2,700 feet
Las Animas Colubrina (*Colubrina californica*)	---	---	G4/S2S3.3	2	Sonoran Desert Creosote Bush Scrub, < 3,300 feet
Lobed Ground Cherry *(Physalis lobata)*	---	---	G5/S1.3?	2	Mojave Desert Scrub, playas, granitic soils, 1640-2625 ft
Mesquite Nest Straw (*Stylocline sonorensis*)	---	---	G3G5/SX	1A	Open sandy drainages; known from one site near Hayfields Dry Lake
Mojave Fishhook Cactus *(Sclerocactus polyancistrus*)	---	---	G4/S3.2	4	Mojavean Desert Scrub (Creosote Bush Scrub and Pinyon-Juniper Woodland, and Great Basin Scrub. Kern, San Bernardino, and Inyo Counties to Nevada; 2100 to 7650 feet
Newberry's Velvet-mallow *(Horsfordia newberryi*)	---	---	G4/S3.3	4	Mostly rocky canyons and toeslopes in Sonoran Desert Scrub; 10 – 2650 ft
Orocopia Sage (*Saliva greatae*)	BLM Sensitive	---	G2/S2	1B	Mojavean and Sonoran Desert Scrubs; gravelly/ rocky bajadas, mostly near washes; below 3,000 feet

Palmer's Jackass Clover (*Wislizenia refracta palmeri*)	---	---	G5T2T4/S2?	2	Sandy washes and dunes in Sonoran Desert Scrub, to northwestern Mexico; potentially Mojave Desert (unverified); <430 ft.
Parish's Club Cholla (*Grusonia parishii*)	---	---	G3G4/S2	2	Joshua Tree Woodland in Mojavean and Sonoran Desert Scrubs; 1,000 -5,000 ft
Parry's Spurge (*Chamaesyce parryi)*	---	---	G5/S1.3	2	Dunes an Aeolian soils in Mojavean Desert Scrub; in California, known only from Kelso; 1300-2400 ft
Pink Fairy Duster (*Calliandra eriophylla*)	---	---	G5/S2S3	2	Sonoran Desert Scrub; washes
Pink Velvet Mallow *(Horsfordia alata)*	---	---	G4/S3.3	4	Rocky areas in Sonoran Desert Scrub, 328-1640 ft
Pointed Dodder *(Cuscuta californica* var. *apiculata*)	---	---	G5T3?/S2S3	3	Sonoran and Mojavean Desert Scrubs in San Bernardino County (one record in western Riverside County), to Nevada and Baja, California; 0 – 1650 ft
Ribbed Cryptantha *(Cryptantha costata*)	---	---	G4G5/S3.3	4	Dunes in Mojavean and Sonoran Desert Scrub, 197-1640 ft
Sand Evening Primrose (*Camissonia arenaria*)	---	---	G4?/S2	2	Sandy washes and rocky slopes below 1,300 feet
Slender Woolly-heads (*Nemacaulis denudata* var. *gracilis*)	---	---	G3G4T3?/S2	2	Dunes in coastal and Sonoran Desert Scrubs, primarily in the Coachella Valley; below 1,500 feet
Spearleaf (*Matelea parvifolia*)	—	—	G5?/S2.2	2	Rocky ledges and slopes, 1,000 to 6,000 feet, in Mojave and Sonoran Desert Scrubs
Spiny Abrojo (*Condalia globosa* var. *pubescens*)	---	---	G5T3T4/S3.2	4	Sonoran Creosote Bush Scrub; 500 to 3,300 feet
Thorny Milkwort (*Polygala acanthoclada*)	---	---	G4/S1	2	Pinyon-Juniper and Joshua Tree Woodlands, Chenopod Scrub; 2500-7550 ft
Winged Cryptantha *(Cryptantha holoptera*)	--	--	G3G4/S3?	4	330-5500 feet in Mojave and Sonoran Desert Scrubs; often sandy habitats
Amphibians					
Couch's Spadefoot Toad (*Scaphiopus couchii*)	BLM Sensitive	SC	G5/S2S3	_	Various arid communities in extreme southeastern California and east, south
Reptiles					
Colorado Desert Fringe-toed Lizard (*Uma notata*)	BLM Sensitive	SC	G3/S2?	_	Restricted to aeolian sandy habitats in the southeastern Sonoran Desert
Desert Rosy Boa (*Charina trivirgata gracia*)	---	---	G4G5/S3S4	---	Rocky uplands and canyons; often near stream courses
Mojave Fringe-toed Lizard (*Uma scoparia*)	BLM Sensitive	SC	G3G4/S3S4	---	Restricted to aeolian sandy habitats in the Mojave and northern Sonoran deserts

Desert Tortoise (*Gopherus agassizii*)	T	T	G4/S2	---	Most desert habitats below approximately 5,000 feet in elevation
Invertebrates					
California McCoy Snail *(Eremarionta rowelli mccoiana*)	---	---	G1/T1/S1	---	Dunes; potentially endemic to McCoy Mts
Riverside Cuckoo Wasp *(Hedychridium argenteum*)	---	---	G1/?S1?	---	Dunes; one CNDDB record 18 mi west of Blythe along I-10; no other distribution information available, although may be endemic to Colorado Desert
Bradley's Cuckoo Wasp *(Ceratochrysis bradleyi*)	---	---	G1/S1	---	Dunes; one CNDDB record 6 mi north of Blythe, although may be endemic to Colorado Desert
Birds					
American Peregrine Falcon (*Falco peregrinus anatum*)	Delisted BCC	Delisted Fully Protected	G4T3/S2	---	Dry, open country, including arid woodlands; nests in cliffs
Bendire's Thrasher (*Toxostoma bendirei*)	BCC BLM Sensitive	SC	G4G5/S3	---	Arid to semi-arid brushy habitats, usually with yuccas, cholla, and trees
Brewer's Sparrow (*Spizella breweri*)	BCC	--	G5/S3	---	Open meadows and flats
Burrowing Owl (*Athene cunicularia*)	BCC BLM Sensitive	SC	G4/S2	---	Open, arid habitats
Crissal Thrasher (*Toxostoma crissale*)	BCC	SC	G5/S3	---	Dense mesquite and willows along desert streams and washes
Ferruginous Hawk (*Buteo regalis*)	BCC	---	G4/S3S4	---	Arid, open country
Gila Woodpecker (*Melanerpes uropygialis*)	---	E	G5/S1S2	---	Requires woodlands containing large trees or columnar cactus for nesting
Golden Eagle (*Aquila chrysaetos*)	BCC	SC Fully Protected	G5/S3	---	Open country; nests in large trees in open areas or cliffs
Loggerhead Shrike (*Lanius ludovicianus*)	BCC	SC	G4/S4	---	Arid habitats with perches
Mountain Plover (*Charadrius montanus*)	BCC BLM Sensitive	SC	G2/S2?	---	Dry upland habitats, plains, bare fields
Northern Harrier (*Circus cyaneus*)	---	SC	G5/S3	---	Open habitats; nests in shrubby pen land and marshes

Prairie Falcon (*Falco mexicanus*)	BCC	---	G5/S3	---	Dry, open country, including arid woodlands; nests in cliffs
Short-eared Owl (*Asio flammeus*)	---	SC	G5/S3	---	Open habitats: marshes, fields; nests on ground and roosts on ground, low poles
Swainson's Hawk (*Buteo swainsoni*)	BCC	T	G5/S2	---	Forages in open stands of grass-dominated vegetation, sparse shrublands, and small, open woodlands.
Yellow-breasted Chat (*Icteria virens*)	---	SC	G5/S3	---	Dense streamside thickets, willows; brushy hillsides and canyons
Mammals					
American Badger (*Taxidea taxus*)	---	SC	G5/S4	---	Many habitats
Arizona Myotis (*Myotis occultus*)	---	SC	G3G4/ S2S3	WBWG:M	Lowlands of the Colorado River and adjacent mountain ranges, up to ponderosa pine habitat; mines, buildings, bridges, riparian woodlands, often near water
Big Free-tailed Bat (*Nyctinomops macrotis*)	---	SC	G5/S2	WBWG:M	Cliffs and rugged rocky habitats in arid, country, also riparian woodlands
Burro (*Equus asinus*)	---	---	---	Protected	Various habitats near water
Burro Deer (*Odocoileus hemionus eremicus*)	---	Game Species	---	---	Arboreal and densely vegetated drainages
California Leaf-nosed Bat (*Macrotus californicus*)	BLM Sensitive	SC	G4/S2S3	WBWG:MH	Lowland desert associate, found in caves, mines, tunnels and old buildings
Colorado Valley Woodrat (*Neotoma albigula venusta*)	---	---	---	---	Under mesquite in Creosote Bush Scrub; southeastern California
Desert Kit Fox (*Vulpes macrotis*)	---	Protected furbearer	---	---	In open desert scrub and dunes.
Nelson's Bighorn Sheep (*Ovis canadensis nelsoni*)	BLM Sensitive	---	---	---	In mountains and adjacent valleys in desert scrub
Pallid Bat (*Antrozous pallidus*)	BLM Sensitive	SC	G5/S3	WBWG:H	Several desert habitats
Pocketed Free-tailed Bat (*Nyctinomops femorosaccus*)	---	SC	G4/S2S3	WBWG:M	Variety of arid areas in pinyon-juniper woodland, desert scrubs, palm oases, drainages, rocky areas
Southwestern Cave Myotis (*Myotis velifer brevis*)	BLM Sensitive	SC	G5/S1	WBWG:M	Caves, mines and buildings in lower desert scrub habitats; also near streams and in woodlands, old ag fields
Spotted Bat (*Euderma maculatum*)	BLM Sensitive	SC	G4 /S2S3	WBWG:H	Arid scrub and grasslands, to coniferous forests, roosts in cliffs, Forages along waterways

Townsend's Big-eared Bat (*Corynorhinus townsendii*)	BLM Sensitive	SC	G4/S2S3	WBWG:H	Broad habitat associations. Roosts in caves and manmade structures; feeds in trees
Western Mastiff Bat (*Eumops perotis californicus*)	BLM Sensitive	SC	G5T4/S3?	WBWG:H	Cliffs, trees, tunnels, buildings in desert scrub
Yuma Myotis (*Myotis yumanensis yumanensis*)	BLM Sensitive	---	G5 /S4?	WBWG:LM	Several habitat associations, but typically near open water; often roosts in manmade structures
Yuma Puma (*Felis concolor browni*)	---	SC	---	---	Colorado River bottomlands

Sources: Unless noted, information is from *The Jepson Manual* (Baldwin et al. 2002), California Native Plant Society (CNPS) Online Inventory (CNPS 2010), and Jepson Flora Project (http://ucjeps.berkeley.edu/)

[1] CDFG and Habitat Data Analysis Branch, Biogeographic Data Branch 2009, http://www.dfg.ca.gov/biogeodata/cnddb/pdfs/SPAnimals.pdf

E Endangered
T Threatened
BCC USFWS Bird of Conservation Concern
State SC CDFG Species of Special Concern (species that appear to be vulnerable to extinction)
Fully Protected Species that cannot be taken without authorization from the Fish and Game Commission
BLM Sensitive Species under review, rare, with limited geographic range or habitat associations, or declining. BLM policy is to provide the same level of protection as USFWS candidate species

WBWG = Western Bat Working Group (http://wbwg.org)
H – High Priority – These species should be considered the highest priority for funding, planning, and conservation actions.
M – Medium Priority – These species warrant closer evaluation, more research, and conservation actions of both the species and the threats
L – Low Priority – Most of the existing data support stable populations of the species and that the potential for major changes in status is unlikely

[2] CNDDB 2011: California Department of Fish and Game, California Natural Diversity Database, Special Animals , January 2011 (www.dfg.ca.gov/biogeodata/cnddb/pdfs/spanimals.pdf) and CDFG Special Vascular Plants, Bryophytes, and Lichens List, January 2011 (www.dfg.ca.gov/biogeodata/cnddb/pdfs/SPPlants.pdf).

Global Rank	State Rank
G1 = Critically Imperiled	S1 = Critically Imperiled
G2 = Imperiled	S2 = Imperiled
G3 = Vulnerable	S3 = Vulnerable
G4 = Apparently Secure	S4 = Apparently Secure
G5 = Secure	S5 = Secure

SX= All California sites are extirpated

Subspecies or Variety Rank and Other Symbols
T1-T5: same definition as global and state ranks, except that rank only applies to the particular variety or subspecies.
X: species is considered extirpated

[3] CNPS. 2010:
List 1A - Plants presumed extinct in California
List 1B - Plants rare and endangered in California and elsewhere
List 2 - Plants rare and endangered in California but more common elsewhere
List 3 - Plants about which CNPS needs more information
List 4 - Plants of limited distribution (Watch List)
(Note: CNPS lists 1 and 2 require CEQA consideration. List 4 plants that must be surveyed per the Northern and Eastern Colorado Desert Management Plan (BLM and CDFG 2002) were also included for surveying)
Threat Ranks: 0.1-Seriously threatened in California (high degree/immediacy of threat)
0.2-Fairly threatened in California (moderate degree/immediacy of threat)

0.3-Not very threatened in California (low degree/immediacy of threats or no current threats known)

1.1.1 Desert Tortoise

The U.S. Fish and Wildlife Service (FWS; 2010) protocols will be used to survey the new linear facilities. This includes100% coverage of the linear route, using transects spaced at 10 meters. The gen-tie corridor is currently estimated to be approximately 35 meters wide; the gas pipeline corridor is approximately 20 meters wide. Buffer surveys will include a single 10-meter-wide belt transect at 200, 400, and 600 meters parallel to the boundary of each linear route. Buffer surveys will be walked unless construction or access on adjacent parcels (e.g., the Desert Sunlight solar project) precludes walking any of these buffers.

All tortoise sign (tortoises, burrows, shells, scat, tracks, drinking depressions) observed will be measured, mapped, and described relative to condition, age and, if possible, gender. No tortoises will be touched. Tortoises will be photographed if this can be achieved without touching or otherwise harassing the tortoise. Tortoise location (e.g., aboveground, visible in burrow, not visible in burrow) will be recorded. Shells and shell parts will be evaluated relative to the cause of death, if possible. Current and recent weather conditions will be recorded and the topography, drainage patterns, soils, substrates, plant cover, and aspect-dominant, common and occasional plant species described and mapped. All incidental sightings of common ravens, other known tortoise predators, and other site features (e.g., anthropogenic influences) that could assist in the analysis of tortoise population impacts will be recorded and mapped. Mapping will be achieved using a GPS unit. All transect data were recorded on specially-designed forms and representative areas photographed. Personnel will include only experienced tortoise biologists (Attachment DR2-1).

The timing and temperature requirements in the FWS (2010) survey protocols will be followed. This requires that surveys be conducted during the tortoise's most active period, typically April through May, and September through October when air temperatures are below 40° C (104° F), although the protocols allow flexibility for extending the survey window based on air temperatures, available forage, and historic tortoise activity.

Determining tortoise density on these short linear segments is not very relevant to the project as a whole, because they are such a small part of the project and edge effects are high. However, if the data are different than observed on previous surveys, such that the previously estimated project density, including confidence intervals, is no longer applicable to the project, then a new project density will be calculated per FWS (2010) protocols. Discussions of impacts will not only include comparisons to earlier survey data, but also include current data from other local projects, where those data are accessible.

1.1.2 Burrowing Owl

The California Department of Fish and Wildlife (DFW) has new survey guidelines (California Department of Fish and Game [CDFG] 2012) that describe a set of consecutive surveys, each based on results of the previous survey. However, burrowing owls were observed on the project solar site in earlier surveys. While none was observed on the linears, the linears appear to offer suitable habitat. Based on the previous surveys, the existing habitat, and the small portion of the project that the additional linears comprise, burrowing owls and their sign will be sought during desert tortoise surveys, including on buffer transects. No additional focused surveys will be conducted for burrowing owls on these new linear segments.

1.1.3 Golden Eagles

Separate golden eagle surveys are being conducted by PSH in accordance with FWS guidance.

1.1.4 Other Birds and Raptors

Separate avian presence and use surveys are being conducted by PSH in accordance with the protocol submitted for preconstruction baseline surveys contained in Proposed New Conditions BIO-C outlined in Supplement No. 1 and modified by recent guidance provided by FWS. However, all special-status bird species observed during wildlife surveys will be recorded.

1.1.5 Couch's Spadefoot

During desert tortoise and wildlife surveys, biologists will identify and record any artificial or temporary water catchments that could serve as breeding pools for Couch's spadefoot. In order to be considered breeding habitat, pools must be present for at least eight days in warm temperatures. Therefore, any potential breeding habitat detected (based on evidence of ponding, vegetation, soil composition, etc.) will be mapped and revisited during summer monsoons to verify if toads are present. If toads are present during summer monsoons, biologists will collect data according to previously approved protocols attached herein (Attachment DR2-2).

1.1.6 Bats

NECO requires surveys to locate bat roosts within one mile of the Modified Project to identify potential impacts from loss of foraging habitat to core population units. During desert tortoise surveys, including buffer transects, biologists will identify and record any potential bat roosts and hibernacula such as abandoned mines and caves. Freeway bridges and all artificial structures within one mile of the linears that might provide bat

roosts or hibernacula will also be inspected. If roosts or hibernacula are found, additional focused bat survey requirements will be discussed with the agencies.

1.1.7 Other Special-status Wildlife

Other special-status wildlife will be sought during tortoise surveys. All observations of special-status wildlife species, their sign (e.g., scat, tracks, bones, feathers), or their habitats (including water sources) listed in Table 1 will be included when compiling and mapping survey results. All deer and desert big horn sheep scat will be collected to verify species if questionable. Desert kit fox den complexes will be mapped and described relative to age and size.

1.2 FOCUSED VEGETATION AND PLANT SURVEYS

1.2.1 Vegetation Mapping and Special Habitats

Vegetation maps will be refined and further described during the biological surveys and will include habitats determined by the agencies to be sensitive or otherwise special. Surrounding anthropogenic and natural features that could provide insight into populations of special-status species, including population functioning (e.g., corridors), and existing or anticipated impacts to special-status species, also will be identified and mapped.

1.2.2 Special-Status Plant Species

Special-status plant surveys will be conducted in accordance with the DFW *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities* (CDFG 2009) and the U.S. Bureau of Land Management's (BLM's) *Survey Protocols Required for NEPA and ESA Compliance for BLM Special Status Plant Species* (BLM 2009). Although plant surveys typically follow BLM (2009) guidelines for an intuitive controlled survey, wherein a full survey is completed (i.e., 100 percent visual examination) in habitats with the highest potential for rare plants, with sampling in the remaining areas, the PSEGS survey covers such a small area that the entire route will be surveyed. Surveys will cover 100% of the new linear routes, where plants may be directly affected during Project construction and Project operations. In addition, areas outside the route where project activities may affect offsite populations will also be surveyed.

Depending on rainfall and primary production, plants will be surveyed when they are in optimum condition for identification (generally with blooms, fruits, and leaves). Surveys will be conducted by qualified botanists familiar with the area and species, including special-status species (Attachment DR2-1). Prior to conducting surveys, surveyors will review the target species (descriptions, photographs of live or herbarium specimens,

microhabitat associations) and inventory of all species observed on the site in previous surveys. Reference populations of target species will be visited, where practical, to enhance search images of plants and microhabitats, as well as identify phenology and plant vigor. All surveyors will carry keys and descriptions to ensure correct identification of all species observed.

Special-status plant species also will be recorded if observed during the desert tortoise and other wildlife survey and not previously documented in the plant survey.

1.2.3 Cacti, Yucca, and Trees

All individuals of cacti, yucca and trees protected by the California Desert Native Plant Act will be tallied on the new linear route segments. Mapping will occur by individuals or populations, depending on biological relevancy.

1.2.4 Noxious Weeds and Invasive Plants

All invasive plant species will be inventoried during the tortoise and plant surveys. Concentrations of invasive species will be mapped and described.

Vegetation surveys will be conducted in March 2013 and Desert Tortoise surveys will be conducted during the first two weeks of April 2013. Results of the surveys will be presented in a report and docketed before the end of April 2013.

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BACKGROUND: RARE PLANT SURVEYS

Several documented occurrences of special-status plants occur at the Palen site including known locations of Harwood's woolly-star (Eriastrum harwoodii), Harwood's milk-vetch (Astragalus insularis var. harwoodii), ribbed cryptantha (Cryptantha costata), California ditaxis (Ditaxis serrata var. californica), and "Palen Lake saltbush" (Atriplex sp. nov. Andre). Due to the potential presence of late season blooming plants the project owner conducted both spring and summer-fall botanical surveys as part of rare plant surveys for the approved project. The spring surveys were conducted between February and April 2009, and fall surveys were conducted in October 2010 based upon the weather pattern of the year in which the surveys were conducted. Rare plant survey data are needed for the modified generation tie-line route, the new gas pipeline, and any other areas not previously surveyed. As discussed earlier, survey results from the Desert Sunlight and Eagle Mountain Pumped Storage projects may not be adequate or recent enough to be acceptable. Per the CDFW Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities (CDFW 2009) (see hyperlink above), desert plant communities that have annual and short-lived perennial plants as major floristic components may require yearly surveys to accurately document baseline conditions for purposes of impact assessment. Staff is concerned that if the survey data the project owner is planning to submit is not acceptable and if the necessary surveys are not initiated soon, the survey window for rare plants potentially occurring in the project area will be missed for this year. Biological resource survey results for any areas not surveyed for the approved project are necessary for staff to analyze the potential impacts of the modified project. Without spring and fall survey results for special status plants for all new project features of the modified project, staff has insufficient information to complete an analysis of impacts to rare plants or assess alternatives that would avoid potential habitats.

Data Request 3. *Spring Survey Plan for Special-Status Plants. Please submit a Special-Status Plant Survey Plan for spring 2013 floristic surveys along the modified generation tie-line route, new gas pipeline, and any other areas not previously surveyed. Include the following components:*

a) *Spring Survey Plan. Develop a study plan for the field surveys that is consistent with the CDFW Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities (CDFW 2009) (http://www.dfg.ca.gov/biogeodata/cnddb/pdfs/Protocols_for_Surveying_and_Evaluating_Impacts.pdf) and BLM Survey Protocols Required for NEPA/ESA Compliance for BLM Special Status Plant Species (BLM 2009) (http://www.blm.gov/ca/dir/pdfs/2009/im/CAIM2009-026ATT1.pdf). Surveys shall include the 1,000-foot buffer along linear features, per the Siting Regulations (Appendix B). The project owner should also abide by BLM guidance/requirements regarding mapping/surveying for succulents/yucca/barrel cactus. If development of the site is approved by*

BLM, BLM will require salvage and transplantation of the succulents. A count of the number of barrel cacti, Joshua trees, or Mojave yuccas should be compiled. BLM requests photographic documentation of any BLM sensitive species found. Please include the names and qualifications of personnel who will be conducting the surveys.

b) *Expert Consultation/Voucher Collections. Consult with recognized experts on special status species potentially occurring in the survey area to assess the suitability of the habitat on site to support special status plants, and the potential for species to occur in the project area.*

c) *Schedule. Provide a schedule for accomplishing the tasks listed above and for submitting a report describing the results of the surveys.*

d) *Spring Survey Report. Provide a report summarizing the methods and results as well as impact analysis and mitigation recommendations once surveys are complete. The Spring Survey Report should be prepared consistent with CDFW guidelines (CDFW 2009), and BLM 2009 guidelines. Please provide the electronic files (raw GPS data and metadata) and CNDDB field forms for any special-status species populations detected.*

Data Response 3.

Please see Section 1.2 of Data Response 2.

Data Request 4. *Fall Surveys. Fall surveys along the modified generation tie-line route, the new gas pipeline, and any other areas not previously surveyed, shall follow all requirements of Condition of Certification BIO-19 (Special-Status Plant Impact Avoidance, Minimization, and Compensation) Section B: Conduct Late-Season Botanical Surveys in the Biological Resources section of the Final Commission Decision for the approved project (09-AFC-07).*

Data Response 4. Fall Plant Surveys

Fall plant surveys are a compliance requirement of Condition of Certification **BIO-19**, to be completed if there is adequate precipitation. Fall surveys will include all modifications of the PSEGS footprint and will be completed in the fall of 2013.

BACKGROUND: GENERAL SPECIES IMPACTS

The project owner is proposing to reconfigure the site and reduce the project footprint as well as use BrightSource's solar power tower technology rather than solar parabolic

trough technology. The Petition and Supplemental Information (February 2013) provides a list of potential environmental benefits from the proposed changes and states that overall disturbance - when considering total acres disturbed - from the Modified Project configuration and layout is reduced. However, the project owner did not demonstrate how the use of solar power tower technology and changes to construction phasing as well as the construction and operation of the modified project would change direct and indirect impacts on biological resources compared to the approved project. The approved project would disturb the entire project site for installation of solar parabolic trough technology. However, the modified project reduces grading across the solar field and open spaces will be preserved and left undisturbed, maintaining existing vegetation to the extent possible with respect to site topography and access requirements. These undisturbed areas could provide an attractant to wildlife by providing marginal habitat within the project site. In addition, relocated or displaced burrowing owl are tenacious about returning to their familiar burrows and are inclined to move back to the impact site if the site is still visible to the owl and/or if the impact site is not completely graded (Bloom, pers. comm.). Maintenance activities such as mowing and vegetation clearing could impact species if found in these areas during vegetation management.

Data Request 5. *Please discuss any potential direct and indirect impacts from the modified project, compared to the approved project in terms of changes to site configuration (e.g. construction phasing, new common area, generation tie-line and natural gas supply line, etc.), construction (e.g. heliostat field preparation), operation and maintenance activities (e.g. road and utility corridor maintenance and vegetation management such as mowing, etc.), and any other new project features/activities.*

Data Response 5. **<u>Direct and Indirect Biology Impacts</u>**

Supplement No. 1 (February 2013), Table 1 identifies all of the direct and indirect impacts to biological resources and electronic shape files were delivered to the CEC in order to enable the Staff to see how the impacts were calculated. A description of indirect impacts will be submitted under separate cover.

SOIL AND WATER RESOURCES (6-8)

BACKGROUND

Erosion and Sedimentation

The modified project proposes substantial changes to the site hydrology compared to the approved project. The modified project removes the three major drainage channels from the approved project that was designed to route the water through and around the entire field of solar troughs. Instead, the heliostat technology of the modified project would allow most flows to maintain existing, pre-project natural drainage patterns through the solar fields. Although the modified project would reduce the impacts of water diversion compared to the approved project, the substantial changes in hydrology could potentially recreate a new set of impacts that were not analyzed during assessment of the approved project.

On February 8, 2013, Palen Solar Holdings, LLC (PSH) submitted a Post-Construction Hydrologic and Hydraulic Analysis for the modified project. The purpose of this analysis is to provide a determination of the difference in runoff volume and peak flows between the Existing Condition and the Post-Construction analyses of the modified project. After initial review of this report, staff notes that it is missing relevant information that PSH stated in the Petition would be included in this report or submitted under separate cover.

Data Request 6. *Section 5.2.3 of the Petition states that the Post-Construction Hydrologic and Hydraulic Analysis would address the scour potential of the heliostat pylons. Please provide information showing pylon penetration depths that would provide enough lateral support and to guard against the potential for scour during significant flood events*.

Data Response 6. Scour Analysis

Attachment DR6-1 includes the Scour Analysis.

Data Request 7. *Section 2.13.1.1 of the Petition states that the modified project's Construction Storm Water Pollution Prevention Plan (SWPPP) would be provided under separate cover. Please provide a Construction SWPPP and/or a Drainage, Erosion, and Sediment Control Plan (DESCP) that implements appropriate best management practices (BMPs) to protect areas disturbed by grading and other ground disturbance from erosion*.

Data Response 7. SWPPP/DESCP

The SWPPP/DESCP was docketed on March 21, 2013.

BACKGROUND

Waste Discharge Requirements

The modified project would eliminate the use of heat transfer fluid and reduce the amount of process waste water compared to the approved project. As a result, the modified project would reduce the number of evaporation ponds, from two-4 acre to two-2 acre evaporation ponds. Although this would be a reduction of impacts, it would require revised Waste Discharge Requirements (WDRs) to reflect the modified project.

This process must be coordinated with the Colorado River Basin Regional Water Quality Control Board (RWQCB), including formal adoption of the WDRs prior to operations.

Data Request 8. *Please submit an updated Report of Waste Discharge (Form 200) with the necessary supplemental information to the Colorado River Basin RWQCB. Please provide Energy Commission staff with copies of correspondence between the applicant and the Colorado River Basin RWQCB regarding this issue.*

Data Response 8. Amended ROWD

Attachment DR8-1 includes an Amended ROWD. PSH notes that the design of the evaporation ponds remains unchanged although the size is reduced. The characteristics of the waste discharge remain unchanged although the quantity of waste is significantly reduced. Additionally, the WDRs issued for the Approved Project also covered the Land Treatment Units for use in handling any leaks of Therminol. These WDRs should be deleted due to the elimination of the use of Therminol.

TRAFFIC AND TRANSPORTATION (9-17)

BACKGROUND: MAXIMUM NUMBER OF EMPLOYEES PER SHIFT
Page 6.3-2 of the Petition to Amend states that the Modified Project would have 100 operation workforce employees.

Data Request 9. *Please state the maximum number of employees for each shift.*

Data Response 9. Operation Employees

PSEGS will have 40 workers during the day shift and 60 workers during the evening shift.

BACKGROUND: CARPOOLING DURING CONSTRUCTION
Page 6.3-1 of the Petition to Amend states:

"The average number (of) day shift workers would be 790. The peak number of day shift workers will be 1,700. Assuming 7.5% of all day shift workers utilize carpooling, the number of average daily (one-way) trips generated will be 1,461 per day and peak daily trips generated will be 3,145."

Staff checked these calculations, as shown below:

Average daily one-way trips assuming 7.5 percent carpool:
• 790 day shift workers (0.075 carpooling rate) = 59.25, or 59 workers carpooling

• 790 day shift workers – 59 workers carpooling = 731 workers drive alone

• (731 workers not carpooling)(2 one-way trips per day) = 1,462 one-way trips per day, but this does not include the carpooling workers. This is a similar number to the 1,461 one-way trips per day given in the Petition to Amend, meaning that the Petition to Amend does not appear to account for the number of trips made by carpooling workers.

Peak daily one-way trips assuming 7.5 percent carpool:
• 1,700 peak day shift workers (0.075) = 127.5, or about 128 workers carpooling

• 1,700 peak day shift workers – 128 workers carpooling = 1,572 workers drive alone

• (1,572 workers not carpooling)(2 one-way trips per day) = 3,144 one-way trips per day, but this does not include the carpooling workers. This is a similar number to the 3,145

one-way peak trips per day given in the Petition to Amend, meaning that the Petition to Amend does not appear to account for the number of trips made by carpooling workers.

Data Request 10. *Please explain the reasoning for assuming that 7.5 percent of workers would carpool.*

Data Response 10. Carpooling Assumption Basis

The Approved Project agreed to develop a Traffic Control Plan (TCP) to mitigate any traffic impacts on I-10 during construction. The TCP would include measures to mitigate potential cumulative impacts on I-10 during construction, including incentives for carpooling, passenger van or bus service, staggered work shifts, off-peak work schedules, travel restrictions, and a truck staging area. The Modified Project adopted this condition of certification without proposing modifications (**TRANS-4**).

The Petition to Amend assumed that the incentive measures to promote carpooling among workers would result in a 7.5% reduction of vehicle trips per day (rather than number of workers). This assumption was based on the analysis conducted for the Hidden Hills project as set forth in the Hidden Hills AFC, Section 5.12, Traffic and Transportation, on Page 5.12-16. The Hidden Hills analysis stated that given the remote location of the project site, the high cost of gas, and the type of construction being conducted, it was estimated that 15% of workers would carpool, and therefore approximately 7.5 % of the construction traffic would be carpools (with a typical vehicle occupancy rate of two persons per vehicle). PSH believes these same factors apply to the Modified Project (e.g., remote project site location, high gas price, solar thermal construction work), and hence the Petition to Amend assumed the same 7.5% reduction of vehicle trips per day.

It is anticipated that a combination of strategies will be utilized to minimize traffic congestion from construction activities, and that the number of workers per vehicle will therefore vary depending on the location from which the workers are traveling, phase of construction, and whether car, van or bus service is most feasible.

The Petition to Amend provided vehicle traffic estimates for a combination of onsite and offsite construction personnel and staggered workshifts to reduce traffic impacts (Appendix 2-C). Table 10.1 provides clarification on how the assumption for carpooling was applied. For simplification, the table presents the peak and average number of vehicle trips with and without carpooling for day-shift workers (onsite and offsite). Again, the assumption for carpooling is based on a reduction in vehicle trips (rather than workers) since the number of passengers sharing a vehicle is likely to vary depending

on the carpooling program implemented.

Average Workers

- Average workers (Day Shift, onsite and offsite): 790
- Average Vehicle Trips per day: 790 x 2 = 1580
- Average Vehicle Trips with 7.5% reduction in vehicle trips per day due to carpooling: 1580 x (1-.075)=1461 (i.e., vehicle trips reduced by 119)

Peak Workers

- Peak workers (Day Shift, onsite, offsite): 1700
- Peak Vehicle Trips per day: 1700 x 2 = 3400
- Peak Vehicle Trips with 7.5% reduction in vehicle trips per day due to carpooling: 3400 x (1-.075)=3145 (i.e., vehicle trips reduced by 255)

Data Request 11. *Where would workers meet up to share a ride (the hotel, a park-and-ride lot, etc.)?*

Data Response 11. Carpooling Locations

As found by the Staff in its Final Staff Assessment for the Approved Project, the majority of construction workers supporting PSEGS are expected to live or reside temporarily in Indio, Blythe, or Parker, Arizona and arrive at the project sites via I-10 east and I-10 west. As mentioned in Data Response 10, the number of passengers sharing a vehicle is expected to vary depending on the carpooling program implemented. It is anticipated that the majority of workers participating in carpooling will reside and meet at a place of temporary lodging.

