Rio Algom Mining LLC

June 15, 2005

Certified Mail
Return Receipt (7004 1350 0000 8065 7709)

ADDRESSEE ONLY
Mr. Gary Janosko, Chief
Fuel Cycle Facilities Branch, NMSS
Mail Stop T-8A33
U.S. Nuclear Regulatory Commission
Washington, DC 20850

Re: **License SUA-1473, Docket 40-8905**
Response to Request for Additional Information for the Soil Decommissioning Plan and The Closure Plan – Lined Evaporation Ponds For Ambrosia Lake Facility (TAC No. LU0077)

Dear Mr.Janosko,

Rio Algom Mining LLC (RAM) has reviewed the Nuclear Regulatory Commission's (NRC) request for additional information (RAI) concerning the decommissioning plan for soil and the lined ponds dated May 5, 2005 and provides this submittal in response to the RAI.

Following discussions with your staff on May 23 and June 2, 2005, which provided clarification to the RAI request, responses to RAI Comments 6, 9 and 13 will require additional time to fully address NRC's request . RAM will provide complete responses to these comments within thirty days of the submittal of this letter.

Rio Algom expressed to your staff that it is important that the review and approval process move forward without delays and it is RAM's understanding from the June 2, 2005 teleconference that your staff can proceed with the review of this initial response while RAM works to submit the balance of the information requested.

In the May 23, 2005 meeting, it was suggested that RAM should revise and resubmit the Soil DP to reflect changes resulting from this RAI. Upon NRC acceptance of RAM's RAI responses, the Soil DP will be revised to incorporate necessary changes to the document and a final soil plan document will be submitted it to NRC.

P.O. Box 218, Grants, NM USA 87020 - Tel: 505.287.8851 - Fax: 505.285.5550

Please contact me if you have any questions or are in need of additional information related to this modification request.

Regards,

Peter Luthiger
Manager, Radiation Safety
and Environmental Affairs

Attachment: As stated

xc: T. Fletcher
B. Law
B. Lewis (Komex)
R. Nelson (NRC)
File

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION (RAI)

SOIL DECOMMISSIONING PLAN
LINED EVAPORATION PONDS CLOSURE PLAN

RIO ALGOM MINING LLC
AMBROSIA LAKE FACILITY
GRANTS, NEW MEXICO

SOURCE MATERIAL LICENSE SUA-1473
DOCKET NUMBER 40-8905

Prepared For:

Rio Algom Mining LLC

6305 Waterford Boulevard

Suite 400

Oklahoma City, OK 73118

Prepared By:

KOMEX

1300 Jackson Street

Suite 200

Golden, CO 80401

June 15, 2005

TABLE OF CONTENTS

COMMENT 1. 2

COMMENT 2. 4

COMMENT 3. 11

COMMENT 4. 11

COMMENT 5. 13

COMMENT 6. 14

COMMENT 7. 14

COMMENT 8. 15

COMMENT 9. 15

COMMENT 10. 16

COMMENT 11: 18

COMMENT 12. 19

COMMENT 13. 19

COMMENT 14. 20

COMMENT 15. 21

COMMENT 16. 22

LINED PONDS CLOSURE PLAN COMMENT REPSPONSES 25

SOIL DECOMMISSIONING PLAN COMMENT RESPONSES

COMMENT 1. Page 4 of the Plan states that Pond 3 is considered part of the main disposal cell (Impoundment 1) and is covered by those requirements. Previously, RAM indicated that Pond 3 would meet the Ra-226 criteria instead of the radon flux criterion because the windblown tailings placed in the pond contained low levels of Ra-226.

REQUEST: Identify where Pond 3 reclamation is mentioned in the approved Reclamation Plan and in the surety cost estimate. Also, state how many radon flux measurements will be made and justify this number, and provide justification that the proposed cover is adequate (stability, radon attenuation) for Pond 3.

RESPONSE TO COMMENT 1:

Pond 3 Reclamation

Rio Algom's (RAM) Source Material License Condition 37.E outlines the requirements that RAM is following for the closure of Pond 3. This condition states:

> "...All contaminated materials that are not covered by the reclaimed Pond 1 outslope shall be relocated to Pond 2 unless an erosion protection plan is submitted to NRC for review and approval."

RAM submitted a detailed erosion protection plan for Pond 3 to NRC on May 16, 2002. This plan included erosion protection for the entire surface of Pond 3 including a run-on apron for the Pond 1 slope contribution to Pond 3 as well as a toe trench for Pond 3. The design contemplated placement of additional materials onto Pond 3 that were associated with surface remediation activities with the potential for placing a cover layer over the

waste materials should field testing indicate the need for a cover layer.

Additionally, RAM used a conservative over-design in the rock sizing for Pond 3 as depicted in the table below:

Pond Area	Calculated Size Required (D_{50} in)	Rock Size Used (D_{50} in)
Pond 1/Pond 3 Run-on Apron	7.5	7.8
Top Surface	0.4	1
Slopes	8.5	12
Toe Trench	8.5	12

Upon review of this submittal and after performing independent calculations, NRC concluded that the design appropriately addressed the Pond 3 erosion protection to ensure stability and provided reasonable assurance of protection for 1000 years. NRC approved the Pond 3 erosion protection plan on November 27, 2002 as Amendment 51 to the License.

