URS

RESULTS OF COMPLETENESS REVIEW
IUC/ WHITE MESA CELL 4A LINING SYSTEM DESIGN REPORT SUBMITTAL

The following presents the results of a completeness review of the submittal in support of a licenses application for IUC White Mesa Mill. It is based on information obtained during a site visit on Tuesday April 4, 2006 and a preliminary review of the following documents:

1. Cell 4A Lining System Design Report For the White Mesa Mill, Blanding, Utah; prepared by GeoSyntec Consultants; January 2006.
2. State of Utah Ground Water Quality Discharge Permit UGW370004 ; January 14, 2004.

To date, the scope of our review has been limited to the design and construction of the Cell 4 A liner system. Therefore, the review performed and the resultant concerns relate only to the liner system proposed for this cell. The primary regulatory requirements applicable to this submittal are included and referenced in the State of Utah Uranium Mills and Source Material Mill Tailings Disposal Facility Requirements R313-24. They include:

- **NRC Regulations 10 CFR 40 Appendix A Criterion 5(A)**
  - ***(1)*** *The primary ground-water protection standard is a design standard for surface impoundments used to manage uranium and thorium byproduct material. Unless exempted under paragraph 5A(3) of this criterion, surface impoundments (except for an existing portion) must have a liner that is designed, constructed, and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil, ground water, or surface water at any time during the active life (including the closure period) of the impoundment. The liner may be constructed of materials that may allow wastes to migrate into the liner (but not into the adjacent subsurface soil, ground water, or surface water) during the active life of the facility, provided that impoundment closure includes removal or decontamination of all waste residues, contaminated containment system components (liners, etc.), contaminated subsoils, and structures and equipment contaminated with waste and leachate. For impoundments that will be closed with the liner material left in place, the liner must be constructed of materials that can prevent wastes from migrating into the liner during the active life of the facility.*

  - ***(2)*** *The liner required by paragraph 5A(1) above must be--*

    (a) Constructed of materials that have appropriate chemical properties and sufficient strength and thickness to prevent failure due to pressure gradients (including static head and external hydrogeologic forces), physical contact with the waste or leachate to which they are exposed, climatic conditions, the stress of installation, and the stress of daily operation;

    (b) Placed upon a foundation or base capable of providing support to the liner and resistance to pressure gradients above and below the liner to prevent failure of the liner due to settlement, compression, or uplift; and

    (c) Installed to cover all surrounding earth likely to be in contact with the wastes or leachate.

  - ***(4)--****A surface impoundment must be designed, constructed, maintained, and operated to prevent overtopping resulting from normal or abnormal operations, overfilling, wind and wave actions, rainfall, or run-on; from malfunctions of level controllers, alarms, and other equipment; and from human error.*

  - ***(5)--****When dikes are used to form the surface impoundment, the dikes must be designed, constructed, and maintained with sufficient structural integrity to prevent massive failure of the*

dikes. In ensuring structural integrity, it must not be presumed that the liner system will function without leakage during the active life of the impoundment.

- **State of Utah Ground Water Quality Protection regulations R317-6, part 6.4.A** "*The Executive Secretary may issue a ground water discharge permit for a new facility if the Executive Secretary determines, after reviewing the information provided under R317-6-6.3, that:"* …
    - Under part **6.4.A.3** … " *the applicant is using best available technology to minimize the discharge of any pollutant*".
    - Best Available Technology (BAT) is defined under **R317-6-1.1.3** as "*Best Available Technology means the application of design, equipment, work practice, operation standard or combination thereof at a facility to effect the maximum reduction of a pollutant achievable by available processes and methods taking into account energy, public health, environmental and economic impacts and other costs".*

For waste cell liner systems as proposed for Cell 4A, the State of Utah considers BAT to be a double liner with leachate collection/detection systems. For Cell 4A, this means:

- Leachate collection layer and removal system above a primary liner consisting of appropriately designed collection pipes, granular filter bed, and sump type extraction system. The leachate collection system shall have the ability to remove liquid from the cell in practical and timely manner.
- Primary HDPE Liner that is at least sixty (60)-mil thick.
- A rapid reporting leak detection layer and removal system between the primary and secondary liner consisting of appropriately designed collection pipes, geonet and/or granular filter bed, and sump type extraction system. The leachate detection system shall operate so as to maintain a minimal head on the secondary liner with a maximum allowable head of one (1) foot under anticipated impacts from siltation and clogging, rib layover and creep of synthetic components of the system, overburden pressures, etc.
- A composite secondary liner that consists of a HDPE liner that is at least sixty (60)-mil thick over at least twelve (12) inches of compacted clay with a maximum permeability of 1×10^{-7} centimeters per second.
- Bedding layer and/or appropriately prepared clean subgrade.
- Maximum side slopes of 3-horizontal to 1-vertical
- Leachate Monitoring, Operations, Maintenance and Reporting Plan (that addressees both the leachate collection and detection system)
- Ground Water Monitoring system (per the facility Ground Water Quality Discharge Permit)
- Ground Water Monitoring Plan (per the facility Ground Water Quality Discharge Permit)
- Liner Maintenance and Inspection Plan

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

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.

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).

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.

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.

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.

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 comments above apply to Phase 1 as defined by the Memo of Agreement (MOA) between the division and IUC, and please note that before Phase 2 and 3 can proceed, additional information will be required.

Please free to contact us with questions comments and concerns you may have.