INTERNATIONAL URANIUM (USA) CORPORATION

May 8, 2006

**VIA E-MAIL AND OVERNIGHT DELIVERY**

Mr. Dane L. Finerfrock
Director
Division of Radiation Control
Department of Environmental Quality
168 North 1950 West
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Re: Cell 4A Lining System Design Report, Response to URS Completeness Review

Dear Mr. Finerfrock:

We are responding to your April 28, 2006 letter, requesting additional information following the Completeness Review of the Cell 4A Lining System Design.

For ease of review, the Division of Radiation Control's ("DRC's") questions are repeated below in italics with International Uranium (USA) Corporation's ("IUSA's") responses following each question.

<u>Comments and Responses</u>

*The above referenced Cell 4A Design Report presents the design of the proposed liner system that does include the liner components listed above for BAT. It also includes select design basis calculations, plans and limited material specifications. However, the following design base issues have not been addressed in the report and need to be provided. The Division will be able to conduct a complete review of the design for compliance with the regulatory requirements when this information is provided.*

1. *To meet the regulatory requirements referenced above for the cell liner system the following evaluations or calculations need to be provided:*
    a. *Liner system material (HDPE, GCL, clay, geonet, fabric, granular material, piping, extraction and monitoring equipment, etc.) to be compatible with leachate so as not to compromise the integrity if the system. Please provide information, data, and/or test results that demonstrate that all of the liner system materials and equipment will not be impacted by the chemical or physical nature of the leachate (e.g., low pH, sulfate content, etc.). Please note that the BAT requirements call for a*

*minimum twelve (12) inch thick layer of clay under the secondary HDPE liner.*

The proposed geomembrane and geonet will be comprised of high density polyethylene, which is chemically resistant to 98% sulfuric and other acids as shown in Attachment A.

The proposed geotextile will be comprised of polypropylene, which is chemically resistant to 96% sulfuric and other acids as shown in Attachment B.

The proposed drainage aggregate will meet the requirements of ASTM C 33 and have a carbonate loss of no greater than 10% when tested in accordance with ASTM D 3042, as described in Section 02225, Part 2.01 of the Project Specifications. The drainage aggregate will lose no more than 10% mass when exposed to an acidic environment.

The proposed pipe will be comprised of polyvinyl chloride, which is chemically resistant to 90% sulfuric and other acids as shown in Attachment C.

The proposed GCL will be installed overlying the prepared subgrade and beneath the primary and secondary HDPE geomembranes. In accordance with EPA requirements, no more than 1 foot of head will develop above the secondary geomembrane, thereby minimizing the potential for liquid migration through the secondary geomembrane and into the GCL and subgrade.

The GCL will be comprised of polypropylene geotextile materials and bentonite clay (montmorillonite clay). The polypropylene geotextile, as discussed above, is chemically resistant to 96% sulfuric and other acids as shown in Attachment B. The performance of the bentonite clay component of the GCL is derived from the ability of the bentonite to hydrate (absorb water). Bentonite clays have been shown to absorb water from adjacent soils with moisture contents as low as 1% (see Attachment D). This absorption occurs over a short period of time (5 to 15 days) and allows the bentonite component of the GCL to hydrate (see Attachment D). The hydraulic conductivity of hydrated bentonite clay to acidic liquids is much lower (better) than unhydrated GCLs, as shown in Attachment E. Based on the proposed installation of the GCL overlying the soil subgrade, the GCL is anticipated to hydrate long before the cell liner system begins operation, thereby allowing the GCL to perform as a hydraulic barrier to the acidic liquids contained within the Cell 4A.

Appendix E of the "Cell 4A Lining System Design Report" dated January 2006 includes a calculation package evaluating the equivalency of the GCL to a compacted clay liner. The results of this calculation suggest that, in terms of flow, the composite liner system containing a GCL performs better than the composite clay liner containing a compacted clay liner.

b. *An evaluation that demonstrates that the proposed lining system will remain stable during cell operations. This includes:*

i. *The impact of stress imposed by tailings and liquid during placement on the liner system side slopes that could result in movement and degradation of the liner system. Specifically, will the primary liner and 20-foot wide protective splashguard on the cell side slope withstand the anticipated stress from tailing placement via the discharge pipe?*

Cell 4A will initially be for used only for storage and evaporation of process solutions. The remaining volume of Cell 3 will be used for disposal of tailings solids. (Cell 3 currently has in excess of 800,000 tons of disposal capacity, the majority of which is reserved for disposal of reclamation materials. Once Cell 4A is completed the reclamation volumes will be reserved in Cell 4A and the full disposal volume will be available in Cell 3.) The process solutions that will initially be stored in Cell 4A will be pumped to the cell and discharged on to one or more of the protective splashguards installed on the north slope of Cell 4A. The splashguard will provide impact and abrasion protection to the lining system from the solution discharge.

