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09-AFC-7	
DATE	MAY 14 2010
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May 14, 2010

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

RE: **Palen Solar Power Project, Docket No. 09-AFC-7**
Responses to Questions from the April 28, 29 and May 7, 2010 CEC Workshops
Palen Aeolian Mitigation Report
Technical Areas: Biological Resources

Dear Mr. Solomon:

Attached please find the following response to questions generated at the April 28, 29, and May 7, 2010 CEC Workshops for the Blythe Solar Power Project. Additional responses to follow.

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

Sincerely,

Alice Harron
Senior Director, Development

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Miles Kenney PhD, PG

Consulting Geologist

DRAFT

Aeolian Sand Mitigation Summary Report

Palen Solar Power Project Riverside County, CA

Prepared By

Miles D. Kenney, Ph.D, PG
Encinitas, CA 92024

Prepared for:

Palen Solar I, LLC

MAY 14, 2010

CEC Docket No. 09-AFC-7

Date: May 14, 2010

To: Arrie Bachrach
Senior Program Manager
AECOM Environment
1220 Avenida Acaso, Camarillo, CA 93012

From Miles D. Kenney PhD, PG
Consulting Geologist
215 Calle de Madera
Encinitas, CA 92024

Re: Aeolian Sand Mitigation Summary Report, Proposed Palen Solar Power Project, Chuckwalla Valley, Riverside County, CA

Dear Mr. Bachrach:

This report provides a preliminary evaluation of the methodology and feasibility of an aeolian sand mitigation program for Palen Solar I Power Project (Project).

Introduction and Motivation for Mitigation

The northeastern portion of the proposed Project transects an aeolian sand migration corridor and will obstruct aeolian sand migration during the life time of the Project. The motivation for mitigation of the obstructed aeolian sand is simply to move it from the obstructed area to a down wind location off the site such that the aeolian sand can continue to migrate within the same sand migration corridor. Relocation of blocked aeolian sand to an area to be re-entrained by wind erosion is considered feasible for the Project. This conclusion is primarily based on a number of factors: 1) the sand to be moved is aeolian to begin with and thus can migrate with the prevailing winds, 2) the Project vicinity is very conducive to aeolian sand migration, and 3) wind soil erosion is actually a more difficult process to deter, then to allow to occur.

There is extensive published data regarding wind erosion of soils and particularly, the evaluation of wind erosion under the influence of obstacles. These studies were motivated to assist in minimizing soil erosion within agricultural regions. Most directly applicable to the proposed Project, there is considerable published information regarding the feasibility of moving aeolian sand to be entrained by the wind to replenish dune systems. Most of these studies have been conducted along shoreline beaches and are published from nearly every continent. One common theme in these publications was that the aeolian sand nourishment program exceeded the initial expectations.

Mitigation could involve the following steps.

- **Adaptive Management Monitoring Program:** Development of a sand nourishment/replenishment program to mitigate Project impacts on aeolian sand migration requires a good understanding of existing conditions. Baseline conditions would be

established through a monitoring program (such as sand traps on the North wall) to evaluate the magnitude of sand moving within the sand corridor, and thus determine how much sand will need to moved, how often and provide data to assist in the nourishment area design. This will involve a quantitative assessment of the magnitude of sand that will be obstructed by the Project and evaluation of potential variations of sand fluxes within the sand corridor. Good data on the natural system prior to development will greatly assist in the identification and design of the mitigation procedures to best mimic the natural flux of sand in the system. The monitoring program would also provide critical data regarding the direction of sand movement near the site, and prevailing wind speeds and durations, and grain size analysis of the migrating sand. All of these parameters will be very useful for the sand nourishment area design discussed next.

A secondary benefit from the monitoring program is that it will also provide data on dust emissions and minimizing dust on the solar array mirrors is an important operational issue for the Project, as dust buildup on the mirrors can affect Project electrical output. .

- **Nourishment Area Design:** A sand nourishment/replenishment area would be designed for implementation in the area to the east of the Project's eastern property boundary. The design for the sand nourishment area would be performed by engineers with expertise in soil wind erosion. Wind erosion engineers are accustomed to providing designs to decrease erosion of soils' as that is a longstanding and important ongoing issue in the United States and around the world (e.g., since the Dust Bowl of the Great Plains in the 1930s). In this case, we would be asking the engineers to reverse their typical protocol and provide a design to maximize erosion rather than to prevent it, but in both cases to actively *manage* the wind erosion.

