State of Utah

Department of Environmental Quality

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DIVISION OF RADIATION CONTROL
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February 8, 2007

Mr. Harold Roberts
Vice President – Corporate Development
Denison Mines (USA) Corporation
1050 Seventeenth Street, Suite 950
Denver, CO 80265

Re: January 5, 2007 and December 8, 2006 DMC Submittals Regarding November 9, 2006 GCL Hydration Demonstration Work Plan and October 6, 2006 DRC Round 5 Interrogatory for the Cell 4A Lining System Design Report Respectively: **DRC Review Findings and Request for Information - Round 6 Interrogatory.**

Dear Mr. Roberts,

We have reviewed the subject submittals. The purpose of this Round 6 Interrogatory is a combined response to both submittals, and to identify those issues and concerns related to cell design and re-lining that continue to be unresolved. As previously, URS staff performed this review and prepared the Interrogatory, which is attached for your consideration and resolution. The size of unresolved items is now quite small. We are encouraged by this, and hope your response will be able to resolve these issues.

The unresolved issues include:

1. Resolution of the cleanup issues by DMC to demonstrate that the existing subgrade for Cell 4A has radiation and contamination levels that are acceptable. This is currently being addressed under a separate cover.
2. Regarding the pond subgrade, a minimum thickness and compaction of soil cover over bedrock is discussed. For other areas, the subgrade surface needs to be investigated by proof rolling to identify areas of potential settlement. These areas will need to have specific criteria to deal with them.
3. Incorporation of specific listed items into the GCL hydration demonstration project. We plan to approve DMC to proceed with the demonstration once these items are included. It is desirable to complete the demonstration prior to liner installation, to identify the parameters needed for a successful outcome.

4. An evaluation that demonstrates that the amount of area covered by the slimes drain is sufficient to remove the tailings solution in an efficient and timely manner. Adjusted plans and specifications will need to be submitted, to reflect the results of the evaluation.

As you are aware, the funds for our review of Phase I in our current Memorandum of Agreement (MOA) have been exhausted. Therefore, we have proposed a draft revision 2 to our MOA, sent earlier via email, which changes the cost and timelines corresponding to a revised URS cost schedule. However, the final cost to complete Phase I will depend largely on the thoroughness of the response by DMC on this interrogatory. Please feel free to contact us if you have any questions on the above.

Sincerely,

David A. Rupp

David A. Rupp, P.E.
Geotechnical Services Section

DAR:dr

cc: Britt Quinby, URS

Attachment

F:/drupp/.../Rnd6TransLtr.doc

File: IUC Cell 4A Relining Project

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UTAH DIVISION OF RADIATION CONTROL
CELL 4A LINING SYSTEM
INTERNATIONAL URANIUM (USA) CORPORATION
WHITE MESA MILL
BLANDING, UTAH

INTERROGATORIES – ROUND 6

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Acronyms and Abbreviations

ALARA	As Low As Reasonably Achievable
BAT	Best Available Technology
CFR	Code of Federal Regulations
CQAP	Construction Quality Assurance Plan
DR	Design Report
DRC	Division of Radiation Control (Utah)
FML	Flexible Membrane Liner
GCL	Geosynthetic Clay Liner
HDPE	High Density Polyethylene
LCRS	Leachate Collection and Removal System
SDR	Standard Dimension Ratios
TDS	Total Dissolved Solids
TEDE	Total Effective Dose Equivalent
TMP	Tailings Management Plan
TRDP	Tailings Reclamation and Decommissioning Plan
URCR	Utah Radiation Control Rules

Summary of Requested Items

Please refer to the interrogatories for the context of the item requests.

1. A Radiation Survey Report to demonstrate that the existing subgrade for Cell 4A has radiation and contamination levels that are acceptable. This is currently being addressed under a separate cover.
2. Ensure subgrade is adequate for the GCL. This includes adequate thickness and compaction. Include compaction criteria for soil that is placed to make the cell subgrade.
3. Revisions to the GCL field hydration work plan.
4. Please provide an evaluation that demonstrates that the amount of area covered by the slimes drain is sufficient to remove the tailings solution in an efficient and timely manner. This has been requested since Round 1 Interrogatories, and to date only descriptive information has been provided. No demonstration has been included. Also, provide revised technical specifications, CQA Plan, and drawings that reflect any changes as a result of the evaluation.

