TETRA TECH

May 14, 2013
TTDN-ADM-13-060(X)

Mr. Peter Pawlowski
Director, Business Development
FloDesign Wind Turbine Corp.
221 Crescent Streets, Suite 103A
Waltham, MA 02453

Subject: DESK TOP GEOLOGIC ASSESSMENT
Sand Hill Wind Project, Task ALT-17
Altamont Pass, California

Dear Mr. Pawlowski:

Tetra Tech Inc. (Tetra Tech) is pleased to transmit our completed desk top geologic and seismic assessment report for the Sand Hill Wind Project. This task was completed in accordance with the scope of work outlined in Exhibit B – Task Order # ALT-17, Desk Top Geologic Assessment for Sand Hill Wind Project and FloDesign PO # 30152 dated April 24, 2013.

This desk top geologic assessment is based on the project description and the information obtained from published and unpublished sources. It has been prepared in accordance with generally accepted geotechnical practices and makes no other warranties either express or implied, as to the professional advice or data included in it. The evaluation was performed by Mr. Douglas Bell (California Registered Geotechnical Engineer GE 2140) and Mr. David Luka (California Certified Engineering Geologist EG 1767) under the oversight of Mr. Peter Skopek, PhD (California Registered Geotechnical Engineer GE 2635). This report will be used as supporting documentation for the EIR for the Sand Hill Wind Project. In addition, it will be used to provide background data to inform the full geotechnical investigations and analyses to be performed as part of the project design and development.

If you have any questions, please call me at (303) 980-3707 or email at ron.versaw@tetratech.com.

Sincerely,
TETRA TECH, INC.

Ron Versaw, P.E.
Senior Project Engineer

RV:bl
Attachment: Desk Top Geologic and Seismic Assessment, Sand Hill Wind Project

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DESK TOP GEOLOGIC AND SEISMIC ASSESSMENT

SAND HILL WIND PROJECT

REGIONAL GEOLOGY AND SEISMICITY

The Sand Hill Wind Project sites are located on the eastern flank of the California Coastal Range (Coast Ranges Geomorphic Province) near the western margin of the Great Valley. The Coast Ranges Geomorphic Province in the region is dominated by generally northwest -southeast trending ridges and valleys. Geologic units include within the Coast Ranges include Mesozoic age shale and lithic sandstone. East of and juxtaposed to the Coast Ranges are sedimentary rocks of the Great Valley Sequence, a Cretaceous age assemblage of sedimentary deposits consisting of sandstone, shale and claystone. The Great Valley sequence is also dominated by generally northwest -southeast trending ridges and valleys. More recent Tertiary and Quaternary age deposits blanket the Great Valley sequence on the east, which in turn, merge with recent sediments of the San Joaquin Valley.

The three proposed project sites are not located within State of California defined Fault Hazard Zones (Alquist Priolo Zone). The closest mapped fault considered of potential significance to the sites is the Midway fault, located immediately west of the Griffith (North and South) sites and east and extending onto the Ralph 1 and 2/Pombo site (Plate 1). The Midway fault is designated by the State of California as a Potentially Active fault; defined by the State as showing evidence of displacement during late Quaternary time (i.e., last 700,000 years). An unnamed fault is mapped extending northerly onto the Ralph 1 site (Dibblee 1980c). Regional mapping by the California Geologic Survey (CGS) indicates that neither of these faults show evidence of Holocene movement and are not considered active by the State. The closest active fault to the project area (i.e., showing evidence of displacement during the Holocene; within the last 100, 000 years) is the Greenville fault. Its closest approach to the project sites is approximately 6 miles west of the Ralph 1 and 2/Pombo site. Other active faults of engineering significance include the: Concord, Pleasant Hill, Calaveras, Hayward, San Andreas and Seal Cove faults, all located progressively to the west. The San Andreas fault is located approximately 43 miles to the southwest.

A preliminary probabilistic seismic evaluation of the project area was performed utilizing the United States Geologic Survey Probabilistic Seismic Hazard Assessment 2008 model (USGS 2008). This evaluation indicates a potential peak ground acceleration for a seismic event with a 10 percent probability of exceedance in 50 years (475 year return period) on the order of 0.36g (Plate 2).

