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MEMORANDUM FOR: Philip S. Justus, Acting Chief
 Geotechnical Branch
 Division of Waste Management, NMSS

FROM: James E. Richardson, Chief
 Engineering Branch
 Division of Engineering Safety, RES

SUBJECT: REVIEW OF DRAFT REPORT BY WESTON GEOPHYSICAL

In accordance with your request, Dr. Zurflueh of my staff has reviewed the subject report. He has the following comments on the report:

1. Overall, the report is well written and contains a good outline of current geophysical practices together with recommendations for future applications of geophysical techniques to site characterization for HLW repositories in basalt, salt and tuff. Minor deficiencies and errors are described in the subsequent detailed comments.
2. Previous work, such as that by Ertec Western, Inc., NUREG/CR-2663, should be mentioned in the report and included in the references.
3. Tables I-IV
 - a) seismic refraction should also be listed as "somewhat useful" for engineering properties.
 - b) VSP and GPR should be spelled out.
 - c) under "borehole logging", electrical methods should be listed as "useful" as acoustic methods for determining fracturing and permeability. While acoustic is better for fracturing, electrical is better for permeability.
 - d) why is the televiwer distinguished from other methods in Table IV and not in Tables I-III?
4. Table II - seismic refraction and gravity should also be "somewhat useful" for shallow faulted and nonfaulted structure.
5. Tables II-IV - electrical logging should be listed as "somewhat useful" for shallow faulted and non-faulted structure in these tables also.

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6. Table III -

- a) use of GPR for shallow faulted and non-faulted structures is questionable, because beds overlying a salt dome are probably saturated.
- b) it should be made clear that, for deep structures GPR can only be used in tunnels and boreholes, not on the surface.

7. Table IV - acoustic logging should be "useful" for engineering properties, as in previous tables.

8. Figure 1.1 - the Hanford site is mislocated.

9. p.4, 2nd paragraph - the description, including gems such as "subsequent buildup of amplitude", should be changed.

10. p.5 - mention that summing increases S/N ratio, particularly with impulsive sources.

11. p.6, item 1.2.3.2 - high frequency ranges for geophones are given as a rule for all site characterization. However, if deeper structures are sought, geophones with lower frequencies may be needed.

12. p.17, item 1.6 -

- a) crosshole methods is a simpler term than cross-borehole methods.
- b) the description is limited to acoustic methods, whereas crosshole methods include other measurements, such as EM and radar, which should be included.

13. pp. 28-30, item 1.8.4 - magnetic methods are especially useful for depth estimation, and this should be described. Depth calculations should also be mentioned in the section on gravity interpretation.

14. p. 44 - the description of problems with data processing and tables for seismic reflection at Hanford is appropriate.

15. p. 49, item 2.8.2 - several magnetic surveys for the same area should not be necessary. One accurate survey with appropriate flight line spacing will give all the information needed (= define the magnetic field).

16. p. 53, item 2.10.9 - acoustic logs more nearly identify porosity rather than permeability.

17. Figure 3.5 - the title should be changed to include lines outside of Deaf Smith County.

18. pp. 57, 58, item 3.8.2 - again, one aeromagnetic survey should be sufficient. The survey should be flown at a low altitude, high altitude surveys are not necessary. A ground magnetometer survey can be useful, but only in areas where faulting is suspected.
19. p. 58, item 3.9 - DC resistivity, which works better in conductive rocks, should be useful in bedded salt which has a higher water content than domed salt.
20. p. 60 - borehole gravity should be added, which could be especially useful for salt.
21. p. 62, item 4.6 - S-wave velocities can be measured reliably and should be used. However, they will not define plastic flow characteristics, which must be obtained by other means.
22. p.63, item 4.8 - the description is not consistent with that given for bedded salt, where magnetic anomalies from sediments could supposedly be detected.
23. p.65, center - basalts at Hanford also attenuate seismic energy (because of fracturing) and are highly variable, although in a different way. The remark that basalt is unlike tuff in this respect is therefore wrong.
24. p.72 - gravity logs should also be obtained, depending on the diameter of boreholes available.



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