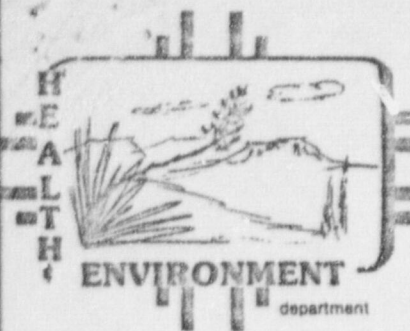


3/15/82



STATE OF NEW MEXICO  
ENVIRONMENTAL IMPROVEMENT DIVISION  
P.O. Box 968, Santa Fe, New Mexico 87503  
(505) 827-5271

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DEPUTY SECRETARY

May 15, 1981

Mr. W. J. Shelley  
Kerr-McGee Nuclear Corporation  
Kerr-McGee Center  
Oklahoma City, OK 73174

CERTIFIED # 619735

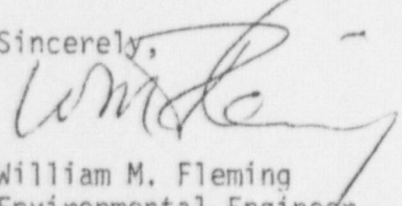
Dear Mr. Shelley:

This letter is a preliminary adequacy evaluation of Kerr-McGee's License Renewal Report for the Ambrosia Lake uranium mill. The purpose is to indicate omissions and inadequacies in the report. Future evaluations will concentrate on technical details and specific quantitative determinations. At any time during the relicensing process, additional information on any part of the application may be required.

The Water Pollution Control Bureau will be responding in detail to Kerr-McGee's ground water discharge plan.

I look forward to our meeting in Santa Fe on May 27 to discuss Kerr-McGee's response to this evaluation.

Sincerely,

  
William M. Fleming  
Environmental Engineer  
Uranium Licensing Section  
Radiation Protection Bureau

WMF:dm  
Enclosures

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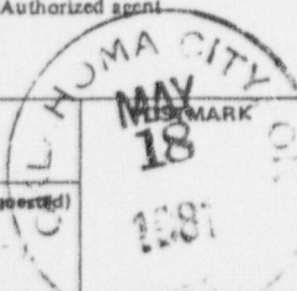
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## ADEQUANCY EVALUATION OF KERR-MCGEE URANIUM MILL RENEWAL APPLICATION

### CHAPTER 1: INTRODUCTION

Section 3-300J of the New Mexico Radiation Protection Regulations states that "An appropriate title report or other documents evidencing land ownership, or properly drawn purchase option, shall be attached to the application."<sup>1</sup>

These documents are necessary for the present disposal site as well as for the State land on Section 36 which must be purchased for the proposed tailings disposal plan.

### CHAPTER 2: THE ENVIRONMENTAL SETTING

#### 2.1 Geography and Demography

The table on p.2-8 of the renewal report on population distribution needs to be accompanied by a map showing the location of the nearest resident. Please indicate this on map 3 (land use).

#### 2.2 Socioeconomic Profiles

Adequate

#### 2.3 Meteorology

1. Please state that New Mexico Environmental Improvement Division meteorological data was analyzed and interpreted by Kerr-McGee's consultant.
2. Please calculate the average morning mixing height, in addition to the afternoon mixing height given on p.2-61.
3. Please indicate whether Kerr-McGee intends to install a meteorological station on company property. Please locate the station used on map 3.

---

<sup>1</sup>) The New Mexico Court of Appeals recently decided that Section 3-300J is invalid. To this date, and pending completion of court proceedings, the New Mexico Environmental Improvement Board has not taken "steps...necessary to remove 3-300J from the Radiation Protection Regulations."

## 2.4 Hydrology

1. Please supply a map showing the catchment area upstream of the mill and tailings area.
2. Please supply an analysis to indicate that the tailings area is protected from flooding with adequate diversion structures.

## 2.5 Geology and Seismology

Please update Sanford's seismic study (1975) with recent data.

# CHAPTER 3: MINING AND MILLING OPERATIONS

## 3.1 Mining Activities

Adequate

## 3.2 Mill Process and Controls

Adequate

## 3.3 Sources of Mill Wastes and Effluents

1. Please modify "MM REC-0041 NRC" on p. 3-27 to read "NRC NUREG-0041".
2. Please provide radiological analysis of solid waste (p. 3-28).