LOCAL GEOLOGIC CONDITIONS AND POTENTIAL IMPACTS

Local geologic conditions and the potential impact on foundation conditions vary somewhat across the project limits as discussed in the following sections. A local geologic map Figure 1 illustrating the three sites and follows the site descriptions.

Ralph 1 & 2/Pombo Sites

Local Geologic Conditions: This project site consists of three contiguous areas and is located on fairly hilly terrain on both sides of Altamont Pass Road, north of Interstate 580. Data obtained from the United States Department of Agriculture (USDA) Web Soil Survey site (USDA 2013) indicates that surficial soils are predominantly "Altamont rock clay." This material is described as having a fairly high clay content with a typical depth on the order of roughly 2 feet. This thin mantle of soil is underlain by the Panoche Formation (Dibblee 1980a, 1980b and 1980c; Dibblee and Minch 2006a and 2006b). This formation is Upper Cretaceous in geologic age and consists of light gray, arkosic sandstone with large

concretions and interbeds of micaceous shale. Mapping of surface exposures of this formation indicate predominantly east-dipping bedding with inclinations varying from 15 to 25 degrees. One small landslide has been mapped to the west of the Pombo site (Sowers 1993), however, no active landslides are mapped within the project sites. Mapping by Nilsen (1972a and 1972b) indicates widespread evidence of bedrock landsliding in the older Cretaceous deposits to the west and to the south of the site. Nilsen also mapped a few smaller landslides with lengths on the order of 200 to 500 feet in the southwesterly portion of the Ralph 1 area and in the southerly portions of the Pombo area. A review of available aerial photographs (Google, Terra Server) did not indicate obvious evidence of active or recent landsliding on the site.

Engineering Considerations: The clay content of the surficial soils may indicate a moderate to high expansion potential which would require specific grading and surface drainage provisions to be implemented in the design of the project. Although a review of the available published literature does not show significant landslides on the site, the easterly inclined structure suggests that special attention may be required for analysis and design of east facing slopes or at improvement locations where surcharging of east facing slope will occur. Based on the geologic age of the near surface formation underlying the site, the potential for liquefaction or ground settlement due to seismic shaking is considered to be very low.

A review of improvement locations with respect to mapped landslides is recommended prior to finalizing design. It is anticipated that additional aerial photograph evaluation (stereographic photograph pairs), field mapping (surface mapping) and possible subsurface exploration (backhoe trenching, bucket auger drilling) will be necessary to provide design level data for plan preparation.

Griffith North & South Sites

Local Geologic Conditions: These project sites are located on gently rolling terrain between North Midway Road and Interstate 580. Data obtained from the United States Department of Agriculture (USDA 2013) Soil Survey Site indicates that surficial soils are predominantly "Linne clay loam." This material has a fairly high clay content with a typical depth on the order of roughly 3 feet. This thin mantle of soil is underlain by the Oro Loma Formation (Dibblee 2006a and 2006b). This formation is Pliocene to early Pleistocene in geologic age and consists of conglomerate gravel, sandstone and claystone. Local bedrock mapping (Dibblee 2006a and 2006b) suggests that the overall structure is easterly dipping, although at inclinations shallower than the Panoche Formation.

No data was available for review that would suggest the presence of large landslides or other geologic hazards have been mapped on these project sites. However, mapping by Nilsen (1972b) indicates that several bedrock landslides are present to the south of the site. Additionally, Nilsen shows two smaller landslides similar to this mapped on the Ralph 1 & 2/Pombo Sites.

Engineering Considerations: The clay content of the surficial soils may indicate a moderate to high expansion potential which would require specific grading and surface drainage provisions to be implemented in the design of the project. Based on the available data, no landslide stabilization measures are anticipated to be required. However, a review of improvement locations with respect to mapped landslides is recommended prior to finalizing design. It is anticipated that additional aerial photograph evaluation (stereographic photograph pairs), field mapping (surface mapping) and possible subsurface exploration (backhoe trenching, bucket auger drilling) will be necessary to provide design level data for plan preparation.

Based on the geologic age of the near surface formation underlying the site, the potential for liquefaction or ground settlement due to seismic shaking is considered to be very low.