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INTERROGATORY IUC R313-24-4-01/05: RADIATION SURVEY AND RELATED DEMONSTRATIONS

PRELIMINARY FINDING:

Refer to R313-24-1(3), R313-24-4, R313-15-501, R313-15-406, and 10 CFR 40 Appendix A, Criterion 5A(1); DRC rules require that a radiation survey be performed to demonstrate that the requirements of R313-15 are met, including the magnitude and extent of radiation levels and concentrations or quantities of radioactive material (see R313-15-501). DRC rules also require IUC to describe "... how facility design and procedures for operation will minimize, to the extent practicable, contamination of the facility and the environment,..." (see R313-15-406). R313-24-4 and 10 CFR 40 Appendix A, Criterion 5A(1) require that for uranium tailings impoundments where wastes have migrated into the liner during the active life of the facility, that closure of said impoundment must include "...removal or decontamination of all waste residues, contaminated containment system components (liners, etc.), contaminated subsoils, and structures and equipment contaminated with waste and leachate."

Refer to R317-6-6.3(Q); "Unless otherwise determined by the Executive Secretary, the application for a permit to discharge wastes or pollutants to ground water shall include the following complete information:... Q. Other information required by the Executive Secretary."

Also refer to R317-6-6.4(A); IUC must provide information that allows the Executive Secretary to determine:..."3. the applicant is using best available technology to minimize the discharge of any pollutant;...".

INTERROGATORY STATEMENT:

This interrogatory is now being addressed under a separate cover.

BASIS FOR INTERROGATORY:

IUC provided to the DRC a report from SENES Consulting (via a transmittal letter dated September 1, 2006) that addressed the radiation levels in Cell 4A subgrade. DRC comments to this report were provided to IUC in an email from Mr. John Hultquist dated 9/15/06. In addition, IUC has communicated that the confirmation sampling of the clean up effort on Cell 4A is complete, and the results and analysis will be submitted to the DRC.

This issue is now being addressed under a separate cover. However, prior to the start of Cell 4A liner installation a final report must be submitted to, and approved by, the DRC that includes data and a demonstration that the existing cell liner subgrade has radiation and contamination levels that are acceptable.

REFERENCES:

Letter from IUC to UDRC dated May 8, 2006; Re: Cell 4A Lining System Design Report, Response to URS Completeness Review,

October 18, 2005 DRC letter to IUC (request for additional information).

Letter from IUC to DRC dated June 22, 2006; Re: Cell 4A Lining System Design Report, Round 2 Interrogator Response.

Letter from IUC to DRC dated June 30, 2006; Re: Cell 4A Lining System Design Report, Response to DRC Request for Additional Information – Round 2 Interrogatory, Cell 4A Design.

Letter from Denison Mines (USA) Corp. (IUC) to DRC dated December 8, 2006; Re: Cell 4A Lining System Design Report, Response to DRC Request for Additional Information – Round 5 Interrogatory, Cell 4A Design.

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INTERROGATORY IUC R313-24-4-02/05: DOUBLE LINER SYSTEM

PRELIMINARY FINDING:

Refer to R313-24-4, 10 CFR 40 Appendix A, Criterion 5A(1): Surface impoundments 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.

Refer to R317-3-1(1.7). 1.7. Construction Supervision. The applicant must demonstrate that adequate and competent inspection will be provided during construction. It is the responsibility of the applicant to provide frequent and comprehensive inspection of the project.

Refer to R317-3-10(4)(E). E. Construction Quality Control and Assurance. A construction quality control and assurance plan showing frequency and type of testing for materials used in construction shall be submitted with the design for review and approval. Results of such testing, gradation, compaction, field permeability, etc., shall be submitted to the executive secretary.

INTERROGATORY STATEMENT:

Please include in the technical specifications that there is to be acceptable subgrade soil under the GCL and over the bedrock so as to provide a stable and smooth surface that will not compromise the integrity of the GCL. Where additional soil is needed, it will be compacted, and if no soil is placed, the subgrade surface will be proof rolled with appropriate compaction equipment so as to confirm the stability of the subgrade and identify potential areas that may cause strain on the GCL and possible damage.

