

DRL-2010-002262



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VIA FEDERAL EXPRESS

March 3, 2010

Mr. Dane Finerfrock, Executive Secretary
Utah Radiation Control Board
Utah Department of Environmental Quality
168 North 1950 West
P.O. Box 144810
Salt Lake City, UT 84114-4810



Dear Mr. Finerfrock:

Re: Renewal Application for Radioactive Materials License (RML) No. UT1900479; Health Physics Interrogatories -- Round 3; and Engineering Comment Interrogatories -- Round 2

This letter is in response to the Executive Secretary's letter of December 28, 2009 addressed to Denison Mines (USA) Corp. ("Denison" or "DUSA"), with attached Health Physics Interrogatories – Round 3 and Engineering Comment Interrogatories – Round 2, pertaining to the White Mesa Mill's (the "Mill's") February 2007 License Renewal Application (the "2007 License Renewal Application").

The following Attachments are included with this letter:

Attachment	Description
A.....	Index to Appendices in the 2007 License Renewal Application revised to add Revision 4.0 of the Reclamation Plan as Appendix P and the Cell 4A BAT Monitoring, Operations and Maintenance Plan as Appendix Q; Tab Sheets and Place Holder Sheets, stating the location of the new Appendices P and Q
B.....	Revised Figure No. A-2.2.4-1 of Revision 4.0 of the Reclamation Plan
C.....	Revised Figures A-5.1-1, -2, and -3 of Revision 4.0 of the Reclamation Plan
D.....	January 29, 2010, Technical Memorandum from MWH Americas, Inc.
E.....	Revised Figure 3.2.3-1 of Revision 4.0 of the Reclamation Plan

Attachment	Description
F.....	Revised Forms Nos. F-23, -25, and -26 of Revision 4.0 of the Reclamation Plan
G.....	Schedule of Amendments to be Inserted at the Beginning of Revision 4.0 of the Reclamation Plan (before the Table of Contents), Indicating the Revisions made to Revision 4.0 of the Reclamation Plan

Accompanying this letter is a package that contains two copies of each of the items in the foregoing Attachments. Those copies are to be inserted directly into the two copies of Revision 4.0 of the Reclamation Plan or the 2007 License Renewal Application, as the case may be, that have previously been provided to the Executive Secretary. In the case of Attachment G, the two accompanying copies of the Schedule of Amendments are to be inserted at the front of each of the two copies of Plan (prior to the Table of Contents). This will allow the copies contained in the Attachments to remain a part of this letter.

Each Interrogatory is shown in italics below, followed by Denison’s response to the question and/or request for information.

1. SECTION 1, HEALTH PHYSICS INTEROGATORIES –ROUND 3

1.1 HEALTH PHYSICS ROUND 3 INTERROGATORY STATEMENT-Release Surveys:

Round One Interrogatory Statement 14-17 “Explain how the survey techniques, the release standards used and documentation of surveys of Equipment are sufficient to demonstrate regulatory compliance and maintain public health and safety. Explain why surveying techniques such as the use of Large Area Wipes and swipes to look for removable contamination are not being used on all items being surveyed for release”

Round Two Interrogatory statement 8 “In response to the method outlined in 49 CFR 173.443(a)(1) Denison Mines states “Using portable alpha detection equipment that measures the combined fixed and removable contamination is therefore “another method” contemplated by paragraph 2. (49CFR 173.443(a)(2) “equal or greater efficiency”), because the Mill applies the removable contamination standard to a combined reading of fixed and removable contamination.” Provide efficiency calculations to determine the efficiency of this method. Include the survey procedure used, the efficiency of the meters and probes used in relation to U-238. Show that the meters and probes that are/will be used has the appropriate sensitivity to provide a small enough reading to measure the required release limits.”

Based on manufacturer calibration sheets and information provided by the site RSO, Cs-137 is used to calibrate the Ludlum Model-3 meters with the 44-9 GM pancake probes, thus they are not calibrated for Alpha radiation. Also Sr-90 is used to perform a function check on the Model-3 meters with 44-9 GM pancake probes. Both Cs-137 and Sr-90 are high energy Beta emitters and will produce a higher efficiency than U-238, thus they are inappropriate to use for calibration or function tests. Re-evaluate the efficiency for the Ludlum Model-3 survey meters with the 44-9 GM pancake probe using U-238 or equivalent alpha source.



