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SCHWENCER,A. Licensing Branch 2

SUBJECT: Forwards supplemental response to NRC Question 361.16 re small magnitude earthquakes. Response will be included in Amend 27 to FSAR

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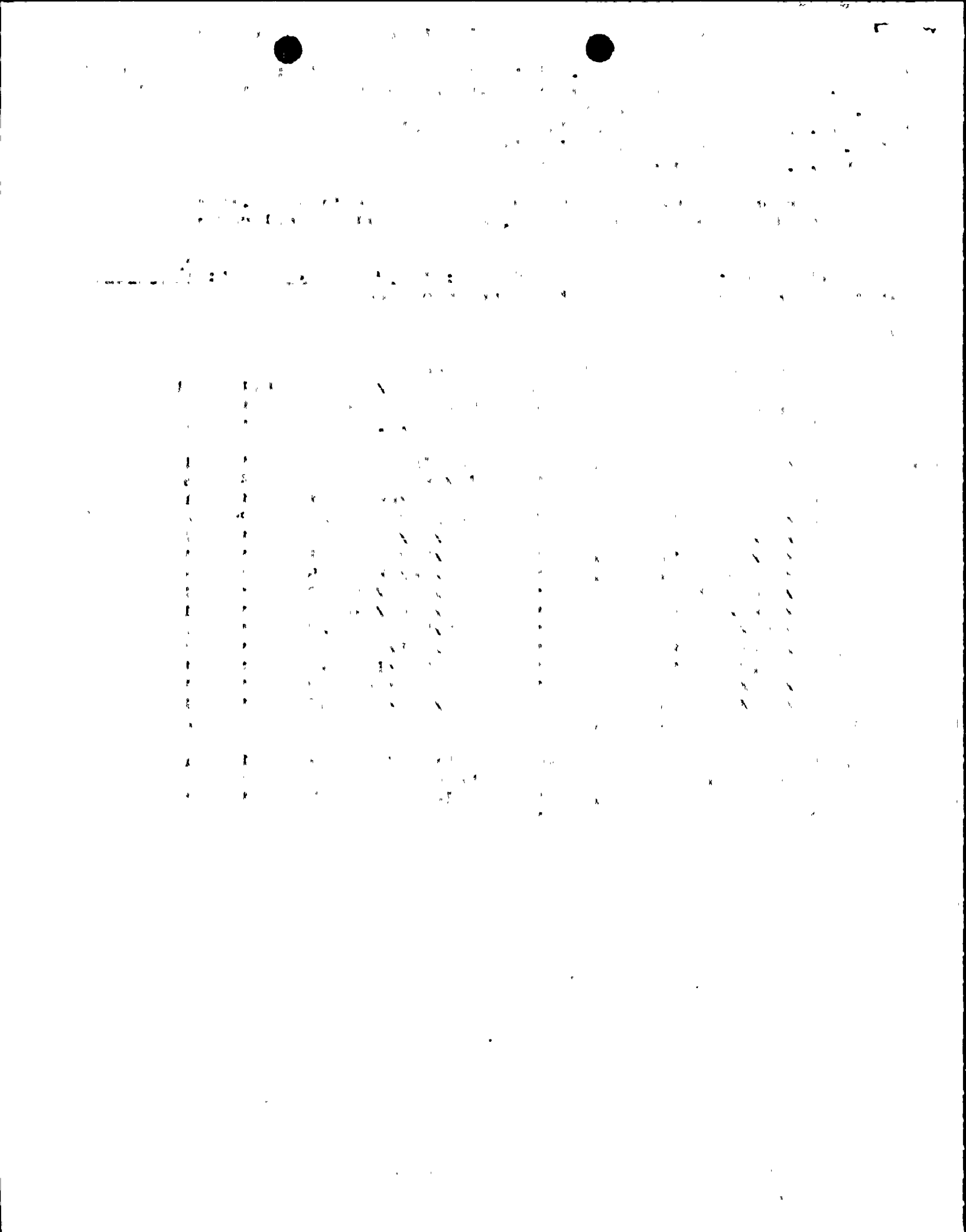

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G02-82-535
June 11, 1982
Docket No. 50-397

Mr. A. Schwencer, Chief
Licensing Branch No. 2
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Schwencer:

Subject: NUCLEAR PROJECT NO. 2
SUPPLEMENTAL RESPONSE TO NRC QUESTION 361.16

As agreed to in a conference call between NRC/Supply System and Consultants, enclosed are sixty (60) copies of a supplemental response to NRC Question 361.16. This response formally states our position on small magnitude earthquakes.

This supplemental response will be included in Amendment No. 27 to the WNP-2 FSAR.