It is also likely that workers will travel to their permanent residences for weekends. It is anticipated that such workers will likely carpool when traveling to their permanent residences. This carpooling will likely result in ultimate carpooling to the site daily due to lack of separate vehicles.

Data Request 12*. For the carpooling workers, please estimate the average number of workers per car.*

Data Response 12. Average Workers Per Car

As discussed in Data Response 10 and 11 above, the number of passengers sharing a vehicle, bus, or van is expected to vary based on the type of transportation used and the location from which the group of workers are traveling. A conservative assumption of a 7.5% reduction in total vehicle trips from carpooling has been assumed for the analysis. Based on this assumption, the average workers per vehicle is estimated to be

approximately 1.1.

Data Request 13. *In the estimates for average daily one-way trips and peak daily one-way trips, please account for the number of vehicle trips made by carpooling workers.*

Data Response 13.

Please see response to Data Request 10.

BACKGROUND: LEVEL OF SERVICE (LOS) DURING CONSTRUCTION

The staff analysis for the original Palen project included projected level of service (LOS) during project construction at the following roadways and intersections:

- *I-10 west of the project site*
- *I-10 east of the project site*
- *Corn Springs Road*
- *I-10 westbound ramps/Corn Springs Road*
- *I-10 eastbound ramps/Corn Springs Road*

The Modified Project would create more construction traffic than the originally approved project, so staff needs additional traffic data for the Modified Project.

Data Request 14. *For average daily construction and peak daily construction, please include tables showing: the existing LOS for each roadway and intersection; and the approximate number of project-related daily one-way trips occurring on each of the above roadways and intersections, with the resulting LOS. Please account for carpooling workers, as discussed in Data Request #13 (above).*

For the existing LOS data, please identify your sources.

Data Response 14. **Traffic Analysis**

The CEC Decision at Pages 12 and 13 of the Traffic and Transportation Section provided the following:

> For the Blythe Solar Power Plant, during month 16, the estimated construction peak would generate about 2,000 one-way worker commute trips per day. In the case of the Palen project, the worst-case scenario

would yield a peak trip generation of approximately 1,145 inbound trips during the morning peak period and another 1,145 outbound trips during the evening peak hour. On the Genesis project, the worst-case scenario would yield a peak trip generation of approximately 1,093 inbound trips during the morning peak period and another 1,093 outbound trips during the evening peak hour.

Because Blythe, Palen, and Genesis would have overlapping construction schedules, traffic impacts could potentially be exacerbated locally along I-10. Therefore, we have adopted Condition of Certification **TRANS-4** to require a traffic plan for Palen. The Blythe and Genesis projects also require traffic plans. The traffic plans would include measures such as staggered work shifts, off-peak work schedules, travel restrictions, and incentives for carpooling to mitigate potential cumulative impacts on I-10 during construction periods. Nevertheless, even with implementation of Condition of Certification **TRANS-4**, there may be some cumulative impacts to I-10 resulting from the other project in the area, and LOS may decrease. However, the conditions we have adopted would ensure that Palen's contribution to this impact would not be cumulatively considerable.

Condition of Certification **TRANS-4** includes a very specific performance standard identified in the first bullet to be contained in and enforced by the TCP. The performance standard is:

> A work schedule and end-of-shift departure plan designed to ensure that ***stacking does not occur at intersections*** necessary to enter and exit the project sites. The project owner shall consider using one or more of the following measures designed to prevent stacking: staggered work shifts, off-peak work schedules, and/or restricting travel to and departures from each project site to ***10 or fewer vehicles every three minutes during peak travel hours on I-10***. (***emphasis added***)

PSH has agreed to meet that performance standard for the Modified Project. The original Palen traffic analysis showed drops of LOS from LOS A to E and the solution was to enforce the above performance standard. Therefore, if the PSEGS increased construction traffic were modeled and it was determined that if left unmitigated, the LOS decrease would be to LOS E or worse, the information is misleading because PSH has agreed to meet the same performance standard (i.e., 10 or fewer vehicles every three minutes during peak travel hours on 1-10). Meeting this performance standard would ensure the same LOS for PSEGS as was sufficient for the CEC Decision to find that the

Approved Project mitigated its contribution to cumulative impacts on I-10. For this reason, PSH believes that modeling traffic impacts as if they are unmitigated is unwarranted and would not be helpful for making a decision on Petition to Amend. When Condition of Certification **TRANS-4** is included in the modeling effort would show the same impacts to the I-10, its on and off ramps, and Corn Springs Road. PSH believes this qualitative analysis is sufficient for Staff to conclude that the original findings of the CEC Decision related to construction traffic are still valid. PSH looks forward to working with Staff at the upcoming Data Resolution Workshop and will provide additional modeling if Staff still believes it is necessary.

BACKGROUND: FAA NOTICE OF PROPOSED CONSTRUCTION OR ALTERATION

Title 14, Subpart B, Section 77.9 of the Code of Federal Regulations requires proponents of any construction exceeding 200 feet above ground level to notify the Federal Aviation Administration (FAA). The project's two solar towers would each be 750 feet in height, requiring the applicant to file Form 7460-1 "Notice of Proposed Construction or Alteration" for each tower.

Data Request 15. *For each solar tower, please submit Form 7460-1 "Notice of Proposed Construction or Alteration" to the FAA, and provide a copy of the submittal to Energy Commission staff.*

Data Response 15. FAA Form 7460-1

A Form 7460-1 "Notice of Proposed Construction or Alteration" for each solar tower was submitted to the FAA on March 13, 2013. Copies are provided as Attachment DR15-1.

Data Request 16. *Once the FAA has completed review of the proposed towers, please provide a copy of the findings to Energy Commission staff.*

Data Response 16. FAA Communication

A copy of the FAA's Obstruction Evaluation Analysis findings will be provided to CEC staff upon receipt.

BACKGROUND: TRUCK TRIPS

Page 6.3-2 states: "With the Modified Project, truck trips are forecasted to generate an average of 20 daily truck trips per hour with a peak of 45 daily truck trips per hour. The Approved Project was forecasted to generate an average of approximately 20 to 30 daily one-way truck trips, with a peak of approximately 40 daily one-way truck trips."

Data Request 17. *It appears that for the Modified Project, the truck trips should be expressed as "daily truck trips" instead of "daily truck trips per hour". Please confirm whether this is true.*

Data Response 17. Truck Trips

Yes, truck trips should be expressed as daily truck trips.

TRANSMISSION SYSTEM ENGINEERING (18)

BACKGROUND

The California Environmental Quality Act (CEQA) requires the identification and description of the "Direct and indirect significant effects of the project on the environment." The Application for Certification requires discussion of the "energy resource impacts which may result from the construction or operation of the power plant." For the identification of impacts on the transmission system resources and the indirect or downstream transmission impacts, staff relies on the Phase I and Phase II Interconnection Studies for insuring the interconnecting grid meets the California Independent System Operator (California ISO) reliability standards. The studies analyze the effect of the proposed project on the ability of the transmission network to meet reliability standards. When the studies determine that the project will cause a violation of reliability standards, the potential mitigation or upgrades required to bring the system into compliance are identified. The mitigation measures often include the construction of downstream transmission facilities. CEQA requires the analysis of any downstream facilities for potential indirect impacts of the proposed project. Without a complete Phase I or Phase II Interconnection Study, staff is not able to fulfill the CEQA requirement to identify the indirect effects of the proposed project.

Data Request 18. *Please provide written confirmation from the California ISO that the existing Phase I and Phase II generator interconnection studies are applicable to the new plant configuration and on-line date. If the California ISO Phase I and/or Phase II Interconnection Studies will need to be updated, please provide the updated studies.*

Data Response 18. <u>CAISO Studies</u>

PSH will interconnect to the CAISO transmission grid at a 230kV bay in the Southern California Edison (SCE) Red Bluff substation. The interconnection facilities, reliability and delivery upgrades required for interconnection are prescribed in the executed LGIA for Queue # 365.

The existing LGIA contemplates interconnecting a solar thermal generator made up of two units of 250 MWs each, for a total capacity of 500 MWs of solar thermal capacity, to be interconnected via queue #365 at Red Bluff substation. Since the generator characteristics have not materially changed from those contemplated in the executed LGIA, PSH can confirm that the existing phase 1 and phase 2 studies, as well as the conclusions defined in the LGIA, are applicable for the new plant configuration and on-line date.

As a matter of compliance with the CAISO tariff, PSH submitted a formal "Material Modification Assessment" request to the CAISO's queue management department on December 6th 2012 (See receipt of request notification from CAISO in Attachment DR18-1).

PSH has not yet received formal notification of the results of the material modification assessment and hence cannot provide to the CEC staff formal CAISO confirmation of the applicability of the existing LGIA. The delay in no way detracts from the informal guidance from both SCE and CAISO that there will be no change in the applicability of the studies due to the fact that there is no change in technology nor any change to the requested point of interconnection or commercial operation date. Regardless, the delay in the formal results of the study are due in part to a preference on the part of PSH to allow the CAISO to allow their analysis to include the potentially positive impacts of the recent downsizing window of January 2013.

Primary points of contact for the PSEGS LGIA (queue #365) are as follows:

Ms. Linda Wright
California ISO
250 Outcropping Way
Folsom, CA 95630

Mr. John Tucker
Southern California Edison
T&D - Federal Regulation and Contracts
Pomona Innovation, PIV3, 2nd Floor
3 Innovation Way
Pomona, CA 91768

Manager of Grid Contracts
Southern California Edison Company
2244 Walnut Grove Avenue
Rosemead, California 91770

ATTACHMENT DR1-1

2010-06-15 APPLICANTS SPRING 2010 SURVEY RESULTS CORRECTED PRELIMINARY IMPACT CALCULATIONS BIO RESOURCES TN-57156

DOCKET	
09-AFC-7	
DATE	JUN 15 2010
RECD.	JUN 16 2010

June 15, 2010

Alan Solomon
Project Manager
California Energy Commission
1516 Ninth Street
Sacramento, CA 95814

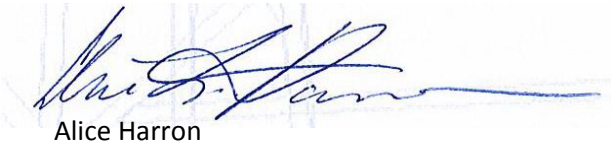
RE: **Palen Solar Power Project, Docket No. 09-AFC-7**
Preliminary Spring 2010 Survey Results Corrected and Preliminary Impact Calculations
Technical Area: Biological Resources

Dear Mr. Solomon:

Attached please find the Preliminary Spring 2010 Survey Results Corrected and Preliminary Impact Calculations for the Palen Solar Power Project.

If you have any questions on this submittal, please feel free to contact me directly.

Sincerely,



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AECOM
1420 Kettner Boulevard
Suite 500
San Diego, CA 92101
www.aecom.com

619.233.1454 tel
619.233.0952 fax

May 27, 2010

Ms. Susan Sanders
California Energy Commission
1516 Ninth Street
Sacramento, California 95814

Subject: Palen Solar Power Project (09-AFC-7) – Preliminary Spring 2010 Survey Results Corrected and Preliminary Impact Calculations for Biological Resources

Dear Ms. Sanders:

On behalf of Palen Solar I, LLC, AECOM is submitting preliminary results of biological surveys conducted in spring 2010 for desert tortoise (*Gopherus agassizii*; DT), rare plants, jurisdictional waters, and incidental wildlife occurrences for the Palen Solar Power Project. This information was requested at the Palen and Blythe Staff Workshops conducted on April 28 and 29, 2010.

Preliminary survey results for DT, rare plants and jurisdictional waters were submitted to the CEC on May 7, 2010. The results provided herein supersede the results provided on May 7, 2010. The preliminary survey results are presented in figures and tables attached. Table 1 and Figure 1 present a summary of observations of DT sign and DT occurrences noted during spring 2010 surveys. Table 2 and Figure 2 present the rare plant population counts observed during spring 2010 surveys. Figure 3 presents the results of a formal jurisdictional delineation of waters of the State. Table 3 and Figure 4 present incidental wildlife occurrences observed during protocol surveys for DT, rare plants, western burrowing owl, and jurisdictional waters. Results from the fall and spring 2009 surveys are not included in the tables and figures for DT, rare plants or incidental wildlife occurrences. However, the jurisdictional waters figure does include results from the 2009 surveys and a table presenting the results of both survey years is provided in the figure. Please note that the results provided in Tables 1 through 3 and Figures 1, 2 and 4 are simply the results of our observations within the 100 percent coverage study area and associated buffers. These tables and figures do not represent total impacts within disturbance areas because we surveyed wider corridor widths and additional areas for contingency in the engineering design that ultimately will not be disturbed.

Figure 5 presents the additional disturbance areas surveyed in 2010 for an access road, transmission line corridor, and additional project components that are outside the 2009 project footprint. Therefore, the total Project Disturbance Area has been revised to be 4,051.1 acres. This total is still preliminary and subject to further refinement in the engineering design. A revised total disturbance area will be provided in final technical reports to be submitted to the CEC in early June.

Figure 6 present preliminary direct impacts to all cover types, including state waters, resulting from the revised Project Disturbance Area. These impact calculations are still preliminary and subject to further refinement in the engineering design. Revised impact calculations will be provided in final technical reports to be submitted to the CEC in early June.

Please let us know if you have any questions.

AECOM

Sincerely,

Mr. Bill Graham
Principal

Enclosure: Table 1. Palen Solar Power Project Desert Tortoise Observations Spring 2010
Table 2. Palen Solar Power Project Rare Plant Population Counts Spring 2010
Table 3. Palen Solar Power Project Incidental Wildlife Occurrences
Figure 1. Preliminary Results Desert Tortoise Spring 2010 Surveys
Figure 2. Preliminary Results Botany Rare Plants Spring 2010 Surveys
Figure 3. Preliminary Results State Waters Spring 2010 Surveys
Figure 4. Preliminary Results Incidental Wildlife Occurrences Spring 2010 Surveys
Figure 5. Preliminary Disturbance Areas May 2010
Figure 6. Preliminary Impacts to Cover Types May 2010
CD. Raw Data Files in Excel and Shapefiles

cc. Alice Harron, Solar Millennium
Elizabeth Ingram, Solar Millennium
Scott Galati, Solar Millennium Counsel
Mark Luttrell, AECOM

AECOM

Table 1. Palen Solar Power Project Desert Tortoise Observations Spring 2010

Description	Proposed Project Study Area	Reconfigured Alternative Project Study Area	Proposed Project/Reconfigured Alternative Study Area[1]	Buffer	Incidental Observations Outside Buffer Area	Grand Total
Adult Tortoise	1			3	3	7
Active Tortoise Burrow or Pallet - Class 1				2		2
Tortoise Burrow or Pallet - Class 3 (deteriorated, definitely tortoise)	1			2		3
Possible Tortoise Burrow or Pallet (Class 4 or 5)		1		6		7
Tortoise Scat	5			10	3	18
Tortoise Bone Fragment - Mineralized	2	5		5	1	13
Tortoise Bone Fragment - Not Mineralized	3	37	1	26	1	68
Tortoise Carcass (shell bone falling apart; growth rings on scutes are peeling)				1		1
Tortoise Tracks				2	1	3

[1]This encompasses the areas where the Proposed Project Study Area and Reconfigured Alternative Study Area overlap.

AECOM

Table 2. Palen Solar Power Project Rare Plant Population Counts Spring 2010

Species	Proposed Project Study Area	Reconfigured Alternative Project Study Area	Proposed Project/Reconfigured Alternative Study Area[2]	Buffer	Incidental Observations Outside Buffer Area	Grand Total
Four wing saltbush				920		920
Cottontop cactus	1					1
Harwood's milkvetch				152		152
Harwood's wollystar		1		37		38
Ribbed cryptantha	6,750	337	30	68,859		75,976
Utah milkvine					11	11

[1] Note that each point on the figure may represent multiple individuals

[2]This encompasses the areas where the Proposed Project Study Area and Reconfigured Alternative Study Area overlap.

AECOM

Table 3. Palen Solar Power Project Incidental Wildlife Occurrences

Species	Proposed Project Study Area	Reconfigured Alternative Project Study Area	Proposed Project/Reconfigured Alternative Study Area[1]	Buffer	Incidental Observations Outside Buffer Area	Grand Total
American Badger Den or Burrow	1	25	1	2	2	31
Ferruginous Hawk				1		1
Kit Fox Burrow or Complex	2	7		4	2	15
Loggerhead Shrike	2	1		3	3	9
Mojave Fringe-toed Lizard	5	310		62	11	388
Unidentified Woodpecker Species – Nest Cavity				1		
Northern Harrier		2		3		5
Swainson's Hawk	1	1		1		3

[1]This encompasses the areas where the Proposed Project Study Area and Reconfigured Alternative Study Area overlap.

1 inch = 4,000 feet
0 4,000 8,000 Feet

DT Observations (Spring 2010)

- Adult Tortoise
- Juvenile Tortoise
- Tortoise Burrow (Active) - Class 1
- Tortoise Burrow - Class 2
- Tortoise Burrow - Class 3
- Tortoise Burrow - Class 4
- Tortoise Burrow - Class 5
- Tortoise Pallet (Active) - Class 1
- Tortoise Pallet - Class 2
- Tortoise Pallet - Class 4
- Tortoise Pallet - Class 5
- Tortoise Scat - Class 1
- Tortoise Scat - Class 2
- Tortoise Scat - Class 3
- Tortoise Scat - Class 4
- Tortoise Scat - Class 5
- Tortoise Carcass - Class 4
- Tortoise Bone Fragment (Class 5) - Not Mineralized
- Tortoise Bone Fragment (Class 5) - Mineralized
- Tortoise Tracks

1 inch = 6,000 feet
0 6,000 12,000 Feet

Map Location

Legend

- Proposed Project Study Area
- Project Disturbance Area
- 1-mile - Project Buffer Transect
- 3/4-mile - Project Buffer Transect
- 1000-ft - Project Buffer Transect
- Alternative Disturbance Area
- Alternative 3/4mile - Buffer Transect
- Alternative 1mile - Buffer Transect
- Study Area (Surveyed in 2009)
- First Solar Study Area

Source: NAIP 2009; AECOM 2010; SolarMillennium 2010

Palen Solar Power Project
Figure 1
Preliminary Results Desert Tortoise Spring 2010 Surveys

N W E S

AECOM

Date: May 2010

Path: P:\2009\09080081 Sol Mil Palen\6.0 GIS\6.3 Layout\Reports\CEC_Data_Requests\Spring2010_Results_May2010\PSPP_DETOSurveyResults_Spring2010.mxd, 05/26/10, SteinB

1 inch = 4,000 feet
0 4,000 8,000 Feet

Rare Plant Observations

CNPS 1B and 2
- Harwood's milkvetch
- Harwood's woollystar
- four wing saltbush

CNPS List 4
- Utah milkvine
- ribbed cryptantha

BLM-requested Cactus Species
- cottontop cactus

1 inch = 6,000 feet
0 6,000 12,000 Feet

Map Location

Legend
- Project Disturbance Area
- Proposed Project Study Area
- Proposed Project BRSA
- Study Area (Surveyed in 2009)
- First Solar Study Area
- Alternative Disturbance Area
- Reconfigured Alternative BRSA

Source: NAIP 2009; AECOM 2010; SolarMillennium 2010

Palen Solar Power Project

Figure 2
Rare Plant
Spring 2010 Surveys

N W E S

AECOM

Date: May 2010

Path: P:\2009\09080081 Sol Mil Palen\6.0 GIS\6.3 Layout\Reports\CEC_Data_Requests\Spring2010_Results_May2010\Fig2_PSPP_BotanySurveyResults_20100526.mxd, 05/27/10, NdemoM

1 inch = 3,000 feet

0 3,000 6,000 Feet

Jurisdictional Waters of the State of California

Desert Dry Wash Woodland

- Wash Dependent Vegetation
- Riparian Interfluve
- Vegetated Ephemeral Dry Wash

Other Waters

- Unvegetated Ephemeral Dry Wash

Jurisdictional Waters of the State		Project Disturbance Area	Buffer	Reconfigured Alternative Disturbance Area	Buffer
Desert Dry Wash Woodland	Wash Dependent Vegetation	1.3	0.2	0.01	0.1
	Riparian Interfluve	43.6	23.5	6.8	5.3
	Vegetated Ephemeral Dry Wash	99.1	61.1	13.6	11.8
Unvegetated Ephemeral Dry Wash	Unvegetated Ephemeral Dry Wash	164.0	28.7	44.5	22.8

1 inch = 6,000 feet

0 6,000 12,000 Feet

Map Location

OR ID NV UT CA AZ

Legend

- Proposed Project Study Area
- Proposed Project DARSA
- Project Disturbance Area
- Reconfigured Alternative Disturbance Area
- Reconfigured Alternative DARSA
- Study Area (Surveyed in 2009)
- First Solar Study Area

*Note: The Reconfigured Alternative Disturbance Area encompasses the disturbance caused by construction of the solar power blocks only and is not a complete engineering design.

Source: NAIP 2009; AECOM 2010; SolarMillennium 2010

Palen Solar Power Project
Figure 3
Preliminary Results State Waters Spring 2010 Surveys

N W E S

AECOM

Date: May 2010

Path: P:\2009\09080081 Sol Mil Palen\6.0 GIS\6.3 Layout\Reports\CEC_Data_Requests\Spring2010_Results_May2010\PSPP_StatewatersSurveyResults_20100526.mxd, 05/26/10, SteinB

1 inch = 4,000 feet
0 4,000 8,000 Feet

Sensitive Wildlife Observations

- American Badger Den
- Mojave fringe-toed lizard
- American Badger Predation Burrow
- Ferruginous Hawk
- Kit Fox Burrow
- Kit Fox Complex
- Loggerhead Shrike
- Nest Cavity - Unidentified Woodpecker Species
- Northern Harrier
- Swainson's Hawk

1 inch = 6,000 feet
0 6,000 12,000 Feet

Map Location

Legend

- Proposed Project Study Area
- Project Disturbance Area
- Project Disturbance BRSA
- Reconfigured Alternative Disturbance Area
- Reconfigured Alternative BRSA
- Study Area (Surveyed in 2009)
- First Solar Study Area

Source: NAIP 2009; AECOM 2010; SolarMillennium 2010

Palen Solar Power Project

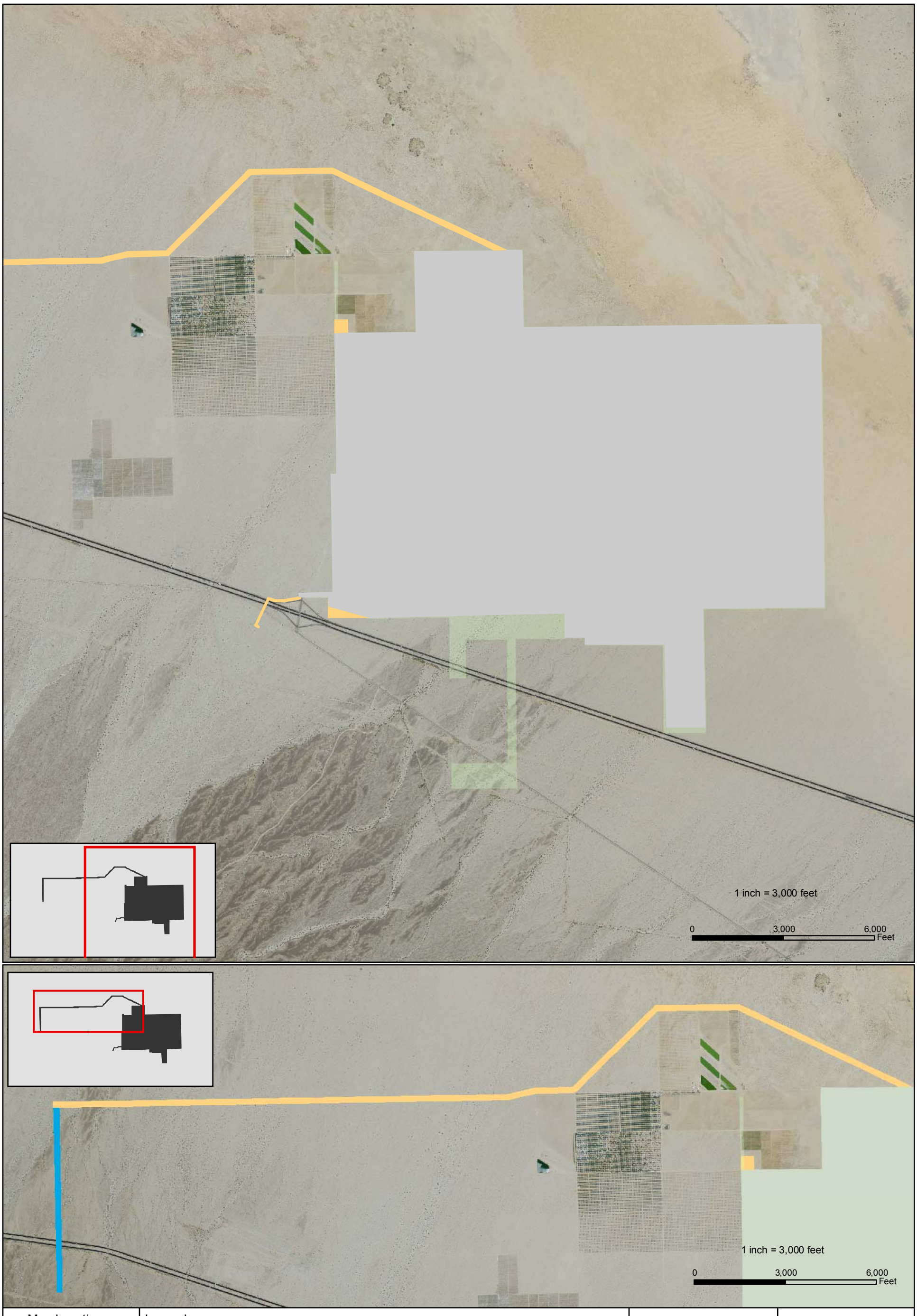
Figure 4
Incidental Wildlife Observations
Spring 2010 Surveys

N W E S

AECOM

Date: May 2010

Path: P:\2009\09080081 Sol Mil Palen\6.0 GIS\6.3 Layout\Reports\CEC_Data_Requests\Spring2010_Results_May2010\Fig4_PSPP_IncidentalWildlifeObs_Spring2010.mxd, 05/27/10, NdemoM



Map Location

Legend

- Disturbance Area (3,870.8 acres)
- Additional Disturbance Areas 2010 (152.3 acres)
- First Solar Overlap Area (28 acres)
- Disturbance Area 2009

Source: NAIP 2009; AECOM 2010; SolarMillennium 2010

Palen Solar Power Project
Figure 5
Preliminary Disturbance Areas Spring 2010 Surveys

N
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S

AECOM

Date: May 2010

Path: P:\2009\09080081 Sol Mil Palen\6.0 GIS\6.3 Layout\Reports\CEC_Data_Requests\Spring2010_Results_May2010\Fig5_PSPP_PreliminaryDisturbanceAreas_20100526.mxd, 05/27/10, NdemoM

1 inch = 3,000 feet
0 3,000 6,000 Feet

Vegetation Communities

Riparian

- Desert dry wash woodland (147.5 acres)
- Unvegetated ephemeral dry wash (164.0 acres)

Upland

- Sonoran creosote bush scrub (3421.9 acres)
- Stabilized and partially stabilized desert dunes (284.7 acres)

Other

- Agriculture (3.0 acres)
- Developed (1.9 acres)

First Solar overlap area not surveyed by AECOM.
Resources and acreage to be determined

1 inch = 3,000 feet
0 3,000 6,000 Feet

Map Location

Legend

- Project Disturbance Area
- First Solar Study Area

Source: NAIP 2009; AECOM 2010; SolarMillennium 2010

Palen Solar Power Project
Figure 6
Preliminary Impacts to Cover Types
May 2010

N W E S

AECOM

Date: May 2010

Path: P:\2009\09080081 Sol M1 Palen\6.0 GIS\6.3 Layout\Reports\CEC_Data_Requests\Spring2010_Results_May2010\PSPP_CoverTypeImpacts_20100526.mxd, 05/26/10, SteinB

STATE OF CALIFORNIA
ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION

In the Matter of: **APPLICATION FOR CERTIFICATION** **for the *PALEN SOLAR POWER PROJECT***	**Docket No. 09-AFC-7** **PROOF OF SERVICE** ***(Revised 5/14/2010)***

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DECLARATION OF SERVICE

I, Carl Lindner, declare that on, June 15, 2010, I served and filed copies of the attached Preliminary Spring 2010 Survey Results Corrected and Preliminary Impact Calculations for Biological Resources**,** dated May 27, 2010.

The original document, filed with the Docket Unit, is accompanied by a copy of the most recent Proof of Service list, located on the web page for this project at:
[http://www.energy.ca.gov/sitingcases/solar_millennium_palen].

The document has been sent to the other parties in this proceeding (as shown on the Proof of Service list) and to the Commission's Docket Unit, in the following manner:

(*Check all that Apply*)

For service to all other parties:

__X_ sent electronically to all email addresses on the Proof of Service list;

__ by personal delivery or by overnight delivery service or depositing in the United States mail at Camarillo, California with postage or fees thereon fully prepaid and addressed as provided on the Proof of Service list above to those addresses **NOT** marked "email preferred."

AND

For filing with the Energy Commission:

__X_ sending an original paper copy and one electronic copy, mailed respectively, to the address below (preferred method);

OR

_____ depositing in the mail an original and 12 paper copies, along with 13 CDs, as follows:

CALIFORNIA ENERGY COMMISSION
Attn: Docket No. 09-AFC-7
1516 Ninth Street, MS-4
Sacramento, CA 95814-5512

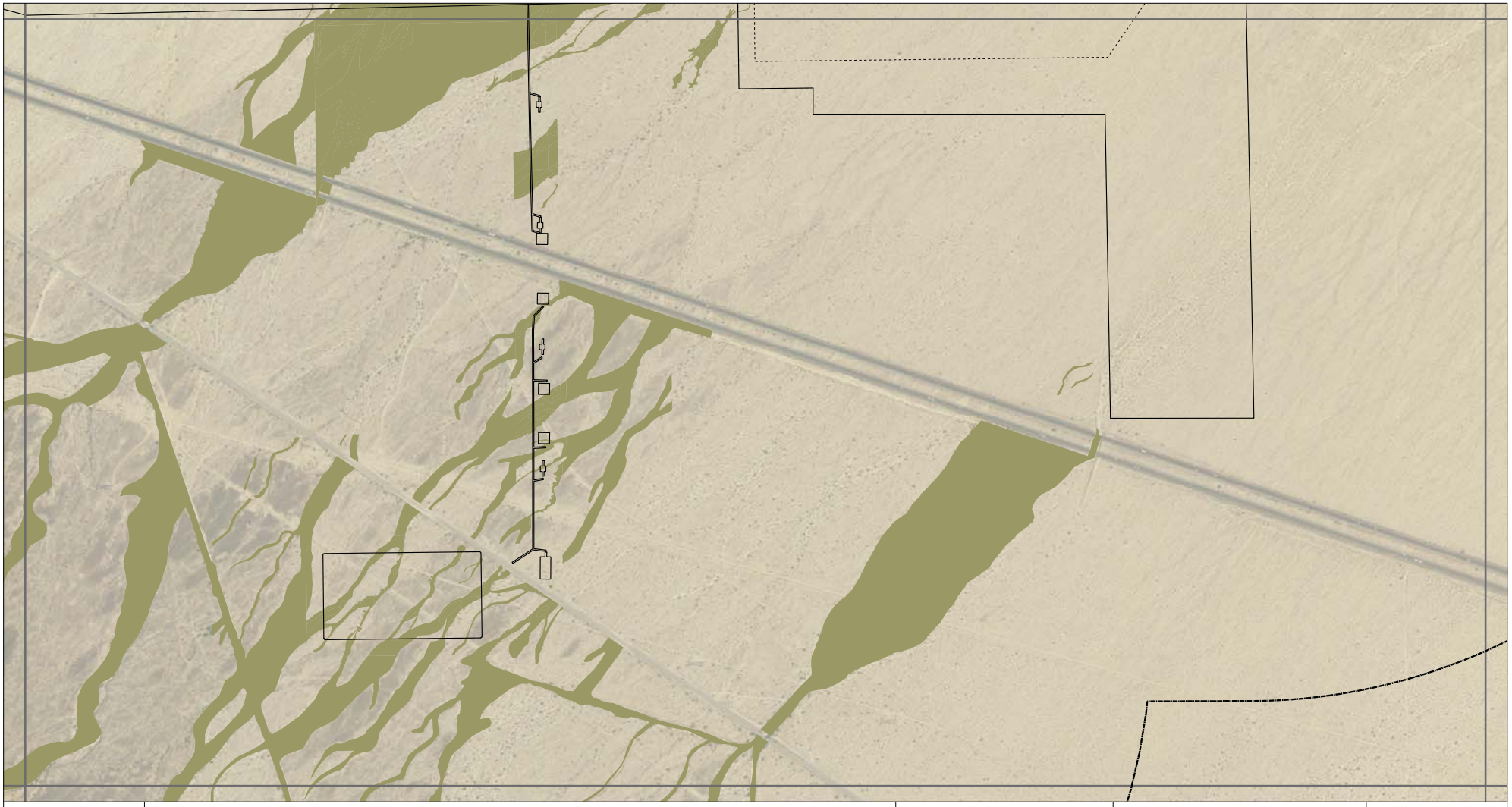
docket@energy.state.ca.us

I declare under penalty of perjury that the foregoing is true and correct.