Pond 3 Surety

License Amendment #54 approved by NRC on April 7, 2005, revised the financial assurance amount for the Ambrosia Lake site which included costs associated with Pond 3 totaling $923,579. This cost includes:

- Surface configuration and contouring

- Cover placement (if needed)
- Flux testing (if needed)
- Rock placement
- QA/QC on geotechnical work

Pond 3 Radon Flux Attenuation and Stability

Following grading and contouring of Pond 3 to conform to the approved design grades, RAM will proceed to conduct radon flux testing of the surface. RAM anticipates collecting 100 samples on Pond 3. This number coincides with EPA criteria listed in the radon flux test method contained in 40 CFR 61, Appendix B, Method 115. Tests will be performed pursuant to this method. Radium-226 data (4 samples) on the existing materials on Pond 3 surface showed a maximum concentration of 7.4 pCi/g, which is the basis for RAMs belief that the radon emission averaged over the entire pond area will be below the emission standard.

In the event an engineered cover is required to meet the radon emission standard, the clay cover will be placed using the same construction specifications that were used for the radon barrier on Pond 1 and Pond 2. Clay will be placed in 6 inch lifts meeting a density of 95% of standard Proctor and + 2% of optimum moisture. Testing frequencies will also be the same as those previously approved for Pond 1 and Pond 2.

RAMs erosion protection plan for Pond 3, which was approved by NRC, supports RAMs belief that the Pond 3 design will ensure stability and provide reasonable assurance of protection for 1000 years as required by Criterion 6 of 10 CFR 40, Appendix A.

COMMENT 2. The Plan states (page 9) that additional characterization of deep contamination is planned for Ponds 9 and 11-21 and the mill site. RAM indicates that only one composite sample was analyzed to characterize Pond 10 after excavation (data to

substantiate the clean-up of Pond 10 was never provided to NRC although the pond was covered years ago). In addition, Figure 1-3 indicates a large area of potential surficial windblown tailings contamination with little radiological data provided.

REQUEST: Provide this needed source characterization data so that staff can assess the adequacy of planned clean-up.

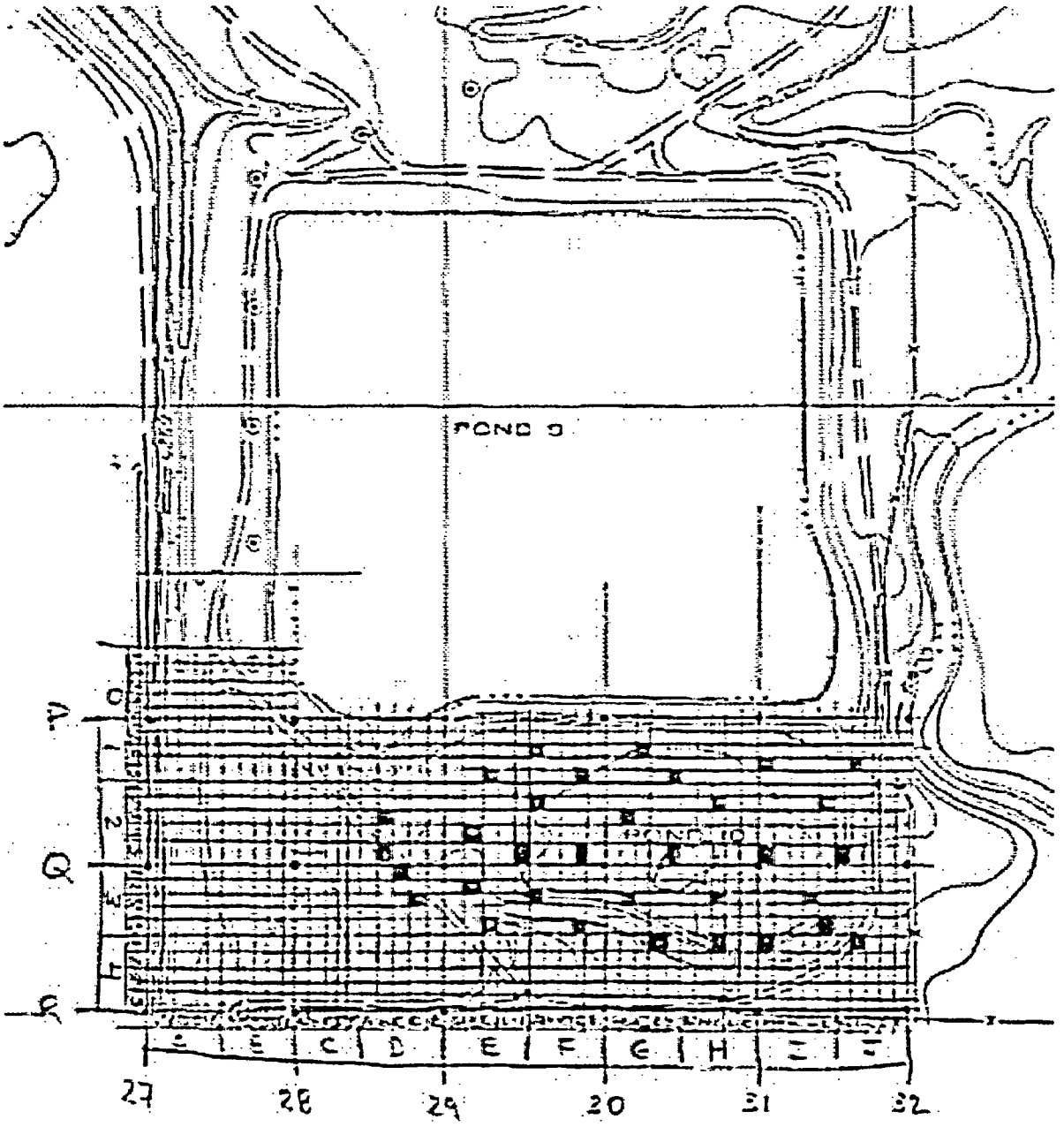
RESPONSE TO COMMENT 2: Additional information concerning the 1994 Pond 10 sampling is provided on the following map and summary table.