Castello and Arnaudo Sites

Local Geologic Conditions: These project sites are located on fairly hilly terrain bounded by the California Aqueduct to the west and the Delta Mendota Canal on the east. Data obtained from the United States Department of Agriculture (USDA 2013) Soil Survey Site indicates that surficial soils are predominantly "Linne clay loam." This material has a fairly high clay content with a typical depth on the order of roughly 3 feet. This thin mantle of soil is underlain by the Oro Loma formation and Neroly Sandstone (Dibblee 2006a) Oro Loma Formation is Pliocene to early Pleistocene in geologic age and consists of conglomerate gravel, sandstone and claystone. The Neroly Sandstone Formation is Miocene in geologic age, unconformably underlies the Oro Loma over most of the sites, and is encountered in the near surface along the western margin of the sites. The Neroly Sandstone is mapped as a thickly bedded, medium- to coarse-grained arkosic sandstone. From a review of the available literature, no landslides or other geologic hazards have been identified on these project sites. However, bedding structure in both the Oro Loma and Neroly formations have been mapped as dipping to the east at angles varying from 9 to 11 degrees.

Engineering Considerations: The clay content of the surficial soils may indicate a moderate to high expansion potential which would require specific grading and surface drainage provisions to be implemented in the design of the project. No landslides have been mapped on these sites, however, with the bedding structure indicated in the referenced literature, special attention may be required for analysis and design of east facing slopes. Based on the geologic age of the near surface formation underlying the site, the potential for liquefaction or ground settlement due to seismic shaking is considered to be very low.

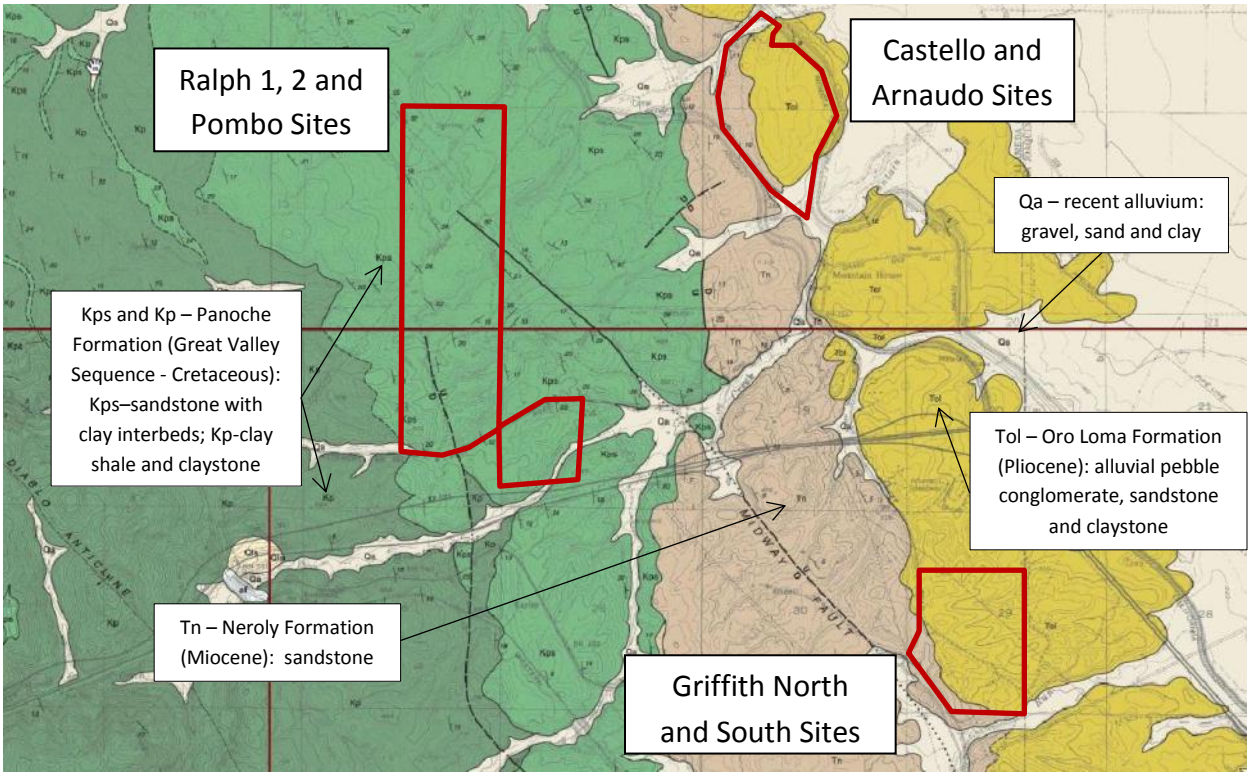

Figure 1 – Local Geologic Map

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_____, 1980b, Preliminary Geologic Map of the Midway Quadrangle, Alameda and San Joaquin Counties, California, USGS Open File Report 80-535, Scale 1:24,000.