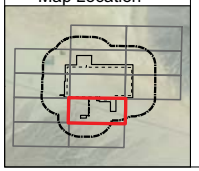
Carl E. Lindner

ATTACHMENT DR1-2

FIGURES FOR PALEN DR BIO 122909



Map Location



Legend

- Facility Footprint
- Project Disturbance Area (Direct Impacts)
- Biological Resources Survey Area (BRSA)
- 1:4,800 Map Extent

Vegetation Communities

Riparian

- Desert Dry Wash Woodland

Upland

- Active Desert Dunes
- Desert Sink Scrub
- Stabilized and Partially Stabilized Desert Dunes

Source: NAIP 2005; AECOM 2009

N
W E
S

1 inch = 400 feet

0 400 800 1,200 1,600 Feet

Palen Solar Power Project

Figure DR-BIO-86-11
Special Vegetation Community Types

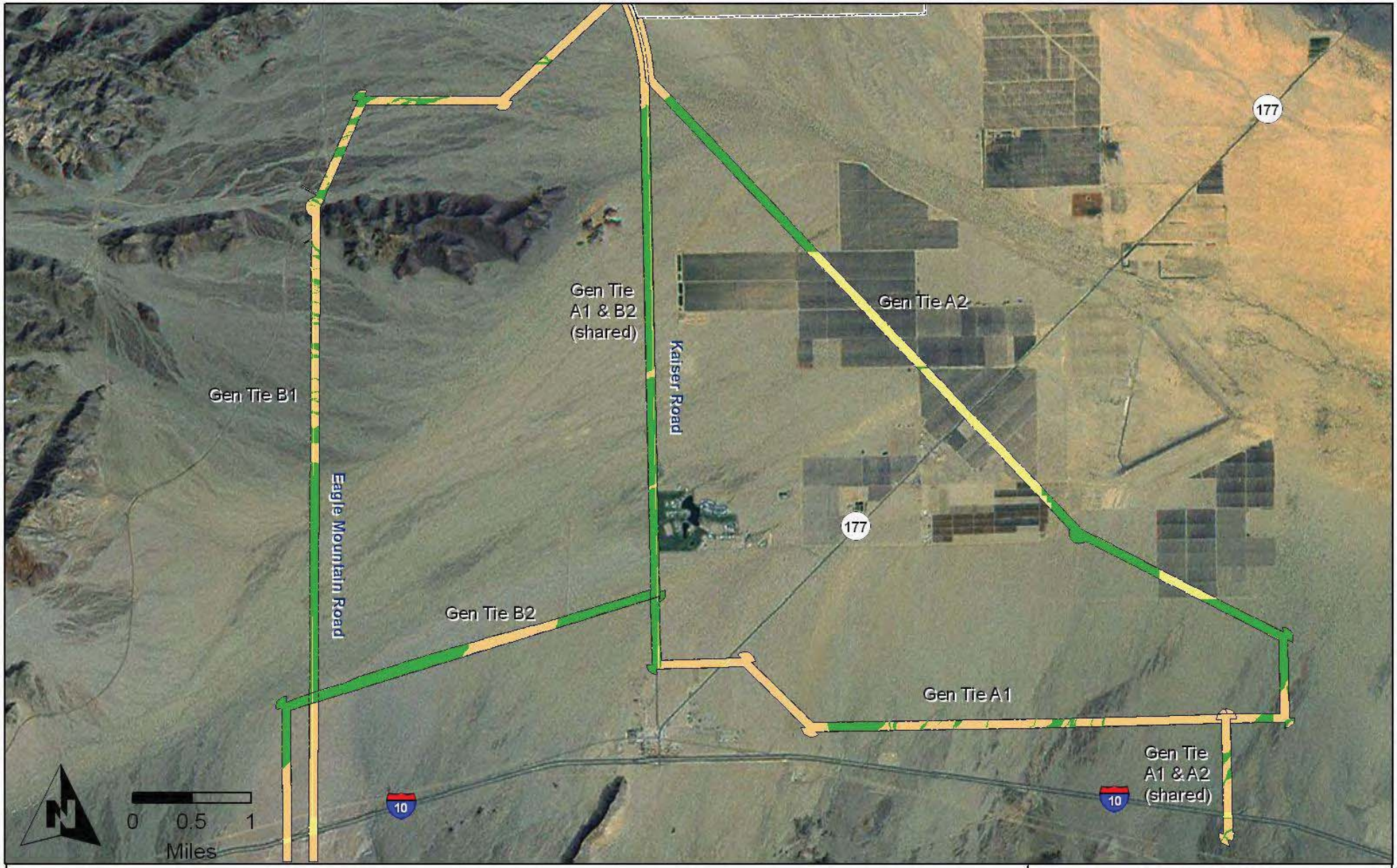
Solar Millennium

AECOM

Date: January 2010

ATTACHMENT DR1-3

DESERT SUNLIGHT FEIS – VEGETATION COMMUNITIES IN APPENDIX H



DESERT SUNLIGHT
SOLAR FARM PROJECT
DESERT SUNLIGHT HOLDINGS, LLC

Figure 9
Vegetation Communities
Sunlight Components
Gen-Tie Line Alternatives

Prepared by Ironwood Consulting, Inc. - July 2010

ATTACHMENT DR2-1

PSEGS SPRING 2013 SURVEYS BOTANISTS AND BIOLOGIST

PSEGS SPRING 2013 SURVEYS: BOTANISTS AND BIOLOGISTS

BOTANISTS:

Alice E. Karl, Ph.D.
Tim Thomas
Glenn Rink

BIOLOGISTS:

Alice E. Karl, Ph.D.
Paul Frank
Art Schaub
Shawn Lindey

ALICE E. KARL, Ph.D.
ALICE E. KARL & ASSOCIATES, INC.
P.O. Box 74006
Davis, California 95617
Phone: (530) 666-9567 (office) (530) 304-4121 (cell) FAX: (612) 465-4822 E-mail: heliophile@mindspring.com

Alice has been an environmental consultant since 1978 and is the principal for the firm Alice E. Karl & Associates, which qualifies for and has been certified as a woman-owned business. She has an extensive knowledge of the arid southwest, having worked continually in the southwestern deserts of the United States and Mexico for nearly 35 years. She has also completed biological surveys in the coastal ranges of California and the Central and San Joaquin valleys. She is a highly experienced botanist, herpetologist, small-mammalogist, and a recognized desert tortoise authority. She holds permits that allow her to conduct all activities on desert tortoises (e.g., handle tortoises, apply transmitters, collect blood for health analyses) and conduct independent Mohave Ground Squirrel trapping. She also holds a California scientific collecting permit.

Alice conducts field surveys on special-status species, assists with project permitting, conducts research and monitors construction. She regularly organizes and leads large crews to conduct the necessary biological resource surveys for projects, but also is contracted as a reviewer for other firms' biological surveys and reports. Agency coordination and permitting is a critical component of her projects and she works with agency biologists and project proponents in an efficient and scientifically credible manner to develop conservation-oriented, practical and feasible project design and mitigation measures. Research has included long-term and geographically extensive projects on (a) desert tortoise reproduction, translocation, population viability, and habitat relationships; (b) rare plants; (c) vertebrate community relationships; and (d) sampling methods, especially for desert tortoise.

In addition to being an accomplished field biologist, crew chief, and project manager, Alice has worked with agency biologists to develop protocols for desert tortoise surveys, translocation, handling, and other procedures. She has developed a sampling technique for estimating tortoise densities over large areas (TRED), which is currently being employed on large military projects. She has also contributed to several area-wide plans (West Mojave Plan, Northern and Eastern Colorado Desert Plan, Clark County HCP).

MAJOR TASK CATEGORIES

- Special-status species surveys
- Mitigation and monitoring plan development
- Permitting (ESA, CESA, CEQA, HCPs, BAs, 2081, 1603, 404, SMARA)
- Agency coordination and workshops
- Designated Biologist/Authorized Biologist
- Scientific research

SPECIAL-STATUS PLANTS and REVEGETATION

- Principal botanist for numerous rare plant surveys in the Mojave, Colorado and Great Basin deserts (California and Nevada), the Tehachapi Mountains, Sonora (Mexico), and the Central and San Joaquin valleys
- Thousands of quantitive plant transects in many desert, subtropical, and forest habitats, using multiple sampling techniques for biomass, density, frequency, vigor, percent cover, etc.
- Extensive knowledge of Mojave and Colorado Desert flora and habitats
- Restoration and revegetation plans and investigations throughout the Mojave, Colorado and Great Basin deserts and northern California
- Wetlands delineation

DESERT TORTOISE

- Recognized desert tortoise authority, with over 34 years experience studying desert tortoises in California, Nevada, Utah, and western Arizona; habitat specialist
- 2 advanced degrees involving desert tortoises
- Holds own handling and research permits from the USFWS and the California Department of Fish and Game
- Author of or contributor to many desert tortoise translocation plans and tortoise permitting documents for solar and other projects
- Designed and implemented three desert tortoise translocation projects, including one of the largest and longest desert tortoise research projects to date - approximately 130 tortoises were telemetered for 10

years to study reproduction, growth, home range, burrow use, dispersal within the context of forage production, size and gender
- Instructor for Desert Tortoise Council Technical Workshops and telemetry use; train construction employee groups and tortoise monitors for construction projects
- Over 25 Bureau of Land Management (BLM)-type trend plots or other mark-recapture plots for population studies and >3000 transects to assess relative densities
- Impacts assessment, mitigation development - numerous projects
- Development of TRED sampling model for region-wide and fine-grained density estimates, used for both the Fort Irwin and the MCAGCC Twentynine Palms base expansions.
- Construction monitoring and development of monitoring protocol
- Contributor to development of methodologies for USFWS survey and handling protocols
- A primary reviewer of USFWS original listing package for desert tortoises
- Contributor to Clark County Habitat Conservation Plan, West Mojave Plan, and Northern and Eastern Colorado Coordinated Management Plan

OTHER WILDLIFE
- Extensive knowledge of southwestern reptile and amphibian fauna
- Extensive small-mammal (rodents) trapping studies in California, Nevada and Arizona, including Mohave ground squirrel and other special-status rodents.
- Survey, research, and permitting experience with the following listed species: Valley elderberry longhorn beetle, Shasta salamander (permitted), Tehachapi slender salamander, San Joaquin kit fox
- Burrowing owl surveys and mitigation
- Numerous bird surveys in desert habitat.
- Mojave ground squirrel - permitted to conduct trapping

PERMITS HELD
- Federal 10(a)(1)(A) for Desert Tortoise (permit in Alice Karl's name) (TE 746058-11)
- State MOU for Desert Tortoise
- California Scientific Collection Permit (SC001368)
- Mohave Ground Squirrel trapping (Authorized field Investigator on W. Vanherweg permit)

EDUCATION

Ph.D., Ecology - University of California, Davis. January 1998. Dissertation: Reproductive strategies, growth patterns, and survivorship of a long-lived herbivore inhabiting a temporally variable environment.

M.S., Biology - California State University, Northridge. 1982. Thesis: The distribution, relative densities, and habitat associations of the desert tortoise, *Gopherus agassizii*, in Nevada.

PROJECT LIST

PROJECT MANAGER and/or SOLE/LEAD BIOLOGIST:

Military Projects

Twentynine Palms Marine Corps Air Ground Combat Center (MCAGCC), Twentynine Palms, California. 2009- ongoing. Directed and conducted desert tortoise, special-status animal, rare plant and habitat surveys to support impacts analysis for potential base expansion and to revise management on base. Over 3000 TRED tortoise transects plus other surveys. Consultant to NREA, MCAGCC.

Nellis Air Force Base, Las Vegas and Tonopah, California. 2005 - ongoing. Surveys for rare plants on the Nellis North Training Ranges. Consultant to Nellis AFB, Las Vegas, Nevada.

Fort Irwin Expansion Project, Barstow, California. 2002-2003. Authored all desert tortoise sections for the Fort Irwin Expansion Biological Assessment. Initial plan for translocation studies for translocation of several hundred tortoises from the expansion area. Contracted to Charis Corporation, Temecula, California.

Fort Irwin Expansion Project, Barstow, California. 1998-2003. Developed and tested methods to quantitatively assess population levels and impacts to desert tortoises from proposed land expansion. Included mark-recapture plots (1998, 2001, 2002) and new methodology for region-wide, quantitative population assessments. Consultant to Charis Corporation, Temecula, California (1999-2002) and Chambers Group, Irvine, California (1998).

Desert Scimitar (U.S. Marine Corps), 2001. BA for training exercise from Colorado River to *Twentynine Palms Marine Corps Air Ground Combat Center*

Twentynine Palms Marine Corps Air Ground Combat Center (MCAGCC), Twentynine Palms, California. 1996-7. Consultant on desert tortoise issues for housing area expansion. Consultant to Merkel and Associates, San Diego, California.

U. S. Air Force MX Missile Project, Coyote Springs Valley, Nevada. Summer, l981. Intensive field survey (300 transects) of potential facility site to determine the relative densities of the desert tortoise. For Biosystems Analysis, Inc., San Francisco, California.

Miscellaneous Projects

Hyundai Motor America Mojave Test Track, western Mohave Desert, California. 2003 - ongoing. Wrote and/or reviewed permitting documents, including HCP. Wrote and conducted 5-year translocation plan and study. Assessed compensation properties. Consultant to Hyundai Motor America, California City, California.

Sonoran Desert Tortoise Project, Sonora, Mexico. 2005- ongoing. Ecology and genetics study of the desert tortoise in Sonora, Mexico. Field work includes continuous cohort of over 20 telemetered tortoises since 2005, habitat analyses, habitat use analyses, genetics, health assessments.

Unnamed Housing Project, Lancaster, California. 2007. Mohave ground squirrel protocol trapping. Consultant to Sundance Biology, Inc., Paso Robles, California.

San Diego County Water Authority, 2002 - 2005. Technical consultant for biological issues relating to Quantification Settlement Agreement water transfer on Colorado River. Consultant to Greystone Environmental Consultants, Sacramento, California.

Los Angeles County Sanitation District Palmdale Water Reclamation Plant, Palmdale, California. 2003. Agency meetings, survey protocol development and surveys for desert tortoise presence and impacts; surveys for burrowing owl; Mohave ground squirrel trapping; habitat assessment for special-status plants. Consultant to Environmental Science Associates, Oakland, CA.

Los Angeles County Sanitation District, Lancaster, California. 2002. Surveys of proposed pipeline for special-status plants and animals. Special-status plants and animals of greatest concern included desert tortoise, Mohave ground squirrel, burrowing owl, alkali mariposa lily, Lancaster milk-vetch. Consultant to Los Angeles County Sanitation District, Whittier, California.

Burlington-Northern Santa Fe Landfarm Project, Barstow, California. 2001-2003. Assessment of desert tortoise impacts , mitigation development, agency coordination for landfarm closure. Consultant to TRC Environmental Solutions, Irvine, California.

Central Washington University and Cal-Tech, Barstow, California. 1994. Monitoring trenching and closure activities for Endangered Species Act compliance (desert tortoises) on Emerson Fault research project. Consultant to Dr. Charles Rubin, Central Washington University.

U.S. Geological Survey, Landers, California. 1993 and 1994. Monitoring trenching and closure activities for Endangered Species Act compliance (desert tortoises) on Landers' Fault project. Consultant to Dr. David Schwartz, U.S. Geological Survey, Menlo Park, California.

Twentynine Palms Marine Corps Air Ground Combat Center (MCAGCC), Twentynine Palms, California. 1993. Tustin military base relocation project. Desert tortoise surveys to determine impacts and mitigation to tortoises from relocation of the base to MCAGCC . Authored several interim reports and co-authored final report to MCAGCC with Ogden Environmental, San Francisco, California

County of San Bernardino Medical Center, San Bernardino, California. September. 1990 General species inventory, and focused surveys for special-status plants and animals at three proposed sites for location of new medical center. Consultant to Higman-Doehle, Inc., Los Angeles, California.

Lake Minerals Corporation, Owens Valley, California. August, 1990 to present. Field surveys to determine tortoise presence at site of soda ash processing plant. Consultant to McClenahan and Hopkins Associates, Inc., San Mateo, California.

Del Webb Housing Development, Palm Desert, California. August, 1990. Assessment of tortoise habitat quality and likelihood of tortoise presence on proposed site. Consultant to Environmental Science Associates, Los Angeles, California.

Miller Housing Development, Palm Desert, California. 1990. Assessment of tortoise habitat and densities at proposed housing site; development of mitigation. For ERC Environmental, San Diego, California

Great Basin Unified Air Pollution Control District, Owens Lake Dust Control Project. December, 1989. Determined impacts to small mammal special-status species on sites proposed for disturbance. Consultant to McClenahan and Hopkins Associates, Inc., San Mateo, California.

Pacific Agricultural Holdings, Inc., Piute Valley, California. Fall, 1989. Field assessment of tortoise presence on site. Consultant to Pacific Agricultural Holdings, Inc., Fresno, California.

City of Rosamond, California, Expansion. Spring, 1989. Field survey of expansion site to determine impacts to sensitive flora, tortoises, and Mojave Ground Squirrel. Tortoise transects, live-trapping for diurnal rodents. Consultant to CWESA, Sanger, California.

Jet Propulsion Lab Site, Edwards Air Force Base, California. Fall and Winter 1988. Field determination of impacts to tortoises (transects, habitat analyses) from new facility siting. Consultant to WESTEC Services, San Diego, CA.

City of Ridgecrest Off-Road Vehicle Park, Searles Valley, California. January to March 1988. Field determination (transects, habitat analyses) of impacts to local desert tortoise populations from siting of proposed park. Consultant to CWESA and Saito Associates, Fresno, California.

Bullhead City Airport Expansion, Laughlin, Nevada. October, 1987. Assessment of potential impacts to the desert tortoise from expansion of the Bullhead City Airport. Transects, habitat analyses. Consultant to Heron, Burchette, Ruckert, and Rothwell Washington, D.C.

U.S. Borax and Chemical Co., Boron, California. May, 1986. Field assessment of impacts to sensitive flora and fauna on proposed Cogeneration II facility. Consultant to Dames and Moore, Santa Barbara, California.

Propeace, Inc., Victorville, CA to Nevada. March, 1986. Assessment of impacts to wildlife and development of mitigation on proposed route of peace march in the Mojave Desert portion of route. Consultant to Propeace, Inc., Los Angeles, California.

Utilities and Transportation (Power Plants, Transmission Lines, Pipelines, Solar or Wind Facilities, Telecommunications, Railroads)

Blythe Solar Power Project, Blythe area, California. 2012 - ongoing. Directed and conducted fall botanical surveys for license compliance. Consultant Tetra Tech, Lakewood, Colorado.

*McCoy Solar Generating Facilit*y, Blythe area, California. 2007 - ongoing. Directed and conducted all botanical and biological surveys for permitting, including spring and fall rare plant surveys. Lead permitting biologist with Tetra Tech, Lakewood, Colorado, through all phases of permitting process; permits are pending.

Copper Mountain and Silver State South Solar Projects, Eldorado Valley and Ivanpah Valley, Nevada. 2011. Rare plant surveys. Consultant to Ironwood Consulting, Inc., Redlands, CA.

Stateline Solar Energy Project (approximate name), Primm, Nevada. 2010. Rare plant surveys. Consultant to Ironwood Consulting, Inc., Redlands, CA.

*Genesis Solar Generating Facilit*y, Blythe area, California. 2007 - ongoing. Directed and conducted all botanical and biological surveys for permitting. Lead permitting biologist with Tetra Tech through all phases of California Energy Commission permitting process (hearings and workshops, preparer and/or reviewer of all plans and documents) and permits with Fish and Wildlife Service and U.S. Bureau of Land Management. Currently implementing the site revegetation plan, authored by myself. Consultant to Tetra-Tech, Inc., Irvine, California.

Eagle Mountain Pumped Storage Project, Desert Center, California. 2007-ongoing. Directed and conducted all botanical and biological surveys for permitting. Lead permitting biologist with GEI through all phases of FERC, USFWS, and BLM permitting processes (meetings, preparer and/or reviewer of all plans and documents) . Consultant to Eagle Crest Energy, Palm Springs, California.

*Abengoa Mojave Solar Project, w*estern Mojave Desert, California. 2008 - ongoing. Advisory role: reviewer and advisor for all biological permitting and mitigation documents; direction to company conducting

mitigation (AECOM). Participant in hearings and workshops. Wrote desert tortoise translocation plan. Consultant to AECOM, Camarillo, California.

Solar Millennium, Blythe, Palen and Ridgecrest Solar Projects. 2009-ongoing. Advisory role: reviewer and advisor for desert tortoise, Mojave fringe-toed lizard and other permitting and mitigation documents. Participant in hearings and workshops. Consultant to AECOM, Camarillo, California.

Palmdale Hybrid Power Project, Palmdale, California. 2008 - ongoing. Advisory role: reviewer and advisor for biological permitting. Consultant to AECOM, Camarillo, California.

Victorville II Hybrid Power Project, Victorville, California. 2007 - 2009. Advisory role: reviewer and advisor for all biological permitting and mitigation documents; direction to company conducting mitigation (AMEC). Participant in hearings and workshops. Consultant to AECOM, Camarillo, California.

Beacon Solar Energy Project, western Mojave Desert, California. 2007 - 2009. Advisory role: reviewer and advisor for all biological permitting and mitigation documents; direction to company conducting biological surveys (AECOM). Conducted field surveys to ssess compensation properties and alternative routes. Consultant to AECOM, Camarillo, California.

Southern California Edison Palo Verde-Devers II Transmission Line, Colorado River to Devers, California. 1985, 1987, 1988, 2002, 2003, 2004, 2005, 2007. Surveys of proposed transmission line for special-status plants and animals; technical reports. Consultant to: E. Linwood Smith and Associates, Tucson, Arizona (1985-8); EPG Inc., Tucson, Arizona (2002-4; 2007); Tetra-Tech, Inc., Irvine, California (2005).

Blythe Energy Project 230 kV Transmission Line, Blythe to Desert Center, California. 2004 and 2005. Surveys of proposed transmission line alternatives, for special-status plants and animals; technical reports. Consultant to Tetra-Tech, Inc., Irvine, California (2005).

Blythe Energy Project, Blythe, California. 2000 - ongoing. Designated biologist for proposed power plant, with attendant duties including surveys; biological technical reports; B.A.; AFC assistance; development of mitigation (BRMIMP), monitoring, and education programs (WERP); implementation of mitigation measures; agency coordination; public hearings; and general document reviewer. Special-status plants and animals of greatest concern included desert tortoise, burrowing owl, Harwood's milk-vetch. Consultant to Greystone Environmental Consultants, Sacramento, California (2000-2002), Blythe Energy, LLC (2003 to present).

Desert Southwest Transmission Project (Imperial Irrigation District) Blythe to Niland and Blythe to Devers, California. 2000-2002, 2005. Surveys of multiple, proposed transmission lines for special-status plants and animals, technical reports, EIR. Consultant to: Greystone Environmental Consultants, Sacramento, California (2000-2002); Tetra-Tech, Inc., Irvine, California (2005).

Moapa Power Project, Las Vegas, Nevada. 2001. Initial surveys for special-status plants and animals for proposed power plant, transmission line and pipeline. Consultant to URS Corp, Santa Barbara, California.

Ocotillo Power Project, Palm Springs, California. 2000-2001. Surveys and biological technical report for special-status plants and animals for proposed power plant, transmission line and pipeline. Consultant to URS Corp, Santa Barbara, California.

Imperial Irrigation District, Blythe to Desert Center, California. 2000. Surveys for special-status plants and animals for proposed transmission line upgrade. Consultant to Greystone Environmental Consultants, Sacramento, California.

Enron Pastoria, Tejon Ranch (Bakersfield), California. 1999-2001. Surveys, biological technical report, and AFC preparation for special-status plants and animals for proposed power plant, transmission line and pipeline. HCP preparation for San Joaquin kit fox. Consultant for CEC hearings. Consultant to URS Corp, Santa Barbara, California.

Enron Antelope Valley, Victorville, California. 1999-2001. Surveys and biological technical report for special-status plants and animals for proposed power plant, transmission line and pipeline. Consultant to URS Corp, Santa Barbara, California.

PG&E Generating Company Harquahala Power Project, Toquop, Arizona. 1999-2000. Surveys and biological technical report for special-status plants and animals for proposed power plant and transmission pipeline. Consultant to URS Corp -Dames and Moore, Phoenix, Arizona.

Santa Fe Pacific Pipeline Company, Concord to Colton Pipeline, Mojave to Adelanto, California. Spring 1995. Surveys for special-status plants, desert tortoises, and Mojave
Ground Squirrels (CHIEF protocol); project leader. Consultant to Woodward-Clyde Consultants, San Diego, California.

Harper Lake Company, San Bernardino County, California. 1994. Re-evaluation of and assistance with position paper on primary compensation measures for LUZ Harper Lake solar project. Consultant to ENSR, Fort Collins, Colorado.

Santa Fe Railroad Company, San Bernardino County, California. Spring 1994. (1) Monitoring construction for Endangered Species Act compliance (desert tortoises) on bridge upgrades and (2) educational presentation to Santa Fe employees. Consultant to Environmental Solutions, Inc., Walnut Creek, California.

Western Area Power Administration, Parker to Yuma, California. 1994. Led large crew to survey transmission line for determining impacts to desert tortoises, special-status plants, birds, amphibians, and mammals from future transmission line upgrades. Consultant to Woodward-Clyde Consultants, Denver, Colorado.

Mojave Pipeline Operating Company, Mojave Desert, California. 1993. Survey of five proposed compressor station sites for desert tortoise impacts. Consultant to CWESA, Sanger, California. Report submitted to Woodward Clyde Associates, Denver, Colorado.

Mojave Pipeline Operating Company, Kramer Junction, California. 1992-93. Led large crew to survey proposed pipeline from Kramer Junction to Inyokern for impacts to desert tortoises, special-status plants, and Mojave ground squirrels. Consultant to CWESA, Sanger, California. Report submitted to Woodward Clyde Associates, Denver , Colorado.

Lake Minerals-Vulcan Mine Railroad Upgrade, Searles, Indian Wells, and Owens Valley, California. 1991. Desert tortoise surveys along existing railroad to determine future impacts to desert tortoises from upgrade of railroad. Report submitted to McClenahan and Hopkins, San Mateo, California.

U. S Ecology Radioactive Waste Facility, Beatty, Nevada. August 1990. Survey of
proposed power line route to radioactive waste site for impacts to tortoises.

Mojave Pipeline Project, Toquop, Arizona to Bakersfield, California. Spring, 1989-90. Lead botanist and wildlife biologist for species of concern in the Mojave Desert and Tehachapi Mountains portion of line. Included: field surveys and agency meetings; development of mitigation and relocation techniques for tortoises and training program for field observers; development of portions of Environmental Quality

Assurance Program for construction phase. For CWESA, Sanger, California, and Woodward Clyde Consultants, Denver, Colorado.

Southern California Edison Victorville/Kramer High Voltage Transmission Line. Spring 1990. Directed field study to determine tortoise abundance along proposed route. Consultant to ERC Environmental, San Diego, California.

AT&T Fiber Optics Cable Route, southern Nevada. 1990. Field survey of route to determine relative tortoise abundance, impacts on tortoise populations, and appropriate mitigation from burial of cable. Also involved relocation of tortoises and training of field personnel during construction. Consultant to ENSR, Fort Collins, Colorado.

Los Angeles Department of Water and Power Telecommunications Network Project, Los Angeles Basin, California. Winter and Spring, 1989. Field survey of proposed microwave facility sites in mountains surrounding the Los Angeles Basin to determine impacts to
wildlife and botanical species of concern. Consultant to Higman Doehle, Inc., Los Angeles, California.

AT&T Fiber Optics Line, Victorville, California to Las Vegas, Nevada. Fall, 1988 to Winter, 1989. Field survey of route to determine relative tortoise abundance, impacts on tortoise populations, and appropriate mitigation from burial of cable. Also involved relocation of tortoises and training of field personnel during construction. Consultant to ENSR, Fort Collins, Colorado.

Luz Engineering, Kramer Junction and Harper Lake, California. Spring, 1987 to 1990. Led large crew to assess tortoise densities and habitat quality on relocation site for solar generating facility; density analyses and habitat assessments on facility expansion sites and relocation of tortoises during construction. Consultant to CWESA, Sanger, California, and ENSR, Fort Collins, Colorado.

U.S. Telecom, Banning to Blythe, California- May, 1986 - Field assessment of impacts to special-status plants and fauna along proposed route. Consultant to E. Linwood Smith and Associates, Tucson, Arizona.

Los Angeles Department of Water and Power, Intermountain Power Project (IPP), Nevada-Utah. July, l982 to August, l985. Field determination of impacts to the desert tortoise (transects), development of mitigation procedures, and implementation of mitigation along two routes of the HVDC Transmission Line in southern Nevada and southeastern Utah. Also, monitoring of sensitive flora and tortoises during construction. Consultant to E. Linwood Smith and Associates, Tucson, Arizona.

Los Angeles Department of Water and Power, Sylmar-Celilo (HVDC) Transmission Line Upgrade, Owens Valley, California. July, l984 to December, 1987. Field determination of impacts to special-status flora and wildlife and development of mitigation procedures along the line from Sylmar, California north to Nevada. Construction monitoring and crew education. Consultant to Applied Conservation Technologies, Inc., Newport Beach, California.

Mines and Aggregate Operations:

Ballast Rock Project, Hinkley, California. 2002- continuing. Special-status species impacts assessments, surveys. Special-status plants and animals of greatest concern included desert tortoise, Mohave ground squirrel, burrowing owl, chuckwalla, Mojave monkeyflower and Barstow woolly sunflower. Consultant to Resource Design Technology, Inc., Folsom, California.

S and V Cinder Mine, Big Pine, California. 2002. Baseline, quantitative vegetation surveys for SMARA compliance. Consultant to Resource Design Technology, Inc., Folsom, California.

Lehigh South (Calaveras) Cement (limestone, shale), Shasta County, California. 1998, continuing. Field surveys, biological impacts assessment, reclamation plans, Shasta salamander 2081, Shasta salamander research, revegetation. Consultant to Resource Design Technology, Inc., Folsom, California.

Carone Properties (hard rock), Napa County, California. 2000, continuing. Field surveys, biological impacts assessment, California red-legged frog issues. Consultant to Resource Design Technology, Inc., Folsom, California.

RMC Lonestar (aggregate), Tulare County, California. 1997, continuing. Biological inventory and impacts assessment; Valley Elderberry Longhorn Beetle surveys; wetlands issues; biological portion of EIR. Consultant to RMC Lonestar, Pleasanton, California, and Resource Design Technology, Inc., Folsom, California.

RMC Pacific Materials (hard rock), Fresno, California. 1999, continuing. Field studies, impacts assessment. Consultant to Resource Design Technology, Inc., Folsom, California.

Lehigh South (Calaveras) Cement (limestone), Tehachapi, California. 1999, continuing. Field studies, impacts assessment. Consultant to Resource Design Technology, Inc., Folsom, California.

Last Chance Sand and Gravel (aggregate), Beatty, Nevada. 1998-9 Biological consultant for all phases of project. Surveys for desert tortoise, special-status plants, mammals, reptiles, birds. Consultant to Bill Marchand (operator), Beatty, Nevada.

San Benito Supply (aggregate). 1997-present. Vegetation survey to determine baseline conditions for SMARA reclamation compliance; developed revegetation plan. Consultant to Lilburn Corporation, San Bernardino, California, and Resource Design Technology, Inc., Folsom, California.

M&T Chico Ranch (aggregate), Butte County, California. 1997-present. Wrote biological portion of EIR. Consultant to Resource Design Technology, Inc., Folsom, California.

Granite Construction Co. (aggregate), Whitewater, California. 1997. General species inventory; surveyed for desert tortoises, special-status plants, mammals, reptiles, birds. Consultant to Lilburn Corporation, San Bernardino, California.

Teichert Aggregates (aggregate), Esparto, Yolo County, California. 1996. Wrote biological portion of EIR. Consultant to Lilburn Corporation, Folsom, California.

Teichert Aggregates (aggregate), Woodland, Yolo County, California. 1996. Wrote biological portion of EIR. Consultant to Lilburn Corporation, Folsom, California.

Cache Creek Aggregates (aggregate), Yolo County, California. 1996. Wrote biological portion of EIR. Consultant to Lilburn Corporation, Folsom, California.

Asphalt Construction Company (aggregate), Ridgecrest, California. 1995. Vegetation surveys to determine baseline and regrowth conditions for SMARA compliance. Consultant to Lilburn Corporation, Folsom, California.