Thirty-one locations were sampled for Ra-226 (per 1994 Criterion 6) at the 0-6" depth and 26 locations at 6-12" depth. Based on the on-site lab analysis, the 15 pCi/g plus background clean-up was achieved. A gamma survey was completed of the pond bottom and appears to support Ra-226 clean-up has been achieved.

The Pond 10 samples that were archived following the 1994 sampling event will be analyzed for total uranium and Th-230 to complete the characterization of this area.

As the pond material was excavated, bedrock was encountered at shallow depth in most areas, which made sampling difficult and resulted in fewer samples at 6-12" depth. Additional excavation would have essentially been in bedrock. Since any further clean-up would have been into underlying bedrock, further excavation was deemed impractical. The equipment being used would be ruined and the language in the Criterion 6 standard applies to concentrations in unconsolidated soils.

Based on the aforementioned results, clean fill material consisting of excavated soil/rock from the nearby diversion channel was placed over Pond 10.


POND 9
POND 10
Q
R
C
D
E
F
G
H
27
28
29
30
31
32

1994 Pond 10 Sampling Map

Results of February-March 1994 Pond 10 Soil Sampling

Date	Location	Depth (inches)	Radium (pCi/g)
13-Jun-94	D2-B3	0-6	10.7
17-Feb-94	D3-C1	0-6	2.5
17-Feb-94	D3-D3	0-6	14.9
11-Feb-94	E1-C5	0-6	1.9
03-Mar-94	E2-B4	0-6	6.7
11-Feb-94	E2-E5	0-6	4.0
11-Feb-94	E3-B2	0-6	6.8
14-Feb-94	E3-C5	0-6	2.6
14-Feb-94	F1-A3	0-6	4.7
11-Feb-94	F1-D5	0-6	8.3
14-Feb-94	F2-A2	0-6	9.5
11-Feb-94	F2-D5	0-6	8.4
14-Feb-94	F3-A3	0-6	4.1
11-Feb-94	F3-D5	0-6	5.2
14-Feb-94	G1-C3	0-6	13.6
11-Feb-94	G1-E5	0-6	5.4
03-Mar-94	G2-B3	0-6	6.1
11-Feb-94	G2-E5	0-6	5.4
03-Mar-94	G3-B3	0-6	2.8
11-Feb-94	G4-D1	0-6	3.2

Results of February-March 1994 Pond 10 Soil Sampling

Date	Location	Depth (inches)	Radium (pCi/g)
14-Feb-94	H2-C2	0-6	6.8
14-Feb-94	H3-C3	0-6	5.7
03-Mar-94	H4-C1	0-6	4.5
11-Feb-94	I1-A4	0-6	3.5
11-Feb-94	I2-A5	0-6	15.7
03-Mar-94	I2-E2	0-6	15.9
03-Mar-94	I3-D3	0-6	5.3
11-Feb-94	I4-A1	0-6	10.2
14-Feb-94	J1-B4	0-6	10.5
11-Feb-94	J2-A5	0-6	10.0
11-Feb-94	J4-B1	0-6	18.7
13-Jun-94	D2-B3	6-12	3.3
17-Feb-94	D3-C1	6-12	4.5
17-Feb-94	D3-D3	6-12	11.4
11-Feb-94	E1-C5	6-12	3.2
11-Feb-94	E2-E5	6-12	1.8
03-Mar-94	E3-B2	6-12	8.4
14-Feb-94	F1-A3	6-12	4.1
11-Feb-94	F1-D5	6-12	3.6
14-Feb-94	F2-A2	6-12	17.0
11-Feb-94	F2-D5	6-12	2.0
14-Feb-94	F3-A3	6-12	0.8

Results of February-March 1994 Pond 10 Soil Sampling

Date	Location	Depth (inches)	Radium (pCi/g)
11-Feb-94	F3-D5	6-12	1.0
14-Feb-94	C1-C3	6-12	3.5
11-Feb-94	C1-E5	6-12	4.6
03-Mar-94	G2-B3	6-12	2.4
11-Feb-94	G2-E5	6-12	5.6
11-Feb-94	G4-D1	6-12	1.9
14-Feb-94	H2-C2	6-12	2.9
14-Feb-94	H3-C3	6-12	2.5
03-Mar-94	H4-C1	6-12	2.9
11-Feb-94	I2-A5	6-12	12.1
03-Mar-94	I3-D3	6-12	3.7
11-Feb-94	I4-A1	6-12	5.1
14-Feb-94	J1-B4	6-12	11.6
11-Feb-94	J2-A5	6-12	10.6
14-Feb-94	J4-B1	6-12	14.0

With NRC requiring a new plan for the site pursuant to the revised Criterion 6, and with the knowledge that elevated Th-230 and uranium is likely present despite meeting clean-up goals for Ra-226, Alternate Release Criteria (ARC) are proposed for Pond 10 as a practical solution that is protective of human health and the environment.

It is expected that similar conditions (e.g. shallow bedrock) will be encountered at the Pond 9 location and will result in a clean-up scenario identical to that proposed at Pond 10 (e.g. application of ARC).

Additional characterization data for Ponds 9 and 11-21 (Section 4 Ponds) will be provided as closure of these areas proceeds. Characterization of the mill site area is expected to begin in June 2005, with sampling results for radionuclides and organics available soon thereafter (see also response to Comment 15).

COMMENT 3. The Plan states (page 13) that RAM plans to survey surface cultural artifacts (archeological resources in three areas), remove them, and return to their original locations after soil remediation.

REQUEST: Provide documentation that this proposal has been approved by the relevant state agencies. A map indicating the location of archeological sites should not be in a public document. However, the document should state the approximate size of the areas. The general locations of the sites were provided by letter dated December 5, 2000.

