PWA
PHILIP WILLIAMS & ASSOCIATES, LTD
ENVIRONMENTAL HYDROLOGY
550 Kearny Street, Suite 900
San Francisco, California 94108-2404
TEL 415.262.2300 FAX 415.262.2303
www.pwa-ltd.com

MEMORANDUM

Date:	June 1, 2010
To:	Susan Sanders, Mike Monasmith
CC:	CEC work group for Genesis project
From:	Andrew Collison
PWA Project #:	2006.00
Subject:	**Revised wind shadow estimations for Genesis Solar Power Plant**

Summary

In PWA's memo of February 26th 2010 (PWA, 2010) we presented preliminary results for areas of dunes supporting Mojave Fringe Toed Lizard (MFTL) that would be impacted by sand transport delivery from the proposed Genesis Project. We identified two sand transport corridors that supply dunes and habitat areas near the project; one that crossed the easternmost part of the proposed project footprint from north to south (the Palen-McCoy corridor) and one that crossed the southeastern corner of the proposed project from west to east (the Chuckwalla corridor). We identified two 'sand shadows' associated with the project's intrusion into these wind transport corridors. Research by Turner et. al. (1984) showed that dune habitat downwind of wind breaks exhibited deflation (loss of sand to wind erosion) and armoring by coarse sediment within a few years, resulting in the absence of MFTL from areas downwind.

In our initial report we made a qualitative assessment of the area impacted based on wind direction evidence and the project footprint provided by the applicant (Worley Parsons, 2010). We have subsequently developed a quantitative model of sand transport based on wind patterns from Blythe airport, which we have applied to the Palen proposed power site (Solar Millennium Palen) and to an area close to the Genesis project footprint. Although we have not been able to modify the model to directly simulate the Genesis project site in the time available, our experience applying the model close by has led to a more refined understanding of sand mixing processes that we have used to revise the analysis of indirect impacts for the Genesis project. In addition, the project proponent NextEra has responded by redesigning the proposed eastern solar array to remove a 'toe' that intruded to the east of the project into the Palen-McCoy corridor. We have refined our assessment of potential project impacts due to wind transport disruption to reflect these two developments since the initial assessment was carried out. The predicted area of indirect impact due to reduction in wind transport processes is 151 acres.

Methodology for Assessing Indirect Project Impacts to Sand Transport

The original assessment of wind transport impacts was based on a qualitative estimate of the extent of the sand shadow. This led to the areas shown in Figure 1.