Castle Mountains Gold Mine (mineral), San Bernardino County, California, 1995, 1996. Assessment of desert tortoise impacts from proposed expansion (field surveys, habitat analysis). Also included re-evaluation of existing mitigation and compensation measures. Consultant to Lilburn Corporation, Folsom, California.

Santa Fe Pacific Gold (mineral), Glamis, California. 1994. (1) Examination of potential drilling sites for desert tortoise impacts (field surveys) and (2) developed proposal to assess remaining tortoise habitat on mine site. Consultant to Santa Fe Pacific Gold Corporation, Reno, Nevada.

Goldfields Mining Company (mineral), Brawley, California. 1991-92. Field surveys and habitat analysis of gold mine site. Co-authored Biological Assessment. Developed mitigation plan and impacts studies. Led large crew for desert tortoise clearance surveys. Trained core group of facility employees in tortoise handling. Consultant to Environmental Solutions, Inc., Irvine, California.

Cactus Gold Mine (mineral), Mojave, California. August, 1990. Assessment of tortoise presence on site of heap leach pad extension. Consultant to McClenahan and Hopkins Associates, Inc., San Mateo, California.

Waste Facilities

Los Angeles County Sanitation Districts Mesquite Regional Landfill, Brawley, California. 2004 - 2008. Developed approximately 18 mitigation plans for construction and operations phases of landfill to ensure that the project remains in compliance with all permits. Conducted baseline biological surveys for identification of project impacts, including quantitative plant surveys, small-mammal trapping, exotic weeds, quantitative and qualitative habitat monitoring and revegetation; developed and directed other baseline surveys on birds and ravens. Conducted tortoise clearance of 1800+ acres. Planned and conducted translocation study for desert tortoises. Co-produced Worker Environmental Awareness Program video. Consultant to Resource Design Technology, Inc., Folsom, California.

Arid Operations Mesquite Regional Landfill, Brawley, California. 1992 to 2000. Led large crew to conduct desert tortoise surveys for determining impacts and mitigation to tortoises from construction and maintenance of proposed landfill and associated rail spur. Co-authored Biological Assessment. Expert witness to address activists' concerns. Developed research program (mitigation) to track ecosystem health effects from landfill development. Consultant to Environmental Solutions, Inc., Irvine, California, Arid Operations, El Centro, California, and Resource Design Technology, Inc., Folsom, California.

NORCAL Sanitary Landfill, Victorville, California. Spring, 1997. General species inventory on expansion area; special surveys for desert tortoises, special-status plants, mammals, reptiles, birds. Consultant to Lilburn Corporation, San Bernardino, California.

NORCAL Sanitary Landfill, Landers, California. Spring, 1997. General species inventory on expansion area; special surveys for desert tortoises, special-status plants, mammals, reptiles, birds. Consultant to Lilburn Corporation, San Bernardino, California.

U.S. Ecology/California Department of Health Services Low-level Radioactive Waste Facility, Ward Valley, California, March. 1987 to 2001. Determined impacts to and developed mitigation for desert tortoises in association with construction and maintenance of proposed facility. Developed and conducted a ~10 year, continuous research project on tortoise translocation that focused on effects to reproduction, movements, physiology and mortality. Study cohort included ~150 radiotelemetered tortoises. Principal author of two biological assessments. Reviewer of numerous project opponents' papers and author of response documents. Consultant to U.S. Ecology, Rocklin, California.

RAIL-CYCLE (Waste Management of North America, Inc. and the Atchison, Topeka, and Santa Fe Railway Company). 1994, 1997. Expert witness for biological impacts at County of San Bernardino hearings for proposed landfill. Consultant to Waste Management of North America, Inc., Pasadena, California.

RAIL-CYCLE, Amboy, California, 1991 - Led large crew for desert tortoise surveys to determine impacts and mitigation to tortoises from construction and maintenance of proposed landfill. Report submitted to Ecological Research Services, Claremont, California and Jacobs Engineering, Pasadena, California.

Yucca Mountain Nuclear Waste Project, Nevada Test Site, Nevada. Fall 1989-90. Determination of tortoise abundance, distribution and habitat associations on proposed site of high-level nuclear waste. With Environmental Science Associates, San Francisco, California

Hidden Valley Resources Toxic Waste Disposal Facility, Newberry Springs, California. June to September 1988. Determination of impacts to and mitigation for desert tortoises from construction and maintenance of facility. Transects and habitat analyses. Consultant to J&M Land Restoration, Bakersfield, California.

Non-Military Government Contracts:

U.S. Army Corps of Engineers Construction Engineering and Research Laboratory (CERL). Spring 2003. Trained biologists in desert tortoise telemetry techniques, handling, and behavior for tortoise activity project near Barstow, California. Contacts: Mr. Andrew Walde and Dr. Larry Pater.

Joshua Tree National Monument, Twentynine Palms, California. 1987-88. Assessed status of the desert tortoise throughout the monument (transects, habitat analyses); developed relocation techniques and assessed sites for tortoises turned in to headquarters. Contact: Dr. Jerry Freilich.

Bureau of Land Management, Las Vegas, Nevada. June to October, 1987 (employee). Developed new method for estimating tortoise densities from transects; led team to estimate tortoise densities from transects throughout southern Nevada; developed habitat assessment technique from quantitative habitat analyses. Supervisor: Sidney Slone.

Nevada Department of Wildlife, Las Vegas, Nevada. Spring, l984 to 1989. Development of a comprehensive, computerized data base of locations and habitat associations of all vertebrate taxa in Nevada through field, literature, and museum collections' surveys. Field research included live-trapping of all taxa, quantitative censuses of birds, rodents, and carnivores, statistical analyses, and development of baseline research methods for the Department of Wildlife. Contract No. 84-33.

Bureau of Land Management, Riverside, California. March to August, l980. Independent, 60-day quantitative and qualitative study of a population of desert tortoises in eastern California. Included extensive analysis of the site's vegetation. Technical report emphasized the relationship of primary production, disturbance, and geo-characteristics to the population demographics of the desert tortoise in this area. Contract No. CA-060-CTO-3.

Bureau of Land Management, Las Vegas, Nevada. March, l979 to August, l982. Sole project to date to determine the distribution and relative densities of the desert tortoise in Nevada; also delineated habitat requirements of the tortoise in Nevada. Solitary research involving foot-transecting over 450 miles in Clark, Lincoln, and Nye counties. Also included qualitative and quantitative examinations of three populations of tortoises similar to those mentioned above. Contract No. YA-512-CT9-90.

Bureau of Land Management, Riverside, California. Spring, l979. Independent, 60-day quantitative and qualitative study of a population of desert tortoises in the western Mojave Desert. Included aforementioned aspects. Contract No. CA-960-CT9-106.

Bureau of Land Management, Riverside, California. Spring, l978. Independent 30-day quantitative and qualitative study of population of desert tortoises in eastern San Bernardino County, California. Included aforementioned aspects. Contract No. CA-060-CT8-000042.

California Department of Fish and Game, Chino, California. June to December, l978 - Independent, foot-transecting of over 400 miles of the Mojave and Colorado deserts in California to assist in the determination of the status of the desert tortoise in California. Additional study of pupfish (*Cyprinodon maculatus*) in the Salton Sea, California.

ASSOCIATE PROJECT BIOLOGIST:

Mojave Ground Squirrel Behavioral Project. 2003. Trapping and telemetry with Drs. Phil Leitner and John Harris near Ridgecrest, California.

Eagle Mountain Landfill, Desert Center, California. 1996**.** Desert tortoise surveys on proposed site. Consultant to Circle Mountain Consultants, Wrightwood, California.

City of Rosamond General Plan. 1992. Trapping ssessment of Mohave Gound Squirrel population status. Consultant to CWESA, Sanger, CA.

*Clark County Desert Tortoise Habitat Conservation Pla*n. 1990-91. Reviewer and partial author of HCP and member of biological technical team; also included field assessments of tortoise habitat quality. Consultant to RECON, San Diego, California.

Desert Tortoise Council. 1990-present. Requested by Council to present techniques for finding tortoises, identifying sign and analyzing data to biologists, developers, and consultants at annual techniques workshop.

American Motorcycle Association/U.S. Fish and Wildlife Desert Tortoise Listing. 1989-90. Review of U.S. Fish and Wildlife Service's basis for Emergency Endangered Listing of the desert tortoise. Examination of all available data, both published and unpublished, to analyze status of the desert tortoise. Draft report heavily cited by U.S. Fish and Wildlife as support for their final listing determination. Subcontracted to Biosystems Analysis, Inc., Tiburon, California.

Salt River Project, Quemado, New Mexico. September, l985, 1987. Determination of impacts to vegetation and evaluation of re-vegetation success (quantitative vegetation transects) from mining coal reserves. In association with E. Linwood Smith and Associates, Tucson, Arizona.

Sonora Mining Corporation, Sonora, California. Fall, 1986. Assessment of impacts to fish populations (electro-shocking)in Woods Creek, from mining operations. CWESA, Sanger, California.

UNOCAL Platform Irene Project, Lompoc, California. September, 1986. Monitoring of pipeline construction for sensitive wildlife and floral issues. CWESA, Sanger, California.

Southern California Edison, Kingman, Arizona. May, 1986. Botanical survey along proposed transmission line route; Kingman, Arizona to Boulder City, Nevada. Biosystems Analysis Inc., Santa Cruz, California

Belridge Cogeneration Project, Bakersfield, California. Spring, 1985. Field survey of the blunt-nosed leopard lizard (Gambelia silus) and analysis of vegetation. CWESA, Sanger, California.

CWESA , Sanger, California- September, l984. Field survey of the blunt-nosed leopard lizard in the San Joaquin Valley, California, to determine population dynamics and ecology.

U.S. Forest Service, Klamath Forest, California. Summer, l983. Project to determine the population dynamics, behavior, and effective control techniques of pocket gophers (Thomomys bottae) in red fir clearcuts. Field work included use of radio telemetry and live trapping. Walter E. Howard, U.C., Davis.

Southwest Biological Associates, Encinitas, California. Winter, l978. Literature search on the herpetofauna of central and southern California.

Bureau of Land Management, Riverside, California. Summer, l978 - Field study of the effects of grazing and urbanization on reptiles at two Mojave Desert sites.

EDUCATIONAL EMPLOYMENT:

Collector and preparer, Museum of Vertebrate Zoology, Wildlife and Fisheries Biology, University of California, Davis, California. l983-l985 - Included trapping, preparation (skeletal and study skin preparation, live-pose taxidermy, freeze-drying), and cataloguing of specimens.

Teaching Assistant, U. C. Davis. l983-85. Courses in wildlife ecology and museum science.

Teaching Assistant, California State University, Northridge. September, l981 to June, l982. Courses in general biology, physiological ecology and local California flora and fauna.

PUBLICATIONS AND PRESENTED PAPERS (not including technical reports and documents associated with projects):

Karl, A. l980. The distribution and relative densities of the desert tortoise, *Gopherus agassizi,* in Nevada. *In*: K. Hashagen, ed., Proceedings of the l980 Desert Tortoise Council Symposium, Riverside, California. Pp 75-87. (Paper also presented.)

Karl, A. l981. The distribution and relative densities of the desert tortoise, *Gopherus agassizi,* in Nevada. Part II. *In*: K. Hashagen, ed. Proceedings of the l981 Desert Tortoise Council Symposium, Riverside, California. Pp76-92. (Paper also presented.)

Karl, A. and E. Smith. l984. - Densities of and impacts to the desert tortoise, *Scaptochelys agassizii,* along the proposed 500 kv D.C. Intermountain Power Project Transmission Line in Nevada and Utah. Paper presented at the Desert Tortoise Council Symposium, Lake Havasu, Arizona.

Karl, A. 1994. Reproduction in desert tortoises - ecological and evolutionary perspectives. Paper presented at both the 1994 Desert Tortoise Council Symposium, Las Vegas, Nevada and the American Society of Ichthyologists and Herpetologists Meetings, Los Angeles, California.

Karl, A. 1995. Indirect censusing methods for desert tortoises. Paper presented at an invitational workshop on censusing desert tortoises. Reno, Nevada.

Karl, A. 1997. Factors affecting reproduction of desert tortoises and resultant implictions for management. Paper presented at the 1997 Desert Tortoise Council Symposium, Las Vegas, Nevada

Karl, A. 1997. Reproductive strategies of the desert tortoise. Paper presented at the 1997 American Society of Ichthyologists and Herpetologists Meetings, Seattle, Washington.

Karl, A. 1998. Growth patterns of the desert tortoise in an East Mojave population. Paper presented at the 1998 Desert Tortoise Council Symposium, Tucson, Arizona.

Karl, A. 2002. Revised techniques for estimating desert tortoise abundance in the Fort Irwin National Training Center Expansion Area in 2001 and the results of those studies. Paper presented at the 2002 Desert Tortoise Council Symposium, Palm Springs, California.

Karl, A. 2004. Drought effects on the desert tortoise and population recovery. Paper presented at the 2004 Desert Tortoise Council Symposium, Palm Springs, California.

Karl, A. 2005. Revised Techniques for Estimating Desert Tortoise Abundance in the Fort Irwin National Training Center Expansion Area in 2001 and the Results of Those Surveys. Paper presented at the 2005 Western Section of the Wildlife Society Meetings, Sacramento, California.

Karl, A., Ma. Cristina Melendez Torres, Cecil R. Schwalbe, Mercy Vaughn, Philip C. Rosen, Daren Riedle and Lisa A. Bucci. 2006. The Morphologically Distinct Sinaloan Desert Tortoise. Paper presented at the 2006 Desert Tortoise Council Symposium, Tucson, Arizona.

Freilich, J., R. Camp, J. Duda and A. Karl. 2005. Problems with sampling desert tortoises: a simulation analysis based on field data. J. Wildl. Manage. 69(1):45-55.

MEMBERSHIPS:

California Native Grass Association
California Native Plant Society
Southern California Botanists
Desert Tortoise Council
Society for the Study of Amphibians and Reptiles
Society for Ecological Restoration

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EDUCATION

September 1994 –August 1996, University of Montevallo, Major Biology
Montevallo, Alabama

September 1996 – August 2000 Auburn University, Bachelor of Science in Wildlife Science
Auburn, Alabama

WORK EXPERIENCE

June/October 2008, March-May 2009 , March-April 2010 and Oct 2010, ***B*****iologist-**MCAGCC potential expansion project and 2010 Tortoise Surveys/ Genesis, Silurian, and Sunrise Solar projects Supervisor: Alice Karl PhD

- Walk triangle transects to locate desert tortoise, chuckwalla, Mojave fringe-toed lizard and burrowing owl sign
- Rare plant surveys
- 45 + hours of burrowing owl observations

October 2006-June 2010 **Biologist**- Proposed addition of maneuver training lands at Fort Irwin (1-8-03-F-48) Ft. Irwin, California Supervisor: Peter Woodman

- Walk transects to locate desert tortoise and desert tortoise burrows
- Radio telemetry- over 3,000 locations on tortoises
- Federally permitted to attach transmitters to juvenile and adult tortoises and remove old transmitters
- X-ray female tortoises to check for the presence of eggs
- Led crew of 5-9 people
- Data entry/proofing

August-October 2006 **Biologist**- Marine Corps Logistics Base Barstow (TE-066452-0) Barstow, California Supervisor: Andrew Walde

- Conduct surveys for desert tortoises (>300 hours), many tortoises and sign were observed on every day of transects
- Assisted with measuring, weighing, and marking tortoises, under the supervision of Andrew Walde.
- >70 desert tortoises have been measured, weighed, and marked.
- >80 tortoises observed during surveys

March 2005-September 2005 **Wildlife Biologist** -Swaim Biological Consulting Livermore, California Supervisor: Holly Shepley

- Sex, PIT tag, and collect morphometric data and tissue samples from snakes
- Federally permitted to process threatened Alameda whipsnakes
- Conduct surveys of federally endangered San Francisco Garter Snakes and federally threatened California Red-Legged Frog
- Manage data with Access and Excel
- Radio telemetry with Alameda whipsnakes

September 2005-June 2006 Research **Technician**-The U. of Alabama (Joint Fire/Herp project)
Talladega National Forest, Alabama Supervisor: Dr. Leslie Rissler

- Research the impact of prescribed fire and season of burn on amphibian and reptile biodiversity patterns in a northern long-leaf ecosystem
- Design of sampling protocol and marking schemes
- Design, implementation, and troubleshooting of 22 drift fence arrays
- Sex, mark, and collect morphometric data and tissue samples from lizards, snakes, frogs, and salamanders
- License to drive Federal vehicle
- Project photographer

September 2003-November 2004 **Biologist I**-Southern Ecosystems Research
Camp Shelby, Mississippi Supervisor: Ed Wester

- Conduct surveys of federally threatened gopher tortoise
- Scope burrows with camera system to determine status(>6000 burrows)
- Observation of >1000 tortoises
- Use of GPS (Trimble GeoExplorer)/GIS(ArcGis)
- Drive off road 4x4 ATV
- Map and compass skills

June-August 2004/June-August 2003/August-Sep. 2007 **Primary researcher**-Independent project
Isla Colon, Panama, Central America

- Study demography and spatial ecology of Casque-headed basilisks (*Corytophanes cristatus*)
- Capture of 54 lizards
- Morphometric data collection for each individual
- Pit tagging
- Location of lizards using harmonic radar

June-August 2004/June-August 2003/April-June 2002/June 2001 **Research assistant** -Dr. Tom Jones (Head of Biological Sciences, Grand Canyon University) and Geoff Sorrell
Bocas del Draqo, Panama, Central America

- Study life history and demography of eyelash pit vipers (*Bothriechis schlegelii*)
- Survey and capture of snakes
- Morphometric data collection for each individual (snout vent length, tail length, wt, sex)
- Marking of individuals (Scale clipping/PIT tags)
- Tree climbing (Using ropes and ascenders)

November 2002-April 2003 **Desert tortoise monitor**-Garcia and Associates
Barstow, California Supervisor: John Martin

- Survey of tortoises and tortoise burrows
- Monitor construction crews in desert tortoise habitat
- Write daily reports on desert tortoise activity and burrow discovery

April 2002 **Map Turtle Research Technician**
Pascagoula, Mississippi Supervisor: Dr. Mary Mendonca

- Capture of turtles
- Taking blood samples
- Morphometric data collection

September 2001-October 2002 /January 1998-0ctober 2000 **Temporary Assistant Manager**-
Davis Arboretum
Auburn, Alabama Supervisor: Robert Rush

Identification, location, and transplantation of new specimens
Care and maintenance of over 250 native woody plant species
Construction of minor projects (fish gate, bridge maintenance)
Manager of arboretum in absence of supervisor
Supervise student workers

October 2000 –May 2001 **Biological Monitor**-Blanton and Associates
Santee, California to Yuma, Arizona Supervisor: Brent Hall
Barstow, California to Primm, Nevada

Monitored construction crews laying fiber optic cable and enforced environmental regulations
Learned site-specific mitigations, storm water pollution protection plan, and interpretation of construction drawings
Underwent species specific training for the Arroyo toad, desert tortoise, burrowing owl and flat-tailed horned lizard
Conducted over 40 miles of preconstruction surveys for desert tortoises and tortoise burrows
Familiar with reading and interpretation of USFWS biological opinions and California endangered species act
Familiar with flora and fauna of Mohave and Colorado deserts
Responsible for managing a crew of six people

February 2000 – October 2000 **Field Assistant**-Aquatic Invertebrate Study
Auburn, Alabama Supervisor: Michael Gangloff

Assisted in freshwater mussel survey which included several endangered species
Measured physical habitat parameters (depth, flow, shear stress, sub-straight frequency) (Wolmann pebble count)
Recorded field data on habitat evaluation sheets
Seining/Backpack shocking

PUBLICATIONS AND HONORS

Featured on National Geographic Channels "Snake Wranglers" series, January 2004

Lindey, S.D., and G.G Sorrell. *Bothriechis schlegelii*(Eyelash viper). Predator/Prey Weight Ratio and Diet. Herpetological Review. 35(3) 272-273.

Sorrell, G.G., **S.D. Lindey**, and C.R. Newton. 2005. *Plethodon glutinosus*: predation. Herpetological Review. 36(4) 249.

Walde, Andrew D., and **Shawn D. Lindey** 2009. *Gopherus agassizii* Burrow associate. Herpetological Review. 40(1) 94.

Sorrell, G.G., **S.D. Lindey**, T.R. Jones, and C. Guyer. The Influence of polychromatism, body size, and sex on growth and survival of *Bothriechis schlegelii*. in prep Copeia

Sorrell, G.G., **S.D. Lindey**, T.R. Jones, and C. Guyer. Vertical distribution of microhabitat use in *Bothriechis schlegelii* in prep Journal of Herpetology

Sorrell, G.G., **S.D. Lindey**, and L.S. de Souza. Population ecology of *Cortophanes cristatus.* in prep Journal of Herpetology

INTERESTS AND ACTIVITIES

Experience with back-country hiking and camping, outdoor survival, hunting, fly-fishing, wildlife photography, and canoeing

REFERENCES

Andrew Walde: ITS Corporation-Project Lead Biologist, P.O. Box 36, Helendale, California, 92342 **(760)-245-0706/awalde@hotmail.com**

Edward E. Wester: Senior Ecologist, Southern Ecosystems Research, Auburn, Alabama **(888)-368-6894/ Edwester@mindspring.com**

Dr. Tom Jones: Amphibians and Reptile Program Manager, Arizona Game and Fish Department, Phoenix, Arizona **(602)-589-2581 /trjones@azgfd.com**

Peter Woodman: Kiva Biological, Inyokern, CA **(760)-861-3961/Kivabio@aol.com**

Alice E. Karl, Ph.D.: Alice E. Karl and Associates, Davis, California **(530)-304-4121 heliophile@mindspring.com**

RESUME of GLENN RINK

801West Birch Street
Flagstaff, AZ 86001
928-779-5820
glenn_rink@hotmail.com

EDUCATION:

Geology BS, Northern Arizona University, 1985
Botany MS, Northern Arizona University, 2003

BOTANICAL RESEARCH EXPERIENCE:

2007-10 Worked as botanist for the Grand Canyon Vegetation Mapping Project.
2006-10 Working on a checklist of the Kaibab Plateau portion of Grand Canyon National Park. Completion by 2011.
2006-10 Working on a checklist of Surprise Canyon, western Grand Canyon.
2003-10 Conducted numerous biological surveys throughout Arizona, New Mexico, California and Nevada.
2006-07 Produced checklists for Aztec Ruins and El Morro National Monuments, New Mexico
2003-04 Produced a checklist for Yucca House National Monument, Colorado
2003-04 Collected herbarium specimens in the San Juan Basin for the San Juan Flora Project, San Juan College, Farmington, New Mexcio.
2003 Conducted a rare and exotic plant survey for Prescott National Forest, central Arizona for Envirosystems Mgmt, Inc.
2001-02 Produced a checklist for Canyon de Chelly National Monument, NE Arizona. MS Thesis.
2001-04 Studied ATV impacts to a sand dune endemic, *Astragalus magdalenae* var. *peirsonii*, in the Algodones Dunes, Mohave Desert.
1996-04 Volunteered for the Navajo Nation Heritage Program to locate rare plant sites on remote parts of the Navajo Reservation.
1998 Studied plants of Hopi ethnobotanical interest along the Colorado River in Grand Canyon as part of Glen Canyon Dam Monitoring.
1997 Worked on the GAP Analysis Program in Northern Arizona, accessing remote locations throughout the northern part of the state to field check vegetation interpretations made from remote sensing.
1996 Studied marshes along the Colorado River in Grand Canyon as part of the Glen Canyon Environmental Studies effort.
1990 Co-directed the Stanton Re-photography Project for study of vegetation in Grand Canyon, matching over 100 photographs taken in 1890.

PUBLICATIONS:

Christie, K., G.R. Rink, and T.J. Ayers, in review, Additions to the flora of Grand Canyon National Park resulting from National Vegetation Mapping Fieldwork.

Rink, G.R., A. McCallum, A. Cully, 2009. A checklist of the vascular flora of El Morro National Monument, Cibola County, New Mexico. Journal of the Torrey Botanical Society 136(3).

Rink, G.R. and A. Cully, 2008. A checklist of the vascular flora of Aztec Ruins National Monument, San Juan County, New Mexico. Journal of the Torrey Botanical Society 135(4) pp.571-584.

Rink, G.R. 2007. A checklist of the vascular flora of Yucca House National Monument, Montezuma County, Colorado. Journal of the Torrey Botanical Society 134 (2) pp. 289-300.

Rink, G.R. 2005. A checklist of the vascular flora of Canyon de Chelly National Monument, Apache County, Arizona. Journal of the Torrey Botanical Society 132(3) pp. 510-532.

Rink, G.R. 1990, Geology, *in* A Guide to the Salt River Canyon: Natural History and River Running, G.R. Rink ed., Worldwide Explorations, Flagstaff, Arizona, p.11-23.

Webb, R.H., P.T. Pringle, and G.R. Rink, 1989, Debris Flows from Tributaries of the Colorado River, Grand Canyon National Park, Arizona, U.S. Geological Survey Professional Paper 1492, 39p.

Webb, R.H., P.T. Pringle, S.L. Reneau, and G.R. Rink, 1988, Monument Creek Debris Flow, 1984: Implications for formation of rapids on the Colorado River in Grand Canyon National Park, Geology 16, p.50-54.

Webb, R.H., G.R. Rink, and B.O. Favor, 1987, Distribution of Radionuclide and Trace-Elements in Ground Water, Grasses, and Surficial Sediments associated with the Alluvial Aquifer along the Puerco River, Northeastern Arizona—A Reconnaissance Sampling Program, U.S. Geological Survey Open-File Report 87-206, 108p.

Webb, R.H., G.R. Rink, and D.B. Radke, 1987, Preliminary Assessment of Water Quality in the Alluvial Aquifer of the Puerco River Basin, Northeastern Arizona, U.S. Geological Survey Water Resources Investigation Report 87-4126, 70p.

REFERENCES:

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San Juan College
4601 College Boulevard
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4 North San Francisco Street
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ARTHUR H. SCHAUB
2954 N Campbell Rd #153
Tucson, AZ 85719
435 260 8685
artsch42@yahoo.com

EDUCATION:
Cornell University, *Ithaca, NY*, Masters of Science, Plant Science, 2000
Oregon State University, *Corvallis, OR*, Bachelor of Science, Fisheries Science, 1992
S.U.N.Y. Cobleskill, *NY*. Associates of Science, Fisheries and Wildlife Technology, 1988

FIELD BIOLOGY EXPERIENCE:

National Park Service – Yellow Stone National Park
2010 **Backcountry Amphibian Surveys –** Surveyed backcountry wetlands for amphibian presence and abundance

Independent Field Biologist (Subcontractor for projects led by Alice Karl, Kemp Anderson and Mercy Vaughn)
2010 Rare Plant Survey (Spring and Fall) Colorado Desert of CA
Plant Inventory Survey, Brassica Monitoring, Desert Tortoise Survey - Dagget, CA
Mojave Desert Tortoise Survey Triangle transect surveys conducted on MCAGCC Marine Base, 29 Palms, CA.
2009 Mojave Desert Tortoise Survey, Rare Plant Survey, Bird point Counts and Sensitive Species Surveys (plant, mammal, bird and reptile) Various sites in CA and NV deserts.

Independent Field Biologist Subcontractor for Ecosphere Environmental Services, Durango, CO
2007 – 2010 Navajo Reservation Range Lands Survey – Soils and ecological community descriptions, range health analysis, plant identification and mass estimates.
2009 Mexican Spotted Owl Survey - Carson National Forest
2007 Mexican Spotted Owl Survey and Goshawk Surveys - Gila National Forest
2005 – 2006 Navajo Reservation Vegetation Transect Surveys - Plant identification and plant mass estimates for range management applications.
2004 Endangered and Threatened Species Surveys in response to natural gas well development and prepared related biological reports.

EPG, Inc., Field Biologist, **Tucson AZ*, 2008, Winter-Spring***
2007 Rare Plant Surveys - Navajo Reservation, New Mexico.
2007 Monitoring for Coachella Valley Fringe - Toed Lizards During roadway and fence construction in Palm Springs, CA.

2006 Sonora and Mojave Desert Plant and Wildlife Surveys - Endangered and Threatened Species surveys, general habitat assessment and biological inventory surveys. Species surveyed included **Mojave Desert Tortoises, Ferruginous Pygmy Owls and Pima Pineapple Cactus.** General habitat surveys included vegetation inventory, raptor nest searches and bird and reptile inventory.

OTHER EXPERIENCE:

Naturalist / Guide, Camp Denali, Northface Lodge, Summer 2006, 2005
PO Box 67, Denali National Park, AK 99755
Guided day hikes. Created and presented evening programs Obtained an Alaskan CDL and Wilderness First Responder certification as prerequisites for this job.

Director, Rim to Rim Restoration, 2004
PO Box 297, Moab UT 84532
Responsible for all operations of a small not for profit company devoted to removing invasive exotic weed species and re-vegetating with native plants.

Mexican Spotted Owl Monitoring and Vegetation Survey, 2002 – 2003 **Geo-Marine, Inc.** Newport News, VA, Supervisor Ann Bowels.
Trained and supervised a **vegetation survey** crew for collecting plot and transect data within the Gila National Forest of New Mexico (2003). Field technician for the assessment of Mexican Spotted Owl (S*tix occidentalis lucida)* habitat in the Gila National Forest of New Mexico (2002, 2003).

Vegetation Survey, GAP analysis, 2003
USGS, Flagstaff AZ, Supervisor Kathryn Thomas
Traveled throughout Arizona mapping vegetative ecosystems.

Soil Conservationist, 2000 – 2002 United States Department of Agriculture, Natural Resources Conservation Service, Ellicottville New York
Technical assistance and planning for the Wetland Reserve Program, Wildlife Habitat Incentives Program, Conservation Reserve Program and other programs promoting resource conservation on private lands.

Graduate Research Assistant, 1997 – 2000 Cornell University, Department of Horticulture, Ithaca, NY - Supervisor, Dr. Frank Rossi
Research concentrated on an integrated pest management and biological control.

Integrated Pest Management Scout, 1996 Cornell Cooperative Extension, Orange County, NY – Supervisor, Marie Ulrich
Surveyed various crops to identify and monitor diseases and insect populations. Consulted farmers to develop strategies to control pests while minimizing pesticide use.

References:

Alice E. Karl, Ph.D., Desert Tortoise Researcher
P.O. Box 74006 Davis, CA 95617
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Alexis Watts, Project Manager, Ecosphere Environmental Services
112 W. Montezuma Ave, Suite 4, Cortez, CO 81321. 970 564-9100.
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Kemp Anderson, Project Manager, Mojave Desert Tortoise Research
324 ½ 15th Street
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Mercy Vaughn, Desert Tortoise Researcher
SUNDANCE BIOLOGY, INC.
179 Niblick Rd. PMB 272
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Eric W. Stitt, M. S., Wildlife Ecologist/Herpetologist
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TIM THOMAS
BIOLOGICAL CONSULTANT
Resume

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18520 Cocqui Road, Apple Valley, CA 92307

SUMMARY OF FIELD EXPERIENCE

Mr. Tim Thomas has over 30 years of experience working as a field biologist in southern California. He has conducted surveys on all eight channel islands, the south coast, transverse and peninsular ranges from Santa Cruz to San Diego Counties, the deserts, and eastern Sierra, including the Inyo/White mountains. He has worked as a field biologist for a variety of organizations and agencies, including The Nature Conservancy, National Park Service, U.S. Fish and Wildlife Service, Department of Defense, U.S. Geological Survey, U.S. Bureau of Land Management, California Energy Commission, California State Parks, Southern Nevada Water Authority, and the California Native Plant Society. He has participated in over 20 Audubon Christmas bird counts, organized and participated in four annual Xerces Society 4th of July butterfly counts, participated in five years of small mammal and small predator capture/recapture projects with the National Park Service, participated as a field biologist for several desert tortoise presence/absence surveys, and conducted many rare plant surveys throughout most of southern California. He authored listing packages and recovery plans for many plant species, and wrote incidental take permits for desert tortoise (section 7 and 10 of the Federal Endangered Species Act) while with the USFWS. He has traveled extensively in Baja California, Mexico, and worked as a Community College instructor, teaching international natural history classes in Costa Rica, Belize, Guatemala, Peru, Borneo and Malaysia. Since retiring from the USFWS in 2004 he has been a self-employed biological consultant.

EDUCATION

A. S., Natural Resource Management, Pierce College. 1974.

Geography Department, UCLA (Phytogeography). 1976 - 1978.

B. A., Geography, CSU Northridge (Phytogeography, Ethnobotany, Land Use Planning). 1980.

EMPLOYMENT HISTORY

US Army, Armor crewman, served a full one-year tour of duty in Viet Nam, received a combat Purple Heart; Honorable Discharge; 1970-1971.

Instructor, Los Angeles, Pierce College; Natural Resources Management Conservation, (Biogeography and Land Use of Southern California habitats); 1974-1976.

Preserve Manager, The Nature Conservancy, Cold Creek Canyon Preserve Santa Monica Mountains, CA, (Directed research and conducted inventories; community outreach; budget); 1976-1979.

Resource Management Specialist, National Park Service, Santa Monica Mountains National Recreation Area, (Naturalist, Resource Inventory (species lists and habitat descriptions); Small predator and small mammal trapping and ID; Prescribed Fire Team; Habitat Restoration; NEPA and CEQA compliance for proposed projects; Conducted, published and presented research at various symposia); 1979-1991.