RESPONSE TO COMMENT 3: RAM owns the land where the two archaeological sites are located. These sites were identified during a survey performed in 1990 as part of the Homestake Mining Company reclamation project of their Section 32 mine. Additional surveys were performed by the same consultant in 1997 for RAM, and during this survey, the consultant flagged the two previously identified sites and RAM fenced them off to prevent any disturbance. Site 1 is located west of Highway 509 on Section 32 and comprises 0.42 acres. Site 2 is also west of Highway 509 and encompasses 0.94 acres.

RAM is coordinating this effort with a cultural resources specialist to implement the action plan proposed for the sites. This is being done in consultation with the New Mexico Office of Cultural Affairs State Historic Preservation Office. Final approval has not been received to date. RAM will forward the approval to NRC when received.

COMMENT 4. According to page 55 of the Plan, the upper 95 percent confidence limit value of 2.3 pCi/g is proposed for the Ra-226 site background. A similar confidence limit isn't proposed for the verification sample results. Also, the NRC staff has not previously accepted confidence limits for soil background values.

REQUEST: The plan should be revised to use the mean Ra-226 value of 2.0 pCi/g, 2.7 pCi/g for Th-230, and 1.7 pCi/g for U-238.

RESPONSE TO COMMENT 4: NRC guidance (NUREG-1620, Rev. 1) states that the arithmetic mean should be used in to determine soil background values. The 95% upper confidence limit (UCL) was used to describe the arithmetic mean background concentration because this value would have a high probability of containing the true mean background value, and accounts for uncertainties associated with measurements of concentration and the use of a limited number of samples from a population to describe the mean (Snedecor and Cochran 1989). Because the background soils are relatively uniform alluvium, the ranges of values observed for Ra-226, Th-230, and uranium-238 are correspondingly narrow and the differences between the mean and 95% UCL for the mean are quite small (Table 3-1 of Soil DP).

The effect on the gamma guideline value of using the sample mean Ra-226 concentration (2.0 pCi/g) instead of the 95% UCL of the mean value (2.3 pCi/g) is relatively small. The revised soil clean-up level of 7.0 pCi/g reduces the gamma guideline value from 30,300 cpm to 29,000 cpm. This change makes an already-conservative gamma guideline value even more conservative. With a gamma guideline value of 30,300 cpm, there were no false negatives observed for the 30 windblown-tailings-affected samples included in the gamma correlation. With this higher gamma guideline value, all but one of the windblown-tailings-affected sample grids would be identified for remediation, even though 17 of the 29 grids (59%) represent false positive values, i.e., grids with Ra-226 concentrations less than the background plus 5 pCi/g clean-up level. Decreasing the background concentration to 2 pCi/g increases the number of false-positive grids by one, because the sole windblown-tailings-affected grid that was not included in the remediation area using the higher gamma

guideline value is now included (sample Komex-121) even though its Ra-226 concentration is well below the 5 pCi/g plus radium background standard (4.38 pCi/g compared to 7 pCi/g). Either gamma guideline value (30,300 cpm or 29,000 cpm) appears to exceed the required 95% confidence required, because no false negatives were observed with either value. Thus, even the higher gamma guideline value would result in most grids being cleaned to near background levels of radiation, as required to demonstrate ALARA (NUREG 1620 Rev. 1).

Because the difference between the 95% UCL and the sample mean background concentrations are relatively small, RAM will commit to using the lower gamma guideline value of 29,000 cpm.

COMMENT 5. For surface soil, RAM indicates (page 49) that radium benchmark dose modeling results in a clean-up criterion of 507 pCi/g for Th-230 (when Ra-226 and U-nat are background). NRC guidance in Appendix H of NUREG-1620 suggests an as low as is reasonably achievable (ALARA) value of 14 pCi/g as this would yield 5 pCi/g Ra-226 in 1000 years. RAM proposes an ALARA value of 30 pCi/g (plus background) based on data in Table 2-1. The table shows two of eleven samples of mine drainage contamination with levels above 30 pCi/g, and soil removal to meet the Ra-226 standard would not always reduce the Th-230 (most samples not in equilibrium). For the Section 4 Ponds, it will be difficult to distinguish pond contamination from mining contamination once the sludge and liners have been removed. Therefore, a Th-230 clean-up level of 14 pCi/g appears to be appropriate because little additional excavation is needed to achieve this level. If alternate criteria are applied to the other ponds, no Th-230 criterion is applied. For the windblown areas without mining contamination, the Ra-226 and Th-230 are approximately in equilibrium (page 14) and the Th-230 limit of 14 pCi/g should be achieved at most locations by meeting the Ra-226 surface standard. Verification sample analysis for Th-230 would be done on the same samples analyzed for Ra-226 primarily where disequilibrium is suspected, perhaps in the pipe trench.

REQUEST: Demonstrate that a Th-230 clean-up limit of 14 pCi/g is not ALARA or

provide additional justification for the discussion on page 49.

RESPONSE TO COMMENT 5: RAM will revise the Th-230 soil clean-up limit to that proposed by NRC based on the Ra-226 concentration limit at 1000 years. A Th-230 concentration of 14.3 pCi/g (taken from NUREG-1620) will be used as the clean-up limit for the top 6 inches of soil. The Th-230 soil concentration limit of 42.9 pCi/g will be used in successive 6 inch layers below the surface. RAM concurs that the unity rule (sum of fractions) applies to subsurface and surface soils.

COMMENT 6. Page 65 states that no further clean-up will be done in the ponds because of the application of alternate release criteria. Dose modeling for Ponds 4-8 is provided but assumes that all contamination is 2 meters (6.5 ft) thick and radionuclide concentrations are the maximum measured value. Around the perimeter of Ponds 4, 5, and 6, the values for both Ra-226 and Th-230 drop to below 20 pCi/g at the 2-foot level except for pit 6A which had 966 pCi/g Th-230 (page 27).