BASIS FOR INTERROGATORY:

During the review of the calculations provided by Denison Mines, the reviewer requested additional information from the Site RSO. The reviewer requested copies of the calibration information and what sources were used when performing function checks on survey instruments. In addition the reviewer contacted Ludlum to find out what the typical efficiency for U-238 for Ludlum Model-3 survey meters with the 44-9 GM pancake probe. Ludlums response was 15%. Using 15% in the same calculations that Denison Mines used in their response, the Ludlum Model-3 survey meters with the 44-9 GM pancake probe is not sensitive enough to detect U-238 at the applicable regulatory levels. A different meter and/or probe may need to be used to do release surveys for ore trucks. (See attached emails)

Example: Using 15% efficiency and background used in Denison example.

$$MDC = \frac{3 + 4.65 \times \sqrt{180}}{(1)(0.15)(0.15)} = 2906 \text{ dpm}/100\text{cm}^2 \text{ Alpha}$$

Denison Response:

Denison agrees that the alpha MDC for the Ludlum Model-3 survey meter with a 44-9 GM pancake probe is 2,906 dpm/100cm². However, when that meter and probe are used to measure contamination on an ore truck or other equipment, it is reading both alpha and beta. A combined alpha and beta reading of less than 2,906 would be indicated as a non-detect. In the 14 radionuclides in the U-238 decay series in uranium ores, there are eight alpha particle and six beta particle emitters. Considering that the 44-9-GM probe is more sensitive to beta radiation, the total count rate could be considered roughly equally divided between alpha and beta counts. Therefore, a total count reading of non-detect (<2,200 dpm/100cm²) would mean that, for ore trucks, the total alpha contamination would be less than about 1,500 dpm/100cm². This is less than the DOE standard for restricted release of 2,200 dpm/100cm² alpha. The Mill's practice with these detectors is to send equipment back for re-decontamination if the meter shows any reading higher than non-detect. For these reasons, Denison is comfortable that the release criteria for ore trucks and intermodal containers etc. have been applied conservatively at the site.

However, Denison realizes that the use of a combined alpha/beta meter such as the Ludlum Model-3 survey meter with a 44-9 GM pancake probe has raised some concerns. As a result, commencing on or before April 30, 2010, Denison will use alpha detectors (as opposed to alpha/beta detectors) with the same or equal efficiency as the alpha detectors currently being used at the Mill for surveying equipment for unrestricted release at the site, such as the Ludlum Model 177 counter and 43-5 alpha detector, for measuring potential alpha contamination on trucks and other vehicles and equipment.

Methods to estimate the MDA (minimum detectable activity) for survey instruments and counters are discussed in NRC'S NUREG-1507 (*Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions*, 1998).

From NUREG-1507 (Equation 3-10), the following is given for the MDA when measuring surface contamination:

$$\text{MDA} = \frac{3 + 4.65\sqrt{\text{CB}}}{Kt} \quad (1)$$

Where:

MDA = minimum detectable activity in disintegrations/min/100 cm²;

CB = background count rate (cpm);

t = counting time (min); and

K = proportionality constant which includes adjustments for detector efficiency and geometry (e.g. coverage relative to 100 cm²).

Typical Denison data for the Model 177 counter with 43-5 alpha detector are:

Background count rate (CB) = 20 cpm

Background counting time (t) = 1 min

Detector alpha efficiency = 11% (0.11)

Probe active area = 50 cm² (or 0.50 of 100 cm² area under consideration)

Using these values in Equation (1), the MDA is estimated as:

$$\text{MDA} = \frac{3 + 4.65\sqrt{20}}{(0.11 \times 0.50 \times 1)}$$

= 430 dpm/100 cm² (rounded to two significant figures).

This MDA is well below both the 49 CFR 173.443 standard of 22 dpm/cm² (2200 dpm/100 cm²) for non-fixed alpha contamination for restricted release of ore trucks and other equipment, and NRC's 1000 dpm/100 cm² standard for non-fixed alpha contamination for unrestricted release of trucks and all other equipment from the Mill's restricted area (see NRC Regulatory Guide 8.30, *Health Physics Surveys in Uranium Recovery Facilities* at Table 2 and Section 2.7).