It is anticipated that once Cell 4A is needed for disposal of tailings solids the cell will contain a significant amount of process solutions. To begin introducing tailings solids to Cell 4A, a slurry discharge pipeline will be installed on each of the splashguards, positioned so as to allow for discharge of the tailings slurry directly in to the free water surface. Once in the solution, the solids will begin to segregate and slowly settle to the bottom of the cell. If the solution level is fairly deep when slurry discharge begins, the solids will slide down the submerged portion of the splashguard and begin to build up at the toe of the dike and into the bottom of the cell. Once sufficient volume of solids is built up a beach area will be formed above the free water surface and the tailings will then be discharged directly onto the tailings sands. The discharge pipeline will be gradually pulled back up the dike slope to prevent the end being buried in the tailings solids. If the solution volume in Cell 4A is relatively deep when slurry discharge begins it will take a significant amount of time to build the tailings beach above the solution level. At no time will the tailings slurry be allowed to discharge directly on to the top liner without settling through the process solutions, and at no time will the slurry pipelines be placed directly on the top liner. Additional startup procedure detail will be provided in the Cell 4A Operations and Maintenance Procedures and Plan, and Best Available Technology Monitoring Plan.

These procedures will prevent un-anticipated stress from tailing placement via the discharge pipe on the primary liner and 20-foot wide protective splashguard on the cell side slope.

ii. *Additional information to demonstrate the stability of the lining system interfaces, particularly the GCL/in-situ clay liner interface, on the cell side slopes during lining system installation and cell operation. Include information assessing the stability of the lining* *system in the event of a possible failure of anchoring of the composite lining system at the anchor trench as a result of cell loading during operations (such as from equipment), during unusually severe wind uplift conditions that might occur prior to or during the operational period, etc.*

During liner system installation, the geosynthetic materials will be anchored at the top of the side slopes with temporary means (e.g. sand bags) until the anchor trench is backfilled. There are no construction loads that will be placed on the side slope liner system components.

During cell operation, the placement of solids within Cell 4A is anticipated to occur in a manner that allows the solids to settle out of the liquid in relatively uniform, near horizontal layers. Due to the nature of the waste placement techniques, significant interim slope stress conditions are not anticipated. Also, the solids settling process is not anticipated to impart forces on the side slope liner system. Equipment will not be utilized within the cell or on the side slopes. Therefore, slope stability problems are not anticipated.

Wind uplift calculations are presented in Appendix E of the “Cell 4A Lining System Design Report”, dated January 2006. These calculations utilize a wind speed of 25 miles per hour, which is exceeded less than 1 percent of the time. The wind uplift calculation is utilized to determine the size of the anchor trench utilized to maintain the stability of the liner system components on the side slope. Based on the results of the anchor trench design analyses, the anchor trench geometry is sized to exceed the anticipated wind uplift forces. Furthermore, once disposal operations commence, the amount of exposed side slope liner system that is susceptible to wind uplift will decrease, thereby decreasing the potential tensile forces within the geosynthetic liner system components.

*iii. The impact of environmental stresses including UV degradation, wetting/drying cycles, freeze-thaw cycles, and temperature fluctuations on the different liner components.*

The materials selected for use in the Cell 4A liner system are well understood and common materials for exposed liner system applications. The primary geomembrane will be the only liner system component that will be exposed to ultraviolet and wetting/drying cycles on the upper side slopes of the cell. The geomembrane is well suited to withstand both ultraviolet and wetting/drying cycle exposures.

The geomembrane manufacturer will provide a 20-year material warranty on the exposed geomembrane. In addition, the geomembrane will be supplied with a white surface to reduce the temperature effects on the expansion and contraction of the geomembrane.