Botanist, US Fish and Wildlife Service, Ecological Services, Ventura and Barstow Field Office, California, (Listing and Recovery - authored: proposed and final rules to list 27 plant species; recovery plans for 25 plant species and one butterfly; Desert Tortoise, Owen's Tui Chub, San Benito Evening-primrose Section 7 and 10; (through biologic knowledge of desert tortoise); 1991-2004.

SURVEYS AND OTHER EXPERTISE

Consulting Biologist; 2004- Present.
- Federal Contract CCR and DUNS; Biological Consultant, Veteran Owned Small Business; 2008- Present.
- Authorized biologist; San Bernardino Co. 2008- Present.
- Manager [volunteer]; Victor Valley College Herbarium; 2004- Present.
- Focused Rare Plant Surveys; Calif. (NPS, USGS, BLM, CEC, private), Nevada (SNWA); 1983-2010.
- Desert Tortoise Surveys [positive observations]; 2004-2010.
- Burrowing Owl Surveys [positive observations]; 2005-2010.
- Oak Tree Surveys [NPS]; 1984-89.
- Grassland habitat survey California State Parks; 2005.
- Audubon Christmas bird counts; 1974-2000.
- Xerces Society - 4th of July Butterfly counts; 1983-1986.
- Mojave Shoulderband survey [positive observation]; 2001.
- Quino Checkerspot foodplant survey (USFS); 2008-2009.
- Naturalist - Santa Barbara Botanic Garden- Santa Barbara Island; 2004.

PROFESSIONAL MEMBERSHIPS

California Native Plant Society
California Botanical Society
Southern California Botanists
Society for Conservation Biology
Natural Areas Association

AWARDS AND POSITIONS

Distinguished Alumni Award - Los Angeles Pierce College; 2001.
Rare Plant Chair, Santa Monica Mountains Chapter, California Native Plant Society (conducted rare plant surveys; wrote petition to list *Pentachaeta lyonii* as endangered, adopted by Calif. DFG); 1983-1995.
State Board Member California Native Plant Society (CNPS); 1985-1988.
President and founding member of the Mojave Desert Chapter of the CNPS; 2001- Present.
Member, CNPS State Rare Plant Committee; 2008- Present.
Member, Significant Ecologic Area Technical Advisory Committee, Los Angeles County Department of Planning, (CEQA compliance review for sensitive species and habitats); 1982-1992.
National Audubon Society - Board Member San Fernando Valley Chapter; 1972 -1975.
Naturalist, Southern Sierra, Golden Trout Camp (10,200 ft.), vouchered floristic inventory; 1975- Present.
Natural history photography, contributions to local flora's and wildflower guides, technical and agency periodicals, presentations; 1978- Present.

CONTRIBUTIONS TO LOCAL FLORAS AND POPULAR PLANT GUIDES

Wildflowers of the Santa Monica Mountains (1984) – McCauly
Flowering Plants of the Santa Monica Mountains (1985) – Dale
Flora of the Santa Monica Mountains (1986) – Raven, Thompson and Prigge
A Flora of Santa Cruz Island (1995) – Junak
California's Native Gardens (1997) – California Native Plant Society
A Flora of Santa Barbara County (1998) – Smith
Wildflowers of the Mojave Desert (2003) – MacKay

ATTACHMENT DR2-2

COUCH'S SPADEFOOT TOAD SURVEY METHODS

Couch's Spadefoot Toad (*Scaphiopus couchii*)
Survey Methods

Surveys for Couch's spadefoot toad include two levels of effort, pre-survey identification of potential ponding areas and field surveys:

1. **Identify areas that may hold water for at least eight days:**

   Surveys on the new linear segments in Spring 2013 will map all potential Couch's breeding sites.

2. **Field Surveys**

   a. Associated with summer thunderstorms at the project site – Couch's spadefoot breed in pools that form during summer storms. Thunder and/or very low levels of precipitation (< 0.5 mm) elicit emergence from subterranean burrows (Dimmitt and Ruibal 1980). While adults become active aboveground for purposes of breeding, they may briefly forage aboveground even if there is inadequate rainfall to pond in the depressions.

   b. Verification of ponding – Locations identified in #1, above, will be visited to assess whether water is ponding. Assessment will account for amount of rain, since initial rain may percolate more readily into the currently dry soil.

   c. Verification of toads – Methods for verification of Couch's spadefoot presence include the following nocturnal surveys:

      i. Road and walking surveys around the impoundment areas to observe foraging adults (Dayton et al. 2004)

      ii. If there is sufficient rain for ponding, listen and spotlight at the ponds to identify spadefoot toad breeding activity. Use digital recording device (e.g., Sony© PCM-D50 linear PCM Recorder) to record male calls to verify presence. Capture, describe and photograph adult spadefoot. Identify other species of toads that are present.

         These activities will occur within the first several days following the thunderstorm. While males begin calling and breeding the first night following a storm, not all males breed the first night (C.R. Schwalbe, pers. comm. to A.E. Karl).

      iii. As feasible, estimate relative abundance by (a) time-constrained searches (i.e., number of foraging toads observed per unit time of systematically walked transect), (b) tadpole density per dipnet effort, and/or (c) other methods

d. At each site, the following data will be collected:
    i. Date and observer
    ii. Current weather conditions (air, ground surface and water temperature; relative humidity; cloud cover and precipitation; wind speed and direction; barometric pressure)
    iii. Recent rainfall (date, amount)
    iv. Location (UTMs in NAD 83)
    v. General habitat of area
    vi. Specific habitat of pond (vegetation [species, cover, degree of establishment based on size of plants]; soils; substrates; why ponding occurs at this location, including if anthropogenic in origin)
    vii. Current threats to pond longevity
    viii. Pond depth and size
    ix. Depth of ponded water, or depth of soil moisture
    x. Water quality (pH, turbidity)

    Photographs will be taken of each ponded area.

Literature Cited

Dayton, G. H., R.E. Jung and S. Droege. 2004. Large-scale habitat associations of four desert anurans in Big Bend National Park, Texas. J. Herp. 38(4): 619-627.

Dimmitt, M.A. and R. Ruibal. 1980. Environmental correlates of emergence in spadefoot toads (*Scaphiopus*). J. Herp.14(1):21-29.

Schwalbe, Cecil R. USGS and southwestern deserts anuran expert. Personal communication to Alice Karl. 18 June 2010.

ATTACHMENT DR6-1

EROSION, SCOUR & SEDIMENT TRANSPORT ANALYSIS

Palen SEGS
Erosion, Scour, and Sediment Transport Analysis

WO# 7477

Doc # 7477HYD400

March 15,2013

Prepared For:

BrightSource

consulting engineers planners surveyors

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I. INTRODUCTION

VTN has prepared an Erosion, Scour, and Sediment Transport Analysis for the proposed Palen Solar Energy Generating Station (Palen SEGS) project. This report describes the methodology and calculations utilized to determine the potential scour within the solar field area. Portions of this analysis referenced results from the previously submitted *Palen SEGS Existing Drainage Conditions Assessment (Existing Condition)* and the *Palen SEGS Developed Conditions Drainage Assessment (Developed Condition)* for the Palen SEGS site prepared by VTN Consulting.

II. DESIGN FLOWS

A. OFFSITE FLOWS

In the referenced Palen SEGS *Existing Condition* analysis, the U.S. Army Corps of Engineers (USACE) HEC-1 software program was utilized to establish storm water runoff values for all tributary offsite basins. Tributary runoff flow values impacting the Palen SEGS site are summarized in the referenced *Table 1* shown below. Refer to *Appendix A* for a copy of the referenced *Existing Condition Basin Map*.

Table 1: HEC-1 Analysis Runoff Results Summary

Basin / Combination Point Label	Tributary Area (sq. mi.)	24-Hr Q100 (cfs)	24-Hr Q50 (cfs)	24-Hr Q25 (cfs)	24-Hr Q10 (cfs)
OFF1	26.09	8,659	7,147	5,750	4,090
DV1	26.09	7,135	5,730	4,340	3,010
DV2	26.09	5,390	4,065	2,985	1,660
OFF2	4.68	1,170	903	666	399
COFF2	30.77	8,262	6,597	4,978	3,389
OFF3	4.71	1,143	879	646	383
COFF3	30.80	6,490	4,909	3,603	2,024
FS3	30.80	304	N/A	N/A	N/A
OFF4	5.08	1,214	938	687	409
COFF4	35.88	1,466	N/A	N/A	N/A
OFF5	13.04	3,193	2,494	1,875	1,156

B. ONSITE FLOWS

The FLO-2D 2-dimensional flood routing program was utilized to generate onsite runoff and to route offsite basin flows through the site in the referenced *Palen SEGS Existing and Developed Condition* analysis. Cross-sections were cut within the FLO-2D model along the downstream end of the site to determine the maximum flows discharged from the site. Cross-sections were also placed at the upstream end of key washes to determine the 100-year flow values to use for the HEC-RAS analysis. The floodplain cross-sections utilized in the FLO-2D analysis are included in Table 2 below. Due to the flow increase during the

developed condition, the Developed Condition analysis results were utilized to determine the general and local scour depths provided in this report. Refer to referenced *Figure HYD301* for locations of cross sections included within *Appendix A*.

Table 2: FLO-2D Flood Plain Cross Section Summary

24-Hour, 100-Year				
Cross Section	Cross Section Purpose	100-Yr Flow Existing (cfs)	100-Yr Flow Developed (cfs)	Flow Increase (cfs)
1	Flows Discharging From Site	8889.2	8982.2	93.1
2	Flows Discharging From Site	582.2	757.9	175.7
3	Flows Discharging From Site	6798.0	7010.6	212.5
4	Flows Discharging From Site	1758.4	1783.3	24.9
5	Western 1 Reach	3829.6	3833.0	3.4
6	Western 2 Reach	2118.7	2124.7	6.0
7	Central 1 Reach	2263.5	2293.4	29.8
8	Central 2 Reach	1904.4	1918.7	14.3
9	Through Private Land - Southern	397.0	397.9	1.0
10	Through Private Land - Northern	1454.0	1469.5	15.5
11	Flows Through Tower Unit-1	69.1	110.7	41.6
12	Flows Through Tower Unit-2	61.6	84.8	23.2
24-Hour, 50-Year				
Cross Section	Cross Section Purpose	100-Yr Flow Existing (cfs)	100-Yr Flow Developed (cfs)	Flow Increase (cfs)
1	Flows Discharging From Site	7053.8	7160.3	106.4
2	Flows Discharging From Site	299.0	520.8	221.8
3	Flows Discharging From Site	5132.1	5342.9	210.8
4	Flows Discharging From Site	1005.5	1059.8	54.3
5	Western 1 Reach	3134.4	3137.1	2.7
6	Western 2 Reach	1710.0	1717.3	7.3
7	Central 1 Reach	1716.8	1745.7	28.9
8	Central 2 Reach	1492.3	1505.6	13.3
9	Through Private Land - Southern	229.0	229.1	0.1
10	Through Private Land - Northern	934.4	967.2	32.9
11	Flows Through Tower Unit-1	27.0	90.9	63.9
12	Flows Through Tower Unit-2	29.8	67.7	37.9
24-Hour, 25-Year				
Cross Section	Cross Section Purpose	100-Yr Flow Existing (cfs)	100-Yr Flow Developed (cfs)	Flow Increase (cfs)
1	Flows Discharging From Site	5312.4	5376.1	63.7
2	Flows Discharging From Site	169.1	312.8	143.8
3	Flows Discharging From Site	3764.0	3905.1	141.1
4	Flows Discharging From Site	701.7	759.0	57.3
5	Western 1 Reach	2446.1	2448.8	2.8
6	Western 2 Reach	1309.9	1315.4	5.4

7	Central 1 Reach	1256.2	1280.9	24.7
8	Central 2 Reach	1133.6	1147.9	14.4
9	Through Private Land - Southern	158.6	159.5	0.9
10	Through Private Land - Northern	685.8	713.0	27.2
11	Flows Through Tower Unit-1	0.0	66.1	66.1
12	Flows Through Tower Unit-2	4.1	52.3	48.1

III. SITE INVESTIGATION FOR SCOUR AND EROSION

Several site investigations were conducted to determine the potential for scour and erosion within the Palen SEGS site. Based on these site investigations, topographic information, and aerial photography, two main areas were determined to be susceptible to potential erosion and scour within the site. The two main areas determined are the Major Flow Corridor areas and Head Cut areas.

The Major Flow Corridor areas consist of the onsite braided washes that convey the offsite flows from the upstream Interstate 10 bridge crossings. The flows conveyed in these braided washes can clearly be seen on referenced figure *HYD301 FLO-2D Depth Map* (provided in Appendix A) and exhibit *HYD401 FLO-2D* Scour Map (provided in Appendix B) where the majority of the flow depths and scour depths occur.

The Head Cut areas occur in the southwestern portion of the site where there is evidence of remnants of earthwork activity that resulted in 3 to 6 feet high mounds to the north and south of an existing roadway. The Head Cut areas are not located within the Major Flow Corridor areas and appear to only be affected by localized flows. Due to the location of the Head Cut areas being within the limits of the Common Area, erosion calculations were not deemed necessary with this report. The Head Cut areas are notated on the latest BrightSource Energy site plan – *Palen Solar Field Layout Drive Zones and Roads*, provided in Appendix A. Photos 1 and 2 below also show the location and evidence of headcutting.

Photo 1: Mound/Headcut Area

Photo 2: Southern Mound/Headcut Area

IV. EROSION & SCOUR ANALYSIS FOR SOLAR FIELD

An erosion and scour analysis was completed to determine potential erosion and scour for the proposed solar field area within the Palen SEGS site. Two components of scour were determined for this analysis: general and local scour. The evaluations of both scour components, as well as the findings of the analyses, are discussed in the sections below.

A. GENERAL SCOUR

General scour is defined as the lowering of the streambed related to the passing of a single flood event. For the purposes of this report, the general scour will be interpreted as the scour anticipated during the 100-year flow event. The FLO-2D analysis computes scour depths for the overall project area and the results of the analysis show the greatest scour depths in the Major Flow Corridor as discussed in Section III.

The section below describes in detail the FLO-2D scour analysis as well as the results obtained.

1. FLO-2D SCOUR ANALYSIS

The FLO-2D program, in conjunction with the software's sediment transport sub-routine, was utilized to provide estimates of potential general scour throughout the site. The FLO-2D model contains imported hydrographs generated from HEC-1 to simulate the 24 hour 100-year runoff from all offsite drainage basins. The model simulates the onsite runoff from the 24 hour 100-year storm event for the onsite areas through the use of its internal precipitation sub-routine. There are many sediment transport equations that can be utilized within FLO-2D, including the Zeller-Fullerton equation. The Zeller-Fullerton equation is a widely accepted predictor of scour under a wide range of field conditions. Therefore, Zeller-Fullerton was chosen as the equation to execute the sediment transport sub-routine within the FLO-2D analysis.

The soil parameters inputted into the FLO-2D model were referenced from the *Preliminary Geotechnical Investigation Report Solar Millenium Concentrating Solar Power Project* dated September 16, 2009 by Kleinfelder (Geotech Report). It was concluded that the near surface soil makeup within the site consisted of poorly graded and silty sands. The borings and test pits from several locations throughout the site consisting of sands that are near the surface were utilized to determine an average sediment size fraction. Referenced Kleinfelder Figure 2 - Palen Boring and Test Pit Locations, with the above mentioned borings and test pits denoted, is provided in Appendix A. The approximated average sediment size fraction and near surface dry density were referenced from the Geotech Report and incorporated in the sediment transport sub-routine. The specific gravity however, was not included in the referenced report so a specific gravity of 2.65 was utilized in the sediment transport sub-routine. The corresponding appurtenant data for the borings and test pits denoted on reference Figure 2 are included in the *FLO-2D Soil Parameter Input Summary* included in Apendix B.

The FLO-2D grid system utilized to conduct this analysis contained 27,625 onsite grid cells within the solar field area. Of the 27,625 grid cells, 1523 cells reported scour depths greater than 1-foot (approximately 5.5%).

The FLO-2D results for the general scour analysis are depicted on *Figures HYD401 and 402* within *Appendix B*. These figures show both the maximum scour and deposition depths computed by the analysis. At a glance it appears that many of the highest deposition depths and scour depths occur in the same grid cells. However, upon close inspection the majority of the deposition depths within the solar field boundary are in close proximity to but do not occur within the same grid elements as the scour depths. This is not unusual since portions of the stream that are in scour will provide a sediment source that can be deposited in adjacent portions of the stream. Deposition and scour can also occur within the same grid cell at different time periods within a flooding event. The scouring of a grid cell provides larger conveyance areas which produce slower velocities that induce deposition of sediment in high concentrated flows. In general deposition depths are less than 2-ft, however there are 212 grid cells where the deposition depths are between 2 and 4-ft. Note that the final ground surface elevation for some of the grid cells will be reflected by the difference in scour and deposition. This will not have an impact on the general scour analysis due to the difference in time interval occurrence between the scour and deposition. Deposition analysis results may not impact the heliostat pylon design depth, but may be important in the design of other project features within the site.

B. LOCAL SCOUR

Local scour is defined as the scour in a channel or on a floodplain that is localized at a pier, abutment, utility pole, or other obstruction to flow. For the purposes of this report, the local scour is defined as the scour that occurs around the pylons used to support the proposed heliostat mirrors.

1. FHWA EQUATION

To determine the potential scour depth around the mirror support pylons at the Palen SEGS site, the *U.S. Department of Transportation Federal Highway Administration (FHWA) Hydraulic Engineering Circular No. 18* (HEC-18) was referenced. Since the shape of the pylons to be installed is a circular cylinder with an average diameter of 0.67-ft, they are assumed to act similar to bridge circular piers during flooding conditions.

$$\frac{y_s}{a} = 2.0\, K_1\, K_2\, K_3\, K_4 \left(\frac{y_1}{a}\right)^{0.35} {Fr_1}^{0.43}$$

Where,

y_s = Calculated scour depth, ft
y_1 = Flow depth directly upstream of pier, ft
K_1 = Correction factor for pier nose shape
K_2 = Correction factor for angle of attack of flow
K_3 = Correction factor for bed condition
K_4 = Correction factor for armoring by bed material size
a = Pier width, ft
V_1 = Mean velocity of flow directly upstream of the pier, ft/s
g = Acceleration of gravity, ft/s^2
Fr = Froude number directly upstream of the pier

The upstream velocity and depth (V_1 and y_1) components of the equation were obtained from the HEC-RAS hydraulic analysis of the channels, based on the worst case scenario (highest values). A K_1 correction factor of 1.0 was based on a circular cylinder pylon shape from referenced *Table 6.1*; a K_2 correction factor based on a 0 degree flow angle attack on the circular pylon; a K_3 correction factor of 1.1 based on small dunes present; and a K_4 correction factor of 1.0 since the onsite geotechnical report indicates a D_{50} < 2 mm at surface samples.

Based on the results of the calculation, the local scour depth (y_s) at the pylon is estimated to be 2.10-ft. However, due to the maximum depth stipulated in HEC-18 under referenced equation(s) 6.2:

$$y_s \leq 2.4 \; x \; pier \; width \; (a) for \; F_r \leq 0.8$$

$$y_s \leq 3.0 \; x \; pier \; width \; (a) for \; F_r \geq 0.8$$

The maximum scour depth is reduced to 1.61-ft since the Froude Number (Fr) is within the sub-critical flow regime.

The impact of debris accumulation on the pylons was considered in the determination of local scour for the pylons. The most significant factors impacting debris accumulation are the width of the pylon, the spacing between the pylons, and the amount of substantial vegetation that is available from the upstream watershed. The relatively small diameter of the pylons (8 inches) does not provide a significant contact surface to facilitate the accumulation of debris. Also the spacing between the pylons (at least 20 feet in each direction) provides an adequate flow width to allow debris to navigate through the solar field without becoming accumulated on individual pylons or between sets of pylons. Finally, the vegetation source for debris is limited to sparse desert vegetation mostly consisting of small shrubs and bushes. There is not a significant amount of large woody plants and trees that would provide the large debris material that traditionally create debris accumulation problems for bridge piers and other structures. In general it is believed that the spacing between the pylons, the small diameter of the pylons, and the lack of substantial vegetation, provide a reasonable assurance that flow debris will be able to navigate through

the solar field pylons without becoming a significant influence on scour depths as determined in this report. Refer to *Appendix C* for calculations and referenced material.

C. TOTAL SCOUR

The strategy for the Palen SEGS project is to design the heliostat pylons to withstand the scour depths from the 100-year 24-hour storm. General scour provides the anticipated scour depth for the 100-year 24-hour storm event while local scour provides additional depth specifically related to scour localized around the heliostat pylons.

For design purposes, it is recommended that the total scour (general + local) be used. With a predicted local scour depth of 1.61 ft, a general scour depth will be determined based on the predicted total scour depth. *Table 3: Total Scour Depth Summary* below provides the predicted general scour depths based on a range of predicted total scour depths from 3.00 ft to 4.00 ft at 0.5 ft increments.

Table 3: Total Scour Depth Summary

Analysis	General Scour Depth (ft)	Local Scour Depth (ft)	Total Scour Depth (ft)
General Scour - FLO-2D	1.39	1.61	3
	1.89	1.61	3.5
	2.39	1.61	4

The total scour depth determined is based on the theoretical scour anticipated for one single large storm event (100-year, 24-hour). The solar field will obviously be subjected to numerous small events during the design life of the project regardless of whether the large storm occurs or not. The smaller storm events that produce runoff can have cumulative erosion and scour effects that over time can equal or exceed the total scour depth reported. Due to this, it is recommended that a maintenance program be implemented which entails inspection of the solar fields for signs of scour after storm events that produce noticeable amounts of runoff from the site and tributary offsite area. If the inspection reveals that scour has occurred to heliostat pylons or other ancillary structures within the site, fill material should be imported, placed, and compacted over the eroded areas to restore structure(s) strength and bring such areas back to the previous grade. The fill material and compaction requirements should be specified by a geotechnical engineer to ensure that the material will provide adequate erosion control and resist being washed away during the next storm event.

D. EXCEEDANCE PROBABLILTY ANALYSIS FOR SOLAR FIELD

An exceedance analysis was completed to determine the percentile of solar field area exceeding the range of general scour depths that were mentioned above. The FLO-2D analysis is driven mostly by the high flow rates in the Major Flow Corridor areas of the project. These high flow rates create large shear stresses on the braided washes and floodplain that create the scour and bed mobility that is predicted by the FLO-2D model.

1. FLO-2D SEDIMENT TRANSPORT MODEL TOTAL SCOUR EVALUATION

The non exceedance percentile represents the percentage of FLO-2D onsite grid cells that report general scour depth equal or less than the proposed general scour depth being evaluated. *Table 4: Non Exceedance Percentile* provides a range of general scour depths from 1.39-2.89 feet that correspond to a total scour depth of 3.0-4.0 feet. The non exceedance percentile is then reported for this range of scour.

Table 4: Non Exceedance Percentile

General Scour Depth (ft)	Local Scour Depth (ft)	Total Scour Depth (ft)	Non Exceedance Percentile
1.39	1.61	3.0	96.3%
1.89	1.61	3.5	97.4%
2.39	1.61	4.0	98.0%

The results in Table 4 will be used to evaluate the design of the heliostat pylons and erosion protecton requirements based on cost benfit analysis and the projected life of the project.

V. SEDIMENT TRANSPORT ANALYSIS

Sediment transport for the onsite area was determined through the Sediment Transport Sub-routine in FLO-2D. The methodology for the sediment transport analysis is the Zeller-Fullerton equation. The soils information reported in Section IV.A.1- FLO-2D Scour Analysis of this report was used as the basis of the analysis. It should be noted that FLO-2D only computes bed load losses for the sediment transport computations. Source sediment from the offsite areas was supplied to the model based on recommendation from FLO-2D personnel. According to FLO-2D personnel, the preferable method in incorporating sediment supply is to place inflow nodes (referenced HEC-1 hydrographs) upstream of the project boundary where 10 or more elements could be utilized as sacrificial grid elements that would generate a supply to the downstream grid elements. The boundary line between the modeling utilizing HEC-1 software and the modeling using FLO-2D is located at Interstate Highway 10. This boundary location provides more than the recommended number of offsite grid cells between the inflow hydrographs and the site boundary for FLO-2D to determine sediment concentrations. All grid cells located between the site boundary and Interstate Highway 10 contain soil parameters as described in Section IV.A.1 that will provide a sediment

source for the FLO-2D analysis upstream of the site boundary. This can be visualized on figure *HYD401 - FLO-2D SCOUR MAP*, where the colored grid cells between Interstate Highway 10 and the site boundary represent the grid cells used to supply a sediment source pior to the flows entering the site. The existing and developed condition sediment transport results, for the four different storm events, from the FLO-2D analysis are summarized below.

Table 5: Onsite Sediment Load Summary

Storm	Exisiting Condition			Developed Condition			% Change in Sediment Load
	Sediment Load (ac-ft)	Storm water Runoff (ac-ft)	Sediment Concentration (%)	Sediment Load (ac-ft)	Storm water Runoff (ac-ft)	Sediment Concentration (%)	
100-YR	182.09	763.02	23.9	187.68	1031.18	18.2	3.07
50-YR	120.34	554.90	21.7	123.58	792.45	15.6	2.70
25-YR	73.56	377.02	19.5	75.59	580.98	13.0	2.76
10-YR	33.04	196.97	16.8	33.76	353.56	9.5	2.19

With the increase in runoff between the existing and developed condition storm events due to the higher CN number values representing development, the sediment concentration is reduced. However, as expected with an increase in runoff, the actual sediment load has increased with only a minor impact between 2.19 to 3.07 percent throughout the different storm events. Please refer to *Appendix D* for the FLO-2D summary output for sediment load results.

VI. REFERENCES

1. VTN Consulting: *Palen SEGS Existing Conditions Drainage Assessment*; November 2012.
2. VTN Consulting: *Palen SEGS Developed Conditions Drainage Assessment*; Devember 2012.
3. U.S. Department of Transportation Federal Highway Administration (FHWA): Hydraulic Engineering Circular No. 18 (HEC-18); May 2001.

APPENDICES:

APPENDIX A:

Reference Material

Offsite Flow Summary Table

Basin / Combination Point Label	Tributary Area (sq. mi.)	24-Hr Q100 (cfs)	24-Hr Q50 (cfs)	24-Hr Q25 (cfs)	24-Hr Q10 (cfs)
OFF1	26.09	8,659	7,147	5,750	4,090
DV1	26.09	7,135	5,730	4,340	3,010
DV2	26.09	5,390	4,065	2,985	1,660
OFF2	4.68	1,170	903	666	399
COFF2	30.77	8,262	6,597	4,978	3,389
OFF3	4.71	1,143	879	646	383
COFF3	30.80	6,490	4,909	3,603	2,024
FS3	30.80	304	N/A	N/A	N/A
OFF4	5.08	1,214	938	687	409
COFF4	35.88	1,466	N/A	N/A	N/A
OFF5	13.04	3,193	2,494	1,875	1,156

Legend

- Palen Solar Energy Boundary
- Tributary to Alluvial Fan
- Tributary to Copa Ditch I-10 Bridge Crossing
- Tributary to Aztec Ditch I-10 Bridge Crossing
- Tributary to Tarantula Ditch I-10 Bridge Crossing
- Tributary to Sutro Ditch I-10 Bridge Crossing
- Berm
- 50-Foot Quad Contours
- Subbasin Combination Points

0 0.25 0.5 1 Miles

OFF2 Copa Ditch I-10 Bridge Crossing

OFF3 Aztec Ditch I-10 Bridge Crossing

OFF4 Tarantula Ditch I-10 Bridge Crossing

OFF5 Sutro Ditch I-10 Bridge Crossing

OFF1 Alluvial Fan

COFF2 COFF3 FS3 COFF4 OFF5 Dv1 Dv2

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N W E S

REV.	DATE	BY	REVISION
1			

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Riverside County, CA

2727 S. Rainbow Boulevard
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Tel (702) 382-2500
Fax (702) 382-2597
www.vtnnv.com

EXISITING CONDITION BASIN MAP

PALEN SEGS
EXISTING DRAINAGE CONDITIONS ASSESSMENT

PROJECT NO.	DRAWN BY:	DATE	SCALE:
7477	VTN	10/29/2012	1 " = 0.5 miles

FIGURE
HYD1A

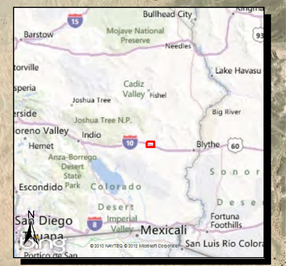
Date: 11/2/2012 Path: J:\7477 - Palen\GIS\mxd\Existing\7477_drainage_basin.mxd

Legend

- Palen Solar Energy Boundary
- Mirror Array Extents
- Bridge Crossing
- CS 1 - Flood Plain Cross Section
- Power Block Location

Flow Depth at Cell (ft)

- 0.100 - 0.250 Excluded
- 0.251 - 1.000
- 1.001 - 1.500
- 1.501 - 2.000
- 2.001 - 3.000
- 3.001 - 4.000
- 4.001 - 9.440



0 500 1,000 2,000
Feet

N
W E
S

CS-5
CS-6
CS-1
CS-2
CS-7
CS-11
CS-8
CS-3
CS-12
CS-10
CS-4
CS-9
Casa Ditch
Azteca Ditch
Tarantula Ditch
Sahro Ditch

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FLO-2D DEPTH MAP
24-HOUR 100-YEAR
DEVELOPED CONDITION

PALEN SEGS

PROJECT NO.	DRAWN BY:	DATE	SCALE:
7477	SDB	12/19/2012	1 " = 1,000 '

FIGURE
HYD301

Date: 12/20/2012 Path: J:\7477 - Palen\GIS\mxd\Developed\7477_100y_Flo2D_dep_dev.mxd

BSE Document Control Number: 7477HYD400

Legend

- Palen Solar Energy Boundary
- Mirror Array Extents
- Bridge Crossing
- Power Block Location

Velocity at Cell (ft/s)

- 0.100 - 1.000 Excluded
- 1.001 - 2.000
- 2.001 - 3.000
- 3.001 - 4.000
- 4.001 - 5.000
- 5.001 - 11.460

Copa Ditch

Aztec Ditch

Tarantula Ditch

Sutro Ditch

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Image courtesy of USGS © 2012 TerraMetrics

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FLO-2D VELOCITY MAP 24-HOUR 100-YEAR DEVELOPED CONDITION

PALEN SEGS

PROJECT NO:	DRAWN BY:	DATE	SCALE:
7477	SDB	12/19/2012	1 " = 1,000 '

FIGURE
HYD302

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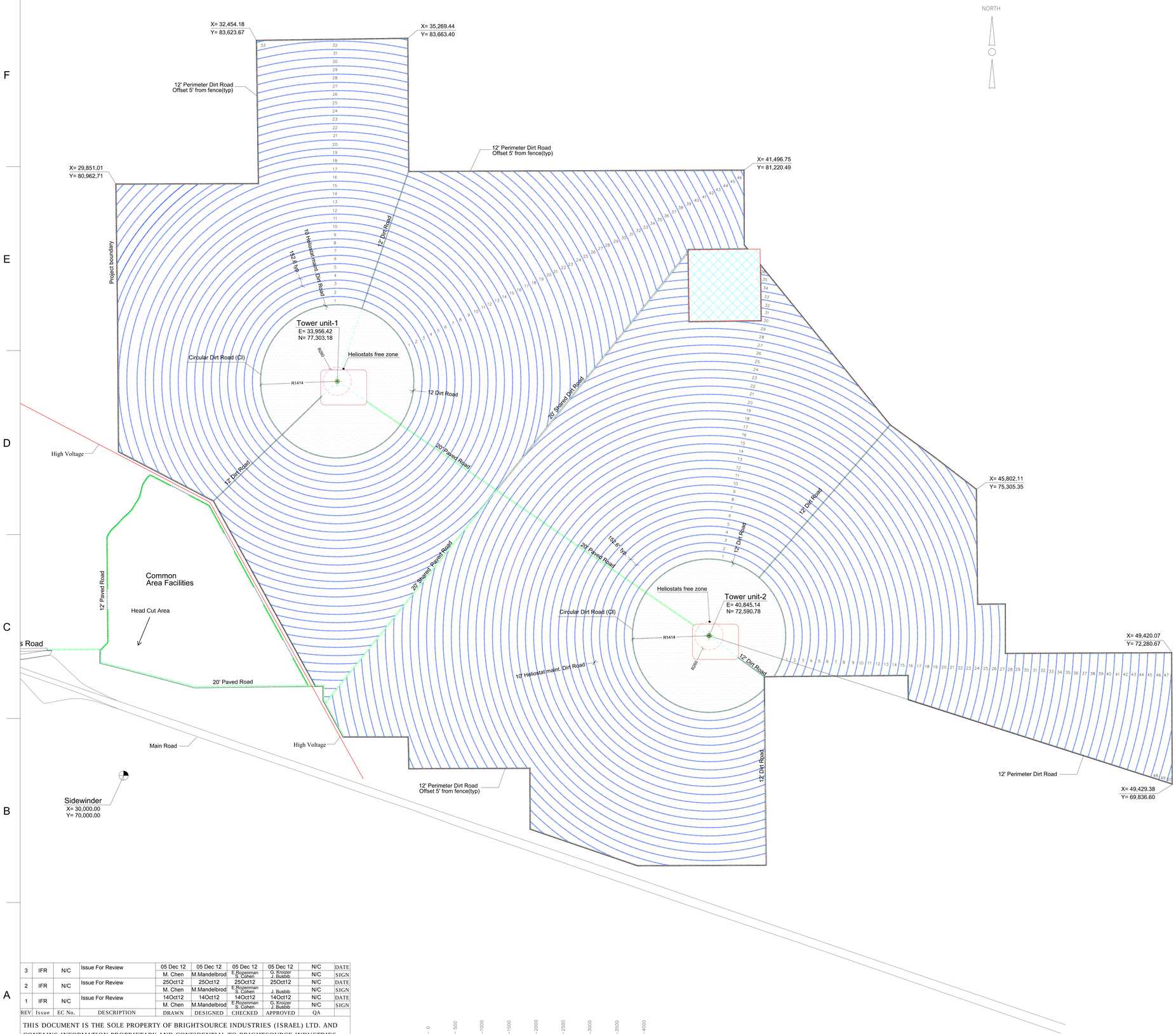
BSE Document Control Number: 7477HYD400



NOTES:

1. **PALEN COORDINATE CONVERSION CONSTANTS**

   SFA = 1.00004560

   SFB = 0.99995440 = 1/**SFA**

Point of Origin (Grid):	**K**	Northing = 2,191,644.389	Easting = 6,869,272.108
Point of Origin (Project):	**M**	Y = 70,000.000	X = 30,000.000
Derived Constant:	**L = K - M**		

   State Plane System → Palen Local System

   To Convert from State Plane Coordinates **S**[1] to Palen Project Coordinates **P**, perform the following computations for each of the Northing and Easting to obtain, respectively, the Y and X coordinates on the local Palen System.