2. SECTION 2, ENGINEERING COMMENT INTERROGATORIES – ROUND 1

2.1 INTERROGATORY STATEMENT - The Reclamation Plan:

I-B DRC Round 1 dated July 2, 2009:

Please update and complete the Section 8 of the License Renewal Application, regarding the Reclamation Plan. Please include the current approved version of the Reclamation Plan as an Appendix to the License Renewal Application.

DUSA Responded by Submitting a Letter dated August 14, 2009, stating Revision 4.0 of the Reclamation Plan would be forthcoming. Revision 4.0 of the plan was sent by DUSA by letter dated November 24, 2009:

The DUSA letter of November 24, 2009 supplied a revised Section 8 to the License Renewal Application as replacement pages. This letter states the Reclamation Plan is submitted as a new Appendix P to the original License Renewal Application.

DRC Response:

The replacement pages to Section 8 of the License Renewal Application are acceptable, and have been incorporated into the License Renewal Application.

The DUSA letter of November 24, 2009 states, “Denison is hereby submitting the enclosed Revision 4.0 as a new Appendix P to the February 28, 2007 renewal application...”

However, the Index to Appendices in the February 28, 2007 License Renewal Application (i.e. page vi) needs to be revised to add Appendix P. Also, a tab sheet and a place holder sheet, stating the location of the new Appendix P, should be submitted to place in the License Renewal Application appendices volume.

Denison Response:

Included as Attachment A to this letter are copies of:

- The Index to Appendices in the 2007 License Renewal Application revised to add Revision 4.0 of the Reclamation Plan as Appendix P and the Cell 4A BAT Monitoring, Operations and Maintenance Plan as Appendix Q;
- Tab Sheets; and
- Place Holder Sheets, stating the location of the new Appendices P and Q.

The two accompanying copies of the Index, Tab Sheets and Place Holder Sheets should be inserted into the two copies of the 2007 License Renewal Application that were previously provided to the Executive Secretary. In the case of the revised Index to Appendices, it should replace the existing Index to Appendices in each of those copies of the Application.

2.2 INTERROGATORY STATEMENT - The Reclamation Plan:

I-C DRC Round 1 dated July 2, 2009:

Regarding the Cell 1 Discharge Channel, on Figure A-2.2.4-1 Sedimentation Basin Detail :

1. *The potential need for or absence of rip-rap protection for the Cell 1 discharge channel, entry and exit platform aprons must be explained and justified. An adequate demonstration will include, but is not limited to analysis according to NUREG-1623.*
2. *The need to join or not join (the existing configuration) the discharge channel to the toe of the new south dike of Cell 1 must be explained and justified.*
3. *Drawing details are needed to show the outcome of the above analyses to describe the sections of the discharge channel, its lining, appurtenant entry, exit apron zones, dike alignment and lining.*

Basis for the Interrogatory:

1. *The need for using rip-rap protection for the Cell 1 discharge channel, entry and exit aprons need to be analyzed under Potential Maximum Precipitation and Flood.*
2. *It appears advantageous to connect the discharge channel to the toe of the new south dike of Cell 1 to ensure entry flow path longevity, and to possibly eliminate need for rip-rap armor south of the discharge channel on the west dike of Cell 1.*
3. *The construction requirements for the discharge channel, its lining, appurtenant entry, exit apron zones, dike alignment and lining need to be specified....*

References:

*Reclamation Plan, Revision 3.0, Figure A-2.2.4-1 Sedimentation Basin Detail
NUREG-1623, Design of Erosion Protection for Long-Term Stabilization
Chow, V.T. 1959, Design of Channels for Uniform Flow, Open Channel Hydraulics, McGraw-Hill Book Company, p. 164-179.*

DUSA Response dated August 14, 2009:

“The Cell Discharge Channel is intended to divert the water accumulated from the PMP storm event from a 143 acre area, which includes the sedimentation basin created from the Cell area, the reclaimed Mill area, and the area to the north of the Cell area but south of the existing diversion ditches. The channel is created by excavation of the undisturbed ground to the west of Cell 1 to maximum depth of approximately 17 feet. The lower 10 feet of the channel is excavated in Dakota Sandstone to an elevation matching the lowest point on the west end of the Cell 1 sedimentation basin. The channel will be excavated at slope of 1% and will daylight in the Dakota Sandstone cliffs in Westwater Canyon. A cross section of the area to be excavated is included in Appendix P to this letter.”