The Geomembrane and geonet components of the liner system will be unaffected by freeze-thaw effects. The water within the GCL will freeze if exposed to low temperatures, which is only anticipated in the areas of side slopes that are exposed. However, the GCL performance will be unaffected by the freeze-thaw cycles (Attachment F).

c. *Per BAT for leachate collection and leak detection systems the Leachate Monitoring, Operations, Maintenance, and Reporting Plan needs to include an estimation of (anticipated flow rates and maximum capacity) in these layers to demonstrate compliance with the above listed respective requirements.*

The Action Leakage Rate calculation package, as described below, will indicate the anticipated flow rate within the leak detection system. This calculation package will be provided by June 16, 2006.

d. *The Action Leakage Rate, which is defined as the maximum design flow rate that the leak detection system can rapidly remove without the fluid head on the liner exceeding one (1) foot, needs to be determined. The action leakage rate must include an adequate safety margin to allow for uncertainties in the design (e.g., slope, hydraulic conductivity, thickness of drainage material), construction, operation, and location of the system, waste and leachate characteristics, likelihood and amounts of other sources of liquids, considerations for rapid reporting when it is exceeded, and proposed response actions (e.g., the action leakage rate must consider decreases in the flow capacity of the system over time resulting from siltation and clogging, rib layover and creep of synthetic components of the system, overburden pressures, etc.). The development of the action leakage rate includes a reasonable and defendable estimation of an allowable leakage rate through the primary liner into the leak detection system. Guidance can be found in 40 CFR 264.302, the EPA document Action Leakage Rates For Leak Detection Systems; January 1992, and in Geosynthetics International, Special Issue on Liquid Migration Control Using Geosynthetic Liner Systems, 1997, Vol. 4 (that includes an article on page 215 by GeoSyntec Consultants on this topic).*

The Action Leakage Rate will be calculated based on the EPA guidance provided in 40 CFR 264.302. This calculation package will be provided by June 16, 2005.

e. *10 CFR 40 Appendix A Criterion 5(A)(4) addresses cell operation and management (Phase 2). However, are there any anticipated conditions that could result in overtopping of the cell, such as the design storm*

> *event? If so, what would be the impact on the liner, and would these lead to any design considerations. Potential overtopping will need to be considered in tailings management.*

The maximum tailings cell pond wastewater levels are regulated by condition 10.3 of the White Mesa Mill 11e.(2) Materials License.

Condition 10.3 states that "**Freeboard limits for Cells 1-1, 3, and 4A, shall be set periodically in accordance with the procedures set out in Section 3.0 to Appendix E of the previously approved NRC license application, including the October 13, 1999 revisions made to the January 10, 1990 Drainage Report. The freeboard limit for Cell 3 shall be recalculated annually in accordance with the procedures set in the October 13, 1999 revision to the Drainage Report.**" The 1990 Drainage Report uses the Local 6-hour Probable Maximum Precipitation (PMP) event for calculating the freeboard requirements for each of the tailings cells. The PMP for the White Mesa site is 10 inches.

Based on the PMP storm event, the freeboard requirement for Cell 1 is a maximum operating water level of 5615.4 feet above mean sea level (amsl). The Cell 1 freeboard limit is not affected by operations or conditions in Cells 2, 3 or 4A.

Cell 2 has no freeboard limit because the cell is 99% full of tailings solids and all precipitation falling on Cell 2 and the adjacent drainage area must be contained in Cell 3. The flood volume from the PMP event over the Cell 2 and Cell 3 pond areas, plus the adjacent drainage areas, is 123.4 acre-feet of water. According to the freeboard calculation procedures, this volume currently must be contained in the existing 24-acre pool area in Cell 3. This results in a maximum operating water level in Cell 3 of 5601.6 feet amsl.

The Cell 4A design includes a concrete spillway between Cell 3 and Cell 4A with the invert elevation approximately 4 feet below the top of the Cell 3 dike, at an elevation of 5606 feet amsl. Once Cell 4A is placed in operation, the cell would be available for emergency overflows from Cell 3, but as long as the freeboard limit in Cell 3 is maintained at 5601.6 it is extremely unlikely that Cell 4A would see any overflow water from Cell 3. Should Cell 3 receive the full PMP volume of 123.4 acre feet of water, approximately 44 acre feet of that volume would flow through the spillway into Cell 4A.