REQUEST: Explain why it is not reasonable to clean-up Pond 6; around the perimeter of Ponds 4, 5, and 6; and other areas where only 1-2 ft of removal is needed to meet or approximate clean-up criteria.

RESPONSE TO COMMENT 6: As discussed previously with NRC staff, a response to Comment 6 will be provided within thirty days of the submittal of this document.

COMMENT 7. Other areas under consideration for alternate criteria are the areas adjacent to the unlined ponds, Pond 9, and the former mill area. No characterization data is available, but RAM expects approval to apply the same methodology (i.e., dose assessment will be compared to the radium benchmark dose to evaluate compliance status (page 53)). That is not the purpose of the radium benchmark dose. Compliance is based on the cost-benefit analysis up to 1000 years and the reasonableness of the clean-up plan.

REQUEST: Any further application of alternate criteria must be justified and submitted to NRC for approval.

RESPONSE TO COMMENT 7: RAM assumes that the Soil DP can be approved without having to wait for characterization and approval of ARC in areas yet to be characterized (e.g. the Mill Area and Pond 9) using approved methods outlined in the Soil DP. The method outlined is simply a site-specific dose assessment for the area in question using actual soil concentrations to demonstrate that the resultant dose is below the radium benchmark. RAM anticipates the submittal of separate characterization and closure reports for areas not currently characterized. In each case, an assessment of the cost-benefit will be included. As a side note, the NRC has found that soil removal below the clean-up criteria, as a general proposition, cannot be justified based on ALARA.

COMMENT 8. RAM assumes (page 50) that the Department of Energy (DOE) will take custody of the Section 4 Ponds for long-term surveillance. There is no assurance that DOE will take this responsibility because institutional controls appear to be unnecessary. The area should be released for unrestricted use, unless the State requires the mining companies to remediate the mill drainage contamination.

REQUEST: Revise page 50 or substantiate that institutional control is needed.

RESPONSE TO COMMENT 8: RAM intends to release the Section 4 area impacted by licensed activities for unrestricted use.

COMMENT 9. RAM plans to cover Ponds 7 and 8 with at least 1 foot of clean soil (page 51), and has placed a similar thickness on Ponds 4-6 (page 66). The half-life of Th-230 is 77,000 years and its decay product, Ra-226, has a half-life of 16,000 years. Because of these half-lives, the expected longevity of the soil cover must be considered.

REQUEST: Describe if the cover soil will be compacted and why the cover on each of these evaporation ponds is likely to last for the design life of 1000 years. Also, since the thin cover soil on Pond 8 has apparently mixed with underlying contamination or eroded in spots (high surface Ra-226 values), clarify that one foot of additional fill will be added and that this fill will be adequate.

RESPONSE TO COMMENT 9: A complete response to Comment 9 will be provided to NRC within thirty days of the submittal of this document.

COMMENT 10. RAM apparently did not adequately remediate Pond 8 per earlier commitments and reporting (letter of May 2, 1988). The subsurface Ra-226 standard was to be achieved before adding at least 6 inches of cover soil (i.e., 15 pCi/g Ra-226 in any 100 square meter area in each 15 cm (6-inch) layer). After the June 5, 2000, NRC letter directing additional clean-up of Pond 8, RAM apparently did not do additional work. Also, windblown tailings remediation does not appear to have been completed by the date (December 31, 1999) established in License Condition 39A (see Figure1-3).

REQUEST: Describe why RAM did not meet the reclamation standard that RAM stated had been obtained for Pond 8. In addition, clarify compliance with the required remediation date for windblown tailings.

RESPONSE TO COMMENT 10:

<u>Pond 8</u>

RAM initially performed reclamation work on Pond 8 during 1987 and 1988. NRC conducted a site inspection on March 30, 1988, which included visual observations of the

work and independent measurements. NRC collected 5 composite soil samples as a check on the reclamation progress at Pond 8. RAM submitted an interim and final survey report describing the Pond 8 reclamation. In October 1988, RAM submitted the soil sample results and cross comparison to the NRC soil samples obtained during the March 1988 inspection. NRC responded on December 28, 1988 approving successful reclamation of Pond 8 and authorized placement of the cover material. RAM submitted a final report to NRC in July 1989 describing the cover placement and revegetation work.

Results of the NRC/ORISE site visit conducted in November 1999 disputed the adequacy of the past reclamation work and rescinded the past NRC approval of the Pond 8 reclamation. This point was clarified in a June 2000 letter to RAM stating that additional reclamation work was required on Pond 8.

As described within RAMs response to NRC Comment 9 in this document, RAM has performed additional work on Pond 8. This included excavation and grading, placement of a minimum of one foot of clay and the area was revegetated. This work was initiated in 2001 and completed in 2002.

RAM is proposing alternate release criteria for Pond 8 and based on the information included in the Soil Plan (Section 5.2.2, Section 8.2.2.2 and Appendix D), the reclamation performed at Pond 8 in response to the NRC/ORISE visit demonstrates that the reclamation goal was achieved for the Pond 7 and Pond 8 area.

Windblown Milestone

License Condition 40.A.(1) lists the milestone pertaining to windblown materials, and states:

"Windblown retrieval and placement on the pile – December 31, 1999.." (emphasis added)

RAM submitted a December 4, 1998 request to extend the milestone date for License Condition 40.A.(1). The basis for the extension request was that, although RAM completed the actual retrieval and placement required by the milestone, RAM encountered difficulties in establishing a reliable verification process.

In addition to the verification process problems, revision of 10 CFR 40 Appendix A, Criterion 6 along with the need to address the findings of the NRC/ORISE site visit in November 1999 resulted in RAM having to redevelop the overall soil plan to incorporate these changes.

