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J. Carl Stepp, Chief
Geology and Seismology Branch
Division of Site Safety
and Environmental Analysis
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: San Onofre Nuclear Station Review

Dear Carl:

The comments on the geologic and seismic review of reports on San Onofre Nuclear Station were prepared by our staff, Siang S. Tan (geologist) and Gordon W. Chase (geophysicist). The reviewed reports were the following:

1. Amendment #11 PSAR (Preliminary Safety Analysis Report) March, 1972, SCE and SDG & E.

2. Recent Geotechnical Studies - Southern Orange County California, Vol. 1 and 2, February, 1976, SCE and SDG & E.

3. Final Safety Analysis Report, Vol. 3 - App. 2.5, March, 1977, SCE and SDG & E.

4. Final Safety Analysis Report, Vol. 4 - App. 2.58, SCE and SDG & E.

5. Geotechnical Studies No. San Diego County, California, October, 1977, SCE and SDG & E.

6. Amendment #52, Final Safety Analysis Report, December, 1977, SCE and SDG & E.

7. Analysis of Geological Features at the San Onofre Nuclear Generating Station, July, 1974, Fugro.

8. Analysis of C & T Type Features at the San Onofre Nuclear Generating Station, November, 1974, Fugro.

9. Final Report on Geological Features at the San Onofre Nuclear Generating Station Unit 2 and 3, August, 1976, Fugro.

10. Safety Evaluation of the Geological Features at the Site of the San Onofre, July, 1975, USNRC.

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1. Further studies are suggested to determine whether the reported ancient (pre-terrace deposition) landslide features in the Horno Canyon area, 5 miles south of the reactor site, (as reported by Fugro, Inc. and P. L. Ehlig) are definitely created by landsliding and not by faulting or a combination of tectonic and subsequent landsliding. Is the ancient landslide feature exposed at the sea bluff? Or is it thought to be concealed by one of the younger slope failures at the sea cliff? If it is considered to be of tectonic origin, it may not be exposed at the sea bluff as it parallels the shoreline. Similarly, any fault trending parallel to the coast could not be exposed anywhere else since as a vast area along the coast of this region is underlain by thick terrace deposits which are not intersected by drainage channels, deeply eroded into the underlying bedrock, except for the two canyons where these features were reported. It is important to consider the possible occurrence of faults along the coastline as they parallel the offshore southern extension of the Newport-Inglewood fault zone. These possible faults may be related to the late Quaternary displacements found more to the south, in the Target Canyon.

   Any feasible geophysical exploration (such as deep seismic profiling, vibro seismic, etc.) and digitized method of providing computerized printout of seismic data showing continuous geologic structure along the profile, which allows the interpretation of structure underneath the coastal terrace deposits, will be very useful in evaluating the possibility of the presence of onshore faults paralleling the Newport-Inglewood fault zone.

2. The nuclear stations are underlain by a couple of sets of fractures and shear joints, particularly Unit 1. These features are exposed at the surface after up to 85 feet overburden was removed; they may experience greater seismic shaking effects than when they were still buried, although they do not separate different lithologies. It seems that many of these joint features are well cemented and are normally not open fissures, but no careful study of the characteristics of these failure features which relates them to potential rupture due to seismic shaking was ever performed.

3. Offshore subsurface studies of the Capistrano embayment indicate that several significant faults may underlie the general vicinity of the site, as reported by J. C. West. Although these faults do not show any evidence of Holocene or Pleistocene movement or high seismicity, more detailed subsurface studies, deep seismic or vibroseismic exploration and computerized profiles of seismic data showing continuous structure may reveal some explanation of the origin and significance of small earthquakes in the region. Seismically active faults may not show any distinct Holocene displacement evidence (but most likely produce only small earthquakes, smaller than M5).

4. Some geomorphologic features indicating possible recent uplift movements may be present in the Capistrano embayment. The Sulphur Creek seems to have changed its stream flow direction and drainage course but this phenomenon could also be explained by a blockage of drainage due to landsliding. Further studies of these features as related to recent tectonics are recommended.

5. On page 12 in "Recent Geotechnical Studies, Southern Orange County, Calfiornia, February 1976, Vol. II, portions of enclosure A" the following statement is made: "The aeromagnetic map indicates there is a change in the basement rock complex from the east to west side of the Christianitos fault." The amount of aeromagnetic data east of the fault is not sufficient to develop this conclusion.

6. Regarding "(Amendment No. 11 to PSAR Unit 2 and 3, March 1972)" the offshore gravity and magnetic data do not appear to conflict with the associated acoustic sections. Using current geologic interpretations, the term "Southern California Mesozoic Subduction Zone" (gravity map and text) may be doubtful at this time. The Bouguer gravity data generally has a transformation from minus to plus values across the continental to oceanic boundary.

We hope these comments will be helpful in the preparation of your forthcoming geologic review on San Onofre Nuclear Station.

Sincerely,

James F. Davis
State Geologist

cc: Priscilla Grew
Perry Y. Amimoto