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Dibblee, T.W. and Minch, J.A., 2006a, Geologic Map of the Byron Hot Springs & Clifton Court Forebay Quadrangles, Contra Costa, Alameda & San Joaquin Counties, California: Dibblee Geological Foundation, Dibblee Foundation Map DF-195, Scale 1:24,000.

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Sowers, J.M., Noller, J.S., Lettis, W.R., 1993, Preliminary Maps Showing Quaternary Geology of Tracy and Midway 7.5 Minute Quadrangles, California, USGS Open File Report 93-225.

USGS Open File Report 80-538, Scale 1:24,000.

United States Department of Agriculture, Natural Resource Conservation Service, Web Soil Survey, (Accessed May 8, 2013) http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx.

United States Geologic Survey (USGS) 2008 NSHMP PSHA Interactive Deaggregation web site, https://geohazards.usgs.gov/deaggint/2008/.

PROJECT SITES
(approximate site centers)

LATITUDE: 37°45' N
LONGITUDE: 121°36' W

LATITUDE: 37°43' N
LONGITUDE: 121°33' W

LATITUDE: 37°46' N
LONGITUDE: 121°34' W

Reference: Excerpt of *Jennings, C.W., and Bryant, W.A., 2010, Fault activity map of California: California Geological Survey, Data Map No. 6, map scale 1:750,000.*

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0 10 20 30 40 50

SCALE IN MILES

EXPLANATION

Geologic Time Scale			Years Before Present (Approx.)	Fault Symbol	Recency of Movement	DESCRIPTION: ON LAND	DESCRIPTION: OFFSHORE
Quaternary	Late Quaternary	Historic	200			Displacement during historic time (e.g. San Andreas fault 1906). Includes areas of known fault creep.	
		Holocene	11,700		? ? ?	Displacement during Holocene time.	Fault offsets seafloor sediments or strata of Holocene age.
		Pleistocene	700,000		? ?	Faults showing evidence of displacement during late Quaternary time.	Fault cuts strata of Late Pleistocene age.
	Early Quaternary		1,600,000		?	Undivided Quaternary faults – most faults in this category show evidence of displacement during the last 1,600,000 years; possible exceptions are faults which displace rocks of undifferentiated Plio-Pleistocene age.	Fault cuts strata of Quaternary age.
Pre-Quaternary			4.5 bya (Age of Earth)			Faults without recognized Quaternary displacement or showing evidence of no displacement during Quaternary time. Not necessarily inactive	Fault cuts strata of Pliocene or older age.

MAP SYMBOLS	
Triangle - termination point data. Square – fault creep slippage. Hachure – linear extent of fault creep (other symbols – see below)	
Approximately located trace	
Location uncertain	
Bar and ball on downthrown side	
Arrows along fault indicate relative or apparent direction of lateral movement	
Direction of fault dip	
Low angle fault (barbs on upper plate)	
171	Numbers refer to annotations listed in explanatory text of map.

Regional Fault Map

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Project Name: Sand Hill Wind Project

Project Number: TET 13-33F

Date: May 2013

Plate 1

FILE: TET 13-33F PLATE 1 SAND HILL WIND PROJECT_PLOT DATE:2013/05/09

PSH Deaggregation on NEHRP BC rock
Ralph_Pombo_Tur 121.608º W, 37.752 N.

Peak Horiz. Ground Accel.>=0.3623 g
Ann. Exceedance Rate .208E-02. Mean Return Time 475 years
Mean (R,M,ε_0) 13.2 km, 6.46, 0.69
Modal (R,M,ε_0) = 13.7 km, 6.58, 0.50 (from peak R,M bin)
Modal (R,M,ε*) = 14.9 km, 6.58, 1 to 2 sigma (from peak R,M,ε bin)
Binning: DeltaR 10. km, deltaM=0.2, Deltaε=1.0

United States Geologic Survey Probabilistic Seismic Hazard Assessment 2008 model (USGS 2008).