If soil backfill is needed to make the cell liner sub-grade, then its placement will be in accordance with acceptable compaction criteria. Acceptable compaction criteria includes 95% of the maximum density as determined by ASTM D698 (Standard Proctor) or 90% of the maximum density as determined by ASTM D1557 (Modified Proctor), at +/- 4% optimum moisture content. This requires testing of the backfill per one of the above ASTM procedures and then confirmation compaction testing in the field. Acceptable field density testing includes ASTM D 1556, D 2167, or D 2922. Acceptable moisture content testing includes ASTM D 2216 or D 3017.

BASIS FOR INTERROGATORY:

Round 5 interrogatory stated that:

"The revised specification provided did not address the requirement that any backfill placed to make the proposed subgrade elevation will be compacted and tested. This must be included."

IUC Responded with:

"The existing sub-grade will be finished graded and used for the sub-grade for the new liner system installation. It is not anticipated that additional fill placement will be required along the base of or side slopes of the existing Cell 4A sub-grade. Therefore, compaction criteria is not included in the Technical Specifications, Construction Drawings, or CQA Plan."

Based on recent observations by DRC personnel of the Cell 4A bottom subgrade, there currently appears to be limited soil cover over the underlying bedrock. The soil covering the bedrock appears to be limited to a thickness of a few inches to approximately 18-inches. As has been expressed in this interrogatory, there is concern that soil placed to meet the final cell subgrade design elevations be compacted. However, in consideration of recent observations of the limited soil currently covering the bedrock in the bottom of the cell, there is added concern that there exists sufficient thickness of compacted soil subgrade over the bedrock so as to provide a smooth and stable base that is free of ruts, protrusions, etc. that may damage the GCL . This is also a concern when considering the hydration of the GCL (subgrade soil provides the needed water to hydrate the GCL). Typically, a minimum of one foot of compacted uniform subgrade bedding is needed under a liner system. Uncompacted soil with a thickness less than one foot is not a sufficient subgrade for the placement of a GCL over bedrock.

IUC must include in the project specifications that there is to be acceptable subgrade soil under the GCL and over the bedrock so as to provide a stable and smooth surface that will not compromise the integrity of the GCL. Where additional soil is needed, it will be compacted, and if no soil is placed, the subgrade surface will be proof rolled with appropriate compaction equipment so as to confirm the stability of the subgrade and identify potential areas that may cause strain on the GCL and possible damage.

REFERENCES:

"Cell 4A Lining System Design Report for the White Mesa Mill, Blanding, Utah," by GeoSyntec Consultants, January 2006. Prepared for International Uranium (USA) Corporation.

Letter from IUC to DRC dated June 22, 2006; Re: Cell 4A Lining System Design Report, Round 2 Interrogator Response.

Letter from IUC to DRC dated June 30, 2006; Re: Cell 4A Lining System Design Report, Response to DRC Request for Additional Information – Round 2 Interrogatory, Cell 4A Design.

Letter from IUC to DRC dated August 28, 2006; Cell 4A Lining System Design Report, Response to DRC Request for Additional Information – Round 4 Interrogatory, Cell 4A Design.

Letter from Denison Mines (USA) Corp. (IUC) to DRC dated December 8, 2006; Re: Cell 4A Lining System Design Report, Response to DRC Request for Additional Information – Round 5 Interrogatory, Cell 4A Design.

INTERROGATORY IUC R313-24-4-03/05: LINER STRENGTH & COMPATIBILITY

PRELIMINARY FINDING:

Refer to R313-24-4, 10 CFR 40 Appendix A, Criterion 5A(2)(a): The liner must be 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;

INTERROGATORY STATEMENT:

Please address the following concerns with the proposed GCL field hydration plan:

