Comments on "Geologic and Seismologic Study of Bodega Head" by St. Amand, 1963.

By Frank Neumann

(Only the seismological aspects are discussed in the following paragraphs.)

At bottom of p. 5, St. Amand states, "A combination of the fracturing, mylonitization, deep weathering, and an abundance of ground water render the bedrock far less stable than similar rock would be had it not been comminuted by the eons of shearing which it has undergone." If this condition extends down to depth of the order of 50 feet, then the granodiorite in Bodega Head may not possess all the seismic stability we generally credit to granitic rock--a rock which for the present purpose must be defined as one yielding minimum earthquake intensities. The writer has previously stated in AEC memoranda that the true seismic foundation factor at the Head can be obtained only after a number of strong motion seismograph records are obtained on this rock. For epicenters within only a few miles of the Head the local geology is not a serious factor, but if the rock were less stable than granite, a maximum intensity might be experienced from earthquakes that centered possibly 10,20, or 30 miles away. The rapid intensity attenuation found in granitic basement rock would not apply to the allegedly less stable rocks of Bodega Head.

Page 16, Richter's table showing magnitude-intensity relationship. St. Amand says the table values are in good agreement with those observed in actual earthquakes. Just how good this agreement is can be seen in Fig. 4 of the writer's paper on Bodego Head now under review by the L & R Division of A.E.C. The table entirely ignores the lower intensities experienced on granitic rocks for the deeper type California earthquakes, and the reader is left to conjecture what it might be. Fig. 4 shows it directly. The writer deplores the practice of those who attempt to evaluate the work of others without offering

In the middle paragraph of p. 16 St. Amand explains the attenuation of the El Centro earthquake as being due to the thick alluvium beneath El Centro. Fig. 3 of my report, which is now being reviewed, shows El Centro as having the minimum intensity of a town on the thick sedimentary basement of southern California, so there is no need to postulate a thick alluvial overburden to explain its intensity or the character of the record obtained. We are not sure to what extent the sedimentary basement itself "alters the power spectrum." St. Amand assumes this alluvial cover somewhat masked the effect of the "fling" at El Centro. In my recent comments on statements by Prof. Housner in Chicago I stated that the acceleration due to this so-called "fling" is quite clearly defined on the El Centro acceleration record. St. Amand evidently hoped to see his "fling" concept better illustrated on seismograph records than it actually is. As to the shaking being much harder in the direction in which faulting progresses, this is entirely a theoretical consideration that still has to be proved from observational data. The shaking is certainly not so much harder that it can be immediately spotted on an intensity distribution map of a shaken area. None of these are seriously important considerations but point up the weakness that many seismologists have in treating their theoretical concepts as facts.

In paragraph 4 I thoroughly agree with St. Amand in his statement that the historical record shows very clearly that higher intensities go with larger earthquakes; and that the use of the El Centro record will not guarantee adequate design factor for the proposed Bodega Head power plant.

Using the equation at the bottom of p. 16 St. Amand arrives at a value of 1 g for mm-10 1/2. If reference is made to Fig. 5 of the writer's Bodego Head report now in preparation, it will be seen that the same result will be

obtained by extending line "C" (for average earthquake accelerations) to 1 g. acceleration. It is felt that Fig. 5 gives a far better picture of the intensity-acceleration relationship and its deviations than the Gutenberg-Richter formula quoted by St. Amand.

Last line on p. 16. - St. Amand evidently believes that 1 g. accelerations have been observed; as does the writer. Dr. Housner does not.

Seattle, Washington,
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DRAFT PUBLIC ANNOUNCEMENT

AEC RECEIVES INTERIOR DEPARTMENT REPORT
ON SITE PROPOSED FOR BODEGA HEAD REACTOR

The Atomic Energy Commission has received a report from the Department of the Interior concerning the geological and seismological aspects of a nuclear power plant site proposed by Pacific Gas and Electric Company at Bodega Head, approximately 50 miles northwest of San Francisco. A report from the Department of the Interior had been requested by AEC.

As noted in the attached letter from Acting Interior Secretary John A. Carver, Jr., to AEC Chairman Glenn T. Seaborg, the geological phase of the Interior Department report reflects the status of excavation by PG&E at the Bodega Head site as of June 6, 1963.

Excavation at the site has continued since that time, and, as requested by the AEC, it has been observed by representatives of the U. S. Geological Survey, as well as by AEC personnel.

Subsequent to the period covered by the Interior Department report on geology, a fault was observed in the sediments above bedrock. The excavation now has reached more than 40 feet below sea level and, within the past few days, it has been found that the fault extends into the bedrock at the location of the proposed plant. It is not yet known whether, in a geological sense, the fault would be considered to be

active or inactive. Work is continuing in an attempt to determine approximately how long ago movement last occurred along the fault. Geologists from the U. S. Geological Survey are at the site and are watching the excavation work.

A further geological report is being requested from the Department of the Interior with respect to this fault.

The Interior Department report which has been received, the further geological report being requested regarding the recently observed fault, and all other information pertaining to Pacific Gas and Electric Company's application for a construction permit will be studied by the AEC Regulatory Staff, its expert consultants in seismology and structural engineering, and by the Commission's Advisory Committee on Reactor Safeguards. The Coast and Geodetic Survey of the U. S. Department of Commerce is assisting the AEC Regulatory Staff in its evaluation of the seismology.

A copy of the letter from the Acting Secretary of the Interior to the Chairman of the Atomic Energy Commission is attached. Copies of the full report of the Department of the Interior are available for inspection at the Commission's Public Document Room, 1717 H Street, N. W., Washington, and at the Commission's San Francisco Operations Office, 2111 Bancroft Way, Berkeley, California.