   P = SFA * (**S** – **K**) + **K** – **L**

   Palen Local System → State Plane System

   To reverse the process, simply solve for **S** as a function of the input coordinates **P**:

   S = (**P** – **K** + **L**)/**SFA** + **K**, or

   S = **SFB** * (**P** - **K** + **L**) + **K**

   [1] NAD83 (2007), epoch 2007.0, CCS83, Zone 6, U.S. Survey Feet

2. Number of heliostats per unit: ~ 85,000
3. Tower locations:
   - Unit-1 E= 33,956.42 N= 77,303.18
   - Unit-2 E= 40,845.14 N= 72,590.78
4. Total Solar Field Area: 3,548 acres (approximated)
   Total Common Area Facilities: 243 acres (approximated)
5. The distance between the tower and the farthest point in the solar field :
   - Unit 1 : 8,456'
   - Unit 2 : 8,966'
6. Heliostat pylon density:
   - Near tower: 0.025-0.03 pylons per sq m.
   - 1 km: 0.01-0.018 pylons per sq m.
   - 2 km: 0.002 – 0.005 pylons per sq m.
7. Heliostat maintenance path width is 10 feet.
8. Typical distance between heliostat maintenance paths center-lines is 152.6 feet.
9. No heliostat will be built closer than 260 feet from the tower Center Line.

LEGEND:

Symbol				
Title	Fence	Paved Road	Dirt Road	Drive Zone

REV	Issue	EC No.	DESCRIPTION	DRAWN	DESIGNED	CHECKED	APPROVED	QA	
3	IFR	N/C	Issue For Review	05 Dec 12	05 Dec 12	05 Dec 12	05 Dec 12	N/C	DATE
				M. Chen	M.Mandelbrod	E.Rozenman S. Cohen	G. Kroyzer J. Busbib	N/C	SIGN
2	IFR	N/C	Issue For Review	25Oct12	25Oct12	25Oct12	25Oct12	N/C	DATE
				M. Chen	M.Mandelbrod	E.Rozenman S. Cohen	J. Busbib	N/C	SIGN
1	IFR	N/C	Issue For Review	14Oct12	14Oct12	14Oct12	14Oct12	N/C	DATE
				M. Chen	M.Mandelbrod	E.Rozenman S. Cohen	G. Kroyzer J. Busbib	N/C	SIGN

0 500 1000 1500 2000 2500 3000 3500 4000

GRAPHIC SCALE
(IN FEET)

Baseline Release Approvers	
NAME	DATE
DRAWN: M. Chen	05Dec12
DESIGNED: M.Mandelbrod	05Dec12
CHECKED: E.Rozenman S. Cohen	05Dec12
APPROVED: G. Kroyzer J.Busbib	05Dec12
DOC. CONTROL: M. Giladi	

BrightSource
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Amot Bldg # 6
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TITLE:

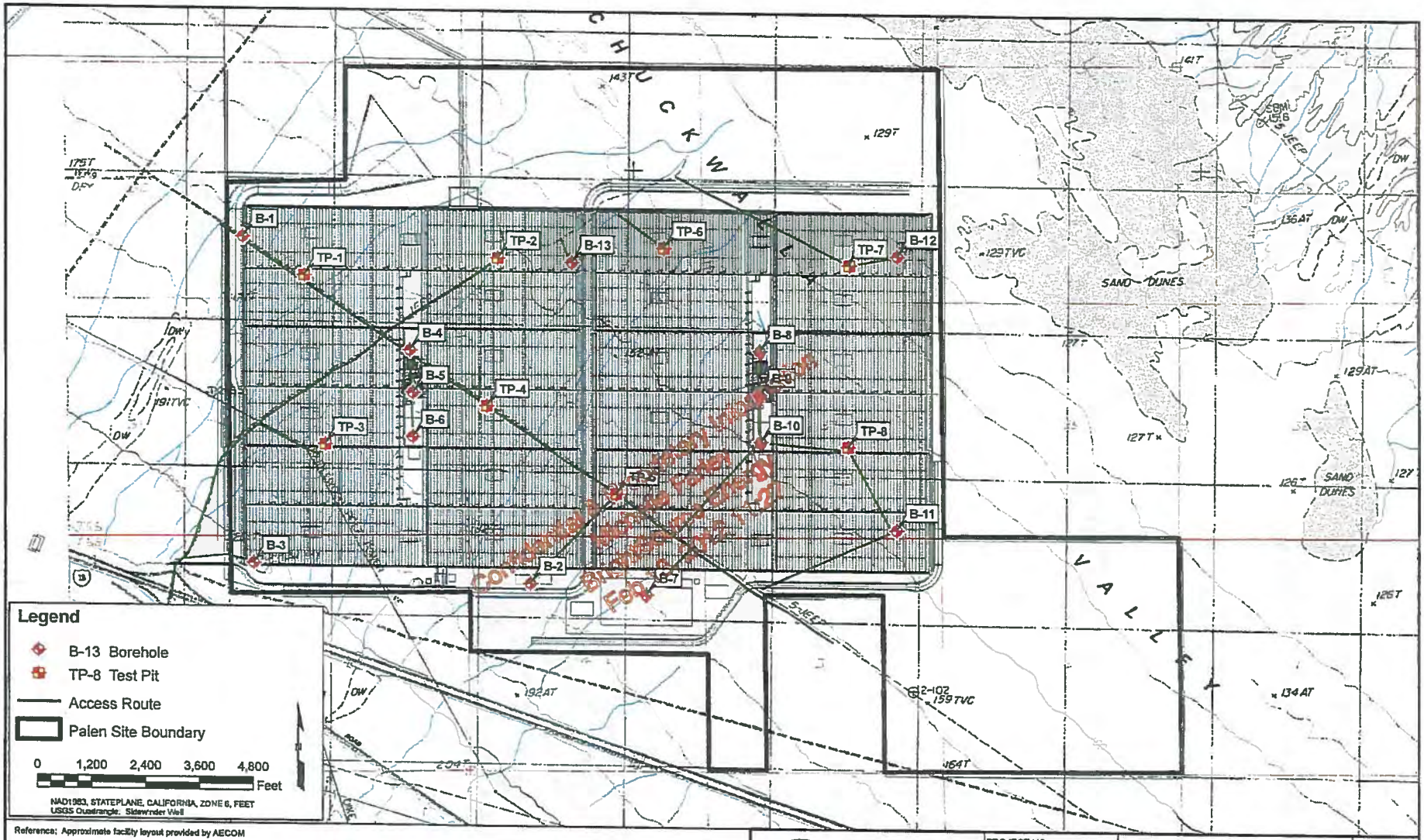
Palen
Solar Field Layout
Drive Zones & Roads

PROJECT NO.	DOCUMENT NO.	REV
60096	60096-SF-C-D-1007	3

SCALE: N.T.S. SIZE: A1 Sh. 1 of 1

FIGURE
HYD300

BSE Document Control Number: 7477HYD400

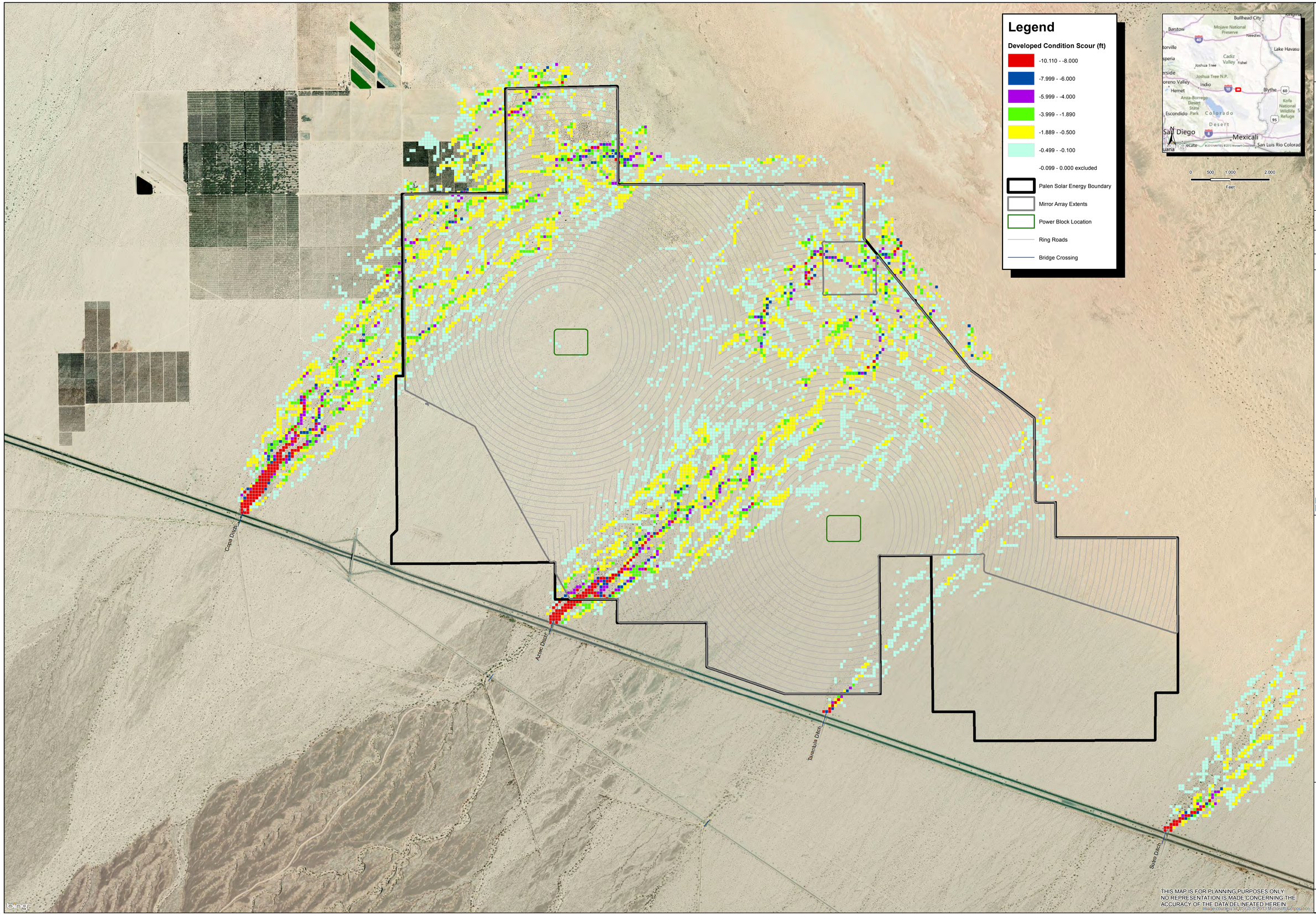


APPENDIX B:

General Scour: FLO-2D Analysis

FLO-2D Soil Parameter Input Summary

Location	B-1	B-2	B-3	B-4	B-5	B-6	B-7	B-7	B-8	B-9	B-10	B-11	B-12	B-13	B-13	TP-1	TP-3	TP-4	TP-8	TP-8	Sand Average Utilized in FLO-2D
Depth	5.00	5.00	0.0-0.5	5.00	5.00	5.00	0.0-0.5	5.00	5.00	5.00	1.00	0.5-5.0	1.50	0.0-0.5	0.5-5.0	3.0-5.0	0.0-0.5	3.0-5.0	1.0-3.0	0.0-0.5	
Soil Type	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand	
Sediment Diameter (mm)																					
D100	9.50	19.05	26.00	19.05	26.00	13.00	19.05	76.00	13.00	9.60	19.05	19.05	27.00	38.10	9.60	76.00	38.10	76.00	38.10	9.53	29.04
D90	2.00	3.00	24.00	1.60	17.00	2.95	3.00	1.80	3.80	0.82	3.60	3.90	15.00	1.70	2.00	1.00	1.70	23.00	1.60	0.40	5.69
D80	1.50	1.60	15.00	0.75	10.00	1.65	1.40	0.95	2.20	0.63	1.50	1.80	8.20	0.72	1.30	0.60	0.92	1.50	0.65	0.23	2.65
D70	1.15	1.15	2.70	0.41	4.80	0.92	0.90	0.59	1.40	0.36	0.67	1.00	4.76	0.45	0.75	0.38	0.71	0.85	0.37	0.17	1.22
D60	0.80	0.80	0.32	0.24	2.70	0.65	0.70	0.38	0.78	0.37	0.35	0.57	2.40	0.30	0.52	0.27	0.56	0.60	0.26	0.15	0.69
D50	0.64	0.60	0.18	0.15	1.65	0.47	0.53	0.27	0.45	0.27	0.23	0.35	1.15	0.23	0.35	0.20	0.26	0.43	0.20	0.13	0.44
D40	0.50	0.44	0.20	0.09	0.85	0.35	0.37	0.18	0.30	0.19	0.15	0.25	0.53	0.17	0.25	0.17	0.21	0.28	0.17	0.10	0.29
D30	0.40	0.27	0.07	0.04	0.48	0.25	0.23	0.13	0.18	0.13	0.08	0.17	0.27	0.13	0.17	0.13	0.18	0.19	0.14	0.09	0.19
D20	0.27	0.17	0.00	0.01	0.30	0.14	0.12	0.07	0.08	0.08	0.00	0.08	0.15	0.08	0.08	0.07	0.15	0.13	0.10	0.07	0.11
D10	0.150	0.060	0.000	0.000	0.180	0.000	0.054	0.003	0.000	0.003	0.000	0.000	0.000	0.052	0.000	0.014	0.056	0.037	0.063	0.047	0.04



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FLO-2D SCOUR MAP (DEVELOPED CONDITION)
24-HOUR 100-YEAR
ZELLER FULLERTON METHOD

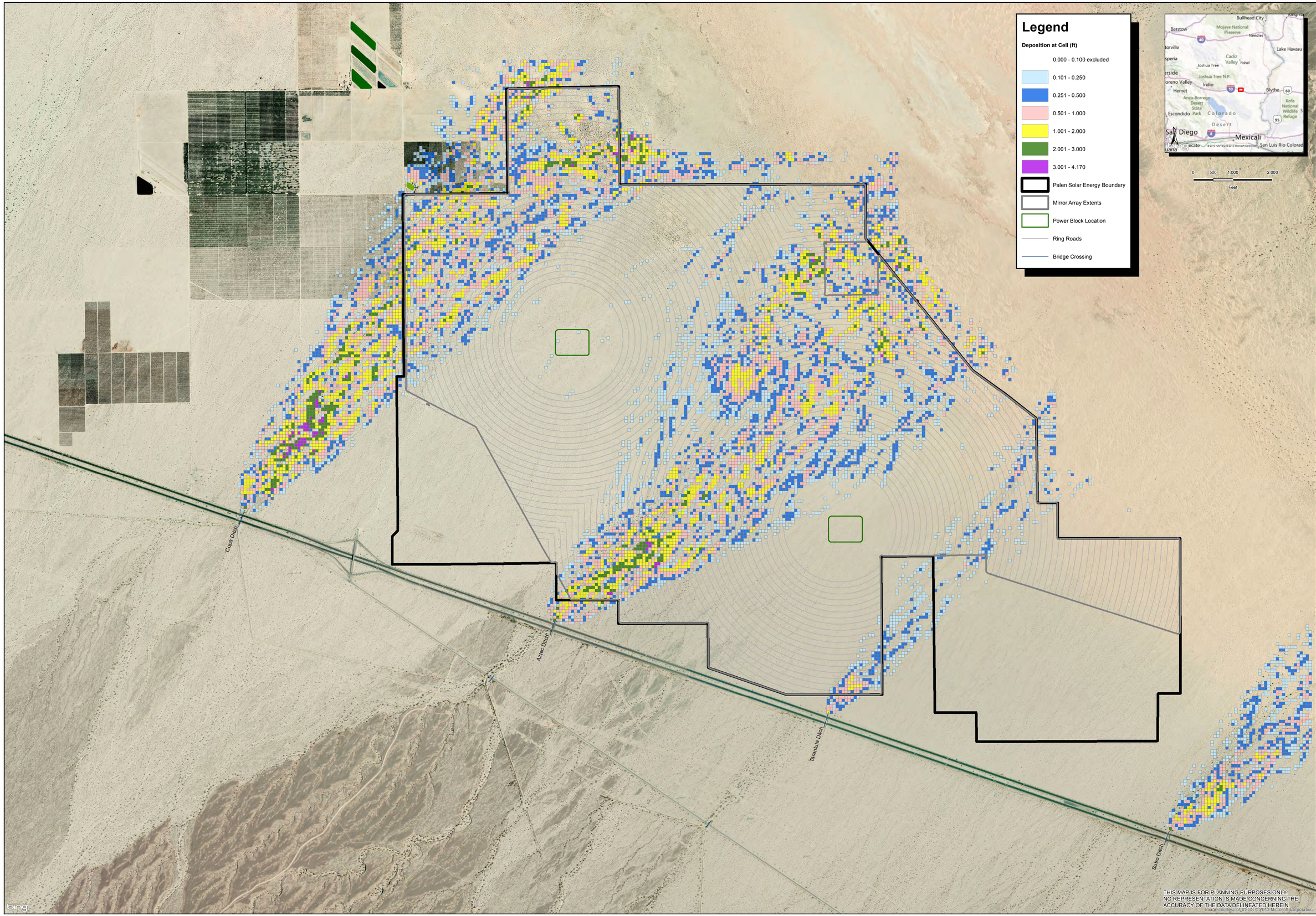
PALEN SEGS

PROJECT NO.	DRAWN BY:	DATE	SCALE:
7477	SDB	02/11/2013	1 " = 1,000 '

FIGURE
HYD401

Date 3/12/2013 Path: J:\7477 - Palen\GIS\mxd\Developed\7477_dev_scour.mxd

BSE Document Control Number: 7477HYD400



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FLO-2D DEPOSITION MAP (DEVELOPED CONDITION) 24-HOUR 100-YEAR ZELLER FULLERTON METHOD

PALEN SEGS

PROJECT NO:	DRAWN BY:	DATE	SCALE:
7477	SDB	2/11/2013	1 " = 1,000 '

FIGURE
HYD402

Date: 3/12/2013 Path: J:\7477 - PalenSB\mxd\Developed\7477_dev_deposition.mxd

APPENDIX C:

Local Scour: FHWA Equation Calculations

Pylon Local Scour Calculations

DEVELOPMENT: Palen SEGS

CALCULATED BY: SDB

Equation :

$$\frac{y_s}{a} = 2.0 K_1 K_2 K_3 K_4 \left(\frac{y}{a}\right)^{0.35} Fr^{0.43}$$

Flow depth directly upstream of pier, ft.	y =	3.27
Correction factor for pier nose shape	K_1 =	1.00
Correction factor for angle of attack of flow	K_2 =	1.00
Correction factor for bed condition from Table 6.3	K_3 =	1.10
Correction factor for armoring by bed material size from Equation 6.5	K_4 =	1.00
pier width, ft.	a =	0.67
Mean velocity of flow directly upstream of the pier, ft/s	V_1 =	6.46
acceleration of gravity, ft/s^2	g =	32.20
Froude number directly upstream of the pier	Fr =	0.63
Calculated Scour depth, ft.	y_s =	2.10

Maximum scour depth for round nose piers:

If Fr < 0.80, y_s = 2.4 x a (pier width)	y_s =	1.61	
If Fr > 0.80, y_s = 3.0 x a (pier width)	**y_s =**	**N/A**	**ft.**

Notes:

1. Y_s equation (Eq. 6.3) referenced from Federal Highway Administration (FHWA, 2001).
2. Worst case flow depth (y) and velocity (V_1) referenced from onsite Q100, 24-Hour HEC-RAS Analysis.
   worst case depth (y) from Reach Western 1, XS = 20+25.13
   worst case velocity (V1) from Reach Central 1, XS = 15+09.67
3. Froude number computated from flow depth and velocitiy, Fr = $V_1/[(g \times y)^{0.5}]$

U.S. Department
of Transportation
Federal Highway Administration

Publication No. FHWA NHI 01-001
May 2001

Hydraulic Engineering Circular No. 18

Evaluating Scour At Bridges
Fourth Edition

REFERENCE MATERIAL

NATIONAL HIGHWAY INSTITUTE
Training Solutions for Transportation Excellence

BSE Document Control Number: 7477HYD400

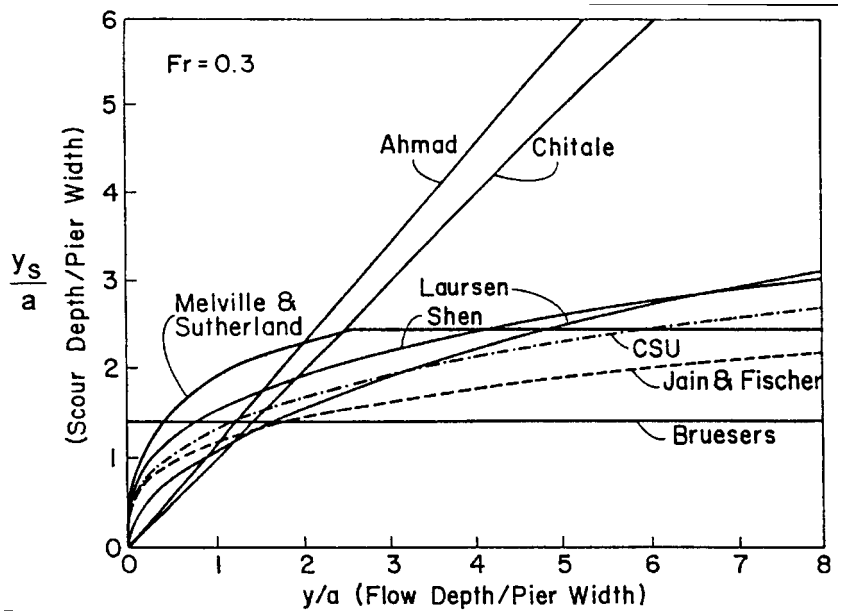

Figure 6.1. Comparison of scour equations for variable depth ratios (y/a) (after Jones).[46]

Mueller[49] compared 22 scour equations using field data collected by the USGS[50]. He concluded that the HEC-18 equation was good for design because it rarely under predicted measured scour depth. However, it frequently over-predicted the observed scour. The data contained 384 field measurements of scour at 56 bridges (Figure 6.2).

From laboratory data, Melville and Sutherland reported 2.4 as an upper limit for the depth of scour to pier width ratio (y_s/a) for cylindrical piers.[28] In these studies, the Froude Number was less than 1.0. Chang[51] also, noted that in all the data he studied, there were no values of the ratio of scour depth to pier width (y_s/a) larger than 2.3. However, values of y_s/a around 3.0 were obtained by Jain and Fischer for chute-and-pool flows with Froude Numbers as high as 1.5.[47] The largest value of y_s/a for antidune flow was 2.5 with a Froude Number of 1.2. These upper limits were derived for circular piers and were uncorrected for pier shape or for skew. Also, pressure flow, ice or debris can increase the ratio.

From the above discussion, the ratio of y_s/a can be as large as 3 at large Froude Numbers. Therefore, it is recommended that the maximum value of the ratio be taken as 2.4 for Froude Numbers less than or equal to 0.8 and 3.0 for larger Froude Numbers. These limiting ratio values apply only to round nose piers which are aligned with the flow.

6.2 LOCAL PIER SCOUR EQUATION

To determine pier scour, an equation based on the CSU equation is recommended for both live-bed and clear-water pier scour.[22] The equation predicts maximum pier scour depths. The equation is:

$$\frac{y_s}{y_1} = 2.0\, K_1\, K_2\, K_3\, K_4 \left(\frac{a}{y_1}\right)^{0.65} Fr_1^{0.43} \qquad (6.1)$$

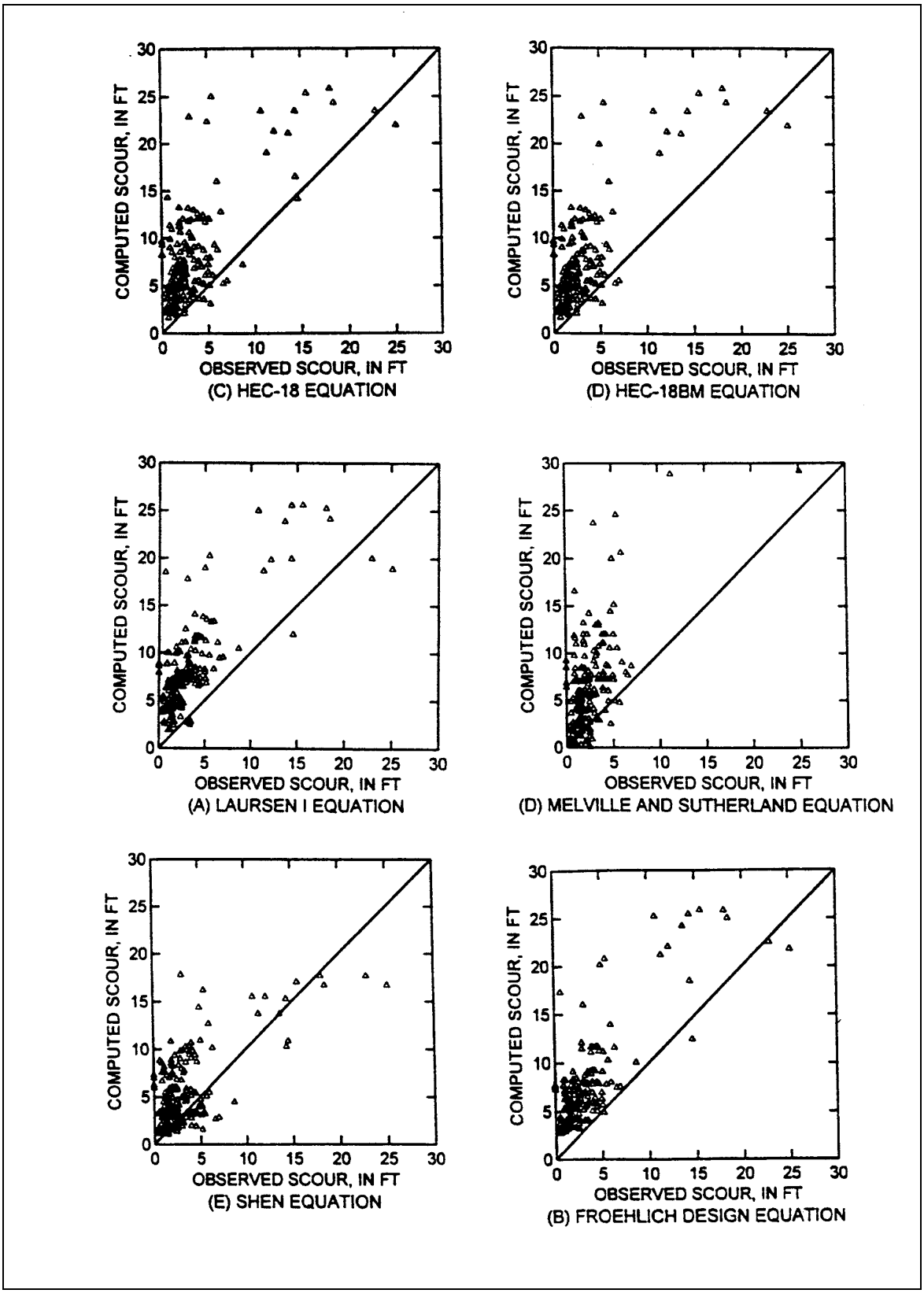

Figure 6.2. Comparison of scour equations with field scour measurements (after Mueller).[49]

As a Rule of Thumb, the maximum scour depth for round nose piers aligned with the flow is:

$y_s \leq$ 2.4 times the pier width (a) for Fr $\leq$ 0.8 (6.2)
$y_s \leq$ 3.0 times the pier width (a) for Fr > 0.8

In terms of y_s/a, Equation 6.1 is:

$$\frac{y_s}{a} = 2.0\, K_1\, K_2\, K_3\, K_4 \left(\frac{y_1}{a}\right)^{0.35} Fr_1^{0.43} \qquad (6.3)$$

Referenced Equation

where:

y_s = Scour depth, m (ft)
y_1 = Flow depth directly upstream of the pier, m (ft)
K_1 = Correction factor for pier nose shape from Figure 6.3 and Table 6.1
K_2 = Correction factor for angle of attack of flow from Table 6.2 or Equation 6.4
K_3 = Correction factor for bed condition from Table 6.3
K_4 = Correction factor for armoring by bed material size from Equation 6.5
a = Pier width, m (ft)
L = Length of pier, m (ft)
Fr_1 = Froude Number directly upstream of the pier = $V_1/(gy_1)^{1/2}$
V_1 = Mean velocity of flow directly upstream of the pier, m/s (ft/s)
g = Acceleration of gravity (9.81 m/s^2) (32.2 ft/s^2)

The correction factor, K_2, for angle of attack of the flow, θ, is calculated using the following equation:

$$K_2 = (\text{Cos}\ \theta + L/a\ \text{Sin}\ \theta)^{0.65} \qquad (6.4)$$

If L/a is larger than 12, use L/a = 12 as a maximum in Equation 6.4 and Table 6.2. Table 6.2 illustrates the magnitude of the effect of the angle of attack on local pier scour.

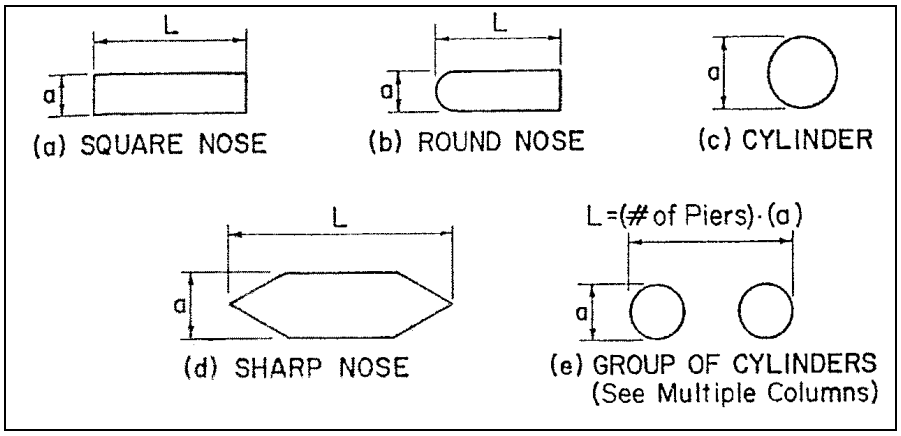

Figure 6.3. Common pier shapes.

Table 6.1. Correction Factor, K_1, for Pier Nose Shape.	
Shape of Pier Nose	K_1
(a) Square nose	1.1
(b) Round nose	1.0
(c) Circular cylinder	1.0
(d) Group of cylinders	1.0
(e) Sharp nose	0.9

Table 6.2. Correction Factor, K_2, for Angle of Attack, θ, of the Flow.			
Angle	L/a=4	L/a=8	L/a=12
0	1.0	1.0	1.0
15	1.5	2.0	2.5
30	2.0	2.75	3.5
45	2.3	3.3	4.3
90	2.5	3.9	5.0
Angle = skew angle of flow L = length of pier, m			

Table 6.3. Increase in Equilibrium Pier Scour Depths, K_3, for Bed Condition.		
Bed Condition	Dune Height m	K_3
Clear-Water Scour	N/A	1.1
Plane bed and Antidune flow	N/A	1.1
Small Dunes	$3 > H \geq 0.6$	1.1
Medium Dunes	$9 > H \geq 3$	1.2 to 1.1
Large Dunes	$H \geq 9$	1.3

Notes:

1. The correction factor K_1 for pier nose shape should be det ermined using Table 6.1 for angles of attack up to 5 degrees. **For greater angles, K_2 dominates and K_1 should be considered as 1.0**. If L/a is larger than 12, use the values for L/a = 12 as a maximum in Table 6.2 and Equation 6.4.

