DEPARTMENT OF CONSERVATION

Managing California's Working Lands

CALIFORNIA GEOLOGICAL SURVEY

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To: California Energy Commission
Dockets Office, MS-4
Docket No. 09-RENEW EO-01
Sacramento, CA 95814-5512

Date: February 5, 2015

From: William R. Short, Supervising Engineering Geologist, and
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Subject: Comments and Additional Information for Incorporation into the Draft Desert Renewable Energy Conservation Plan (DRECP) and Environmental Impact Report/Environmental Impact Statement (EIR/EIS)

At the request of the California Department of Fish and Wildlife (CDFW) the California Geological Survey (CGS) developed maps and supporting data to assist in identifying geomorphic processes that can be related to ecological values of interest to the Desert Renewable Conservation Plan (DRECP). This mapping was conducted in concordance with the CDFW Section 6 Habitat Conservation Plan support grant provided by the U.S. Fish and Wildlife Service in August of 2011; under the heading of "Ecosystem Processes."

CGS' initial project within this grant focused on wind-blown (eolian) resources that serve as habitat for many desert species, including DRECP Covered Species and Natural Communities and attendant alliances, such as the Mojave fringe-toed lizard (*Uma scoparia*) and North American warm desert dunes and sand flats, respectively. CGS also performed an assessment of Quaternary surficial processes in collaboration with DRECP vegetation mapping that had been developed by CDFW. This work was conducted in an area of roughly 69 km^2 (27 mi^2), located in southwestern part of Johnson Valley, and includes a portion of the Johnson Valley development focused area (DFA). The principal objective of this component was to compare the distribution of vegetation alliances, with soil substrate and geomorphic domains, in order to examine the critical biologic-geomorphic relationships in the Johnson Valley DFA.

CGS incorporated the above studies into two project reports and attendant maps. These interdisciplinary studies of desert processes provide insight into surficial processes and the distribution of ecological values that may be considered by the DRECP in advance of changes in land use. The project was delivered on August 4, 2014 and includes the following reports:

- Eolian System Mapping report: 52 pages, 2 appendices, and 4 plates (scales 1:36,000 to 1:100,000).
- ArcGIS database that contains eolian source and depositional features from plates 1 through 4 in the report cited above.
- GIS metadata that describes map attributes.
- The Influence of Surficial Processes on Vegetation Patterns in Southern Johnson Valley: 39 pages, 2 appendices, and 2 plates (scale 1:12,000).

As part of this submittal, CGS reviewed the Draft Desert Renewable Energy Conservation Plan and Environmental Impact Report/Environmental Impact Statement, dated September 2014. Based on our review of Volume III, Chapters 4 and 7 (including referenced documents therein). Based upon our review, it appears that the above information, which was developed for DFW specifically to inform the DRECP, was not incorporated or referenced into the Draft DRECP or the Draft EIR/EIS. We provide comments in the attached California Energy Commission comment form.

If you have any questions regarding the attached reports and comments, please contact Jeremy Lancaster at Jeremy.Lancaster@conservation.ca.gov.

Respectfully submitted,

Jeremy T. Lancaster, PG 7692, CEG 2379
Engineering Geologist

Concur:

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Attachments:
Pages 3-9 of this letter: CGS comments to Draft DRECP EIR/EIS Docket No. 09-RENEW EO-01

Electronic Attachments:
(On CD)
Report 1: Eolian System Mapping Report (52 pages)
Appendix A - Eolian System Maps (Includes Metadata)
Plate 1: Johnson Valley (Map Scale: 1:36,000)
Plate 2: East Riverside (Map Scale: 1:100,000)
Plate 3: San Felipe Dunes (Map Scale: 1:48,000)
Plate 4: Imperial Dunes (Map Scale: 1:100,000)
Appendix B - Geo-Logic Sieve Analysis Results

Report 2: The Influence of Surficial Processes on Vegetation Patterns in Southern Johnson Valley (39 pages)
Appendix A – Project Maps
Plate 1: Surficial Geologic Map of the Southwest Portion of Johnson Valley (Map Scale: 1:12,000)
Plate 2: Comparison of Vegetation Patterns with Surficial Geologic Mapping Southwest Portion of Johnson Valley (Map Scale: 1:12,000)
Appendix B - Vegetation Mapping Metadata

