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FROM: G. D. CALKINS

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		Effective Rule (RM)	
		Federal Register Notice	43 FR 2770
		SD Task No.	FP 920-7
		NUREG Report	NUREG/CR-0570
		Contract No.	

Subject: DECOMMISSIONING

8009300646

PDR

United States Department of the Interior

GEOLOGICAL SURVEY
RESTON, VA. 22092

In Reply Refer To:
EGS-ER-80/841
Mail Stop 760

SEP 1 1 1980

Office of Standards Development
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Sir:

We have reviewed the main report and appendices on technology, safety and costs of decommissioning a reference low-level waste burial ground (NUREG/CR-0570).

In general, we find that the report is thorough and that the analysis has been carefully considered. Our comments are presented in the enclosure.

Sincerely yours,

George H Davis

for H. William Menard
Director

Enclosure

COMMENTS ON VOLUME 1, MAIN REPORT

General Comment. We suggest further consideration and possibly revision of one of the basic assumptions for the western reference burial ground site. It is assumed that the ground-water pathway for radionuclide contamination is not important because of the greater depth to water (60m) than beneath the eastern site (p. 2-12, 2-13, 8-20, 10-5). In many geologic situations in the west, vertical permeability is fairly high to considerable depths. For example, marginal deposits of many desert basins and alluvial fans in the west consist principally of sand and gravel to considerable depths. Sequences of basalt flows with open fractures, especially where interbedded with only scattered small lenses of sediments, may permit rather rapid downward migration of water. Although total annual precipitation is low, periods of relatively high rainfall intensity and in some areas periods of snowmelt may result in appreciable downward migration of recharge. Therefore, we suggest that either the assumptions for the reference western burial site should be modified to specify extensive very impermeable layers above the aquifer or that the ground-water pathway should be considered important in modeling potential radionuclide migration beneath the western reference site.

Page 2-10, sec. 2.5.3. Listed site characteristics are vague; they need qualification and quantification. For instance, how deep is "great depth to ground water?" What is "moderate-to-high permeability?"

Page 2-23, last two lines. Although there are some uncertainties in nuclide transport models, the major uncertainties are in the parameters and boundary conditions fed into the model to represent a specific site. The need for developing more realistic transport models is much less than the need for demonstrating (verifying) models on actual field sites and for developing better methods for measuring and estimating critical parameters such as distribution coefficient and dispersivities that must go into the models. We are convinced that, for most purposes, existing models are adequate.

Page 3-4, table 3.1-2. The depths to continuous ground-water zones for Morehead, Kentucky, and West Valley, New York, are at least questionable if not inaccurate. Although this depth is variable in space and time, more appropriate numbers are 20 to 30 feet for Morehead and 5 to 15 feet for West Valley.

Interstitial permeability for Barnwell and Beatty appear to be too low. Our data indicate typical permeabilities for Barnwell on the order of 10 cm/day. Although we do not have definitive data, the permeability of the Beatty sediments should at least be about two orders magnitude higher than the numbers shown in the table.

The data shown for Morehead on permeability and sorptive capacity are misleading in that predominant ground-water flow (and presumably nuclide migration) is through fractures, not interstitial pores. Fracture permeability and flow velocity are probably orders of magnitude higher than interstitial values. Similarly, sorption would presumably be much less in fractures than interstitially.

Tritium migration in ground water has been observed at Barnwell (onsite). To our knowledge, there has been no offsite migration of nuclides in ground water at Morehead.

The terms "moderate," "high," and "low" have little useful meaning for sorptive or ion exchange capacity.

Page 3-12, table 3.1-4. Silt is also a prominent component of the Idaho surficial material. The depth to the regional aquifer at Idaho should be 300 m, not 60-300 m. Principal flow paths away from burial at Idaho should also include fractures in basalt. The terms "very low," "moderate," etc., have little useful meaning for sorption or permeability.

Page 3-15, par. 2. Subsurface migration on site at Morehead has been documented.

Page 3-20, par. 2. Migration of nuclides from burial ground 3 has also been detected.

Page 30, last line. The purpose of the trench dams is unclear.

Page 7-24. The bulleted characteristics are vague; quantification is needed. "Shallow," "deep," "high," and "low" mean different things to different people.

Page 7-32, table 7.4-3. Is the "average total annual evaporation" potential or actual? Does it also include transpiration? The ground-water flow rate should be for the width of the site, which is not listed. It appears unlikely that the cobalt K_d would be higher than that for cesium or even strontium. Studies at other sites (ORNL, INEL, Barnwell, Morehead) indicate that cobalt is among the most mobile of the low-level waste nuclides (possibly as a complexed ion).

Page 8-4, par. 3. The justification for using two different leach times, an order of magnitude apart, for overland versus ground-water pathway is unclear. Leach time should be independent of sorption and should be the same or similar for either scenario.

Page 8-5, top par. Soil permeability and dispersion coefficients are not nearly as difficult to measure in the field as K_d's and leach rates.