As previously stated, RAM believed that all identified windblown material was retrieved and placed in Pond 3. These areas were identified based on plans that required extensive revision to incorporate the regulatory actions described above. The Soil Plan incorporated all these changes and other than hot spots that may occur during the verification phase, the milestone requirement to retrieve and place windblown tailings material was met.

Identifying additional areas requiring retrieval and placement in the pile will be primarily controlled by the gamma guideline that NRC eventually approves as part of the overall surface reclamation plan for the site. RAM anticipates that these potential windblown contamination areas will be limited to minor 'hot spots.

COMMENT 11: RAM proposes to use soil mixing for areas where removal is not reasonably achievable or would cause excessive risk to workers or the public (page 58).

REQUEST: Give examples of where and how RAM will decide to use this method (e.g., what is excessive risk). Also, address comment nine from the December 22, 2004, NRC request for information (i.e., demonstrate ALARA and stakeholder involvement per NRC policy).

RESPONSE TO COMMENT 11: RAM will not utilize soil mixing as a remediation strategy.

COMMENT 12. Per the NRC guidance in Section 5.2 of NUREG-1620 Rev.1, the instruments and techniques to be used for verification of compliance with Criterion 6(6) should be the same or very similar to those used to assess background values and the radium-gamma correlation.

REQUEST: State where the Plan provides this information or revise the Plan to include this information.

RESPONSE TO COMMENT 12: The instruments and techniques to be used for verification of compliance with Criterion 6(6) will be the same or very similar to those used to assess background values and radium-gamma correlation. Equivalent statements are provided on pages 55 (2nd paragraph, 3rd sentence) and 63 (7th paragraph, 2nd sentence) of the Soil Decommissioning Plan.

COMMENT 13. RAM states (page 63) that 2 percent of remediated grids in the windblown area will be soil sampled.

REQUEST: Describe what sampling will be done in other areas such as pipe trenches and the Section 4 Ponds.

RESPONSE TO COMMENT 13: As discussed previously with NRC staff, a response to Comment 13 will be provided to NRC within thirty days of the submittal of this document and will include a strategy for sampling of pipeline trenches.

The Section 4 Pond area will utilize the same sampling protocol that will be used in the windblown areas.

COMMENT 14. Page 64 states that a quality assurance project procedure will be developed for the final status survey using a graded approach. It is unclear why this procedure has not been developed because some soil verification has been done. Under the heading "Document Control-Implementation," RAM states that written procedures and instructions governing implementation of the program shall be developed. These should be in place now.

REQUEST: RAM should state when the procedures are complete so that they can be inspected. Also, describe how the pervious verification data will be included in the final status report. Describe the quality assurance procedures that were used for verification sampling that has been completed.

RESPONSE TO COMMENT 14: The statement on page 64 is referring to an operating procedure that was written for the approved survey plan according to the MARSSIM QAPP approach. Elements of the QAPP will include planning and scoping (project objectives); design of data collection including training (sampling design); implementation of operations including documents and records (sampling execution and sample analysis); assessment and response (review); and assessment of verification of data usability (assessment of data quality). Evaluation of these elements will largely determine the level of detail in the procedure.

The survey plan provided in the Soil DP contains significant boundaries or conditions that must be known in order to develop this procedure. Two primary conditions are the gamma guideline and the clean-up levels for Th-230 and uranium. The gamma guideline and the clean-up levels have considerable impact on decisions regarding planning, design, and implementation of the final status survey, and therefore associated QA/QC activities. It is premature to develop a description of QA/QC activities for planning, design, and

implementation of the final status survey until the final survey plan is approved. Once the Soil DP is approved, RAM will develop the QAPP and make it available for inspection.

All soil verification completed to date has been done by approved procedures, and the procedures included quality control elements to ensure that the activities were technically sound, valid and properly documented. All previous soil verification data will be evaluated to determine if it meets the standards provided by the QAPP for final verification prior to including it in the FSS.

COMMENT 15. Page 69 states that the mill site may have a small amount of organic solvent contamination.

REQUEST: Provide soil test data to determine the extent, if any, of the organic solvent contamination. If contamination exceeds the State regulations, describe how and when remediation will be performed.

RESPONSE TO COMMENT 15: RAM's mill circuit utilized a solvent extraction process in which the solution consisted primarily of kerosene. Completing the majority of the mill demolition in early 2004 now allows RAM to access the areas that were used as part of the solvent extraction circuit. A characterization study, scheduled to be initiated on June 6, 2005, will identify the extent of any organic contamination and will also determine soil concentrations.

In the event concentrations exceed State regulations, RAM will utilize a combination of bioremediation processes and land farming/soil tilling on soils requiring remediation. Numerous products are available to perform this bioremediation process. RAM will introduce microbes and/or nutrients to the soil and allow the microbial agents to convert or degrade the organic compounds into non-toxic substances such as carbon dioxide and water. The process will be monitored until organic concentrations fall below clean-up criteria.

RAM recognizes that organic contaminated soil may contain elevated concentrations of radionuclides. RAM will use in-situ soil characterization data (e.g. borehole sampling) from the ongoing mill site characterization effort to determine whether soil contaminated by organics should be classified as byproduct material (e.g. soils will not be classified based on radionuclide concentrations after land-farming is completed, which would be less conservative). Soils classified as containing by-product material will be disposed of on-site.

COMMENT 16. It does not appear that RAM has addressed all the NRC comments (January 1, 2001) on the previous soil decommissioning plan in the current Plan.

REQUEST: Provide responses for comments 7 (indirect method of compliance, repeated on page 48 of the 2005 plan), 12 (is DOE willing to accept the site with alternate criteria leaving high radionuclide levels and could ground water eventually be affected), 18 (gamma correlation when using ATV), and 26 (extent of buffer zone survey).