Draft Desert Renewable Energy Conservation Plan (DRECP) and Environmental Impact Report/Environmental Impact Statement (EIR/EIS)

Comment Form

Commenter: Jeremy T. Lancaster, Certified Engineering Geologist – California Geological Survey

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Comment Number	Comments					
	Volume	Chapter	Section #	Page #	Paragraph	Comment
1	III	4	2	III.4-4	1	Comment on the statement: "broad washes called bajadas" This is incorrect. Coalescing alluvial fans are called bajadas.
2	III	4	2.1	III.4-5	1	Table of "dry lakes within the Plan Area" This table is incomplete. The reference link provided to CEC (2012) does not indicate the source of the "dry lake" data. A cursory review of existing dry lakes within the Pinto Lucerne Valley and Eastern Slopes Ecoregion Subarea of The Plan indicates that dry lakes such as Lucerne, Soggy, Galway, and Emerson, are not included in the list. If the areal distribution of dry lake beds are used in the development of plan alternatives, a complete data set should be used.
3	III	4	2.1	III.4-5	3	The term "Surficial geology" is commonly used to describe geologically young sediments that have been deposited within the last 2.6 million years (the Quaternary Period; See: http://www.geosociety.org/science/timescale/timescl.pdf). The term "unconsolidated" may not realistically describe all of these deposits within the Plan Area, as some may be moderately consolidated. In addition, hard crystalline volcanic rocks of Quaternary age are typically included on geologic maps of Quaternary surficial deposits.
4	III	4	2.1	III.4-5	3	Figure III.4-1: "Surficial Geology" This is not a map of the surficial geology. Based on the map

						references (CGS, 2011 is cited but not included in the Volume III, Literature Cited section), this map is a generalized version of the State of California Geologic Map that was published at a small scale (1:750,000) (For reference See: http://www.conservation.ca.gov/cgs/cgs_history/Pages/2010_geologicmap.aspx). The map provided in this figure appears to be a derivative of the State map, where the geologic deposits of Quaternary age (or Surficial deposits) have been merged together into the general description of "Sedimentary." While it appears it may be reasonable to use this map to display the Regional Geology, it is a misstatement to say that this is a surficial geologic map because fundamentally the description of map units does not include subdivision of the surficial geologic deposits of Quaternary age. For a description of surficial geologic mapping methods and nomenclature, please see: http://www.consrv.ca.gov/cgs/fwgp/Pages/sr217.aspx and, http://eeg.geoscienceworld.org/content/20/4/335.figures-only
5	III	4	2.1	III.4-6	1-3	"Sand dunes" The data used to define the general distribution of sand dunes in the plan area is not well described. Additional mapping has been conducted for the DRECP by the California Geological Survey and is attached as part of our submittal of comments. Please see the attached report entitled "Eolian System Mapping Report," dated August 4, 2014, 52p., 2 appendices, 4 plates (including GIS data).
6	III	4	2.1	III.4-6	1-4	If the areal distribution of "landslide deposits in the plan area" is based on the map reference CGS (2011), then any analysis using this data layer is fundamentally flawed. As specifically stated in on the State Geologic Map (http://www.conservation.ca.gov/cgs/cgs_history/Pages/2010_geologicmap.aspx), only the largest landslide features (perhaps these would be considered mega-slides) were included on the map. The use of map data with a stated omission of