Very truly yours,

GD Bouchey

G. D. Bouchey
Deputy Director, Safety and Security

CDT/jca
Enclosure

cc: R Auluck - NRC
WS Chin - BPA
R Feil - NRC Site
I Alterman - NRC
MT Hait - USGS

B001

SUPPLEMENT RESPONSE TO QUESTION 361.16

As discussed in detail in Appendix 2.5J to the WNP-2 FSAR, the maximum magnitude of a shallow earthquake that can be expected to occur within the Columbia Plateau basalts in close proximity to the WNP-2 site is M_C (coda-length magnitude) 3.0. Results of the investigation of the relationship between M_C and M_L by Malone (1979) (discussed in Section 2.5J.2.1 of WNP-2 FSAR, Appendix 2.5J) suggest that this coda-length magnitude may be equivalent to an M_L value of about 2.7. The closest location to the WNP-2 site of earthquakes approaching M_C 3.0 is the Wooded Island swarm area, which is discussed in detail by Rothe (1978) and summarized in Section 2.5J.4.3 of Appendix 2.5J. Activity within this swarm area, which has been intermittently active since 1969, has been concentrated within the uppermost 3 km of the crust. The earthquakes in the swarm area are located at epicentral distances between 5 and 7 km from the WNP-2 site. The largest recorded event had a magnitude of M_C 2.8.

The occurrence of earthquakes approaching the maximum magnitude of M_C 3.0 at distances less than 5 km from the site is very unlikely. This conclusion is based on consideration of the observed seismic and tectonic environment of the part of the central Columbia Plateau within which the WNP-2 site is located, as follows:

1. The statistical analysis presented in Section 2.5J.6.3 of Appendix 2.5J shows that there is a strong spatial correlation between the occurrence of shallow seismicity and areas within the central Columbia Plateau that are subject to significant ground-water elevation changes resulting from irrigation or waste fluid disposal. Therefore, the likelihood of occurrence of shallow seismicity is greatly increased for those portions of the central Columbia Plateau that are subject to such ground-water elevation changes. The Columbia River acts as a ground-water barrier between the unirrigated Hanford Reservation, within which the site is located, and the irrigated areas to the east (see Figure 2.5J-36, Appendix 2.5J). Therefore, ground-water elevation changes sufficient to have an effect on the shallow seismicity are not expected to occur closer to the WNP-2 site than the Columbia River. As discussed in Section 2.5J.6.4 of Appendix 2.5J, no temporal correlation between ground-water elevation changes and shallow seismicity was found. The mechanisms responsible for irrigation-induced seismicity are discussed in Section 2.5J.6.5 of Appendix 2.5J.

2. The WNP-2 site is located between areas of relatively greater tectonic deformation and seismicity to the north (Saddle Mountains and Frenchman Hills) and to the south and southwest (Horse Heaven Hills and Rattlesnake Mountain). The part of the central Columbia Plateau containing the Hanford Reservation appears to be undergoing essentially no current shallow deformation, as suggested by the very low level of shallow seismic activity and as revealed by geodetic measurements (Savage and others, 1981, discussed in Sections 2.5J.5.4 and 2.5J.7.1 of Appendix 2.5J).

3. As discussed in Sections 2.5J.5.1 and 2.5J.7.1 of Appendix 2.5J, available evidence suggests that the shallow Columbia River basalts are a low-stress environment.

4. No shallow earthquakes having magnitudes greater than or equal to M_C 1.0 have been recorded closer to the site than the Wooded Island swarm area (see Figure 2.5J-19, Appendix 2.5J). Future shallow earthquake activity close to the WNP-2 site would be expected to occur in the vicinity of the Wooded Island swarm area, consistent with the observation that shallow seismicity is concentrated in locales of recurrent swarms (Malone, 1979).

In conclusion, the maximum magnitude of a shallow earthquake that can be expected to occur in close proximity to the WNP-2 site is M_c 3.0. Future earthquakes with magnitudes approaching this value are not expected to occur closer to the site than 5 km (epicentral distance). The analysis of ground motions for an M_L 4 event at a distance of 3 to 5 km (Response to Question 361.16), therefore, represents a conservative assessment in terms of both magnitude and the distance from the closest significant seismic source.

REFERENCES:

Malone, S.D., 1979, Annual technical report on earthquake monitoring of the Hanford region, Eastern Washington: Report prepared for the U.S. Department of Energy and the Washington Public Power Supply System by the Geophysics Program, University of Washington, Seattle, 80 p.

Rothe, G.H., 1978, Earthquake swarms in the Columbia River basalts: PH.D. dissertation, University of Washington, Seattle, 181 p.

Savage, J.C., Lisowski, M., and Prescott, W.H., 1981, Geodetic strain measurements in Washingtin: Journal of Geophysical Research, v. 86, no. 36, pp. 4929-4940.