RESPONSE TO COMMENT 16:

COMMENT 7 (January 1, 2001): ACTION REQUESTED: Derive the radium benchmark dose using the appropriate contaminated area size and an erosion rate of 0.0001, or justify the value used in the modeling. Also, justify the assumed long term land use and related parameter values.

RESPONSE TO COMMENT 7 (January 1,2001): Parameter and land use assumptions for the benchmark dose modeling are described in Appendix B of Soil DP, and address previous NRC concerns. The benchmark dose was revised downward from 68.4 mrem/yr to 18 mrem/yr.

COMMENT 12 (January 1, 2001): ACTION REQUESTED: Indicate (1) the alternative criterion requested (apparently leaving existing elevated levels of Ra-226 and Th-230 in place with a clean soil cover at least 1-foot (30cm); (2) how the byproduct material will be controlled/stabilized for 1000 years; (3) if the groundwater could be affected in the long term; and (4) if DOE is willing to except the land with this level of contamination. Also, provide (5) a map indicated the pond sample locations; and (6) a table of radionuclide concentrations by depth and sample number, for each pond.

RESPONSE TO COMMENT 12 (January 1,2001): Items (1), (2), (5) and (6) of this comment were addressed adequately within the Soil DP. With respect to item (4), the DOE has accepted RAMs proposed LTSM Boundary and will therefore accept the subject property for transfer. With respect to item (3), potential groundwater contamination issues have been addressed with the context of the Alternate Concentration Limit (ACL) application(s) and will not adversely affect human health or the environment.

COMMENT 18 (January 1, 2001): ACTION REQUESTED: If any of the final status survey data was/will be obtained using a vehicle-mounted gamma detector, provide the associated radium-gamma correlation.

RESPONSE TO COMMENT 18 (January 1,2001): An assessment of this condition is described in the Soils Decommissioning Plan on page 34 (1st paragraph, last two sentences). Otherwise a radium-gamma correlation using data obtained by walking the gamma survey may be derived from Table 2-1 of the Soils Decommissioning Plan.

Because of the relatively flat terrain at the site, the vast majority of the final status survey data will be obtained using a vehicle-mounted gamma detector, as noted in

the last sentence of the first paragraph on page 34 of the Soils Decommissioning Plan. The preceding sentence in the Soils Decommission Plan states that the gamma measurements obtained using a hand-held and with a vehicle-mounted detector were compared and found to be essentially identical ($r^2 = 0.98$, Figure 3-1). Therefore, a gamma correlation developed with the hand-held detector data will be indistinguishable from the correlation developed with the vehicle-mounted detector data. Any potential shielding of the detector when mounted on the ATV used at the site was/will be avoided by mounting the detector 18" above the ground and 3 feet from the vehicle.

COMMENT 26 (January 1, 2001): ACTION REQUESTED: Indicate the minimum number of grids beyond the excavation edge that will be part of the final survey.

RESPONSE TO COMMENT 26 (January 1, 2001): Sampling of the area beyond the clean-up area (buffer zone) will conform to requirements of NUREG-1620, Section 5.2.2.(7). RAM will include a 30-meter buffer zone beyond the clean-up area that will be included as part of the final status survey.

LINED PONDS CLOSURE PLAN COMMENT REPSPONSES

COMMENT 1. It does not appear that RAM has addressed all the NRC comments dated December 22, 2004.

REQUEST: Provide appropriate responses or indicate where in the January 2005 submittals the response is discussed for Section 5, comments 7-16 and 19-23.

RESPONSE TO POND CLOSURE PLAN COMMENT 1:

COMMENT 7 (December 22, 2004): ACTION REQUESTED: RAM should revise Section 5.3 on page 7.

RESPONSE TO COMMENT 7 (December 22, 2004): RAM will revise Section 5.3 of the Lined Pond Closure Plan to state that RAM will apply the unity rule to individual grids using the established concentration limits and the grid-specific measured values.

COMMENT 8 (December 22, 2004): ACTION REQUESTED: Clarify the purpose of this approach and provide justification for an alternate clean-up/release criterion (also see requests 10 and 18 for this section).

RESPONSE TO COMMENT 8 (December 22, 2004): A justification and methodology of the ARC are described within Section 5.2 of the Soils Decommissioning Plan and elaborated upon elsewhere in this RAI response document.

COMMENT 9 (December 22, 2004): ACTION REQUESTED: Provide the detailed method and justification (the cost vs. benefit analysis) for this approach, including the criteria to determine worker safety. Note that current NRC policy on soil mixing requires application of ALARA, stakeholder involvement, and can be considered only where it can be demonstrated that removal of the soil would not be reasonably achievable (Regulatory Issue Summary 2004-08, May 28,2004). This is in addition to requiring that the contaminated soil footprint not be enlarged and clean soil not be brought into the footprint.

RESPONSE TO COMMENT 9 (December 22, 2004): RAM has decided not to pursue soil mixing as a reclamation strategy, thus no response is provided for this request.

COMMENT 10 (December 22, 2004): ACTION REQUESTED: RAM should put all information concerning the proposed ARC in one section.

RESPONSE TO COMMENT 10 (December 22, 2004): Section 7.2 of the Soil Decommissioning Plan will be revised to specifically state that the scope is limited to approval of ARC for the individual areas described in Section 5.2.

COMMENT 11 (December 22, 2004): ACTION REQUESTED: Indicate why other types of surface contamination are not to be considered. RAM has already indicated that mine water drainage contamination will not be removed if it can be identified. That still leaves spills, leaks, and waterborne byproduct material to consider.