						landslide deposits is not appropriate, and would affect the DRECP statistical analysis significantly.
7	III	4	2.1.2	III.4-15	1	Description of Geologic process as listed show only the depositional processes (primary processes) that act on the landscape. Secondary processes – those that modify the deposits formed by primary processes, such as erosion, weathering, bioturbation, and pedogenic soil development should also be considered here. The Miller et al. (2009) publication, as listed, also describes the secondary processes. Also, please see seminal articles, such as: Blair, T.C., and McPherson, J.G., 1994, Alluvial fan processes and forms, in Abrahams, A.D. and Parson, A.J., eds., Geomorphology of Desert Environments: Chapman and Hall, London, p. 354-402.
8	III	4	2.1.2	III.4-15	3	The statement in this paragraph: Alluvial fans are formed through flowing water that "pushed debris." The water does not "push debris." Flood waters entrain sediment and debris in their flows by the process of overland flow erosion, and channel bed scour and bank collapse.
9	III	4	2.1.2	III.4-15	4	The final statement in this paragraph is vague, and does not fully describe why surficial deposits vary. Other reasons why surficial deposits vary include: The time since the deposit was abandoned (or isolated) and the relative increase in pedogenic soil development and erosion that occurs with time after abandonment. Also, the surficial deposit's depositional setting has much to do with the particle size and geomorphic signature.
10	III	4	2.1.2	III.4-16	1	An additional source of eolian sediment may also be existing sand dunes. Additional mapping has been conducted for the DRECP by the California Geological Survey and is attached as part of our submittal of comments. Please see the attached report entitled "Eolian System Mapping Report," dated August 4, 2014, 52p., 2 appendices, 4 plates (including GIS data).
11	III	4	2.1.2	III.4-16	1	Comment on the statement: "Strong winds generally transport the [eolian] sands to areas at the mountain front." General comment: eolian sands are deposited in locations where there are topographic irregularities that cause the wind velocity to drop. These can cause eolian sediments

						to deposit in many settings, not just at the "mountain front." Please see the attached report entitled "Eolian System Mapping Report," dated August 4, 2014, 52p., 2 appendices, 4 plates (including GIS data).
12	III	4	2.1.2	III.4-16	2	Figure III.4-1, Surficial Geology: See comment #4, above.
13	III	4	2.1.2	III.4-17	1	Comment on citation of "California Department of Conservation 2007;" Comment: This reference is not included in the reference list for Volume III, Chapter 4.
14	III	4	2.2	III.4-17	1	Comment on Table III.4-1 and the data sources used: The source of this data is listed as California Department of Conservation, 2010, however this reference is not included in the reference list for Volume III, Chapter 4. Additionally, if the source of this data is the State of California Geologic Map, there should be an accompanying explanation as to how the geologic map units were converted to soil type. Also the type of soil classification used (such as US Department of Agriculture, or Unified Soil Classification System) should be indicated and referred to.
15	III	4	2.2.1	III.4-18	1	Comment on the misstatement, "Erosion occurs when wind or water propels fine-grained soil components." Erosion occurs when wind or water entrain not just fine-grained soils (which would be those of silt and clay grain size) but rather soils and bedrock of all grain sizes.
16	III	4	2.2.1.1	III.4-18	1	General comment on Sand Transport Corridors Section 4.2.2.1.1 and Figure III.4-2: Mapping of Dune Systems and Sand Transport Corridors appears to be taken from the "land cover mapping of North American warm desert dunes and sand flats" data layer. Comment: It is a misstatement to call these "Sand Transport Corridors." Using this term implies that the mapping describes where the sand is coming from and where it is moving to (or source areas, zones of transport, and zones of deposition). This information cannot be determined from the mapping provided. Additional mapping has been conducted for the DRECP by the California Geological Survey and is attached as part of our submittal of comments. Please see the attached report entitled "Eolian System Mapping Report," dated August 4, 2014, 52p., 2 appendices, 4 plates (including GIS data).

17	III	4	2.2.4	III.4-22	1	Desert pavements have formed in the past in many parts of the plan area. Rainfall and elevation have some control on the development and degradation of desert pavement. Please see the following article (Quade, 2001) in order to provide a better informed statement for the public. (http://geomorphology.sese.asu.edu/Papers/Quade_desert_pavements_Geology_01.pdf) Comment on the statement: "Topographically, pavements tend to form along the middle elevations of alluvial fans, where stormflow runs along distinct down-cut channels." While the second part of this statement is true, the first part of it may benefit from by describing the dissected landform as an abandoned or relict alluvial fan segment.
18	III	4	3	III.4-22	3	Comment on the statement: The "largest are the San Andreas and the San Jacinto" Comment: This statement does not make sense. How about using the phrase most active, or faults that have the potential to generate the largest earthquakes.
19	III	4	3	III.4-22	4	The statement: "The assessment of risk from earthquakes is complex and usually expressed as zones of probability for given accelerations from shaking." This is not correct. The assessment of risk is usually expressed in terms of probability of exceeding a certain ground motion. For example, the 10% probability of exceedance in 50 years maps depict an annual probability of 1 in 475 of being exceeded each year. For example, please see: http://www.consrv.ca.gov/cgs/rghm/psha/pages/index.aspx
20	III	4	3	III.4-22	4	Comment on Figure III.4-4: The reference cited (CA Dept. of Conservation, Division of Mines and Geology, 1994). The source for this map is not included in the Volume III reference section. In addition, this reference appears to be an older version of the more recently published (2010) fault activity map of California. See: http://www.quake.ca.gov/gmaps/FAM/faultactivitymap.html This comment is also applicable to figures III.4-5 through III.4-12.