The flood volume from the PMP event over the Cell 4A area is 36 acre-feet of water (40 acres, plus the adjacent drainage area of 3.25 acres, times the PMP of 10 inches). This would result in a total volume of 80 acre-feet including the 44 acre-feet of solution from Cell 3. The freeboard depth required for Cell 4A from the PMP event would be 2.0 feet, plus a wave run-up depth of 0.77 feet (from the 1990 Drainage Report), for a total freeboard requirement of 2.77 feet. However, the Groundwater Quality Discharge Permit, No. UGW370004, for the White Mesa Mill requires that the minimum freeboard be no less than 3.0 feet for any of the existing Cell construction. The freeboard for Cell 4A would therefore be 5595.0 amsl (top of liner 5598.0 – 3.0 feet). This freeboard elevation would provide a factor of safety of 1.1 for storm events above the PMP, and therefore we do not believe there are anticipated conditions that could result in overtopping of the cell.

In the unlikely event the PMP storm event is exceeded, Cell 4A could handle an additional 13.5 acre-feet of water before overtopping would occur. Should overtopping of the Cell 4A dike occur, the flows would most likely occur along a wide area (several hundred feet) of the south dike. The water velocity over the top of the HDPE liner and the dike crest would be relatively slow and would most likely reach erosion velocities only after discharging down the outside slope of the dike. Damage would be limited to erosion of the outside slope toward the dike toe and would have no impact on the HDPE liner system.

*f. Per 10 CFR 40 Appendix A Criterion 5(A)(5), Stability of the slopes under anticipated static and dynamic conditions needs to be demonstrated. The above referenced design report includes the material and construction data for the cell berms. However, a static and dynamic analysis of there stability needs to be demonstrated.*

Included as Attachment G is a copy of Section 3.4 from the original NRC approved Cell 4A Design. Section 3.4 deals with Stability Considerations for the Cell 4A embankments.

The stability analysis performed for the Cell 4A design assumed that the tailings are saturated and are completely fluid. It also assumed that the cell liner has completely failed and that the steady state seepage condition has been reached. Under actual operating conditions it is highly improbable that these conditions could exist. Therefore, the stability analysis produced results that are considered to be extremely conservative.

Two embankment sections were analyzed for static and dynamic stability. Material properties used in the analyses are shown in the attached Figure 3.4-1 from the Design.

Figure 3.4-1 is a section through the highest portion of the Cell 4 dike. The maximum height is 31 feet. A 15-foot wide bench was added on the downstream side of the dike to improve the stability. Using this embankment configuration in the analysis, the minimum factor of safety under static conditions is 1.5. Applying a seismic loading of 0.10g to simulate dynamic conditions, the analysis produces a minimum pseudostatic factor of safety of 1.1.

Figure 3.4-2 shows a dike section with a maximum height above the stripped surface (prepared subgrade) of 25 feet. The dike has 3(H) to 1(V) faces and an 18-foot crest width. The results of the analyses indicate a minimum static factor of safety of 1.5 and a minimum pseudostatic safety factor of 1.1 for a 0.10g lateral loading.

Additional details on the stability analysis and evaluations on foundation and embankment settlement, and liquefaction potential are also included in Attachment G.

g. *Since the means for ensuring the integrity of the liner system through time is through maintenance and inspection, IUC should provide a Liner Maintenance and Inspection Plan at this time.*

IUSA agreed with DRC to provide the Cell 4A Operations and Maintenance Procedures Plan, and Best Available Technology Monitoring Plan as a part of the Phase 2 effort, resulting in issuance of an amended Radioactive Materials License and modified Ground Water Discharge Permit. IUSA committed to submit the Operations and Maintenance Procedures Plan by August 11, 2006 and the Best Available Technology Monitoring Plan by August 25, 2006.

2. *Prior to the installation of the liner system, IUC needs to demonstrate that the existing subgrade has radiation levels that are acceptable for free release. IUC has submitted the results of a preliminary radiation survey. However, the DRC had comments and IUC has yet to provide the complete plan and results. Please provide this plan so that agreement can be reached as to how release of the cell subgrade can be demonstrated.*

The revised plan for determining cleanup criteria and the results of initial sample is being submitted under separate cover to DRC.

If you need any additional clarification on any of the above responses please feel free to contact me at (303) 389-4160. We are hopeful that URS has continued their detailed design review and that we will see their first interrogatories by May 17th.

Very tours truly,

Harold R. Roberts
Vice President – Corporate Development

cc: Ron F. Hochstein, IUSA
David C. Frydenlund, IUSA
Gregory T. Corcoran, GeoSyntec Consultants

Attachments