RESPONSE TO COMMENT 11 (December 22, 2004): The Lined Pond Closure Plan is intended to address surface soil contamination due to licensed activities. RAM expects the other areas mentioned in this comment to be captured within the footprint of the windblown area or the areas of deep contamination. Then one of the two final status survey methods will inherently be applied to the other areas

named in the respective request.

COMMENT 12 (December 22, 2004): ACTION REQUESTED: Justify the use of this analytical method.

RESPONSE TO COMMENT 12 (December 22, 2004): Gamma spectrometry is a quick, effective, and common means of determining concentration of uranium in soil. A primary limiting factor is the minimum detectable activity (MDA) of the technique. An estimate of MDA for U-238 in soil can be derived from the soil samples described in Table 2-1 of the Soil Decommissioning Plan. These analyses were completed by gamma spectrometry[1]. The table reflects detectable concentrations as low as 2 pCi/g and MDAs no greater than 5 pCi/g as U-238, or approximately 4 and 10 pCi/g total uranium, respectively.

The estimated MDA is about 40 times less than the respective soil concentration limit (SCL), and is one-third of the proposed soil clean-up level; i.e. the estimated MDA allows the analytical technique to accurately distinguish the presence or absence of uranium in soil compared to the SCL or the soil clean-up level.

COMMENT 13 (December 22, 2004): ACTION REQUESTED: Such [survey] procedures must be summarized in sufficient detail in this plan or in the soil decommissioning plan.

RESPONSE TO COMMENT 13 (December 22, 2004): Survey procedures are summarized in the Soils Decommissioning Plan at Section 8.1.2.2.

COMMENT 14 (December 22, 2004): ACTION REQUESTED: Indicate how this [soil sample collection] will be accomplished or reference specific procedures or

1 Department of Energy, EML Procedures Manual, HASL-300, 1997, "Ga-01-R Gamma Radioassay".

QA/QC plan section. Some document should indicate the level of management oversight.

RESPONSE TO COMMENT 14 (December 22, 2004): All survey and soil sampling completed to date has been done by approved procedures, and the procedures included quality control elements to ensure that the activities were consistent, verifiable, etc. The QA procedures are summarized in the Soil Decommissioning Plan at Section 8.1.6 and Attachment 1 to the DP.

COMMENT 15 (December 22, 2004): ACTION REQUESTED: Indicate how it will be determined that soil samples need to be dried, how drying is done, and the quality control performed for this process.

RESPONSE TO COMMENT 15 (December 22, 2004): The Standard Operating Procedures (SOP) will include a Quality Assurance section on soil drying. All soil samples will be dried. The anticipated method is to place the soil in a metal pan for 12 hours at 100 °C. Quality control will be limited to monitoring drying temperature and drying time. The drying method and quality control will be described in a written procedure.

COMMENT 16 (December 22, 2004): ACTION REQUESTED: Clarify that stored verification soil samples will be stored at least until NRC approval of the FSS Report is provided to RAM.

RESPONSE TO COMMENT 16 (December 22, 2004): Verification soil samples will be stored at least until NRC approval of the FSS Report is provided to RAM.

COMMENT 19 (December 22, 2004): ACTION REQUESTED: If this means that gamma scans are not effective to delineate areas of elevated Th-230 levels, then

say so. If elevated levels of RA-226 are likely, then gamma scanning should be considered. Also, indicate how soil analytical results will be compared to the Criterion 6(6) requirement for measurements of 100 m2 areas, and what *QA/QC* measures will be used, or justify that the sampling pattern will provide representative results for the ARC proposal. RAM can't assume the ARC will be approved so this section should be revised to state that these proposed verification methods are subject to approval of the ARC.

RESPONSE TO COMMENT 19 (December 22, 2004): RAM concurs that deep soil contamination cannot be characterized by surface scans. RAM concedes that application of ARC is subject to approval of NRC.

<u>COMMENT 20 (December 22, 2004):</u> ACTION REQUESTED: Indicate why 80 percent [confidence interval] is a reasonable level and how it compares to the statement on page 16 that 2 percent of the grids will be soil sampled. Also, indicate why the deeper soil is being sampled differently, or if all subsurface contamination will be included in the ARC proposal.

RESPONSE TO COMMENT 20 (December 22, 2004): Justification for the 80% confidence interval is derived from application in SW-846 Section 9.1.1.1. Subsurface (deep) contamination is subject to ARC provisions described in the Plan (and approval by NRC).

<u>COMMENT 21 (December 22, 2004):</u> ACTION REQUESTED: Provide a summary of the gamma survey and soil sampling plan for trenches that meet Criterion 6(6).

RESPONSE TO COMMENT 21 (December 22, 2004): RAM will provide a complete response to this comment within 30 days of submittal of this document, including a strategy for sampling of pipeline trenches.

COMMENT 22 (December 22, 2004): ACTION REQUESTED: Summarize the QA procedure as part of the FSS Plan so that staff can complete its evaluation of the Closure Plan.

RESPONSE TO COMMENT 22 (December 22, 2004): The QA procedures are summarized in the Soil Decommissioning Plan at Section 8.1.6 and Attachment 1 to the DP.

COMMENT 23 (December 22, 2004): ACTION REQUESTED: Indicate the basis for assuming that non-radiological hazardous constituents don't exist beneath the ponds, or why the Closure Plan would meet Criterion 6(7).

RESPONSE TO COMMENT 23 (December 22, 2004): The distribution of heavy metals in soils at the facility is directly correlated to the distribution of radiological constituents. For this reason, remediation of the radiological constituents in soil will likely result in concurrent remediation of non-radiological heavy metals. To ensure that heavy metals are being adequately remediated, RAM will collect four composite verification samples per pond to be analyzed for heavy metal concentrations. RAM will also collect additional discrete soil samples in areas where visual evidence of contamination exists (e.g. damp or stained areas), also to be analyzed for heavy metal concentrations.