1. *Please provide detailed information on the justification for the 100% optimum moisture content (providing for low permeability) of the GCL in consideration of liquids with pH in the 1 to 2 range. Is CETCO stating that 100% is the optimum moisture content that will provide for the optimum (low) permeability under the acidic conditions? If so, what is their basis?*
2. *Please modify the work plan to state that samples will be taken until optimum hydration is reached, or a maximum level reached. This may require more samples through time than is currently planned.*
3. *Please revise the work plan to state that if field evidence indicates that hydration of the GCL appears to have occurred due to lateral leakage from an edge or edges of the GCL panel at one or more locations, this will be documented through photographs and field sketches. Also, the samples collected need to be away from any influences from lateral leakage.*
4. *IUC is proposing to place the test plot in the northeast corner. Where on NE corner? At the top of the slope, the bottom of slope, in the middle? Please provide this information.*
5. *Confirm that the sampling as well as maintenance between sampling events will be by qualified personnel.*
6. *Please modify the work plan so it is clear that the final report will include (but not be limited to) the following documentation:*
    a. *Date/time*
    b. *Weather conditions*
    c. *Names of those performing the work*
    d. *Methods used to place GCL/HDPE*
    e. *Condition of subgrade*
    f. *Sample ID's, locations, packaging and shipment details*
    g. *Photos of samples during collection*

h. *Description of samples during collection*
i. *Field diagrams (as needed)*
j. *Results of periodic inspections though out the testing period (including photos)*
k. *Repairs performed (if needed)*
l. *Records of weather conditions though out the testing period (particularly daily temperatures and precipitation)*
m. *Formal and informal test results as well as the methods used to obtain the results*

BASIS FOR INTERROGATORY:

Round 5 Interrogatory requested a work plan that included detailed methodology and documentation associated with the proposed GCL field hydration testing. IUC provided a work plan in there October 20, 2006 correspondence to the DRC. URS reviewed this work plan and provided comments in a separate technical memorandum dated November 8, 2006. IUC subsequently provided responses to URS's comments as well as a revised work plan, to the DRC in a letter dated January 5, 2007. Concerns remaining with the revised work plan include:

1. ***Item #2*** *– IUC states in the second paragraph that the critical hydration moisture content is 100%. This is repeated in the response to item 7. Also, in item 7 the justification given for the 100% is communications from CETCO (the supplier). However, the justification is not complete. More detailed information on the justification for the optimum moisture content for liquids with pH in the 1 to 2 range needs to be provided. Is CETCO stating that 100% is the optimum moisture content under the acidic conditions? If so, what is their basis?*

   Also in the response to item #2, IUC states that they will take samples at 1, 2, and, if needed, at 3 weeks. However, samples need to be taken until optimum hydration is reached, or a maximum level reached. This may require more samples through time.

2. ***Item #3*** *– If field evidence indicates that hydration of the GCL appears to have occurred due to lateral leakage from an edge or edges of the GCL panel at one or more locations, this needs to be documented through photographs and field sketches. Also, it is important that the samples collected need to be away from any influences from lateral leakage. The Work Plan should be amended to reflect this requirement.*

3. ***Item #5(b)*** *– IUC is proposing to place the test plot in the northeast corner. Where on NE corner? At the top of the slope, the bottom of slope, in the middle?*

4. ***Item #9*** *– IUC needs to confirm that the sampling as well as maintenance between sampling events will be by qualified personnel.*

5. ***Item #10/11*** *– IUC sated that the work plan has been modified to include the specific reporting requirements listed in the technical memorandum. However, the work plan only listed the sections of the report to be included (i.e., item #11).*

Please confirm that at a minimum, the report will include the items listed in item #10.

REFERENCES:

"Cell 4A Lining System Design Report for the White Mesa Mill, Blanding, Utah," by GeoSyntec Consultants, January 2006. Prepared for International Uranium (USA) Corporation.

IUC, March 7, 2005 Request to Amend Radioactive Material License, White Mesa Mill and Environmental Report.

IUC May 1999, Groundwater Information Report for White Mesa Uranium Mill.

Letter from IUC to DRC dated June 22, 2006; Re: Cell 4A Lining System Design Report, Round 2 Interrogator Response.

Letter from IUC to DRC dated June 30, 2006; Re: Cell 4A Lining System Design Report, Response to DRC Request for Additional Information – Round 2 Interrogatory, Cell 4A Design.

Letter from IUC to DRC dated August 28, 2006; Re: Cell 4A Lining System Design Report, Response to DRC Request for Additional Information – Round 4 Interrogatory, Cell 4A Design.

Letter from Denison Mines (USA) Corp. (IUC) to DRC dated December 8, 2006; Re: Cell 4A Lining System Design Report, Response to DRC Request for Additional Information – Round 5 Interrogatory, Cell 4A Design.