# CHAPTER 4: EXISTING TAILINGS MANAGEMENT SYSTEMS

## 4.1 Description

Adequate

## 4.2 Operation History

Adequate

## 4.3 Tailings Dam Stability

Adequate when considered in conjunction with consulting reports not included in this application and State Engineer Office evaluations.

## 4.4 Evaporation Ponds

Adequate

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#### 4.5 Backfill

The description of backfilling operations is inadequate in terms of monitoring data and environmental impacts (p. 4-11 to 4-15).

Please follow the outline enclosed for the submission of information required (attachment 2).

### CHAPTER 5: RADIOLOGICAL IMPACTS

Section 4-200 of the New Mexico Radiation Protection Regulations requires that "each licensee or registrant shall make or cause to be made such surveys as may be necessary for him to establish compliance with these regulations". With the exception of selected water quality parameters (radium and uranium) in Appendix A, radiological monitoring data for the mill and tailings disposal do not appear in the renewal report. Because of these omissions, it is impossible to establish compliance with Part 4 standards.

Please submit all previous relevant data. *For* stations where a number of data points exist over time, please graph the points (with standard error brackets) with concentration on the y-axis. Several sampling stations may be presented on the same graph if the results are clear. Maximum permissible concentrations should be indicated on each graph.

#### 5.1 SOURCES AND EXPOSURE PATHWAYS

1. Groundwater: It is stated that although "there is a possibility of some seepage of radioactive liquids from the tailings...into the...groundwater system...no significant contribution to dose through liquid pathways is expected" (p.5-8). It is further stated that "the mill operator is currently performing environmental and other monitoring programs to provide detection of any seepage that occurs".

According to data presented in Appendix A (Hydrologic Assessment), Ra-226 concentrations for four ground water wells in unrestricted areas greatly exceed Part 4 standards of the Radiation Protection Regulations for soluble Ra-226. The following values indicate seepage from the tailings area.

<u>Well Number</u>	<u>Depth(ft)</u>	<u>Ra-226 Concentrations (pCi/l)</u>
36-02 Trb	240 (Tres Hermanos)	75.66
32-52 Kd	272 (Dakota)	874.72
32-41	61 (alluvium)	174.99
32-42	38 (alluvium)	121.24



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The areal extent of this seepage plume must be accurately defined on an isoline map by Kerr-McGee.

In addition, analyses for Th-230, Pb-210 and Po-210 should be included.

2. Surface Water: Data for Th-230, Pb-210 and Po-210 should be submitted for the liquid released from the mill reservoir, in addition to data supplied for U and Ra on p. 38 of the hydrological assessment.
3. Air Particulates and Radon: Data for <sup>U</sup>nat, Ra-226, Th-230, Pb-210 and Rn-222 must be submitted from at least three stations at or near property boundaries, one at the nearest residence, and one at a control location. Continuous sampling is necessary and specific locations of these monitors must be noted on map 1 (environmental monitoring map). A large number of air sampling stations are located on map 1, but these are not specified in terms of sampling frequency, duration of sampling program or constituents sampled. Please specify the location of the nearest resident.
4. Vegetation, Livestock and Fish: Data for <sup>U</sup>nat, Ra-226, Th-230, Pb-210 and Po-210 should be submitted. Vegetation samples should be from three grazing areas near the site in different sections which would have the highest predicted air particulate concentrations during milling operations. Sampling should be made from the most commonly grazed grasses two to three times annually. Please note locations on the monitoring map. Data from livestock for <sup>U</sup>nat, Th-230, Ra-226, Pb-210 and Po-210, collected once, should be submitted for animals grazing within 3km of the site. Please supply similar data collected for "minnow and planted catfish samples" (p.9-5).
5. Soil and Sediment: Data on soil samples, collected from the same sites as air particulate samples, should be submitted for <sup>U</sup>nat, Th-230, Ra-226 and Pb-210. Data from Kerr-McGee's yearly sediment survey (p.9-5) should be submitted for <sup>U</sup>nat, Th-230, Ra-226 and Pb-210. Please note the soil sampling locations on map 1, as has been done for the sediment locations.