“The maximum discharge volume through the channel will be 1344 cubic feet per second resulting in flow velocity of 7.45 feet per second assuming bottom channel width of 120 feet. The channel design proposed in the reclamation plan is actually 150 feet wide at the bottom, which will further reduce the flow velocity. The allowable flow velocity for bedrock channel is 8-10 feet per second; therefore no riprap is required in the channel bottom. The entrance to the channel will match the bottom elevation of the sedimentation basin; so no riprap will be necessary at that point. The channel discharge will be on to the cliffs of Westwater Canyon; therefore no riprap will be necessary at that point. The discharge calculations are included in Attachment G to the Reclamation Plan, and also included in Appendix P to this letter.

“We do not believe that the discharge channel should be joined with the toe of the new fill area on the north slope of the Cell 1 dike. The flows off the dike slope will be very small and the rip rap toe will easily protect the slope and the reclamation cover. The flow velocities at the entrance to the discharge channel could possibly impact the rip rap toe, or require additional rip rap, and should therefore be avoided. Water potentially backing up from the entrance to the

discharge channel would be very low velocity in the area near the toe of the Cell 1 north slope and would not impact the stability of the slope.”

DRC Response:

Interrogatory IC Item 1:

It appears the approach velocity at entry to the channel may exceed the scouring resistance of the existing Cell 1 soil upstream of the channel, creating erosion prior to flow on the in-situ rock lined channel bed.

To support your claim that this is not a problem for the Cell 1 floor:

Please analyze the dimensions, area of extent, and anticipated channel entry scour velocities in accordance with methods outlined in NUREG-1623, and submit quantitative calculations for DRC review.

If said calculations indicate soil scour will occur, please submit design for an appropriate channel entryway rip-rap apron, to accommodate the area of scouring velocities, for revision to the current Reclamation Plan Version 4.0. This calculation and/or the design change, plans and specifications will need to be included as part of this License Renewal Application.

Denison Response:

Section 3.2.2.2 of Revision 4.0 of the Reclamation Plan describes the removal of contaminated soils and process material from the Cell 1 area. Cell 1 was constructed by excavating soils and rock to the design contours, which resulted in the bottom of Cell 1 being entirely in the Dakota Sandstone formation. The discharge channel is created by excavation of the undisturbed ground to the west of Cell 1 to maximum depth of approximately 17 feet. The lower 10 feet of the channel is excavated in Dakota Sandstone to an elevation matching the lowest point on the west end of the Cell 1 sedimentation basin. The channel will be excavated at a slope of 1% and will daylight in the Dakota Sandstone cliffs in Westwater Canyon. The only soil present at the inlet to the discharge channel is the topsoil placed on the bottom of Cell 1 as a part of the final reclamation. In order to reduce the potential for erosion of the topsoil at the inlet to the discharge channel, the plan has been modified to eliminate the topsoil within 100 to 150 feet of the inlet and provide a band of rip rap, similar to the rock apron illustrated on Figure A-5.1-4, at the transition from the topsoil to the Dakota sandstone. The flow velocities at this point will be significantly lower than at the entrance to the discharge channel. Figure No. A-2.2.4-1 of Revision 4.0 of the Reclamation Plan has been revised to show the revised area of topsoil and the band of rip rap at the topsoil transition to the Dakota Sandstone. A copy of the revised Figure No. A-2.2.4-1 is included as Attachment B to this letter. The two accompanying copies of this revised Figure should be inserted as replacement Figures into the two copies of Revision 4.0 of the Reclamation Plan that were previously provided to the Executive Secretary.

Interrogatory IC Item 3:

The dimensions shown on the Reclamation Plan drawings for the Cell 1 outlet channel need to be corrected to indicate the dimensions discussed by DUSA above. The Reclamation Plan drawings currently show a 200-foot wide channel bottom. In contrast, your August 14, 2009 response said it would be 150-foot wide.

Please submit revised calculations (above) and corrected drawings of the channel dimensions with plans and specifications for the rip-rap entry apron provision mentioned above for revision to the current Reclamation Plan Version 4.0. This change will need to be included as part of this License Renewal Application.

Denison Response:

The dimensions of the discharge channel have been revised on Figure No. A-2.2.4-1 of Revision 4.0 of the Reclamation Plan, to show the discharge channel as 150 feet wide. The revised Figure is included as Attachment B to this letter. The two accompanying copies of the revised Figure are to be inserted as replacement Figures into the two copies of Revision 4.0 of the Reclamation Plan that were previously provided to the Executive Secretary. The calculations for the discharge channel flow are in the existing Attachment G of Revision 4.0 of the Reclamation Plan.