  The design would utilize data collected during the pre-operational monitoring program, and solar facility plans (heights of structures, fences, walls, surface roughness, etc). Prevailing winds capable of migrating sand lose momentum as the wind encounters barriers. The most commonly cited distance downwind from a vertical barrier where wind regains sufficient strength to entrain sand (and thus cause wind erosion) is a maximum ratio of 1:10 (barrier height: horizontal distance downwind from the base of the wall). The sand nourishment area would essentially begin a distance of 10:1 from the base of the fence and then extend into the unsheltered region for a distance determined by the wind erosion engineer (where soil erosion will occur). The width of the nourishment area would be a function of the amount of aeolian sand that will be moved to this area to erode based on the relative sand flux data collected during the pre-operational monitoring program. Thus, the amount of sand moved to various locations along the eastern property boundary and the width of the nourishment area will likely vary in a north to south direction; depending on the monitoring results.

- **Start Up Date for Nourishment Area:** I recommend that during the initial stages of grading in the northeastern portion of the site, that some aeolian sand be moved and placed within the nourishment area. In this way aeolian sand will immediately be available for erosion within the nourishment area and begin its journey within the sand migration corridor. In other words, this procedure would eliminate the lag time of waiting for sand to build up along the

northern property boundary, which may be a while before sufficient sand accumulates along the northern boundary that would be practical to move with heavy equipment.

- **How Often to Move the Obstructed Sand:** This will be clearly understood upon evaluation of the pre-operational monitoring program that will determine quantitative values for local sand fluxes. It is my opinion that sand fluxes in the obstruction region of the Project are relatively low. I believe that sand will likely only need to be moved from the obstructed area every 2 to 3 months, to possibly once a month during winter and spring (times of the year with strong prevailing winds).

- **Maintenance of the Nourishment Area:** To establish and properly maintain the sand nourishment area, will require a number of kinds of activities, the details of which will be worked out during mitigation program design. First, the sand should be placed to maximize erosion. Thus, the emplaced sand should be graded (not tilled) on a regular basis (once a month at a minimum if not more) to a relatively flat surface in order to minimize surface roughness and maintain high wind velocities. Frequent grading is also very important in order to loosen the sand to minimize harden crusts, to discourage formation of wind abrasion lags that increase surface roughness and to discourage the infiltration of native plants and animals into the area. The nourishment area could be surveyed in once or twice a year to evaluate the magnitude and rate of eroded sand mass.

  Frequent grading of the nourishment area will be one of the most important aspects to the mitigation program. Think of the nourishment area as a fluvial wash. Drainages are primary source of aeolian sand and they produce wind blown sand as a function of how often they flow. In addition, if the wash flows regularly, then plants and animals tend to not move into the wash itself. So, it is the opinion of the author that the nourishment area should be actively disturbed (agitated-graded) quite frequently even when no aeolian sand is being transported from the obstructed area to the nourishment area. Actively disturbing the nourishment area when no mitigation (sand placement by the owner) is occuriring is important so that the transported sand is eroded away by the wind prior to the next aeolian sand transport from the obstructed area.

Conclusion

In summary, there is considerable published information regarding the feasibility of moving aeolian sand to be entrained by the wind to replenish dune systems. As stated above, most of these studies have been conducted along shoreline beaches and are published from nearly every continent. However, one common theme in these publications was that the aeolian sand nourishment program exceeded the initial expectations. In other words, the degraded down wind dunes grew more quickly and robustly than expected once the nourishment program was in place.

There is overwhelming published data regarding wind erosion of soils and particularly, the evaluation of wind erosion under the influence of obstacles. These studies were motivated to assist in minimizing soil erosion within agricultural regions. Professional resources exist with the experience and expertise to conduct an adaptive management program of both a construction phase aeolian monitoring program and a monitoring program during the operational lifetime of the Project. It is my judgment

that a sand nourishment program can be designed and implemented that would successfully mitigate the impacts of the Palen Solar Power Project on aeolian sand migration.

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, May 14, 2010, I served and filed copies of the attached **Palen Aeolian Mitigation Report,** dated May 14, 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.