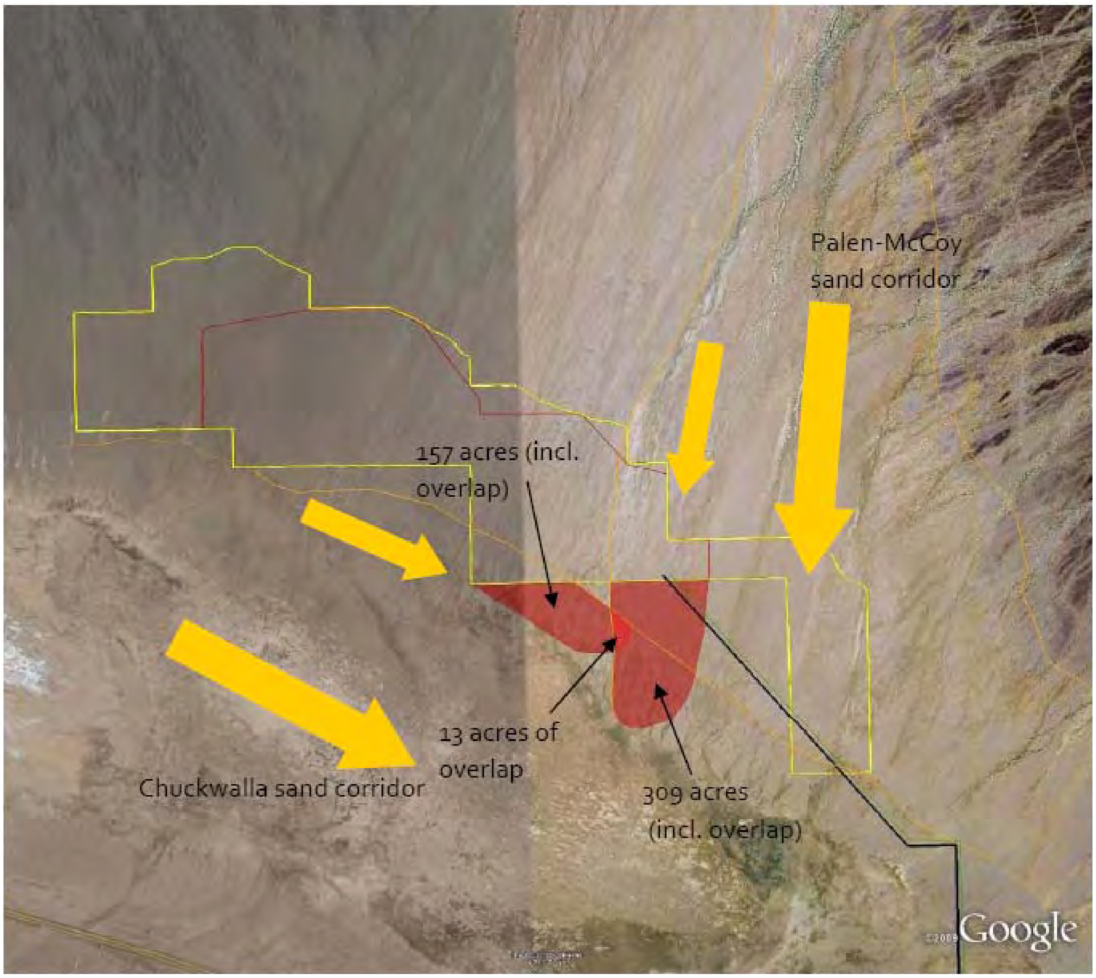

Figure 1. Original estimate of sand transport shadow (now superseded by this memo). Source: PWA, 2010 (February 26th).

Subsequently we developed a quantitative sand shadow model that takes data on the pattern of wind directions and strengths from Blythe (located 20 miles east of the project site) and combines this with data on prevailing sand transport direction collected by the applicant. The combined model uses a mixture of prevailing sand transport direction (shown by sand dunes in the field, and representing the resultant vector of all the different wind directions encountered over the course of several years) and diffusion (representing the variations around that prevailing transport direction). We applied this model to the nearby Solar Millennium Palen project site (located 12 miles west of the Genesis site). A description of the model is given in PWA, 2010 (Revised wind shadow calculations for Palen Solar Energy Project, June 2nd 2010). Given sufficient time it is our intention to adapt the quantitative model from Palen to the Genesis site so as to make a comparable assessment of project impacts to sand transport, but it has not been possible to make these modifications within the project timetable. However, in developing and applying the model southeast of the Palen project we simulated an area northwest of the Genesis project site that has the same wind direction and we were able to make observations about the pattern and extent of sand disruption that would very likely have been found had we extended the model to the Genesis project footprint. This provides us with a means of refining our initial estimations of indirect project impact.

We observed in the course of the analysis that the variations in wind direction and strength around a prevailing wind direction resulted in zones of different degrees of sand transport reduction downwind of obstacles that had consistent and predictable lengths and widths. We applied these zone patterns to the Genesis footprint, adjusting the orientation of the zones to conform to the prevailing wind direction of N68W estimated by the applicant in the vicinity of the area of project under discussion (see Figure 2).

We assumed that a line drawn from the outer edge of the project footprint intrusion into the Chuckwalla sand transport corridor and extending downwind with an orientation of S68E (180 degrees from N68W) would delineate the line of 50% sand reduction, per our observations made using the quantitative sand transport model. Zones of 25% and 75% sand reduction were drawn diverging from the point of maximum project intrusion so that they widened from the 50% reduction line at a rate of 0.12 miles per linear mile, again per our observations of the Palen model. This produced the fan shaped areas of different impact shown in Figures 3 and 4. The downwind limit of the impact area is taken as the point at which fluvial transport from the McCoy valley is no longer disrupted by the project footprint. We assume that an area shown in blue on Figures 3 and 4 will see a substantial disruption in fine sediment delivered by the alluvial fan (the area is not extended further west because the alluvial fan channels here are much smaller). East of this area we assume that the alluvial fan channels and the McCoy wind transport corridor will dominate fine sediment delivery, making the reduction in sediment transport from the Chuckwalla valley insignificant.