6. Gamma Radiation: Please submit data from the 23 TLD locations mentioned on p.9-5 and identified on map 1.
7. A map showing all source term locations including stacks, vents, ore storage pads, and tailings areas should be submitted. Please indicate which stacks have emission controls and which are vents. Please describe emission controls.
8. Please include in the MILDOS analysis the time necessary for the tailings pile to dry out and undergo reclamation, in addition to the assumed 18 year mill life.
9. Please state on p.5-1 that meteorological data provided by the State of New Mexico was used and interpreted by Kerr-McGee consultants.
10. Please supply sample calculations for stack emission rates for each mill cycle step as well as "established references" for assumed controls (p. 5-2 and 5-3).  
  
Please supply details of measurement techniques, including the process rate at the time of measurement.
11. Please explain why the value for Th-230 is so far from equilibrium (17% of the U-238 value; p. 5-4).
12. Please explain the size ranges stated for tailings ("75m, 10-75m, -10m"; p. 5-4).
13. Please explain how an "exit velocity of 17.2 mps" was measured and calculated (p. 5-6).
14. Please provide technical justification for the assumptions of 55% control for roads and the dam, and tailings activity control levels of 85% and 90% (p. 5-7). Please provide a map of the tailings area with control factors for various sectors.
15. Please indicate if the average morning mixing height has been accounted for in the MILDOS analysis.

16. Please summarize the entire set of MILDOS input parameters in a single table.
17. Please document the assumed beef cattle density of four animal units/mi<sup>2</sup> (p. 5-8).
18. Please indicate the values used for the portion of the area population diet assumed to come from locally grown meat, milk and vegetables (p. 5-8).

#### 5.2 Dose Commitments to Individuals and Populations

1. Because of high radium 226 values in ground water in unrestricted areas (section 5.1.1), dose commitments must be calculated for the ground water pathway. This is particularly important because alluvial and Dakota wells are used for domestic and stock water.
2. Please locate the nearest downwind resident and the nearest population center on map 1 (p. 5-10).

#### 5.3 Evaluation of Radiological Impacts

Included in this evaluation (Table 5-10) must be impacts for liquid pathways, particularly ground water, as discussed previously in this section. A specific evaluation of the seepage plume is necessary, as well as an assessment of possible impacts of the seepage on domestic and stock wells.

#### 5.4 Occupational Dose

The annual limit on intake for uranium as published in ICRP 30 is not binding on the NMEID (p. 5-20). Current NMEID Radiation Protection Regulations (4-130A) limit the intake per quarter to  $6.3 \times 10^{-2} \mu\text{Ci}$ . The intake formula should be calculated according to:

$$I = b \sum_{i=1}^n x_i t_i$$

where,

- I = uranium intake,  $\mu\text{g}$  or  $\mu\text{Ci}$
- $t_i$  = time of exposure to average concentration  $x_i$ , hrs
- $x_i$  = average concentration of uranium in breathing zone air during the time  $t_i$ ,  $\mu\text{g}/\text{m}^3$  or  $\mu\text{Ci}/\text{m}^3$
- b = breathing rate,  $1.2 \text{ m}^3/\text{hr}$
- n = number of exposure periods during the week or quarter



## CHAPTER 6: NON-RADIOLOGICAL IMPACTS OF OPERATIONS

### 6.1 Physical and Biological Systems

1. Please supply a reference for Table 6-2 on p. 6-7 (Animal Species Expected to Occur-Ambrosia Lake Area).
2. Please supply a reference for the statement that "annual herbage production is estimated at between 500-1000 air dry pounds/acre/yr".

### 6.2 Economic and Social Effects

1. Please explain why the assumption of a "phased closure" of the mill after 1996 is made (p. 6-18).
2. Please document the assumption of an 87% "capture rate" for indirect employment in McKinley and Valencia counties resulting from the Ambrosia Lake operations (p. 6-18). Please document the information which would allow such a precise estimate.

## CHAPTER 7: IMPACTS OF OPERATIONS ON WATERWAYS AND GROUNDWATER

### 7.1 Surface Water

Please supply data on Thorium 230 and Lead 210 in addition to uranium and radium for "reservoir water and that released to the creek" (p. 38 of Appendix A).

