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REQUEST FOR SEISMIC TESTING INFORMATION

A copy of the report prepared by Charles B. Reynolds and Associates covering an August 1985 shallow seismic survey in the vicinity of Exile Hill is enclosed, in response to your request. We must note, however, that there is no plan to issue the report as a Sandia National Laboratories document due to problems with interpretation and data collection methods and a consequent inability to take a definitive position regarding the results of the survey. Our specific reservations with respect to the usefulness of the data in the report are discussed below.

The reflection sections, upon which the interpretation of faulting was based, are probably unreliable. Part of the "raw" data recorded, as presented in the form of a common depth point (CDP) stack (figure 3, of the report), exhibits almost no interpretable coherence. The paucity of coherence in the raw data may have resulted from a problem in the design of the receiver array for the field conditions and from the weak input signal of the somewhat unconventional "drop-bag" source that was used. After applying a frequency-wave number (f-k) velocity filter, and a nonlinear dip filter, the appearance of the sections (for example, figure 5, which is based on the same data as figure 3) is suggestive of artifacts produced by processing. The description of the processing steps used tends to support this observation. The f-k filter probably produced the grouped lineups that are seen throughout the processed sections. The dip filter (an unconventional approach that enhanced traces in the vicinity of any localized lineup on the section) probably compounded the artifacts generated by the f-k filter.

The basic problem with seismic reflection of the type described in the subject report is that the reflections back to the surface are so weak that they are drowned out by extraneous "noise" trapped at the surface in the form of surface waves. The f-k filter is a powerful technique for rejecting the noise, because it senses which direction waves are traveling when they are received; reflections travel vertically, while surface waves travel horizontally. However, when used on spatially aliased data (the majority of all reflection data), the f-k filter aliases and mixes up the phase and frequency information, producing artifacts.

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The data acquired in the survey are definitely spatially aliased. Surface refraction data and downhole velocity surveys showed the shear wave velocity to be on the order of 400 to 500 m/sec, which can be regarded as the approximate phase velocity of ground roll. With receiver spacing of 20 meters and a source band of roughly 20 to 60 Hz, the ground roll wavelength range of 6 to 25 meters was inadequately sampled. The resulting grouped lineups were probably caused by the f-k filter (5,000 m/sec cutoff). Other investigators have produced the same type of artifact using the f-k filter.

In summary, the project has no current plans to use the results of this shallow seismic survey, due to the major uncertainties involved. We are consequently providing a copy of the report for information only.

If you have any questions, please contact David C. Dobson of my staff at 794-7940, or Michael A. Glora of Science Applications International Corporation at 794-7609.

Maxwell Blanchard

Maxwell B. Blanchard, Director
Regulatory & Site Evaluation Division
Yucca Mountain Project Office

YMP:DCD-1240

Enclosure:
Survey Report ENCLOSURE FILED IN JACKET 9002220139 900213

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