The refined assessment of the indirect impacts to the Chuckwalla transport corridor is as follows:
75 – 100% reduction in sand transport = 54 acres
50 – 75% reduction in sand transport = 50 acres
25 – 50% reduction in sand transport = 47 acres
Total indirect impact = 151 acres

Our refined assessment is in contrast with the original finding of 157 acres of indirect impact to the Chuckwalla transport corridor and 309 acres of impact to the Palen-McCoy corridor.

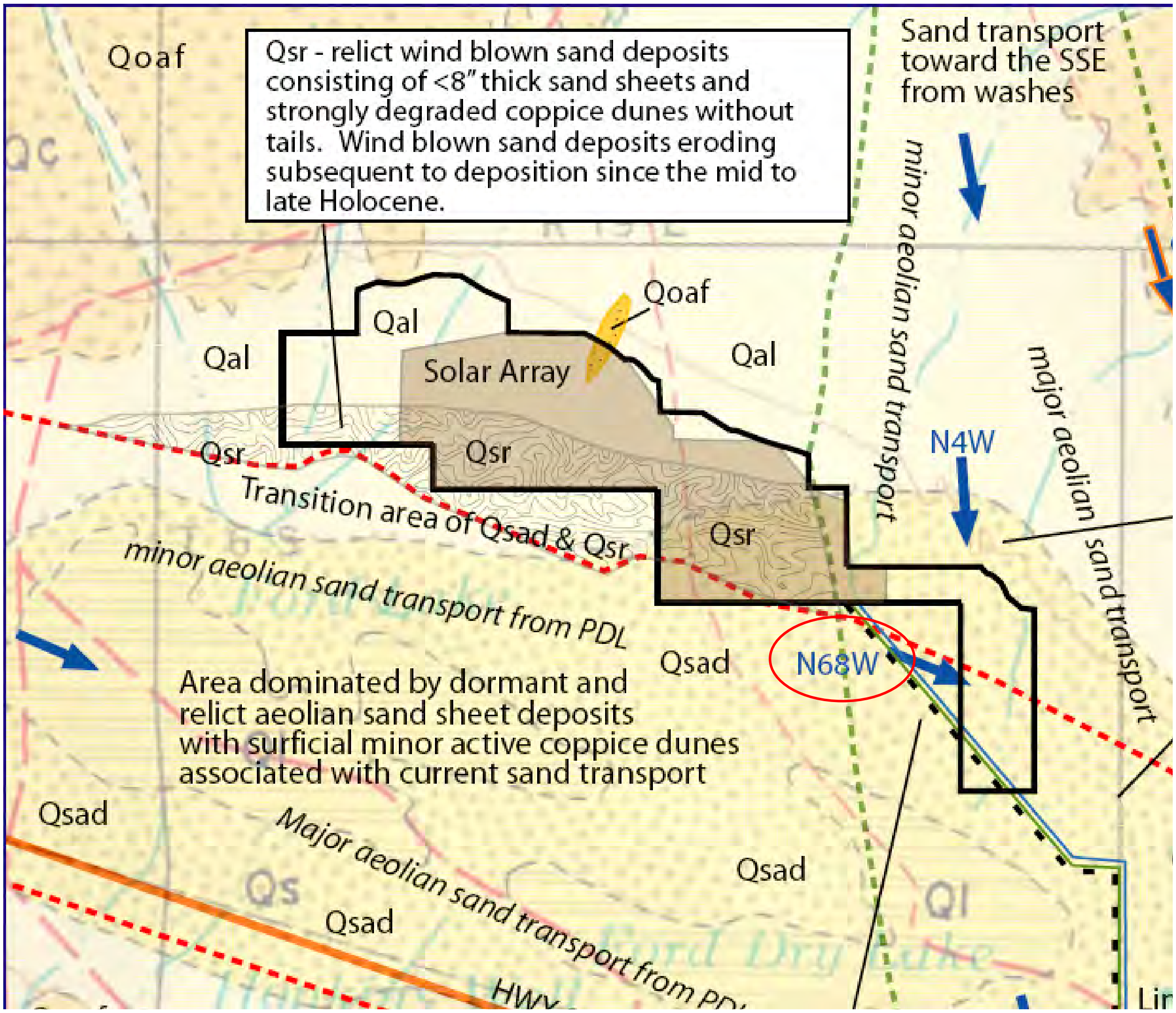

Figure 2. Prevailing wind transport evidence based on orientation of sand dunes in the project area (Worley Parsons, 2010).