2. The values of the correction factor K_2 should be applied only when the field conditions are such that the entire length of the pier is subjected to the angle of attack of the flow. Use of this factor will result in a significant over-prediction of scour if (1) a portion of the pier is shielded from the direct impingement of the flow by an abutment or another pier; or (2) an abutment or another pier redirects the flow in a direction parallel to the pier. For such cases, judgment must be exercised to reduce the value of the K_2 factor by selecting the effective length of the pier actually subjected to the angle of attack of the flow. **Equation 6.4 should be used for evaluation and design**. Table 6.2 is intended to illustrate the importance of angle of attack in pier scour computations and to establish a cutoff point for K_2 (i.e., a maximum value of 5.0).

3. The correction factor K_3 results from the fact that for plane-bed conditions, which is typical of most bridge sites for the flood frequencies employed in scour design, the maximum scour may be 10 per cent greater than computed with Equation 6.1. In the **unusual** situation where a dune bed conf iguration **with large dunes** exists at a site during flood flow, the maximum pier scour may be 30 per cent greater than the predicted equation value. This may occur on very large rivers, such as the Mississippi. For smaller streams that have a dune bed conf iguration at flood flow, the dunes will be smaller and the maximum scour may be only 10 to 20 percent larger than equilibrium scour. For antidune bed conf iguration the maximum scour depth may be 10 percent greater than the computed equilibrium pier scour depth.

4. Piers set close to abutments (for example at the toe of a spill through abutment) must be carefully evaluated for the angle of attack and velocity of the flow coming around the abutment.

The correction factor K_4 decreases scour depths for armoring of the scour hole for bed materials that have a D_{50} equal to or larger than 2.0 mm and D_{95} equal to or larger than 20 mm. The correction factor results from recent research by Molinas and Mueller. Molinas's research for FHWA showed that when the approach velocity (V_1) is less than the critical velocity (V_{c90}) of the D_{90} size of the bed material and there is a gradation in sizes in the bed material, the D_{90} will limit the scour depth.[30, 52] Mueller and Jones [53] developed a K_4 correction coefficient from a study of 384 field measurements of scour at 56 bridges. The equation developed by Jones[54] given in HEC-18 Third Edition should be replaced with the following:

- If $D_{50} < 2$ mm or $D_{95} < 20$ mm, then $K_4 = 1$
- If $D_{50} \geq 2$ mm and $D_{95} \geq 20$ mm

then:

$$K_4 = 0.4\,(V_R)^{0.15} \tag{6.5}$$

where:

$$V_R = \frac{V_1 - V_{icD_{50}}}{V_{cD_{50}} - V_{icD_{95}}} > 0 \tag{6.6}$$

and:

V_{icDx} = approach velocity (m/s or ft/sec) required to initiate scour at the pier for the grain size D_x (m or ft)

$$V_{icD_x} = 0.645 \left(\frac{D_x}{a}\right)^{0.053} V_{cD_x} \tag{6.7}$$

V_{cDx} = critical velocity (m/s or ft/s) for incipient motion for the grain size D_x (m or ft)

$$V_{cD_x} = K_u\, y_1^{1/6}\, D_x^{1/3} \tag{6.8}$$

where:

y_1 = Depth of flow just upstream of the pier, excluding local scour, m (ft)
V_1 = Velocity of the approach flow just upstream of the pier, m/s (ft/s)
D_x = Grain size for which x percent of the bed material is finer, m (ft)
K_u = 6.19 SI Units
K_u = 11.17 English Units

While K_4 provides a good fit with the field data the velocity ratio terms are so formed that if D_{50} is held constant and D_{95} increases, the value of K_4 increases rather than decreases.[53] For field data an increase in D_{95} was always accompanied with an increase in D_{50}. **The minimum value of K_4 is 0.4**.

APPENDIX D:

Sediment Transport: FLO-2D Analysis Output Files

i. 24-hour, Existing Condition 100-Year SUMMARY

NEGATIVE VOLUME CONSERVATION (ACRE FEET)
INDICATES EXCESS VOLUME (OUTFLOW + STORAGE > INFLOW)

SIMULATION TIME (HOURS)	AVERAGE TIMESTEP (SECONDS)	VOLUME CONSERVATION (ACRE FEET)	PERCENT OF INFLOW
	SUMMARY.OUT FILE CREATED WITH VERSION: 2009.06 BUILD NO. 09-12.06.09		
0.250	18.028	0.000000	0.000001
0.500	30.000	0.000000	0.000002
0.750	30.000	0.000000	0.000001
1.000	30.000	0.000000	0.000002
1.250	30.000	0.000000	0.000001
1.500	30.000	0.000000	0.000001
1.750	30.000	0.000000	0.000002
2.000	30.000	-0.000001	0.000004
2.250	30.000	0.000000	0.000001
2.500	30.000	0.000000	0.000002
2.750	30.000	0.000000	0.000001
3.000	30.000	0.000000	0.000001
3.250	30.000	0.000000	0.000001
3.500	30.000	0.000000	0.000000
3.750	30.000	-0.000001	0.000001
4.000	30.000	0.000000	0.000000
4.250	30.000	0.000004	0.000005
4.500	30.000	0.000000	0.000000
4.750	20.904	0.000002	0.000002
5.001	7.650	-0.000003	0.000003
5.251	5.432	-0.000002	0.000002
5.500	4.570	-0.000005	0.000004
5.751	4.081	0.000006	0.000004
6.000	3.992	-0.000001	0.000001
6.251	3.991	0.000008	0.000004
6.500	3.992	0.000003	0.000001
6.750	3.934	-0.000002	0.000001
7.000	3.538	0.000002	0.000001
7.250	3.349	0.000004	0.000001
7.500	3.038	-0.000002	0.000001
7.750	2.833	0.000001	0.000000
8.001	2.197	-0.000002	0.000000
8.250	2.165	0.000012	0.000002
8.500	2.165	-0.000005	0.000001
8.750	2.165	-0.000031	0.000004
9.000	2.155	-0.000005	0.000001
9.250	2.001	-0.000020	0.000002
9.500	1.915	0.000021	0.000002
9.750	1.827	0.000019	0.000001
10.000	1.827	-0.000010	0.000001
10.250	1.828	-0.000063	0.000004
10.500	1.792	-0.000035	0.000002
10.750	1.722	-0.000094	0.000004
11.000	1.682	0.000038	0.000002
11.250	1.708	0.000062	0.000002
11.500	1.721	-0.000009	0.000000
11.750	1.655	-0.000061	0.000002
12.000	1.575	0.000126	0.000004
12.250	1.651	0.000169	0.000004
12.500	1.721	0.000089	0.000002
12.750	1.695	0.000197	0.000004
13.000	1.589	0.000065	0.000001
13.250	1.575	-0.000241	0.000004
13.500	1.606	-0.000009	0.000000
13.750	1.662	0.000233	0.000004
14.000	1.575	0.000316	0.000005
14.250	1.575	-0.000051	0.000001
14.500	1.575	0.000098	0.000001
14.750	1.575	-0.000026	0.000000
15.000	1.575	-0.000135	0.000002
15.250	1.575	-0.000435	0.000005
15.500	1.575	0.000449	0.000005
15.750	1.575	-0.000655	0.000007
16.000	1.575	0.000415	0.000004
16.250	1.575	0.000572	0.000005
16.500	1.580	0.000447	0.000004
16.750	1.588	0.000075	0.000001
17.000	1.575	-0.000760	0.000007
17.250	1.575	-0.000079	0.000001
17.500	1.591	-0.000160	0.000001
17.750	1.702	-0.000248	0.000002
18.000	1.732	0.000176	0.000001
18.250	1.818	-0.000242	0.000002
18.500	1.828	0.000016	0.000000
18.750	1.827	-0.000442	0.000003
19.000	1.827	0.000262	0.000002
19.250	1.853	-0.000432	0.000003
19.500	1.949	0.001022	0.000008
19.750	2.016	0.000342	0.000003
20.000	2.154	-0.000336	0.000003
20.250	2.165	-0.000287	0.000002
20.500	2.165	-0.000563	0.000004
20.751	2.165	-0.000170	0.000001
21.000	2.165	-0.000039	0.000000
21.250	2.165	0.000487	0.000004
21.500	2.165	-0.000626	0.000005
21.750	2.165	-0.000632	0.000005
22.000	2.165	0.000011	0.000000
22.250	2.165	-0.000760	0.000005
22.501	2.165	-0.000113	0.000001
22.750	2.165	0.000024	0.000000
23.000	2.165	-0.000117	0.000001
23.250	2.165	-0.000179	0.000001
23.500	2.165	-0.000865	0.000006
23.750	2.165	0.001200	0.000008
24.000	2.165	0.000613	0.000004
24.251	2.165	0.000459	0.000003
24.500	2.165	0.001195	0.000008
24.750	2.165	0.000540	0.000004
25.001	2.165	-0.000323	0.000002
25.250	2.165	0.000090	0.000001
25.500	2.165	-0.000379	0.000003
25.750	2.165	0.000118	0.000001

26.000	2.165	-0.000632	0.000004
26.250	2.165	0.000512	0.000004
26.500	2.165	-0.000373	0.000003
26.751	2.165	-0.000198	0.000001
27.000	2.165	-0.000112	0.000001
27.250	2.165	0.000389	0.000003
27.500	2.165	0.000964	0.000007
27.750	2.165	-0.000331	0.000002
28.000	2.581	0.000530	0.000004
28.250	2.828	0.000288	0.000002
28.501	2.828	0.000250	0.000002
28.750	2.828	-0.000558	0.000004
29.000	2.828	0.001066	0.000007
29.251	2.828	0.000445	0.000003
29.500	2.828	0.000990	0.000007
29.750	2.828	0.001057	0.000007
30.000	2.828	0.000733	0.000005
30.251	2.828	0.000444	0.000003
30.500	2.828	-0.000050	0.000000
30.750	2.828	-0.000249	0.000002
31.001	2.828	-0.001015	0.000007
31.251	3.001	0.000181	0.000001
31.501	3.038	-0.000154	0.000001
31.750	3.038	-0.000479	0.000003
32.000	3.038	0.001047	0.000007
32.251	3.037	0.000336	0.000002
32.500	3.038	0.000378	0.000003
32.750	3.038	-0.000744	0.000005
33.000	3.135	0.000386	0.000003
33.250	3.288	0.000024	0.000000
33.501	3.325	0.000080	0.000001
33.750	3.459	-0.000171	0.000001
34.000	3.526	-0.000978	0.000007
34.251	3.525	-0.000325	0.000002
34.500	3.565	0.000515	0.000003
34.750	3.641	-0.000533	0.000004
35.000	3.704	-0.000344	0.000002
35.251	3.715	0.000782	0.000005
35.501	3.715	-0.000169	0.000001
35.750	3.712	-0.000315	0.000002
36.001	3.712	-0.000470	0.000003

MASS BALANCE INFLOW - OUTFLOW VOLUME

*** INFLOW (ACRE-FEET) ***

TOTAL POINT RAINFALL: 4.2000 INCHES

	WATER
RAINFALL VOLUME	1934.58
INFLOW HYDROGRAPH	12806.73
INFLOW HYDROGRAPHS + RAINFALL	14741.31

*** OUTFLOW (ACRE-FT) ***

OVERLAND INFILTRATED AND INTERCEPTED WATER 1.08 INCHES

OVERLAND FLOW	WATER
WATER LOST TO INFILTRATION & INTERCEPTION	1171.56
FLOODPLAIN STORAGE	807.12
FLOODPLAIN OUTFLOW HYDROGRAPH	12762.63
FLOODPLAIN OUTFLOW, INFILTRATION & STORAGE	14741.31

*** TOTALS ***

TOTAL OUTFLOW FROM GRID SYSTEM 12762.63

TOTAL VOLUME OF OUTFLOW AND STORAGE 14741.31

SURFACE AREA OF INUNDATION REGARDLESS OF THE TIME OF OCCURRENCE:
(FOR FLOW DEPTHS GREATER THAN THE "TOL" VALUE TYPICALLY 0.1 FT OR 0.03 M)

THE MAXIMUM INUNDATED AREA IS: 6746.46 ACRES

SEDIMENT TRANSPORT VOLUME CONSERVATION ERROR: 0.00 CU. FT. 0.000000 PERCENT OF BED VOLUME

COMPUTER RUN TIME IS : 30.93555 HRS

THIS OUTPUT FILE WAS TERMINATED ON: 3/ 9/2013 AT: 22:40:35

ii. 24-hour, Developed Condition 100-Year SUMMARY

NEGATIVE VOLUME CONSERVATION (ACRE FEET)
INDICATES EXCESS VOLUME (OUTFLOW + STORAGE > INFLOW)

SUMMARY.OUT FILE
CREATED WITH VERSION: 2009.06 BUILD NO. 09-12.02.08

SIMULATION TIME (HOURS)	AVERAGE TIMESTEP (SECONDS)	VOLUME CONSERVATION (ACRE FEET)	PERCENT OF INFLOW
0.250	18.028	0.000000	0.000000
0.500	30.000	0.000000	0.000002
0.750	30.000	0.000000	0.000002
1.000	30.000	0.000000	0.000003
1.250	30.000	0.000000	0.000002
1.500	30.000	0.000000	0.000003
1.750	30.000	0.000000	0.000002
2.000	30.000	0.000001	0.000004
2.250	30.000	0.000001	0.000003
2.500	30.000	0.000001	0.000004
2.750	30.000	-0.000001	0.000004
3.000	30.000	0.000001	0.000003
3.250	30.000	0.000001	0.000002
3.500	30.000	0.000000	0.000001
3.750	30.000	0.000000	0.000001
4.000	30.000	-0.000001	0.000002
4.250	30.000	0.000003	0.000005
4.500	30.000	-0.000002	0.000003
4.750	20.904	-0.000003	0.000003
5.001	7.650	0.000002	0.000002
5.251	5.432	0.000001	0.000000
5.500	4.570	-0.000009	0.000006
5.751	4.081	-0.000007	0.000004
6.000	3.992	0.000003	0.000002
6.251	3.991	0.000005	0.000002
6.500	3.992	-0.000004	0.000002
6.750	3.934	-0.000009	0.000003
7.000	3.538	-0.000001	0.000000
7.250	3.349	0.000004	0.000001
7.500	3.038	0.000008	0.000002
7.750	2.833	-0.000020	0.000004
8.001	2.197	-0.000012	0.000002
8.250	2.165	0.000015	0.000002
8.500	2.165	-0.000015	0.000002
8.750	2.165	-0.000024	0.000003
9.000	2.150	-0.000029	0.000003
9.250	2.014	-0.000010	0.000001
9.500	1.972	-0.000040	0.000003
9.750	1.875	0.000006	0.000000
10.000	1.828	-0.000059	0.000004
10.250	1.827	0.000028	0.000002
10.500	1.796	-0.000033	0.000002
10.750	1.721	0.000032	0.000001
11.000	1.684	0.000013	0.000001
11.250	1.711	-0.000064	0.000002
11.500	1.722	0.000203	0.000007
11.750	1.660	0.000133	0.000004
12.000	1.575	0.000079	0.000002
12.250	1.617	0.000040	0.000001
12.500	1.680	0.000268	0.000006
12.750	1.668	0.000217	0.000005
13.000	1.592	0.000218	0.000004
13.250	1.575	-0.000186	0.000003
13.500	1.638	0.000166	0.000003
13.750	1.664	-0.000274	0.000004
14.000	1.589	0.000026	0.000000
14.250	1.575	-0.000117	0.000002
14.500	1.575	0.000016	0.000000
14.750	1.575	-0.000201	0.000003
15.000	1.575	0.000035	0.000000
15.250	1.575	0.000125	0.000001
15.500	1.575	-0.000333	0.000004
15.750	1.575	0.000652	0.000007
16.000	1.575	-0.000197	0.000002
16.250	1.575	-0.000456	0.000004
16.500	1.575	-0.000294	0.000003
16.750	1.575	0.000214	0.000002
17.000	1.575	-0.000229	0.000002
17.250	1.575	-0.000028	0.000000
17.500	1.575	-0.000146	0.000001
17.750	1.575	-0.000380	0.000003
18.000	1.575	0.000709	0.000006
18.250	1.664	0.000310	0.000002
18.500	1.746	0.000104	0.000001
18.750	1.827	-0.000572	0.000004
19.000	1.828	-0.000621	0.000005
19.250	1.827	0.000294	0.000002
19.500	1.835	0.000030	0.000000
19.750	1.919	0.000706	0.000005
20.000	1.988	0.000498	0.000004
20.250	2.009	-0.001091	0.000008
20.500	2.114	-0.000141	0.000001
20.750	2.165	-0.000563	0.000004
21.000	2.165	0.000658	0.000005
21.250	2.165	0.000128	0.000001
21.500	2.165	-0.000064	0.000000
21.751	2.165	0.000034	0.000000
22.000	2.165	-0.000300	0.000002
22.250	2.165	0.000196	0.000001
22.500	2.165	0.000226	0.000002
22.750	2.165	0.000270	0.000002
23.000	2.165	-0.000086	0.000001
23.250	2.165	0.000251	0.000002
23.501	2.165	0.000837	0.000006
23.750	2.165	-0.000699	0.000005
24.000	2.165	0.000195	0.000001
24.250	2.165	0.000018	0.000000
24.500	2.165	0.000887	0.000006
24.750	2.165	0.000582	0.000004
25.000	2.165	-0.000498	0.000003
25.250	2.165	0.000324	0.000002
25.500	2.165	-0.000310	0.000002
25.750	2.165	0.000581	0.000004

26.001	2.165	-0.000876	0.000006
26.250	2.165	0.000823	0.000006
26.500	2.165	-0.000921	0.000006
26.750	2.165	-0.000560	0.000004
27.000	2.165	0.000974	0.000007
27.250	2.165	0.001014	0.000007
27.500	2.212	-0.000251	0.000002
27.750	2.828	-0.000208	0.000001
28.001	2.828	-0.000548	0.000004
28.250	2.828	-0.001188	0.000008
28.500	2.828	-0.000763	0.000005
28.751	2.828	-0.000084	0.000001
29.001	2.828	-0.000448	0.000003
29.250	2.828	0.001469	0.000010
29.500	2.828	0.000320	0.000002
29.751	2.828	0.000457	0.000003
30.000	2.828	0.000244	0.000002
30.250	2.948	-0.000611	0.000004
30.501	3.038	0.000432	0.000003
30.751	3.038	0.000063	0.000000
31.000	3.038	0.000723	0.000005
31.250	3.038	0.000555	0.000004
31.501	3.037	-0.000969	0.000007
31.750	3.038	-0.000518	0.000004
32.000	3.058	-0.001041	0.000007
32.251	3.244	-0.000590	0.000004
32.500	3.290	0.000560	0.000004
32.750	3.370	0.000535	0.000004
33.000	3.515	0.000589	0.000004
33.251	3.525	-0.000058	0.000000
33.500	3.569	0.000063	0.000000
33.750	3.699	-0.000112	0.000001
34.000	3.784	0.000387	0.000003
34.251	3.937	0.000956	0.000006
34.500	3.992	-0.000737	0.000005
34.751	3.994	-0.000889	0.000006
35.000	3.992	0.000534	0.000004
35.251	3.991	-0.000601	0.000004
35.500	4.009	-0.000552	0.000004
35.751	4.199	0.000185	0.000001
36.000	4.272	-0.000138	0.000001

MASS BALANCE INFLOW - OUTFLOW VOLUME

*** INFLOW (ACRE-FEET) ***

TOTAL POINT RAINFALL: 4.2000 INCHES

	WATER
RAINFALL VOLUME	1934.81
INFLOW HYDROGRAPH	12806.74
INFLOW HYDROGRAPHS + RAINFALL	14741.54

*** OUTFLOW (ACRE-FT) ***

OVERLAND INFILTRATED AND INTERCEPTED WATER 0.84 INCHES

OVERLAND FLOW	WATER
WATER LOST TO INFILTRATION & INTERCEPTION	903.63
FLOODPLAIN STORAGE	812.69
FLOODPLAIN OUTFLOW HYDROGRAPH	13025.22
FLOODPLAIN OUTFLOW, INFILTRATION & STORAGE	14741.54

*** TOTALS ***

TOTAL OUTFLOW FROM GRID SYSTEM 13025.22

TOTAL VOLUME OF OUTFLOW AND STORAGE 14741.54

SURFACE AREA OF INUNDATION REGARDLESS OF THE TIME OF OCCURRENCE:
(FOR FLOW DEPTHS GREATER THAN THE "TOL" VALUE TYPICALLY 0.1 FT OR 0.03 M)

THE MAXIMUM INUNDATED AREA IS: 6799.98 ACRES

SEDIMENT TRANSPORT VOLUME CONSERVATION ERROR: 0.00 CU. FT. 0.000000 PERCENT OF BED VOLUME

COMPUTER RUN TIME IS : 33.39124 HRS

THIS OUTPUT FILE WAS TERMINATED ON: 2/10/2013 AT: 2:34:46

SEDCONSERV.OUT
SEDIMENT VOLUME CONSERVATION (CUBIC FT OR M)
NEGATIVE VOLUME INDICATES THAT OUTFLOW + STORAGE EXCEEDS INFLOW

SIMULATION TIME (HRS)	INFLOW	FLOODPLAIN STORAGE	CHANNEL STORAGE	STREET STORAGE	OUTFLOW	CONSERVATION TOTAL	CONSERVATION PERCENT
0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
1.25	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
1.75	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
2.25	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
2.75	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
3.25	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
3.75	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
4.25	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
4.75	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
5.25	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
5.50	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
5.75	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
6.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
6.25	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
6.50	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
6.75	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
7.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
7.25	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
7.50	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
7.75	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
8.25	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
8.50	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
8.75	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
9.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
9.25	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
9.50	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
9.75	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
10.25	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
10.50	0.00	-348.22	0.00	0.00	348.22	0.00	0.000000
10.75	0.00	-1359.26	0.00	0.00	1359.26	0.00	0.000000
11.00	0.00	-3057.17	0.00	0.00	3057.17	0.00	0.000000
11.25	0.00	-7633.49	0.00	0.00	7633.49	0.00	0.000000
11.50	0.00	-24357.03	0.00	0.00	24357.03	0.00	0.000000
11.75	0.00	-56977.23	0.00	0.00	56977.23	0.00	0.000000
12.00	0.00	-104501.54	0.00	0.00	104501.54	0.00	0.000000
12.25	0.00	-167527.42	0.00	0.00	167527.42	0.00	0.000000
12.50	0.00	-248365.13	0.00	0.00	248365.13	0.00	0.000000
12.75	0.00	-346460.88	0.00	0.00	346460.88	0.00	0.000000
13.00	0.00	-463555.89	0.00	0.00	463555.89	0.00	0.000000
13.25	0.00	-603929.29	0.00	0.00	603929.29	0.00	0.000000
13.50	0.00	-767935.68	0.00	0.00	767935.68	0.00	0.000000
13.75	0.00	-951619.79	0.00	0.00	951619.79	0.00	0.000000
14.00	0.00	-1154871.24	0.00	0.00	1154871.24	0.00	0.000000
14.25	0.00	-1375568.49	0.00	0.00	1375568.49	0.00	0.000000
14.50	0.00	-1612784.40	0.00	0.00	1612784.40	0.00	0.000000
14.75	0.00	-1864921.18	0.00	0.00	1864921.18	0.00	0.000000
15.00	0.00	-2131368.82	0.00	0.00	2131368.82	0.00	0.000000
15.25	0.00	-2409164.07	0.00	0.00	2409164.07	0.00	0.000000
15.50	0.00	-2704799.64	0.00	0.00	2704799.64	0.00	0.000000
15.75	0.00	-3017698.08	0.00	0.00	3017698.08	0.00	0.000000
16.00	0.00	-3339172.57	0.00	0.00	3339172.57	0.00	0.000000
16.25	0.00	-3660242.64	0.00	0.00	3660242.64	0.00	0.000000
16.50	0.00	-3978436.62	0.00	0.00	3978436.62	0.00	0.000000
16.75	0.00	-4290519.58	0.00	0.00	4290519.58	0.00	0.000000
17.00	0.00	-4590315.43	0.00	0.00	4590315.43	0.00	0.000000
17.25	0.00	-4876172.87	0.00	0.00	4876172.87	0.00	0.000000
17.50	0.00	-5146281.14	0.00	0.00	5146281.14	0.00	0.000000
17.75	0.00	-5395844.83	0.00	0.00	5395844.83	0.00	0.000000
18.00	0.00	-5624729.73	0.00	0.00	5624729.73	0.00	0.000000
18.25	0.00	-5831327.53	0.00	0.00	5831327.53	0.00	0.000000
18.50	0.00	-6021497.29	0.00	0.00	6021497.29	0.00	0.000000
18.75	0.00	-6195218.42	0.00	0.00	6195218.42	0.00	0.000000
19.00	0.00	-6352039.58	0.00	0.00	6352039.58	0.00	0.000000
19.25	0.00	-6490251.68	0.00	0.00	6490251.68	0.00	0.000000
19.50	0.00	-6612047.89	0.00	0.00	6612047.89	0.00	0.000000
19.75	0.00	-6719813.79	0.00	0.00	6719813.79	0.00	0.000000
20.00	0.00	-6814899.52	0.00	0.00	6814899.52	0.00	0.000000
20.25	0.00	-6900156.52	0.00	0.00	6900156.52	0.00	0.000000
20.50	0.00	-6976474.30	0.00	0.00	6976474.30	0.00	0.000000
20.75	0.00	-7044840.16	0.00	0.00	7044840.16	0.00	0.000000
21.00	0.00	-7105586.83	0.00	0.00	7105586.83	0.00	0.000000
21.25	0.00	-7159531.83	0.00	0.00	7159531.83	0.00	0.000000
21.50	0.00	-7208215.85	0.00	0.00	7208215.85	0.00	0.000000
21.75	0.00	-7252198.65	0.00	0.00	7252198.65	0.00	0.000000
22.00	0.00	-7292315.47	0.00	0.00	7292315.47	0.00	0.000000
22.25	0.00	-7329372.35	0.00	0.00	7329372.35	0.00	0.000000
22.50	0.00	-7364226.90	0.00	0.00	7364226.90	0.00	0.000000
22.75	0.00	-7397471.72	0.00	0.00	7397471.72	0.00	0.000000
23.00	0.00	-7429254.68	0.00	0.00	7429254.68	0.00	0.000000
23.25	0.00	-7459766.00	0.00	0.00	7459766.00	0.00	0.000000
23.50	0.00	-7489584.56	0.00	0.00	7489584.56	0.00	0.000000
23.75	0.00	-7519001.25	0.00	0.00	7519001.25	0.00	0.000000
24.00	0.00	-7546786.90	0.00	0.00	7546786.89	0.00	0.000000
24.25	0.00	-7572996.45	0.00	0.00	7572996.45	0.00	0.000000
24.50	0.00	-7597882.12	0.00	0.00	7597882.12	0.00	0.000000
24.75	0.00	-7622700.84	0.00	0.00	7622700.84	0.00	0.000000
25.00	0.00	-7647900.67	0.00	0.00	7647900.67	0.00	0.000000
25.25	0.00	-7672980.55	0.00	0.00	7672980.55	0.00	0.000000
25.50	0.00	-7697657.26	0.00	0.00	7697657.26	0.00	0.000000
25.75	0.00	-7721409.13	0.00	0.00	7721409.13	0.00	0.000000
26.00	0.00	-7743478.69	0.00	0.00	7743478.69	0.00	0.000000
26.25	0.00	-7763483.79	0.00	0.00	7763483.79	0.00	0.000000
26.50	0.00	-7781416.28	0.00	0.00	7781416.28	0.00	0.000000
26.75	0.00	-7797156.23	0.00	0.00	7797156.23	0.00	0.000000

SEDCONSERV.OUT

27.00	0.00	-7811044.63	0.00	0.00	7811044.63	0.00	0.000000
27.25	0.00	-7823364.93	0.00	0.00	7823364.93	0.00	0.000000
27.50	0.00	-7834383.50	0.00	0.00	7834383.50	0.00	0.000000
27.75	0.00	-7844381.87	0.00	0.00	7844381.87	0.00	0.000000
28.00	0.00	-7853376.52	0.00	0.00	7853376.52	0.00	0.000000
28.25	0.00	-7861361.02	0.00	0.00	7861361.02	0.00	0.000000
28.50	0.00	-7868525.84	0.00	0.00	7868525.84	0.00	0.000000
28.75	0.00	-7874852.92	0.00	0.00	7874852.92	0.00	0.000000
29.00	0.00	-7880448.53	0.00	0.00	7880448.53	0.00	0.000000
29.25	0.00	-7885353.07	0.00	0.00	7885353.07	0.00	0.000000
29.50	0.00	-7889708.82	0.00	0.00	7889708.82	0.00	0.000000
29.75	0.00	-7893614.70	0.00	0.00	7893614.70	0.00	0.000000
30.00	0.00	-7897140.66	0.00	0.00	7897140.66	0.00	0.000000
30.25	0.00	-7900306.32	0.00	0.00	7900306.32	0.00	0.000000
30.50	0.00	-7903127.98	0.00	0.00	7903127.98	0.00	0.000000
30.75	0.00	-7905713.08	0.00	0.00	7905713.08	0.00	0.000000
31.00	0.00	-7908063.96	0.00	0.00	7908063.96	0.00	0.000000
31.25	0.00	-7910328.00	0.00	0.00	7910328.00	0.00	0.000000
31.50	0.00	-7912448.91	0.00	0.00	7912448.91	0.00	0.000000
31.75	0.00	-7914367.48	0.00	0.00	7914367.48	0.00	0.000000
32.00	0.00	-7916207.89	0.00	0.00	7916207.89	0.00	0.000000
32.25	0.00	-7917944.88	0.00	0.00	7917944.88	0.00	0.000000
32.50	0.00	-7919500.67	0.00	0.00	7919500.67	0.00	0.000000
32.75	0.00	-7920879.38	0.00	0.00	7920879.38	0.00	0.000000
33.00	0.00	-7922161.37	0.00	0.00	7922161.37	0.00	0.000000
33.25	0.00	-7923368.10	0.00	0.00	7923368.10	0.00	0.000000
33.50	0.00	-7924494.19	0.00	0.00	7924494.19	0.00	0.000000
33.75	0.00	-7925520.44	0.00	0.00	7925520.44	0.00	0.000000
34.00	0.00	-7926472.09	0.00	0.00	7926472.09	0.00	0.000000
34.25	0.00	-7927349.09	0.00	0.00	7927349.09	0.00	0.000000
34.50	0.00	-7928146.79	0.00	0.00	7928146.79	0.00	0.000000
34.75	0.00	-7928888.89	0.00	0.00	7928888.89	0.00	0.000000
35.00	0.00	-7929606.76	0.00	0.00	7929606.76	0.00	0.000000
35.25	0.00	-7930257.32	0.00	0.00	7930257.32	0.00	0.000000
35.50	0.00	-7930855.26	0.00	0.00	7930855.26	0.00	0.000000
35.75	0.00	-7931403.08	0.00	0.00	7931403.08	0.00	0.000000
36.00	0.00	-7931905.24	0.00	0.00	7931905.24	0.00	0.000000

iv. 24-hour, Developed Condition 100-Year SEDCONSERV

SEDCONSERV.OUT
SEDIMENT VOLUME CONSERVATION (CUBIC FT OR M)
NEGATIVE VOLUME INDICATES THAT OUTFLOW + STORAGE EXCEEDS INFLOW