Page 8-10, fig. 8.4-1. There is no mention of the gaseous emanation pathway, which can also be significant.

Page 8-20, item 12 and 13. See comment for page 8-4 above for item 12. If periods of thousands of years are being considered, the possibility of a major climatic change must also be considered. A change to glacial or pluvial conditions would drastically alter hydrologic conditions, making the water pathway much more probable. Irrigation could also affect this assumption.

Page 10-15, table 10.2-1. We question the effectiveness ratings given for "curtain wall" and retention media injection in the hydrological mechanisms. Both these techniques could be carried out only under special circumstances and even then their effectiveness would be questionable. For instance, the geologic media at most of these sites is not conducive to injecting retentive media such as bentonite. Curtain walls would probably be only marginally effective on any existing site. We therefore believe an "M" rating would be more appropriate for these options.

COMMENTS ON VOLUME 2--APPENDICES

Page C-10, par. 2. Boundary conditions are also needed for input.

Page C-10, par. 3. "Isopleth" should be "isotherm." Is the model 1-, 2-, or 3-dimensional?

Page C-12, table 2-3. Cr K_d's appear high, especially if Co is complexed as it is at ORNL.

Page C-13, 1st line. Ground-water velocity requires effective porosity in the calculation also.

Page C-13, par. 2. Brookhaven National Laboratory has published data on leachability in field sites.

Page C-13, par. 3. What are assumed leach times based on? They appear rather arbitrary.

Page C-14, par. 1, last 3 sentences. Why should leach times be longer if no sorption occurs? They are independent. WISAP data is for high-level waste or spent fuel, which should have different leaching properties, and should not be applied any necessary modification.

Page C-15, fig. C.2-2. Perhaps real, instead of fractional, distances should be used. Fractional implies the curve would look the same, regardless of distance to discharge sites, which is incorrect.

Page C-20, par. 2. Same comment as above. The probability depends on the site. At West Valley, overland flow is much more probable than ground-water transport.

Page C-20, par. 4. Where was the average permeability derived? Average permeabilities generally are not very meaningful. The calculated travel time of 400 million years appears to be high. Apparently, the calculated velocity was not divided by the moisture content (perhaps 10% or less), as it should be, yielding a travel time about 10 times too high (or more). Same comment applies to the 2-million-years travel time.

Page C-21, par. 1, last sentence. "Climatological <u>and hydrological</u> data indicate that ...." Underlined words should be added.

Page C-21, par. 4. Effective porosity is also an uncertain parameter.

Page D-2, table D.1-1. It 's misleading to present these data as typical for a low-level waste site. O er sites yield data vastly different--sometimes by orders of magnitudes--fro hese; what is "typical?"

Page D-4, sec. D.2.1. This procedure is inadequate for determinations of many chemical parameters such as pH, Eh, dissolved iron, alkalinity, bicarbonate, and metals or nuclides sensitive to oxidation state changes (such as plutonium and tecnetium). This procedure will also yield samples unrepresentative of the ground water or trench water outside the sump or well bore. The water within the well or sump bore often has grossly different chemical characteristics than the bulk formation water. Generally, adequate sampling procedure requires, among other things:

1. Pumping the sample from the sump or well (rather than bailing) with an anoxic pumping-collection system.

2. Determination of certain unstable parameters (temperature, Eh, pH, alkalinity, etc.) on site at the time of sampling.

3. Extraction of several well/sump bore-volumes before collecting the final sample.

4. Filtration of the sample to remove particulate matter (generally through 0.45 μm-pore filter or smaller).

5. Preservation of some unstable chemical species, such as dissolved iron and other metals, dissolved organic carbon, certain nitrogen species and others by chemical fixation, refrigeration, or other procedures.

Page F-4, par. 1. One of the best procedures to reduce subsidence would probably be to incinerate before burial all combustibles (paper, cloth, wood, plastics, solvents, etc.) which decompose in the ground, leaving void spaces.

Page F-6, par. 2. Ground-water flow modifications by curtain walls and trench dams have not been demonstrated as an effective method at any low-level waste site. In fact, these methods often fail to accomplish desired effects.

Page F-6, last par. One of the greatest influences on percolation through the trench cap is subsidence and slumpage (due to waste decomposition and compaction) with resultant surficial cracks providing openings for water to enter. Discussion of control measures for percolation should include stabilizers of the waste and trench capping material to minimize subsidence.

Pate F-22, par. 4. It should be mentioned that pumping and treating of trench water also increases chances for surface spills and occupational exposures. The conventional treatment method--evaporation--releases volatile nuclides to the atmosphere and creates a sludge that must be repackaged and buried as waste.

Page F-23, sec. M. Use of curtain walls have not been demonstrated as effective for ground-water flow modifications at any low-level waste disposal sites. These procedures often fail to produce desired effects. We think they are over emphasized in the report.