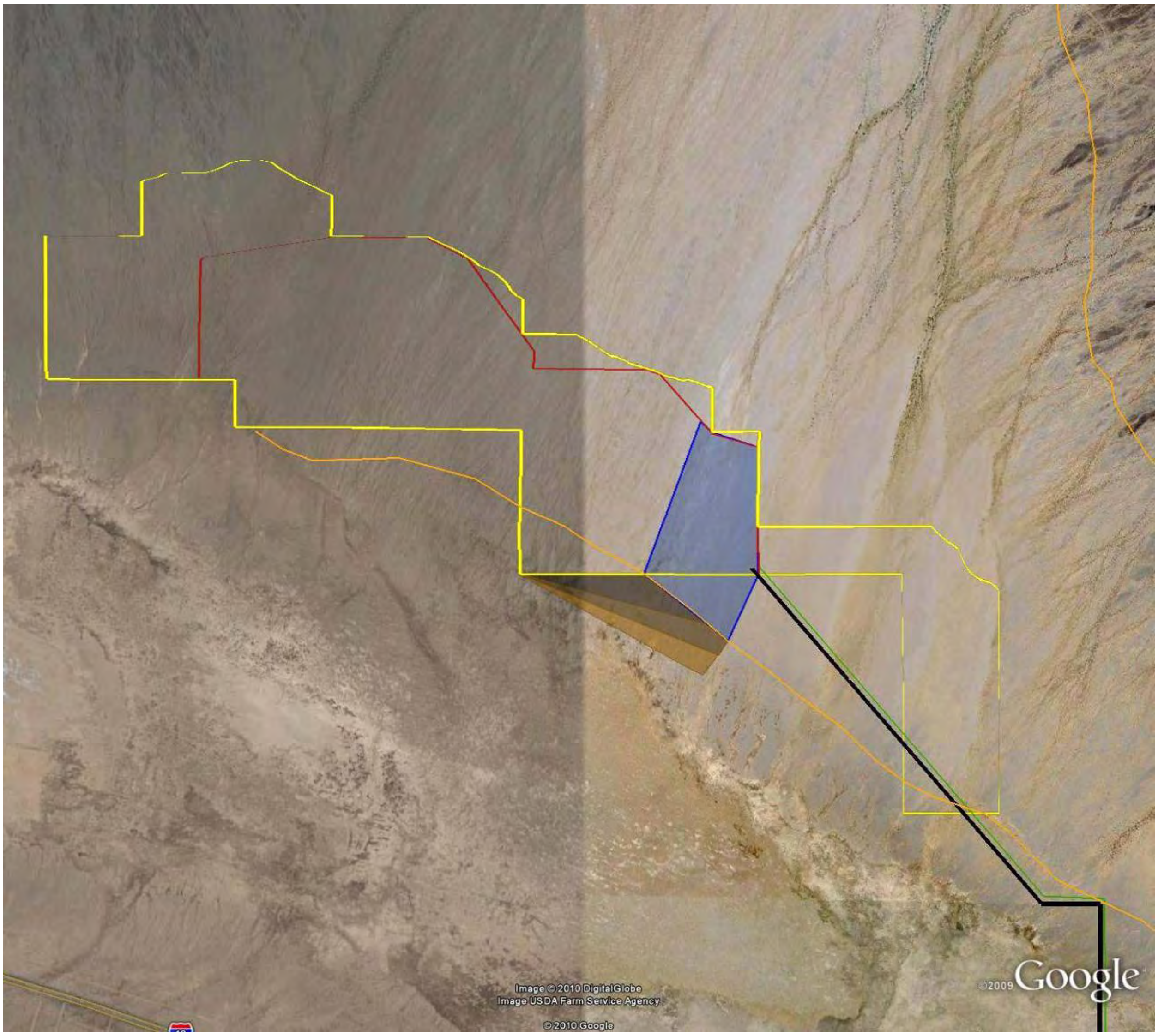

Figure 3. Refined indirect impact areas due to sand transport disruption (overview). Area in blue is area where fluvial sediment is disrupted by project. Areas in brown are different levels of sediment reduction from wind transport. Orange line is the NECO landuse boundary for sand dunes (coincides with applicant's delineation of the northern boundary of the Chuckwalla sand transport corridor).