Letter from Denison Mines (USA) Corp. (IUC) to DRC dated January 5, 2006; Re: Response to technical review of IUC proposed Geosynthetic Clay Liner Hydration Demonstration Work Plan to be used in the liner for Cell 4A.

Ruhl, J., and Daniel, D. 1997. "Geosynthetic Clay Liners Permeated with Chemical Solutions and Leachates", Journal of Geotechnical and Geoenvironmental Engineering, Vol. 123, No. 4, pp. 369-381.

State of Utah Ground Water Discharge Permit No. UGW370004.

Smith R.D.1987, U.S. Nuclear Regulatory Commission, Sampling of Uranium Mill Tailings Impoundments for Hazardous Constituents, Memorandum, Februarey9, 1987, Division of Waste Management.

U.S. Nuclear Regulatory Commission, Standard Review Plan for Review of DOE Plans for Achieving Regulatory Compliance at Sites With Contaminated Ground Water Under Title I of the Uranium Mill Tailings Radiation Control Act, Draft Report for Comment, NUREG-1724, June 2000.

INTERROGATORY IUC R313-24-4-04/05: LINER SETTLEMENT

PRELIMINARY FINDING:

Refer to R313-24-4, 10 CFR 40 Appendix A, Criterion 5 A(2)(b): The liner must be 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.

INTERROGATORY STATEMENT:

This request has been satisfied.

BASIS FOR INTERROGATORY:

This request has been satisfied.

REFERENCES:

"Cell 4A Lining System Design Report for the White Mesa Mill, Blanding, Utah," by GeoSyntec Consultants, January 2006. Prepared for International Uranium (USA) Corporation.

Letter from IUC to DRC dated June 30, 2006; Re: Cell 4A Lining System Design Report, Response to DRC Request for Additional Information – Round 2 Interrogatory, Cell 4A Design.

INTERROGATORY IUC R313-24-4-05/05: DIKE INTEGRITY

PRELIMINARY FINDING:

Refer to R313-24-4, 10 CFR 40 Appendix A, Criterion 5A(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.

10 CFR 40 Appendix A, Criterion 4(E): The impoundment may not be located near a capable fault that could cause a maximum credible earthquake larger than that which the impoundment could reasonably be expected to withstand. As used in this criterion, the term "capable fault" has the same meaning as defined in section III(g) of Appendix A of 10 CFR Part 100. The term "maximum credible earthquake" means that earthquake which would cause the maximum vibratory ground motion based upon an evaluation of earthquake potential considering the regional and local geology and seismology and specific characteristics of local subsurface material.

Refer to R313-24-4, R317-6-1.13 and 1.14: 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. Best Available Technology Standard means a performance standard or pollutant concentration achievable through the application of best available technology.

INTERROGATORY STATEMENT:

This request has been satisfied.

BASIS FOR INTERROGATORY:

The stability analysis received from IUC (June 9, 2006), included the basis for the 0.10g seismic loading. The slope stability analysis evaluated the southern Cell 4A berm, and defined it with a 2H:1V interior slope and a 3H:1V exterior (outside) slope. It identified the critical slope as the interior 2H:1V slope under both static and dynamic conditions. It also evaluated the lined and unlined conditions, and due to the installation of a double liner and drain system discounted the unlined condition. However, the concern over the seismic loading has yet to be satisfactory addressed. As presented in Round 4 Interrogatories, the seismic loading used (0.10g) is based on an evaluation of seismic activity and impacts from the 1970s and 1980s and is dated. A more recent evaluation based on current data and evaluation methods was requested by the DRC. IUC provided in their June 30, 2006 response to Round 2 Interrogatories a discussion of how the 1996 seismic hazardous analyses (Wong 1996) supported the use of 0.10g and the outdated analysis. IUC also presented in the August 28, 2006 response to Round 4 Interrogatories a 1994 seismic evaluation performed by Lawrence Livermore National Laboratory

(LLNL) for the US Nuclear Regulatory Commission (NRC) that supports seismic loading of 0.05 to 0.12. Based on the 1996 (Wong) and 1994 (LLNL) reports IUC states that that there appears to be nothing to suggest that the 0.10g value used for the White Mesa design is not appropriate, and further study is not warranted.