### 7.2 Groundwater

1. As discussed in the comments on Chapter 5, it is necessary to accurately define on isoline maps the areal extent of the seepage contamination. This should include U, Ra, Th and Pb concentrations.
2. Please supply evidence for the statement that "leakage from ponds 2, 7 and 8 is considered to be small and of inconsequential impact to anyone" (Appendix A, p. 41). Please submit radionuclide water quality results from well 36-05, as well as from the ponds.

3. Several faults and fracture zones with a northerly trend are present in the tailings disposal area, as well as in the proposed new tailings area (Appendix A, p. 3, 21 and Figure 8). Please comment on the impacts of these structural features, particularly the younger fractures in the Mancos and Tres Hermanos formations, on ground water movement.

## CHAPTER 8: EFFECTS OF ACCIDENTS

### 8.1 Mill and Tailings System Accidents Involving Radioactivity and 8.4 Contingency Plan

1. Section 3-300L states that "Mill applicants shall analyze realistic tailings release scenarios and provide systems to contain potential releases to company controlled property".<sup>1</sup> Measures for dealing with a failure of the tailings dam at maximum capacity are not addressed. The "Contingency Plan for Accidental Release of Radioactive Material to Unrestricted Areas" (Appendix F of the renewal report) is adequate in terms of organizational and administrative guidance, but inadequate in describing the technical/engineering consequences of a dam failure specific to the Ambrosia Lake facility. Failure scenarios of overtopping resulting from a large runoff event and physical impoundment failure from liquefaction should be addressed. The statement on p. 8-3 that "For the expected rainfall and low seismic activity in the area, no dam failure should result" is inadequate.

The EID is not requiring a detailed analysis of the likelihood of the above-mentioned event occurring, but rather a contingency plan predicting the volume, chemistry and ultimate location of spilled radioactive material.

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<sup>1</sup>The New Mexico Court of Appeals recently decided that Section 3-300L is invalid. To this date, and pending the completion of court proceedings, the New Mexico Environmental Improvement Board has not taken "steps...necessary to remove 3-300L...from the Radiation Protection Regulations".

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As part of the contingency plan required by amendment number 31 of Kerr-McGee's present license, this information is required for the evaporation ponds as well as the tailings impoundment. The analysis should include engineering information, including topographic determinations, on methods for containing potential releases to company controlled property.

2. Clean-up criteria for contaminated soil are incomplete. The concentration for uranium of 30 pCi/g above background is acceptable, but values for radium, thorium and lead are necessary. The value for radium should not be greater than 10 pCi/g. In addition, Kerr-McGee needs to establish background values for soil concentrations of uranium, thorium, radium and lead.
3. Please supply engineering details for procedures to deal with a pipeline rupture between the mill and the tailings pond (p. 8-3), as well as plans to improve or replace the wooden pipeline, which develops constant leaks. Please also detail procedures for dealing with a pipeline failure between the tailings impoundment and the Section 4 evaporation ponds.

#### 8.2 Non-Radiological Accidents

Adequate

#### 8.3 Transportation Accidents (including Appendix C)

Adequate

### CHAPTER 9: MONITORING PROGRAMS

For all of the environmental monitoring programs, the EID requires that Kerr-McGee commits to submitting a quarterly report based on the suggested format of Attachment III.

#### 9.1 Air Quality Monitoring

1. Map 1 should indicate which air sampling stations monitor continuously for particulates (U, Ra, Th, Pb) and which stations monitor continuously for radon.



2. Please discuss the details of analytical methods of measurement for U, Ra, Th and Pb, as well as lower limits of detection and standard error terms.
3. Stack flows should be measured semi-annually and the process rate should be specified at the time of measurement.
4. Please confirm that air particulate sampling is continuous, rather than 24-hour sampling.

## 9.2 Water Quality Monitoring

Groundwater and surface water samples must be analyzed for  $U_{nat}$ , Th-230, Ra-226, Pb-210 and Po-210.

## 9.3 Vegetation, Food, Fish, Soil and Sediment

1. Vegetation, food (cattle) and fish should be analyzed for Pb-210.
2. Sediment samples should be analyzed for  $U_{nat}$ , Th-230, Ra-226 and Pb-210.
3. Soil samples should be collected at the same sites as the air particulate samples and should be analyzed for  $U_{nat}$ , Ra-226 and Pb-210.