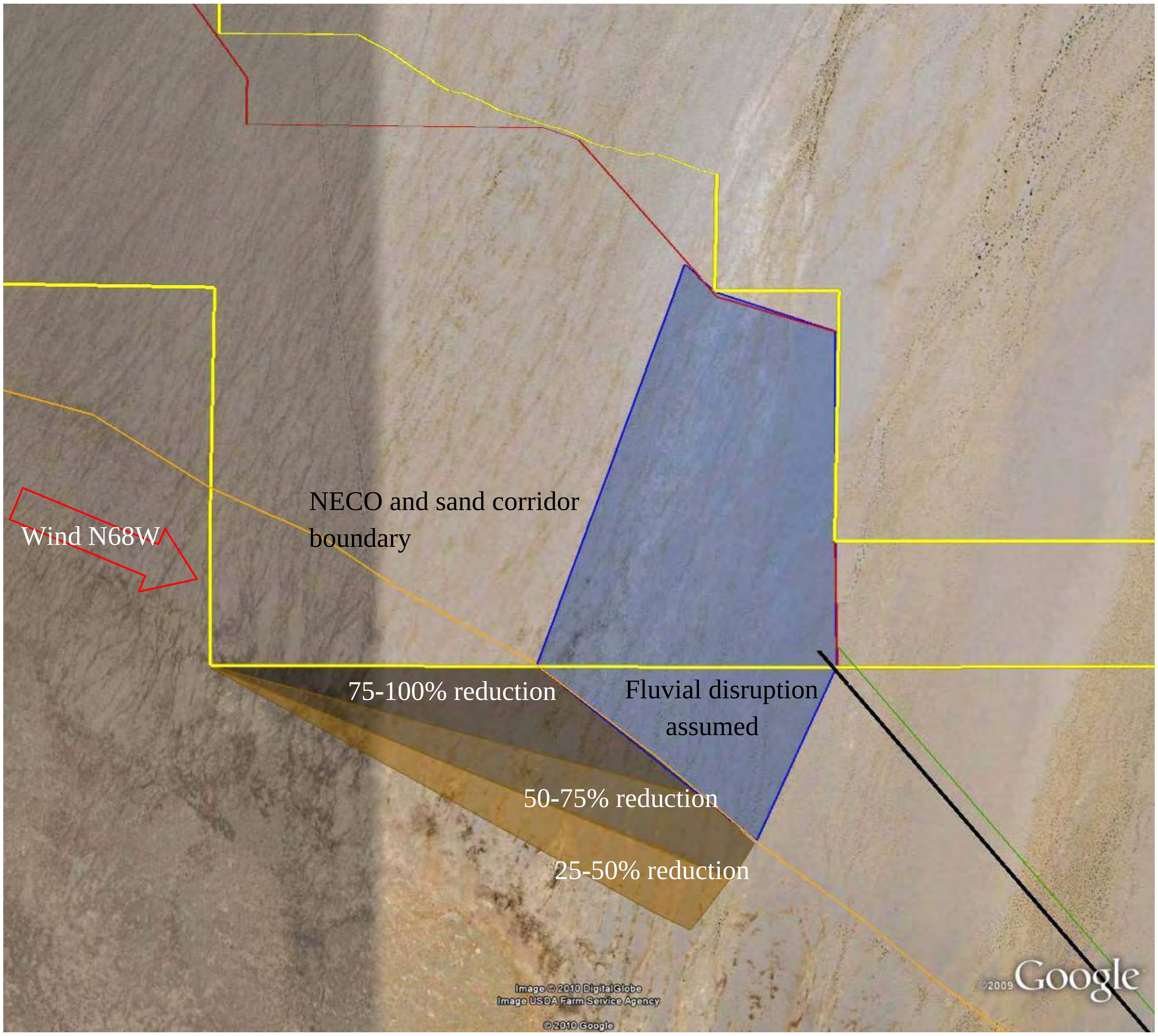

Figure 4. Refined indirect impact areas due to sand transport disruption (detail). Area in blue is area where fluvial sediment is disrupted by project. Areas in brown are different levels of sediment reduction from wind transport. Orange line is the NECO landuse boundary for sand dunes (coincides with applicant's delineation of the northern boundary of the Chuckwalla sand transport corridor).