2.3 INTERROGATORY STATEMENT - The Reclamation Plan:

I-D DRC Round 1 dated July 2, 2009:

This interrogatory is being provided for DUSA's information only. This item will be pursued concurrent with DRC review of the Infiltration and Contaminant Transport Modeling Report, White Mesa Mill Site, Blanding Utah (ICTM) prepared by DUSA. Last correspondence on the report was furnished by DUSA on April 30, 2009.

Is installation of a rock apron at the base of all the final covered tailings cell outslope intended for the entire perimeter of the final covered tailings cell system? If so, please clarify by specifying on the drawings that such is required. If not, please demonstrate that the absence of such will be adequate for the 1,000-year design period or at minimum a 200-year period.

Basis for the Interrogatory:

The reclamation plan drawings only distinctly specify rock aprons on the south outslope of Cell 4A. It is unclear if installation of a rock apron at the base or toe of all dike outside side slopes is intended. That is, are rock aprons to be installed for the entire perimeter of the tailings cell system? Reclamation Plan figures A-5.1-1, -2, -3 and -4 show a plan view and cross-sections of the tailings cells. The section A-A' on Figure A-5.1-2 on the left side refers to Fig. A-5.1-4, which is a drawing of the "Rock Apron at Base of the Toe of the Cell Outslope." None of these

plan views or cross-sections specifically shows rock aprons, other than the south side of Cells 4A...

References:

Reclamation Plan, Revision 3.0, Figures A-5.1-1, -2, -3 and -4.

Reclamation Plan, Revision 3.0, Figure A-2.2.4-1 Sedimentation Basin Detail

NUREG-1623, Design of Erosion Protection for Long-Term Stabilization

Chow, V.T. 1959, Design of Channels for Uniform Flow, Open Channel Hydraulics, McGraw-Hill Book Company, p. 164-179.

DUSA Response dated August 14, 2009:

“The questions raised in Interrogatory Statement I-D will be addressed in the re-design of the tailings cover system in accordance with the approved ICTM.”

DRC Response:

We agree that the need for rock aprons discussed above will be addressed by DUSA in the ICTM study. However, we have determined that this issue must be addressed and resolved now as a part of the License Renewal Application.

Due to the uncertain timeline for the ICTM study completion on this item, DUSA must submit design analysis, plans and specifications for rock aprons for the tailings cells perimeter outslope as discussed above.

The design for the rock aprons, as appropriate, will need to be included as part of this License Renewal Application, and must comply with the engineering guidelines found in NRC NUREG 1623.

However, we realize the final design of appurtenant rock aprons for the outslope of the tailings cells may be in accordance with an approved ICTM design, and will need to be included in the future revision to the White Mesa Mill Reclamation Plan to be submitted for approval after completion and approval of the ICTM study.

Denison Response:

Figures A-5.1-1, -2, and -3 of Revision 4.0 of the Reclamation Plan have been revised to clarify the requirement for rock aprons to be placed on the 5h:1v outslopes of the reclaimed tailings area. This was the original intent of the reclamation design, and had been included in the estimated costs in Attachment C to revision 4.0 of the Reclamation Plan. These revised Figures are included as Attachment C to this letter. The two accompanying copies of these revised Figures are to be inserted as replacement Figures into the two copies of Revision 4.0 of the Reclamation Plan that were previously provided to the Executive Secretary. The design for the rock apron outslope protection is contained in Attachment G to Revision 4.0 of the Reclamation Plan.

2.4 INTERROGATORY STATEMENT - The Reclamation Plan:

I-E DRC Round 1 dated July 2, 2009:

Please demonstrate that for final reclamation of the tailings cells a filter blanket is necessary or unnecessary to be installed below the riprap cover, for the top, side slopes, and rock aprons of the tailings cells.

Basis for the Interrogatory:

There is no filter blanket shown or specified in the Reclamation Plan. A demonstration of layer stability is needed to justify the omission of a filter blanket in the cover design.

Also, we recognize that different engineering design has been proposed by DUSA in the November 21, 2007 Infiltration and Contaminant Transport Modeling Report, White Mesa Site, Blanding, Utah, prepared by MWH Americas Inc. Erosion stability issues and radon controls must be considered in the final reclamation plan and must be closely coordinated with ICTM report that may be approved later.