## 9.4 Gamma Radiation

Adequate

# CHAPTER 10: ALTERNATIVE TAILINGS MANAGEMENT SYSTEMS

## 10.1 Alternative Sites and 10.2 Below Grade Disposal

Kerr-McGee proposes to convert a present and temporary evaporation pond area (ponds 2, 7 and 8) to a permanent solid tailings disposal site. In addition, Kerr-McGee must purchase a portion of Section 36, now State land, as part of the proposed disposal plan.

Section 3-300K of the New Mexico Radiation Protection Regulations requires that applicants for a uranium mill license "shall perform an analysis of viable tailings management alternatives including below-grade disposal and alternative sites". According to the Environmental Improvement Board's interpretation and ruling on April 11, 1980, the EID considers the area upon which you propose to dispose of solids and slimes (p. 10-3 of the renewal report) to constitute a new site for tailings disposal.

The EID is consistent in its position that evaporation ponds are transitory, not permanent, disposal features. The EID is not requiring Kerr-McGee to address the question of moving existing tailings to a new site or to below-grade trenches. The EID is requiring an analysis of alternatives, including other sites and below-grade disposal, for the new, permanent disposal site. Specific guidance for the preparation of an alternative site analysis is attached (Attachment 1).

### 10.3 Other Alternatives

1. Please supply a timing commitment for the liquid recycle program and pond liner repair for ponds 9 and 10 (p. 10-3). Engineering details on pond liners are necessary. Please specify when and how ponds 2, 3s, 3n, 7 and 8 will be lined. Geo-technical and stability analyses for all ponds will be necessary.
2. The tailings management program described in outline terms for the next 17 years on p. 10-3 and map 4 is inadequate. Details on timing, volumes of solids and liquids, interim stabilization, final reclamation, the need for more evaporation ponds, engineering details on impoundment stability for the proposed system, and flood hazard analysis are necessary.
3. Section 3-300H of NM Radiation Protection Regulations states that each application, including the first renewal, must address the "short-term and long-term environmental, radiological and public and safety aspects of the application and alternatives to the proposed action". The potential radiological hazard from possible seepage and accidental release associated with Kerr-McGee's 21 evaporation ponds is a source of continuing concern. Under the category of alternative methodology, the EID requires that Kerr-McGee investigate the economic feasibility of neutralizing the tailings material (solids and liquids) before deposition in the tailings impoundment backfilled in mines, or stored in evaporation ponds.

The investigation should quantify both costs and benefits of neutralization. Costs should be quantified for at least the following: 1) annual cost of necessary amounts of lime and other material. 2) capital cost of lime handling and mixing equipment. Benefits should be quantified for at least the following: 1) savings from evaporation pond construction, maintenance and instrumentation; 2) savings in reclamation costs; 3) savings in tailings impoundment stability analyses and instrumentation; 4) savings in operational aspects of tailings management; 5) reduction in risk of a tailings impoundment failure; 6) savings from reduced groundwater monitoring requirements. The resulting difference between costs and benefits should be expressed in terms of additional production cost per pound of yellow-cake produced.

4. The Radiation Protection Bureau requires details of the "planned grout curtain" and its effect on intercepting radionuclide seepage (p. 10-4). Please submit your plans for improving and lining the ditch around the tailings pile used to carry decant liquid from pond 1 to the evaporation ponds. Please supply implementation schedule.
5. There is a detailed quantitative discussion, including dollar figures, of the cost of mining, milling and severance taxes to the uranium industry (p. 10-5 to 10-15). It is stated that "contemplated regulatory actions...would require such an expenditure that continued operation would be questionable", but no dollar figures are cited. The previous statement would have credibility if accompanied by competent economic analysis which quantifies the cost to the uranium industry of present and proposed environmental regulations.
6. Please prepare a set of operational procedures for spigotting which will increase the distance of the spigot from the crest of the tailings pile to reduce the risk of spills.

## CHAPTER 11: LONG TERM IMPACTS

### 11.1 Interim Stabilization and Reclamation

Measures to deal with interim stabilization have not been adequately addressed in the renewal report.



The statement on p. 5-7 of the renewal report that "Dale Gillette of NOAA indicates that wind velocities in excess of 100 mph would be necessary for significant dusting of...crusts" in the south half of the impoundment is insufficient. Documentation is insufficient to make the assumption that half of the tailings is "heavily crusted with gypsum" and therefore, not susceptible to wind dispersion (MILDOS assesement). Also necessary is a commitment from Kerr-McGee for weekly documented inspections to determine the effectiveness of the interim stabilization program, as well as monthly reporting to the EID.