SIMULATION TIME (HRS)	INFLOW	FLOODPLAIN STORAGE	CHANNEL STORAGE	STREET STORAGE	OUTFLOW	CONSERVATION TOTAL	CONSERVATION PERCENT
0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
1.25	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
1.75	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
2.25	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
2.75	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
3.25	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
3.75	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
4.25	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
4.75	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
5.25	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
5.50	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
5.75	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
6.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
6.25	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
6.50	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
6.75	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
7.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
7.25	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
7.50	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
7.75	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
8.25	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
8.50	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
8.75	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
9.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
9.25	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
9.50	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
9.75	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
10.25	0.00	0.00	0.00	0.00	0.00	0.00	0.000000
10.50	0.00	-347.16	0.00	0.00	347.16	0.00	0.000000
10.75	0.00	-1359.50	0.00	0.00	1359.50	0.00	0.000000
11.00	0.00	-3059.69	0.00	0.00	3059.69	0.00	0.000000
11.25	0.00	-10071.56	0.00	0.00	10071.56	0.00	0.000000
11.50	0.00	-31171.38	0.00	0.00	31171.38	0.00	0.000000
11.75	0.00	-67403.64	0.00	0.00	67403.64	0.00	0.000000
12.00	0.00	-118174.50	0.00	0.00	118174.50	0.00	0.000000
12.25	0.00	-185290.12	0.00	0.00	185290.12	0.00	0.000000
12.50	0.00	-270787.03	0.00	0.00	270787.04	0.00	0.000000
12.75	0.00	-372945.92	0.00	0.00	372945.92	0.00	0.000000
13.00	0.00	-494521.68	0.00	0.00	494521.68	0.00	0.000000
13.25	0.00	-637926.19	0.00	0.00	637926.19	0.00	0.000000
13.50	0.00	-803780.50	0.00	0.00	803780.50	0.00	0.000000
13.75	0.00	-991704.69	0.00	0.00	991704.69	0.00	0.000000
14.00	0.00	-1199612.00	0.00	0.00	1199612.00	0.00	0.000000
14.25	0.00	-1424885.90	0.00	0.00	1424885.90	0.00	0.000000
14.50	0.00	-1667625.87	0.00	0.00	1667625.87	0.00	0.000000
14.75	0.00	-1927448.15	0.00	0.00	1927448.15	0.00	0.000000
15.00	0.00	-2201236.45	0.00	0.00	2201236.45	0.00	0.000000
15.25	0.00	-2490825.37	0.00	0.00	2490825.37	0.00	0.000000
15.50	0.00	-2797384.96	0.00	0.00	2797384.96	0.00	0.000000
15.75	0.00	-3118368.03	0.00	0.00	3118368.03	0.00	0.000000
16.00	0.00	-3446775.51	0.00	0.00	3446775.51	0.00	0.000000
16.25	0.00	-3775113.38	0.00	0.00	3775113.38	0.00	0.000000
16.50	0.00	-4099492.76	0.00	0.00	4099492.76	0.00	0.000000
16.75	0.00	-4416153.79	0.00	0.00	4416153.79	0.00	0.000000
17.00	0.00	-4717914.16	0.00	0.00	4717914.15	0.00	0.000000
17.25	0.00	-5006599.56	0.00	0.00	5006599.56	0.00	0.000000
17.50	0.00	-5284321.70	0.00	0.00	5284321.70	0.00	0.000000
17.75	0.00	-5544583.42	0.00	0.00	5544583.42	0.00	0.000000
18.00	0.00	-5782754.68	0.00	0.00	5782754.68	0.00	0.000000
18.25	0.00	-5997137.44	0.00	0.00	5997137.44	0.00	0.000000
18.50	0.00	-6192136.03	0.00	0.00	6192136.03	0.00	0.000000
18.75	0.00	-6368805.60	0.00	0.00	6368805.60	0.00	0.000000
19.00	0.00	-6529369.24	0.00	0.00	6529369.24	0.00	0.000000
19.25	0.00	-6670880.14	0.00	0.00	6670880.14	0.00	0.000000
19.50	0.00	-6797011.03	0.00	0.00	6797011.03	0.00	0.000000
19.75	0.00	-6907694.00	0.00	0.00	6907694.00	0.00	0.000000
20.00	0.00	-7006463.19	0.00	0.00	7006463.19	0.00	0.000000
20.25	0.00	-7094128.51	0.00	0.00	7094128.51	0.00	0.000000
20.50	0.00	-7170848.34	0.00	0.00	7170848.34	0.00	0.000000
20.75	0.00	-7238980.17	0.00	0.00	7238980.17	0.00	0.000000
21.00	0.00	-7300392.58	0.00	0.00	7300392.58	0.00	0.000000
21.25	0.00	-7356314.32	0.00	0.00	7356314.32	0.00	0.000000
21.50	0.00	-7406996.65	0.00	0.00	7406996.65	0.00	0.000000
21.75	0.00	-7453535.81	0.00	0.00	7453535.81	0.00	0.000000
22.00	0.00	-7496713.75	0.00	0.00	7496713.75	0.00	0.000000
22.25	0.00	-7537350.32	0.00	0.00	7537350.31	0.00	0.000000
22.50	0.00	-7575589.93	0.00	0.00	7575589.93	0.00	0.000000
22.75	0.00	-7610936.98	0.00	0.00	7610936.98	0.00	0.000000
23.00	0.00	-7643975.97	0.00	0.00	7643975.97	0.00	0.000000
23.25	0.00	-7675421.28	0.00	0.00	7675421.27	0.00	0.000000
23.50	0.00	-7705201.58	0.00	0.00	7705201.58	0.00	0.000000
23.75	0.00	-7734178.00	0.00	0.00	7734178.00	0.00	0.000000
24.00	0.00	-7762564.64	0.00	0.00	7762564.63	0.00	0.000000
24.25	0.00	-7789804.22	0.00	0.00	7789804.22	0.00	0.000000
24.50	0.00	-7816225.72	0.00	0.00	7816225.72	0.00	0.000000
24.75	0.00	-7842423.43	0.00	0.00	7842423.43	0.00	0.000000
25.00	0.00	-7868692.24	0.00	0.00	7868692.24	0.00	0.000000
25.25	0.00	-7894997.33	0.00	0.00	7894997.32	0.00	0.000000
25.50	0.00	-7921806.15	0.00	0.00	7921806.15	0.00	0.000000
25.75	0.00	-7948005.48	0.00	0.00	7948005.47	0.00	0.000000
26.00	0.00	-7972254.39	0.00	0.00	7972254.39	0.00	0.000000
26.25	0.00	-7994290.14	0.00	0.00	7994290.14	0.00	0.000000
26.50	0.00	-8013795.85	0.00	0.00	8013795.85	0.00	0.000000
26.75	0.00	-8030709.76	0.00	0.00	8030709.76	0.00	0.000000

27.00	0.00	-8045573.43	0.00	0.00	8045573.43	0.00	0.000000
27.25	0.00	-8058771.33	0.00	0.00	8058771.33	0.00	0.000000
27.50	0.00	-8070552.71	0.00	0.00	8070552.71	0.00	0.000000
27.75	0.00	-8081096.39	0.00	0.00	8081096.39	0.00	0.000000
28.00	0.00	-8090661.16	0.00	0.00	8090661.15	0.00	0.000000
28.25	0.00	-8099191.77	0.00	0.00	8099191.77	0.00	0.000000
28.50	0.00	-8106874.17	0.00	0.00	8106874.17	0.00	0.000000
28.75	0.00	-8113834.54	0.00	0.00	8113834.53	0.00	0.000000
29.00	0.00	-8120115.96	0.00	0.00	8120115.96	0.00	0.000000
29.25	0.00	-8125692.19	0.00	0.00	8125692.19	0.00	0.000000
29.50	0.00	-8130712.60	0.00	0.00	8130712.60	0.00	0.000000
29.75	0.00	-8135292.67	0.00	0.00	8135292.67	0.00	0.000000
30.00	0.00	-8139395.82	0.00	0.00	8139395.82	0.00	0.000000
30.25	0.00	-8143151.74	0.00	0.00	8143151.74	0.00	0.000000
30.50	0.00	-8146571.13	0.00	0.00	8146571.13	0.00	0.000000
30.75	0.00	-8149622.90	0.00	0.00	8149622.90	0.00	0.000000
31.00	0.00	-8152388.42	0.00	0.00	8152388.42	0.00	0.000000
31.25	0.00	-8154931.18	0.00	0.00	8154931.18	0.00	0.000000
31.50	0.00	-8157254.93	0.00	0.00	8157254.93	0.00	0.000000
31.75	0.00	-8159343.08	0.00	0.00	8159343.08	0.00	0.000000
32.00	0.00	-8161177.84	0.00	0.00	8161177.84	0.00	0.000000
32.25	0.00	-8162847.91	0.00	0.00	8162847.91	0.00	0.000000
32.50	0.00	-8164322.63	0.00	0.00	8164322.63	0.00	0.000000
32.75	0.00	-8165661.85	0.00	0.00	8165661.85	0.00	0.000000
33.00	0.00	-8166895.95	0.00	0.00	8166895.95	0.00	0.000000
33.25	0.00	-8168028.68	0.00	0.00	8168028.68	0.00	0.000000
33.50	0.00	-8169051.64	0.00	0.00	8169051.64	0.00	0.000000
33.75	0.00	-8169956.44	0.00	0.00	8169956.44	0.00	0.000000
34.00	0.00	-8170766.26	0.00	0.00	8170766.26	0.00	0.000000
34.25	0.00	-8171489.87	0.00	0.00	8171489.87	0.00	0.000000
34.50	0.00	-8172144.37	0.00	0.00	8172144.37	0.00	0.000000
34.75	0.00	-8172775.01	0.00	0.00	8172775.00	0.00	0.000000
35.00	0.00	-8173360.50	0.00	0.00	8173360.50	0.00	0.000000
35.25	0.00	-8173927.13	0.00	0.00	8173927.13	0.00	0.000000
35.50	0.00	-8174446.29	0.00	0.00	8174446.29	0.00	0.000000
35.75	0.00	-8174923.67	0.00	0.00	8174923.67	0.00	0.000000
36.00	0.00	-8175361.95	0.00	0.00	8175361.95	0.00	0.000000

ATTACHMENT DR8-1

AMENDED REPORT OF WASTE DISCHARGE

INTRODUCTION

This application package constitutes a Report of Waste Discharge (ROWD) pursuant to California Water Code Section 13260. Section 13260 states that persons discharging or proposing to discharge waste that could affect the quality of the waters of the State, other than into a community sewer system, shall file a ROWD containing information which may be required by the appropriate Regional Water Quality Control Board (RWQCB).

This package is to be used to start the application process for all waste discharge requirements (WDRs) and National Pollutant Discharge Elimination System (NPDES) permits* issued by a RWQCB except:

a) Those landfill facilities that must use a joint Solid Waste Facility Permit Application Form, California Integrated Waste Management Board Form E-1-77; and
b) General WDRs or general NPDES permits that use a Notice of Intent to comply or specify the use of an alternative application form designed for that permit.

This application package contains:

1. Application/General Information Form for WDRs and NPDES Permits [Form 200 (10/97)].
2. Application/General Information Instructions.

Instructions

Instructions are provided to assist you with completion of the application. If you are unable to find the answers to your questions or need assistance with the completion of the application package, please contact your RWQCB representative. *The RWQCBs strongly recommend that you make initial telephone or personal contact with RWQCB regulatory staff to discuss a proposed new discharge before submitting your application.* The RWQCB representative will be able to answer procedural and annual fee related questions that you may have. (See map and telephone numbers inside of application cover.)

All dischargers regulated under WDRs and NPDES permits must pay an annual fee, except dairies, which pay a filing fee only. The RWQCB will notify you of your annual fee based on an evaluation of your proposed discharge. Please do NOT submit a check for your first annual fee or filing fee until requested to do so by a RWQCB representative. Dischargers applying for reissuance (renewal) of an existing NPDES permit or update of an existing WDR will be billed through the annual fee billing system and are therefore requested NOT to submit a check with their application. Checks should be made payable to the State Water Resources Control Board.

Additional Information Requirements

A RWQCB representative will notify you within 30 days of receipt of the application form and any supplemental documents whether your application is complete. If your application is incomplete, the RWQCB representative will send you a detailed list of discharge specific information necessary to complete the application process. The completion date of your application is normally the date when all required information, including the correct fee, is received by the RWQCB.

*** NPDES PERMITS:** If you are applying for a permit to discharge to surface water, you will need an NPDES permit which is issued under both State and Federal law and may be required to complete one or more of the following Federal NPDES permit application forms: Short Form A, Standard Form A, Forms 1, 2B, 2C, 2D, 2E, and 2F. These forms may be obtained at a RWQCB office or can be ordered from the National Center for Environmental Publications and Information at (513) 891-6561.

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

State of California
Regional Water Quality Control Board

APPLICATION/REPORT OF WASTE DISCHARGE
GENERAL INFORMATION FORM FOR
WASTE DISCHARGE REQUIREMENTS OR NPDES PERMIT

INSTRUCTIONS

FOR COMPLETING THE APPLICATION/REPORT OF WASTE DISCHARGE GENERAL INFORMATION FORM FOR: WASTE DISCHARGE REQUIREMENTS/NPDES PERMIT

If you have any questions on the completion of any part of the application, please contact your RWQCB representative. A map of RWQCB locations, addresses, and telephone numbers is located on the reverse side of the application cover.

I. FACILITY INFORMATION

You must provide the factual information listed below for ALL owners, operators, and locations and, where appropriate, for ALL general partners and lease holders.

A. FACILITY:
Legal name, physical address including the county, person to contact, and phone number at the facility. (**NO P.O. Box numbers!** If no address exists, use street and nearest cross street.)

B. FACILITY OWNER:
Legal owner, address, person to contact, and phone number. Also include the owner's Federal Tax Identification Number.

OWNER TYPE:
Check the appropriate Owner Type. The legal owner will be named in the WDRs/NPDES permit.

C. FACILITY OPERATOR (The agency or business, not the person):
If applicable, the name, address, person to contact, and telephone number for the facility operator. Check the appropriate Operator Type. If identical to B. above, enter "same as owner".

D. OWNER OF THE LAND:
Legal owner of the land(s) where the facility is located, address, person to contact, and phone number. Check the appropriate Owner Type. If identical to B. above, enter "same as owner".

E. ADDRESS WHERE LEGAL NOTICE MAY BE SERVED:
Address where legal notice may be served, person to contact, and phone number. If identical to B. above, enter "same as owner".

F. BILLING ADDRESS
Address where annual fee invoices should be sent, person to contact, and phone number. If identical to B. above, enter "same as owner".

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

State of California
Regional Water Quality Control Board

APPLICATION/REPORT OF WASTE DISCHARGE
GENERAL INFORMATION FORM FOR
WASTE DISCHARGE REQUIREMENTS OR NPDES PERMIT

II. TYPE OF DISCHARGE

Check the appropriate box to describe whether the waste will be discharged to: A. Land, or B. Surface Water.

Check the appropriate box(es) which best describe the activities at your facility.

Hazardous Waste - **If you check the Hazardous Waste box,** STOP **and contact a representative of the RWQCB for further instructions.**

Landfills - **A separate form, APPLICATION FOR SOLID WASTE FACILITY PERMIT/WASTE DISCHARGE REQUIREMENTS, California Integrated Waste Management Board Form E-1-77, may be required. Contact a RWQCB representative to help determine the appropriate form for your discharge.**

III. LOCATION OF THE FACILITY

1. Enter the Assessor's Parcel Number(s) (APN), which is located on the property tax bill. The number can also be obtained from the County Assessor's Office. Indicate the APN for both the facility and the discharge point.

2. Enter the Latitude of the entrance to the proposed/existing facility and of the discharge point. Latitude and longitude information can be obtained from a U.S. Geological Survey quadrangle topographic map. Other maps may also contain this information.

3. Enter the Longitude of the entrance to the proposed/existing facility and of the discharge point.

IV. REASON FOR FILING

NEW DISCHARGE OR FACILITY:
A discharge or facility that is proposed but does not now exist, or that does not yet have WDRs or an NPDES permit.

CHANGE IN DESIGN OR OPERATION:
A material change in design or operation from existing discharge requirements. Final determination of whether the reported change is material will be made by the RWQCB.

CHANGE IN QUANTITY/TYPE OF DISCHARGE:
A material change in characteristics of the waste from existing discharge requirements. Final determination of whether the reported change would have a significant effect will be made by the RWQCB.

CHANGE IN OWNERSHIP/OPERATOR:
Change of legal owner of the facility. Complete Parts I, III, and IV only and contact the RWQCB to determine if additional information is required.

WASTE DISCHARGE REQUIREMENTS UPDATE OR NPDES PERMIT REISSUANCE:
WDRs must be updated periodically to reflect changing technology standards and conditions. A new application is required to reissue an NPDES permit which has expired.

OTHER:
If there is a reason other than the ones listed, please describe the reason on the space provided. (If more space is needed, attach a separate sheet.)

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

State of California
Regional Water Quality Control Board

APPLICATION/REPORT OF WASTE DISCHARGE GENERAL INFORMATION FORM FOR WASTE DISCHARGE REQUIREMENTS OR NPDES PERMIT

V. CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA)

It should be emphasized that communication with the appropriate RWQCB staff is vital before starting the CEQA documentation, and is recommended before completing this application. There are Basin Plan issues which may complicate the CEQA effort, and RWQCB staff may be able to help in providing the needed information to complete the CEQA documentation.

Name the Lead Agency responsible for completion of CEQA requirements for the project, i.e., completion and certification of CEQA documentation.

Check YES or NO. Has a public agency determined that the proposed project is exempt from CEQA?
If the answer is YES, state the basis for the exemption and the name of the agency supplying the exemption on the space provided. (Remember that, if extra space is needed, use an extra sheet of paper, but be sure to indicate the attached sheet under Section VII. Other.)

Check YES or NO. Has the "Notice of Determination" been filed under CEQA? If YES, give the date the notice was filed and enclose a copy of the Notice of Determination and the Initial Study, Environmental Impact Report, or Negative Declaration. If NO, check the box of the expected type of CEQA document for this project, and include the expected date of completion using the timelines given under CEQA. The date of completion should be taken as the date that the Notice of Determination will be submitted. (If not known, write "Unknown")

VI. OTHER REQUIRED INFORMATION

To be approved, your application MUST include a COMPLETE characterization of the discharge. If the characterization is found to be incomplete, RWQCB staff will contact you and request that additional specific information be submitted.

This application MUST be accompanied by a site map. A USGS 7.5' Quadrangle map or a street map, if more appropriate, is sufficient for most applications.

VII. OTHER

If any of the answers on your application form need further explanation, attach a separate sheet. Please list any attachments with the titles and dates on the space provided.

VIII. CERTIFICATION

Certification by the owner of the facility or the operator of the facility, if the operator is different from the owner, is required. The appropriate person must sign the application form.
Acceptable signatures are:

1. **for a corporation,** a principal executive officer of at least the level of senior vice-president;
2. **for a partnership or individual (sole proprietorship),** a general partner or the proprietor;
3. **for a governmental or public agency,** either a principal executive officer or ranking elected/appointed official.

DISCHARGE SPECIFIC INFORMATION

In most cases, a request to supply additional discharge specific information will be sent to you by a representative of the RWQCB. If the RWQCB determines that additional discharge specific information is not needed to process your application, you will be so notified.

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

State of California
Regional Water Quality Control Board

APPLICATION/REPORT OF WASTE DISCHARGE
GENERAL INFORMATION FORM FOR
WASTE DISCHARGE REQUIREMENTS OR NPDES PERMIT

I. FACILITY INFORMATION

A. Facility:

Name: Palen Solar Electric Generating System (PSEGS) - Formerly the Palen Solar Power Project			
Address: Immediately north of US Interstate I-10 at Corn Springs Road exit			
City: Approx 10 miles east of Desert Center	**County:** Riverside	**State:** California	**Zip Code:** 92239
Contact Person: Charlie Turlinski		**Telephone Number:** (510) 550-8161	

B. Facility Owner:

Name: Palen Solar Holdings, LLC			**Owner Type (Check One)** 1. ☐ Individual 2. ☐ Corporation 3. ☐ Governmental Agency 4. ☐ Partnership 5. ☑ Other: LLC
Address: 1999 Harrison Street, Suite 2150			
City: Oakland	**State:** CA	**Zip Code:** 94612	
Contact Person: Charlie Turlinski		**Telephone Number:** (510) 550-8161	**Federal Tax ID:** 46-0791243

C. Facility Operator (The agency or business, not the person):

Name: Same as Owner			**Operator Type (Check One)** 1. ☐ Individual 2. ☐ Corporation 3. ☐ Governmental Agency 4. ☐ Partnership 5. ☐ Other:
Address:			
City:	**State:**	**Zip Code:**	
Contact Person:		**Telephone Number:**	

D. Owner of the Land:

Name: United States Bureau of Land Management			**Owner Type (Check One)** 1. ☐ Individual 2. ☐ Corporation 3. ☑ Governmental Agency 4. ☐ Partnership 5. ☐ Other:
Address: 1201 Bird Center Drive			
City: Palm Springs	**State:** CA	**Zip Code:** 92262	
Contact Person: John Kalish		**Telephone Number:** (760) 833-7100	

E. Address Where Legal Notice May Be Served:

Address: Same as Owner		
City:	**State:**	**Zip Code:**
Contact Person:	**Telephone Number:**	

F. Billing Address:

Address: Same as Owner		
City:	**State:**	**Zip Code:**
Contact Person:	**Telephone Number:**	

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

State of California
Regional Water Quality Control Board

APPLICATION/REPORT OF WASTE DISCHARGE
GENERAL INFORMATION FORM FOR
WASTE DISCHARGE REQUIREMENTS OR NPDES PERMIT

II. TYPE OF DISCHARGE

Check Type of Discharge(s) Described in this Application (A or B):

☑ **A. WASTE DISCHARGE TO LAND** ☐ **B. WASTE DISCHARGE TO SURFACE WATER**

Check all that apply:

- ☐ Domestic/Municipal Wastewater Treatment and Disposal
- ☑ Cooling Water
- ☐ Mining
- ☐ Waste Pile
- ☐ Wastewater Reclamation
- ☐ Other, please describe: _____
- ☐ Animal Waste Solids
- ☐ Land Treatment Unit
- ☐ Dredge Material Disposal
- ☑ Surface Impoundment
- ☐ Industrial Process Wastewater
- ☐ Animal or Aquacultural Wastewater
- ☐ Biosolids/Residual
- ☐ Hazardous Waste (see instructions)
- ☐ Landfill (see instructions)
- ☐ Storm Water

III. LOCATION OF THE FACILITY

Describe the physical location of the facility.

1. Assessor's Parcel Number(s)	2. Latitude	3. Longitude
Facility:	**Facility:** 33 deg 50'56" N	**Facility:** 115 deg 14'22"W
Discharge Point:	**Discharge Point:**	**Discharge Point:**

IV. REASON FOR FILING

- ☐ New Discharge or Facility
- ☑ Changes in Ownership/Operator (see instructions)
- ☑ Change in Design or Operation
- ☐ Waste Discharge Requirements Update or NPDES Permit Reissuance
- ☑ Change in Quantity/Type of Discharge
- ☑ Other: Elimination of Land Treatment Units

V. CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA)

Name of Lead Agency: California Energy Comission

Has a public agency determined that the proposed project is exempt from CEQA? ☐ **Yes** ☑ **No**

If Yes, state the basis for the exemption and the name of the agency supplying the exemption on the line below.

Basis for Exemption/Agency: _____

Has a "Notice of Determination" been filed under CEQA? ☐ **Yes** ☑ **No**

If Yes, enclose a copy of the CEQA document, Environmental Impact Report, or Negative Declaration. If no, identify the expected type of CEQA document and expected date of completion.

Expected CEQA Documents:

☐ **EIR** ☐ **Negative Declaration** **Expected CEQA Completion Date:** September 2016

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

State of California
Regional Water Quality Control Board

APPLICATION/REPORT OF WASTE DISCHARGE GENERAL INFORMATION FORM FOR WASTE DISCHARGE REQUIREMENTS OR NPDES PERMIT

VI. OTHER REQUIRED INFORMATION

Please provide a COMPLETE characterization of your discharge. A complete characterization includes, but is not limited to, design and actual flows, a list of constituents and the discharge concentration of each constituent, a list of other appropriate waste discharge characteristics, a description and schematic drawing of all treatment processes, a description of any Best Management Practices (BMPs) used, and a description of disposal methods.

Also include a site map showing the location of the facility and, if you are submitting this application for an NPDES permit, identify the surface water to which you propose to discharge. Please try to limit your maps to a scale of 1:24,000 (7.5' USGS Quadrangle) or a street map, if more appropriate.

VII. OTHER

Attach additional sheets to explain any responses which need clarification. List attachments with titles and dates below:

WDRs were issued as part of the California Energy Commission license dated December 2010 and included WDRs for the evaporation ponds and Land Treatment Units for Therminol spills. Therminol and Land Treatment Units have been eliminated. The quantity of water and therefore the evaporation ponds have been reduced but the charactertistcs of the waste remains unchanged.

You will be notified by a representative of the RWQCB within 30 days of receipt of your application. The notice will state if your application is complete or if there is additional information you must submit to complete your Application/Report of Waste Discharge, pursuant to Division 7, Section 13260 of the California Water Code.

VIII. CERTIFICATION

"I certify under penalty of law that this document, including all attachments and supplemental information, were prepared under my direction and supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

Print Name: Charlie Turlinski **Title:** Project Manager

Signature: _____ **Date:** _____

FOR OFFICE USE ONLY

Date Form 200 Received:	Letter to Discharger:	Fee Amount Received:	Check #:

California Environmental Protection Agency
Bill of Rights for Environmental
Permit Applicants

California Environmental Protection Agency (Cal/EPA) recognizes that many complex issues must be addressed when pursuing reforms of environmental permits and that significant challenges remain. We have initiated reforms and intend to continue the effort to make environmental permitting more efficient, less costly, and to ensure that those seeking permits receive timely responses from the boards and departments of the Cal/EPA. To further this goal, Cal/EPA endorses the following precepts that form the basis of a permit applicant's "Bill of Rights."

1. Permit applicants have the right to assistance in understanding regulatory and permit requirements. All Cal/EPA programs maintain an Ombudsman to work directly with applicants. Permit Assistance Centers located throughout California have permit specialists from all the State, regional, and local agencies to identify permit requirements and assist in permit processing.

2. Permit applicants have the right to know the projected fees for review of applications, how any costs will be determined and billed, and procedures for resolving any disputes over fee billings.

3. Permit applicants have the right of access to complete and clearly written guidance documents that explain the regulatory requirements. Agencies must publish a list of all information required in a permit application and of criteria used to determine whether the submitted information is adequate.

4. Permit applicants have the right of timely completeness determinations for their applications. In general, agencies notify the applicant within 30 days of any deficiencies or determine that the application is complete. California Environmental Quality Act (CEQA) and public hearing requests may require additional information.

5. Permit applicants have the right to know exactly how their applications are deficient and what further information is needed to make their applications complete. Pursuant to California Government code Section 65944, after an application is accepted as complete, an agency may not request any new or additional information that was not specified in the original application.

6. Permit applicants have the right of a timely decision on their permit application. The agencies are required to establish time limits for permit reviews.

7. Permit applicants have the right to appeal permit review time limits by statute or administratively that have been violated without good cause. For state environmental agencies, appeals are made directly to the Cal/EPA Secretary or to a specific board. For local environmental agencies, appeals are generally made to the local governing board or, under certain circumstances, to Cal/EPA. Through this appeal, applicants may obtain a set date for a decision on their permit and, in some cases, a refund of all application fees (ask boards and departments for details).

8. Permit applicants have the right to work with a single lead agency where multiple environmental approvals are needed. For multiple permits, all agency actions can be consolidated under a lead agency. For site remediation, all applicable laws can be administered through a single agency.

9. Permit applicants have the right to know who will be reviewing their application and the time required to complete the full review process.

ATTACHMENT DR15-1

FAA FORM 7460

Federal Aviation Administration

« OE/AAA

Notice of Proposed Construction or Alteration - Off Airport

Project Name: PALEN-000232720-13 **Sponsor:** Palen Solar Holdings, LLC

Details for Case : Unit 1

Show Project Summary

Case Status

ASN:	2013-AWP-1618-OE	**Date Accepted:**	03/13/2013
Status:	Accepted	**Date Determined:**	
		Letters:	None
		Documents:	None
Public Comments:	None		Project Documents: None

Construction / Alteration Information

Notice Of:	Construction
Duration:	Permanent
if Temporary :	Months: Days:
Work Schedule - Start:	
Work Schedule - End:	

For temporary cranes-Does the permanent structure require separate notice to the FAA?
To find out, use the Notice Criteria Tool. If separate notice is required, please ensure it is filed.
If it is not filed, please state the reason in the Description of Proposal.

State Filing:

Structure Summary

Structure Type:	Solar Tower
Structure Name:	Unit 1
NOTAM Number:	
FCC Number:	
Prior ASN:	

Structure Details

Latitude:	33° 41' 50.94'' N
Longitude:	115° 13' 32.35'' W
Horizontal Datum:	NAD83
Site Elevation (SE):	548 (nearest foot)
Structure Height (AGL):	760 (nearest foot)
Current Height (AGL): ** For notice of alteration or existing provide the current AGL height of the existing structure. Include details in the Description of Proposal*	(nearest foot)
Nacelle Height (AGL): ** For Wind Turbines 500ft AGL or greater*	(nearest foot)
Requested Marking/Lighting:	Dual-red and medium intensity
Other :	
Recommended Marking/Lighting:	
Current Marking/Lighting:	N/A Proposed Structure
Other :	
Nearest City:	Desert Center
Nearest State:	California
Description of Location: *On the Project Summary page upload any certified survey.*	Located approximately 10 miles east of Desert Center, CA.(north of Interstate 10)
Description of Proposal:	Filing for one of two solar towers near Desert Center, CA.

Common Frequency Bands

Low Freq	High Freq	Freq Unit	ERP	ERP Unit

Specific Frequencies

Federal Aviation Administration

« OE/AAA

Notice of Proposed Construction or Alteration - Off Airport

Project Name: PALEN-000232720-13 **Sponsor:** Palen Solar Holdings, LLC

Details for Case : Unit 2

Show Project Summary

Case Status

ASN:	2013-AWP-1619-OE	**Date Accepted:**	03/13/2013
Status:	Accepted	**Date Determined:**	
		Letters:	None
		Documents:	None
Public Comments:	None		Project Documents: None

Construction / Alteration Information

Notice Of: Construction
Duration: Permanent
if Temporary : Months: Days:
Work Schedule - Start:
Work Schedule - End:
For temporary cranes-Does the permanent structure require separate notice to the FAA?
To find out, use the Notice Criteria Tool. If separate notice is required, please ensure it is filed.
If it is not filed, please state the reason in the Description of Proposal.
State Filing:

Structure Summary

Structure Type: Solar Tower
Structure Name: Unit 2
NOTAM Number:
FCC Number:
Prior ASN:

Structure Details

Latitude:	33° 41' 3.65" N
Longitude:	115° 12' 11.39" W
Horizontal Datum:	NAD83
Site Elevation (SE):	538 (nearest foot)
Structure Height (AGL):	760 (nearest foot)
Current Height (AGL): **** For notice of alteration or existing provide the current AGL height of the existing structure. Include details in the Description of Proposal***	(nearest foot)
Nacelle Height (AGL): **** For Wind Turbines 500ft AGL or greater***	(nearest foot)
Requested Marking/Lighting:	Dual-red and medium intensity
Other :	
Recommended Marking/Lighting:	
Current Marking/Lighting:	N/A Proposed Structure
Other :	
Nearest City:	Desert Center
Nearest State:	California
Description of Location: ***On the Project Summary page upload any certified survey.***	Located approximately 10 miles east of Desert Center, CA.(north of Interstate 10)
Description of Proposal:	Filing for one of two solar towers near Desert Center, CA.

Common Frequency Bands

Low Freq	High Freq	Freq Unit	ERP	ERP Unit

Specific Frequencies

ATTACHMENT DR18-1

CAISO COMMUNICATION

From: Quadro, Raeann [mailto:rquadro@caiso.com]
Sent: Friday, December 07, 2012 9:50 AM
To: Chifong Thomas
Cc: QueueManagement; Wright, Linda; Kirrene, Daune; Tucker, John
Subject: RE: Palen Material Modification Assessment Request

Hi Chifong-

The ISO is in receipt of your request, and I have started the review process. We are coordinating internally and I will provide an estimate for when we can complete the review as soon as possible. Queue Management will be the primary point of contact at the ISO for this request, so if you have any questions please send an email to queuemanagement@caiso.com

Thanks,
Raeann

Raeann Quadro
Queue Management Specialist
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BEFORE THE ENERGY RESOURCES CONSERVATION AND DEVELOPMENT
COMMISSION OF THE STATE OF CALIFORNIA
1516 NINTH STREET, SACRAMENTO, CA 95814
1-800-822-6228 – WWW.ENERGY.CA.GOV

AMENDMENT
FOR THE PALEN SOLAR ELECTRIC GENERATING SYSTEM

Docket No. 09-AFC-7C
PROOF OF SERVICE
(Revised 3/22/13)

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COMMISSION DOCKET UNIT
California Energy Commission
Docket Unit
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1516 Ninth Street, MS-4
Sacramento, CA 95814-5512
docket@energy.ca.gov

*Indicates change

OTHER ENERGY COMMISSION PARTICIPANTS (LISTED FOR CONVENIENCE ONLY):

After docketing, the Docket Unit will provide a copy to the persons listed below. Do not send copies of documents to these persons unless specifically directed to do so.

KAREN DOUGLAS
Commissioner and Presiding Member

David Hochschild
Commissioner and Associate Member

Raoul Renaud
Hearing Adviser

Galen Lemei
Adviser to Presiding Member

Jennifer Nelson
Adviser to Presiding Member

Jim Bartridge
Adviser to Associate Member

*Kelly Foley
Adviser to Associate Member

Eileen Allen
Commissioners' Technical
Adviser for Facility Siting

DECLARATION OF SERVICE

I, Marie Fleming, declare that on March 25, 2013, I served and filed copies of the attached, **PALEN SOLAR HOLDINGS, LLC'S RESPONSE TO CEC STAFF DATA REQUEST SET 1 (1-18)** dated March 2013. This document is accompanied by the most recent Proof of Service, which I copied from the web page for this project at: http://www.energy.ca.gov/sitingcases/palen/compliance/.

The document has been sent to the other parties in this proceeding (as shown on the Proof of Service) and to the Commission's Docket Unit, as appropriate, in the following manner:

(C*heck one*)

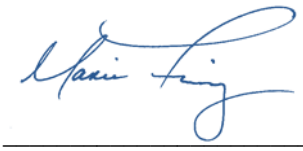
For service to all other parties and filing with the Docket Unit at the Energy Commission:

___ I e-mailed the document to all e-mail addresses on the Service List above and personally delivered it or deposited it in the US mail with first class postage to those parties noted above as "hard copy required"; **OR**

_X_ Instead of e-mailing the document, I personally delivered it or deposited it in the US mail with first class postage to all of the persons on the Service List for whom a mailing address is given.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct, and that I am over the age of 18 years.

Dated: March 25, 2013



Marie Fleming