However, there are two components that go into a seismic hazard analysis: (1) a seismic source model that characterizes the active faults and background (random) seismicity around a site and (2) ground motion attenuation relationships. The latter are used to estimate ground motions given, in general, magnitude, distance, and site condition. Based on a preliminary review, URS does not believe there is any new information on active faults that would impact the hazard at White Mesa. For the latter however, the attenuation relationships that have been used in practice date back to 1997.

These include relationships developed by three teams: Abrahamson and Silva, Sadigh et al., and Boore et al. (USGS). All these relationships have been updated and preliminary versions have been posted on the website for the Pacific Earthquake Engineering Research Center (PEER), a NSF-sponsored center that supported updating of the relationships. URS has all of the new relationships but have evaluated only one to date; Abrahamson and Silva, which is the most accepted and used relationship in the U.S.

In this new relationship, the peak horizontal acceleration for M 5 to 5.5 earthquakes increases by a factor of two. The probabilistic hazard in the Colorado Plateau where both the Atlas Moab and White Mesa sites are located is controlled by earthquakes in the M 5 to 6 range. Therefore, it is difficult to say what the impact may be on probabilistic hazard at White Mesa or any other site in the Colorado Plateau without running the calculations using the current methods, but they could go up. The other new relationships which would also be used in a probabilistic seismic hazard analysis would need to be looked at to see whether the levels of ground motions go up or go down compared to the ones in 1997.

In response to Round 5 Interrogatories IUC provided an analysis based on the Naional Hazard Maps developed by the U.S. Geological Survey (not using the approach suggested above). However, since the U.S. Geological Survey Hazard Maps do incorporate the random earthquake, and consider a return period of 2500 years, the estimated value of 0.10 g for the seismic loading as presented in MFG's evaluation is sufficient.

REFERENCES:

"Cell 4A Lining System Design Report for the White Mesa Mill, Blanding, Utah," by GeoSyntec Consultants, January 2006. Prepared for International Uranium (USA) Corporation.

Letter from IUC to DRC dated June 22, 2006; Re: Cell 4A Lining System Design Report, Round 2 Interrogator Response.

Letter from IUC to DRC dated June 30, 2006; Re: Cell 4A Lining System Design Report, Response to DRC Request for Additional Information – Round 2 Interrogatory, Cell 4A Design.

Letter from IUC to DRC dated August 28, 2006; Re: Cell 4A Lining System Design Report, Response to DRC Request for Additional Information – Round 4 Interrogatory, Cell 4A Design.

Letter from Denison Mines (USA) Corp. (IUC) to DRC dated December 8, 2006; Re: Cell 4A Lining System Design Report, Response to DRC Request for Additional Information – Round 5 Interrogatory, Cell 4A Design.

Wong, Ivan G., Olig, Susan S., and Bott, Jacqueline D.J. 1996. Earthquake Potential and Seismic Hazards in the Paradox Basin, Southeastern Utah. 1996 Utah Geological Association Guidebook, pages 241 to 250.

Wong Ivan G., Olig, Susan S., Hassinger, Bruce W., Blubaugh, Richard E. 1997. Earthquake Hazards in the Intermountain US: Issues relevant to uranium mill tailings disposal. Tailings and Mine Waste 1997, pages 203 to 212.

INTERROGATORY IUC R313-24-4-06/05: BEST AVAILABLE TECHNOLOGY

PRELIMINARY FINDING:

Refer to R313-24-4, R317-6-1.13: ***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.*

Refer to R313-24-4, R317-6-6.4(A)(3/112): 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: 1.the applicant demonstrates that the applicable class TDS limits, ground water quality standards protection levels, and permit limits established under R317-6-6.4E will be met; 2. the monitoring plan, sampling and reporting requirements are adequate to determine compliance with applicable requirements;3. the applicant is using ***best available technology*** *to minimize the discharge of any pollutant; and 4. There is no impairment of present and future beneficial uses of the ground water.*

INTERROGATORY STATEMENT:

All interrogatories provided to IUC to date on the subject of the slimes drain design have requested a demonstration that the slimes drain system will remove the tailings solution remaining in the cell (after the cell has become full) in a timely manner. To date only descriptive information and drawings have been provided. Even though DRC feels the use of a cyclone system could help in the placement of courser tailings material over the slimes drainpipes and encourages this approach, a demonstration that the slimes drain will be effective in a timely manner has not been provided.