#### 11.2-11.4 Decommissioning, Decontamination, Reclamation

Section 12-300H of the NM Radiation Protection Regulations states that "Licensees processing active and inactive waste-retention systems on the effective date of these regulations shall develop proposed or projected engineering plans and costs for stabilizing the licensee's waste-retention system". According to the definition in Part 12 of the Regulations, "stabilization means all measures necessary to minimize the transport of radioactive gases and particulates into the atmosphere and the erosion or long-term leaching to ground or subsurface waters of milling so as not to exceed the applicable standards found in Part 4".

The EID requires a detailed discussion of operating procedures to prevent the dispersion of tailings particulates by wind and water outside the tailings area prior to cessation of operations and final reclamation (interim stabilization). Engineering details and cost projections of Kerr-McGee's plan to accomplish this are necessary.

Decommissioning and reclamation details, both technical and economic, are inadequate (p. 11-2 and 11-3). The following details are necessary:

1. A technical and financial feasibility assessment on methods and costs of stabilizing tailings retention system(s). Please prepare a scheme for covering the tailings to prevent sheet erosion and arroyo headcutting, and to reduce radon emanation and gamma radiation to applicable standards.
2. Cost estimates should be provided for decommissioning of the mill site. Costs figures supplied in the renewal report (\$12 million) are too general for adequate evaluation, and must be detailed into component costs.

Post-operation groundwater reclamation and monitoring should be included. Plans and associated costs should be provided for any necessary post-stabilization ground water measures including the following:  
1) restoration of the quality of the water bearing zone to acceptable levels as dictated by applicable radiation regulations; 2) runoff diversion contouring at the perimeter of the stabilized tailings piles; 3) a radiation monitoring program of sufficient scope to demonstrate the success of items 1) and 2).

## CHAPTER 12: ADMINISTRATION

### 12.1 Corporate Organization

Adequate

### 12.2 Qualifications of Key Personnel

Adequate

### 12.3 Training

Please document dates for the past five years when "periodic review sessions" (p. 12-8) of the Radiation Safety Training Program took place.

### 12.4 Security

Adequate

### 12.5 Radiation Safety Program

1. It is stated on p. 12-15 that "All employees working in the yellowcake areas shall endeavor to prevent yellowcake from entering the body or contaminating adjacent areas". Based on recent inspections of your facility and the observation of improper face mask use by the yellowcake packaging operator, the EID requires specifics of procedures for operators in the yellowcake areas.

A more detailed description of the respirator program is needed. It is stated in Part D on p. 12-24 that "the proper respirator factor is used in determining yellowcake exposures". Kerr-McGee can take no credit for reduction of exposure unless it has a respirator program approved by EID.

2. Please specify "administrative action levels" for exposure to airborne radioactivity in accordance with the ALARA objective (P. 12-20). The action levels should be some fraction of allowable intakes and should be established for time-weighted exposures averaged over a week and for the concentration of airborne radioactivity in any air sample. If certain action levels are reached, an investigation should be performed by the RSO to ensure that levels are kept as low as reasonably achievable.
3. Please specify the LLD for each mill survey and the method of calculating U, Th, Ra, and Pb concentrations from gross alpha analyses (yellowcake and ore dust surveys, p. 12-20).
4. Please specify which samples are from area samples and which are from breathing zone samples (p. 12-21).
5. Please describe the "time studies", both in terms of purpose and methodology (p. 12-22).
6. A more detailed description of the bioassay program is needed. Refer to NRC Reg. Guide 8.22. An in vivo radiation measurement program should be established as outlined in the guide.
7. Please detail the Surface Contamination Survey described on p. 12-24.
8. The value specified by NRC in Draft Reg. Guide OH 710-4 specifies that the maximum total surface contamination level should not exceed 15,000 dpm alpha per 100 cm<sup>2</sup>. Please document the choice of 25,000 dmp as well as the level chosen for beta/gamma survey levels (p. 12-25).

Attachments:

- I Alternative Site Analysis Guidance
- II Outline for Environmental Report on Backfilling
- III Sample Format for Reporting Monitoring Data