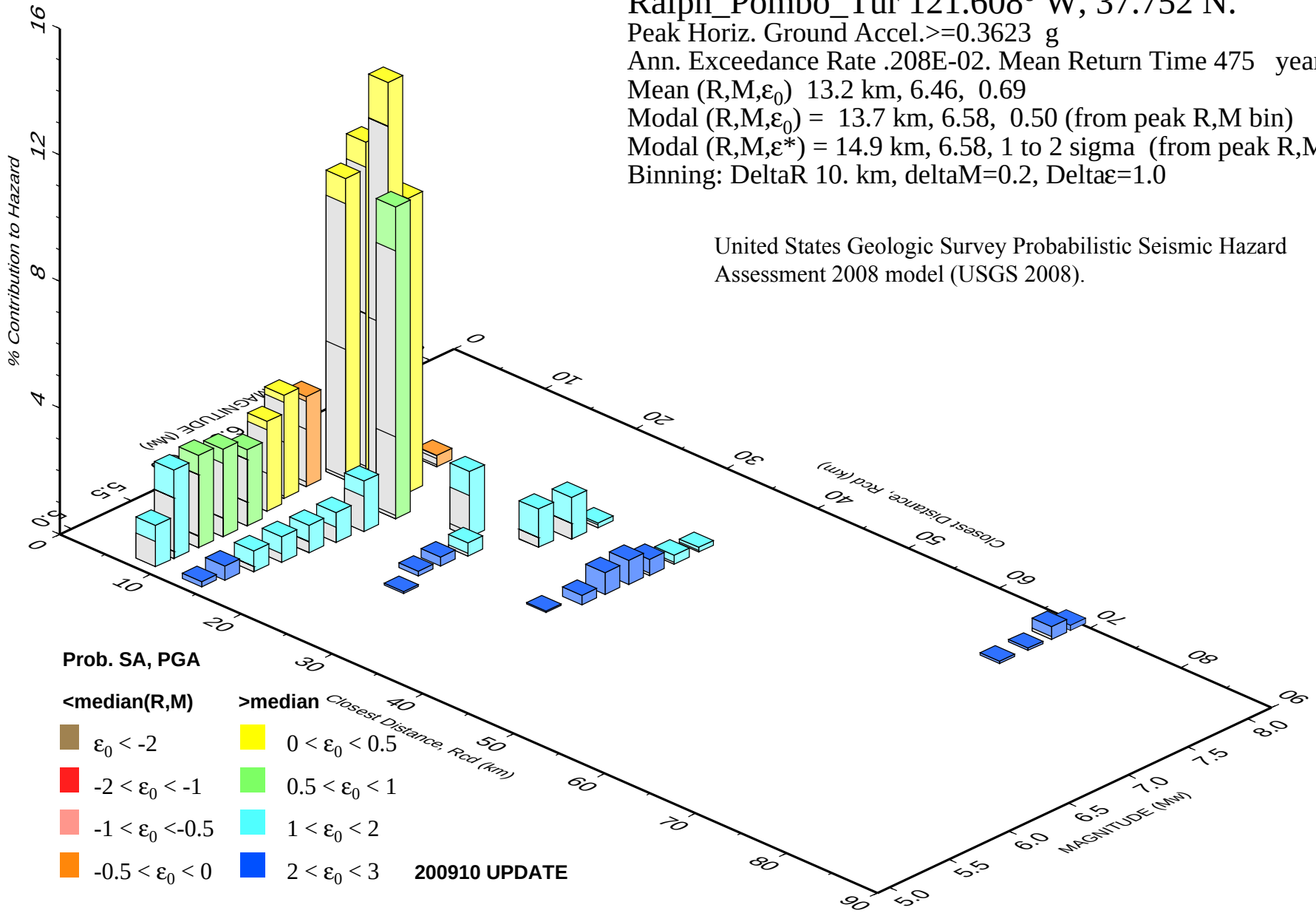

Plate 2