This demonstration needs to include an estimation of the maximum solution flow rate from the tailings into the slimes drain and the predicted ability of the slimes drain to remove this solution in a timely manner. It should also function so there is a minimum head of solution on the upper liner. The maximum flow rate of the solution from the tailings could be estimated using the various models such as SEEP/W, SVFLux, Vadose/W, HELP, UNSAT-H, HYDRUS-2D (or another appropriate model/calculation method) and consider potential tailings properties as well as local environmental conditions. The prediction of the flow capacity of the slimes drain needs to consider the potential for clogging of the drain system through time, the uncertainty in the actual permeability of the courser tailings produced using the cyclone system (i.e., use conservative permeability's), the slope of the drain, size and length of the drainpipes, and a means to monitor the fluid head on the liner to evaluate and ensure the effectiveness of the drain and extraction system. The results of the evaluation will be carried into the design and revised project technical specifications, CQA Plan, and drawings will be provided as applicable.

BASIS FOR INTERROGATORY:

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 was defined in Round 1 Interrogatory. Round 1, 2, 4, and 5 Interrogatories expressed concerns about different aspects of the liner system. Specifically ones concerning the GCL, the ability of the slimes drain to remove tailing solution in a timely manner, and the ALR. The outstanding concerns over the GCL are being addressed under a separate cover, and the concerns over the ALR have been addressed. However, the concerns on the ability of the slimes drain to remove tailing solution in a timely manner has not been adequately addressed by IUC.

Round 2 and 4 Interrogatories included the following request:

> *"Please provide a Leachate Monitoring, Operations, Maintenance, and Reporting Plan that includes an estimate of the anticipated flow rates and maximum capacity in the leachate collection system (slimes collection layer). This estimate must include a calculation that:*
>
> - *Estimates the flow rate of the tailings cell solution through the tailings and into the collection pipes.*
> - *A demonstration that the sand fraction will settle out and provide an adequate slimes drainage layer, this sand drainage layer is properly designed so that tailings fines will not filter into it and result in the clogging of the sand layer (restricting flow in this drainage layer), and that the proposed collection pipe layout is adequate to collect and remove the leachate solution."*

IUC proposed in their August 28, 2006 response to this request that a cyclone be used to process the tailings slurry. The cyclone will separate out the coarser sand fraction of the slurry, which will then be placed over the slimes drain as a drainage blanket. The placement of this coarser sand fraction would start in the southwest corner, and then move to the north. The finer fraction of the tailings would be placed in Cell 3 or in Cell 4A along the north or east sides. This approach should provide for a drainage blanket over the slimes drain thus facilitating the timely removal of solution from the tailings through the slimes drain. However, the details of the tailings processing must be included in the cell operations procedures to be provided by IUC as part of Phase 2. In addition, it should noted that if tailings are to be placed in the southeast corner, a splashguard will be needed in this area. This must be included on the drawings to be submitted prior to the start of work.

In addition, as discussed in the August 28, 2006 conference call between DRC representatives and IUC, IUC was to provide an evaluation that demonstrates that the amount of area covered by the slimes drain is sufficient to remove tailings solution in a timely manner.

Round 5 Interrogatories repeated the request for a demonstration that the slimes drain layer design is sufficient to remove the tailing solution present (after the cell is filled) in a

timely manner. In response, IUC proposed to increase the area of the cell bottom covered by the slime drainpipes by 12 to 25 %. This is encouraged, however, no demonstration that the proposed slime drain will effectively remove the tailing solution in a timely manner and result in minimal head on the upper liner has been provided (as has been requests since Round 1 Interrogatory). This demonstration needs include an estimation of the maximum solution flow rate from the tailings into the slimes drain and the predicted ability of the slimes drain to remove this solution in a timely manner so there is a minimum of head on the upper liner. The maximum flow rate of the solution from the tailings could be estimated using various models such as SEEP/W, SVFlux, HYDRUS-2D, HELP, or another appropriate model/calculation method. The prediction of the flow capacity of the slimes drain needs to consider the potential for clogging through time, the uncertainty in the actual permeability of the courser tailings placed using the slimes drain (i.e., use conservative permeability's), the slope of the drain, size and length of the drainpipes, and a means to monitor the fluid head on the liner to evaluate the effectiveness of the drain and extraction system.

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