21	III	4	3	III.4-45	1	Comment on the following statement: "Earthquake magnitude is measured on the Richter magnitude scale." Comment: The modern preferred method is the use of the "moment magnitude scale." This is because the Richter magnitude scale cannot accurately describe large earthquakes. For example, please see: http://earthquake.usgs.gov/learn/topics/measure.php
22	III	4	4.1	III.4-47	1	Comment on the following statement: "A commonly used benchmark for intensity is peak horizontal ground acceleration, which is the probability that an earthquake will exceed the peak acceleration of gravity by 10%." This statement is incorrect. Peak horizontal ground acceleration is the maximum peak horizontal acceleration experienced from an earthquake expressed in percent of the acceleration due to gravity (%g). The sentence that follows, "Peak horizontal ground acceleration is the ground motion effect at the site for all earthquakes believed to be possible at that site." Comment: This is a misstatement and perhaps what is intended here is a discussion of the results of a probabilistic seismic hazard analysis and how they are used to model peak horizontal ground acceleration. For example, please see: http://www.consrv.ca.gov/cgs/rghm/psha/Pages/Index.aspx
23	III	4	4.2	III.4-47	1	Comment regarding liquefaction and the use of the term "fine-to-medium-grained": Liquefaction occurs in loose saturated sands, typically at depths less than 50 feet. What is stated is not technically correct. The term "fine to medium grained soils," if applied to the entire spectrum of grain sizes – clay to boulder – would suggest that clays, silts and sands are all liquefiable. This is not true. Please see the following publication for reference: http://www.conservation.ca.gov/cgs/shzp/webdocs/Documents/sp117.pdf
24	III	7	2.6	III.7-17	1	Comment on use of the term "Surficial Geology" in Table III.7-6. Please see our comment to Items 3 and 4.
25	III	7	2.6	III.7-18	1	Comment on Dunes and Sand Resources mapping, Table III.7-7. Please see the attached reports and mapping referred to in our transmittal letter.

26	III	7	2.6	III.7-19	1	Comment on how "surficial deposits vary." Please see our comment to Item 9.
27	III	7	3.2	III.7-24	1	Comment on the effects of "sand deposition in a single wind event." Please see our attached reports and mapping referred to in our transmittal letter. Specifically the Johnson Valley study identifies the enhancement of coppice dune formation by the deposition of eolian sand.
28	III	7	4.1.2	III.7-Fig		Comment on Figure III.7-4, "Natural Communities and Other Land Covers – Cadiz Valley and Chocolate Mountains Ecoregion Subarea" Please see our comment in Item 5 and the attached reports and mapping referred to in our transmittal letter.
29	III	7	4.1.2	III.7-Fig		Comment on Figure III.7-5, "Natural Communities and Other Land Covers – Imperial Borrego Valley Ecoregion Subarea" Please see our comment in Item 5 and the attached reports and mapping referred to in our transmittal letter.
30	III	7	4.1.2	III.7-Fig		Comment on Figure III.7-10, "Natural Communities and Other Land Covers –Pinto Lucerne Valley and Eastern Slopes Ecoregion Subarea" Please see our comment in Item 5 and the attached reports and mapping referred to in our transmittal letter.
31	III	7	4.2.6	III.7-68	1	Comment on "Dune and San-Based Communities." Additional mapping has been conducted by CGS to Identify the presence of eolian deposits. Please see our comment in Item 5 and the attached reports and mapping referred to in our transmittal letter.

Based on our understanding of California's diverse geology and surficial processes that are pertinent to resources and hazards in the state, and our review of the DRECP EIR/EIS, we recommend that the comments and referenced studies enclosed be used to refine the DRECP analysis.