Regulatory Basis:

- 1. R313-24-4. Uranium Mills and Source Material Mill Tailings Disposal Facility Requirements -Clarifications or Exceptions incorporate 10CFR40 Appendix A with some exceptions and substitutions.*
- 2. 10CFR40, Appendix A, Criterion 9 requires an Executive Secretary approved reclamation plan for the White Mesa Mill.*

References:

- 1. 2002, T.L. Johnson, NUREG-1623, Design of Erosion Protection for Long-Term Stabilization, Appendix D, Designing Riprap Erosion Protection, Paragraph 2.1.1, Filter Requirements: "It is generally recommended that a filter or bedding layer comprised of well-graded rock material be placed on the cover or in locations where rock riprap is to be placed for erosion protection. Locations recommended for filter placement include impoundment side slopes, toes of slopes, transition areas, diversion ditches and channels, stilling areas, and flow impact areas. The purpose of the filter is to bed the riprap and prevent stone penetration into the cover and/or radon barrier, prevent soil erosion from flow at the stone/soil interface, and to prevent the pooling of precipitation and/or tributary runoff from infiltrating into the cover and waste materials. Filter sizing criteria are presented in NUREG/CR-4620 (Nelson, 1986)."*
- 2. Same Drawing References, per the interrogatory immediately above this one.*

DUSA Response dated August 14, 2009:

“It is not clear why filter blanket was not included in the original cover design. As noted by DRC, Denison is proposing revised cover design as part of the Infiltration Analysis [ICTM] which will eliminate the rip rap on the top surface of the reclaimed tailings. The need for a filter blanket on the embankment side slopes and toe areas will be evaluated at that time.”

DRC Response:

We agree that the need for the filter blanket discussed above will be addressed by DUSA in the ICTM study. However, we have determined that this issued must be addressed and resolved now as a part of the License Renewal Application.

Due to the uncertain timeline for the ICTM study completion on this item, DUSA must submit design analysis, and plans and specifications for a filter blanket to be installed below all riprap cover, including but not limited to the top, side slopes, channel lining aprons and dike outslope rock aprons of the tailings cells.

The design for the filter blankets will need to be included as part of this License Renewal Application, and must comply with the engineering guidelines found in NRC NUREG 1623.

However, we realize the final design of the filter blanket for the rip/rap system may be in accordance with an approved ICTM design, and will need to be included in the future revision to the White Mesa Mill Reclamation Plan to be submitted for approval after completion and approval of the ICTM study.

Denison Response:

Included as Attachment D to this letter a January 29, 2010, Technical Memorandum from MWH Americas, Inc. that evaluates the need for a filter layer below the side slope riprap cover included in the existing design. MWH’s conclusion is that the filter layer is needed on the side slopes, but not on the toe slope or toe apron areas. The details of the analysis and a recommendation for filter sizing are included in the MWH Technical Memorandum. Figure A-5.1-3, Detail 2 of Revision 4.0 of the Reclamation Plan, has been revised to indicate the requirement for the filter layer in the reclaimed side slopes. The revised Figure is included as Attachment C to this letter. The two accompanying copies of the revised Figure are to be inserted as replacement Figures into the two copies of Revision 4.0 of the Reclamation Plan that were previously provided to the Executive Secretary. The two accompanying copies of the January 29, 2010, Technical Memorandum from MWH Americas, Inc. should be inserted as an addition to Attachment G into the two copies of Revision 4.0 of the Reclamation Plan that were previously provided to the Executive Secretary. The additional cost for production and placement of the filter layer will be included in the next revision to the Reclamation Plan Cost Estimate, due March 4, 2010.

2.5 INTERROGATORY STATEMENT - The Reclamation Plan:

I-F DRC Round 1 dated July 2, 2009:

Reclamation Plan Fig. 3.2.3-1, Site Map Showing Locations of Buildings and Tankage needs to be updated to current conditions....

DUSA Responded by Submitting a Revision 4.0 of the Reclamation Plan on November 24, 2009:

The DUSA letter of November 24, 2009 conveyed a revised Figure 3.2.3-1 in Reclamation Plan Version 4.0.

DRC Response:

The revised Figure 3.2.3-1 provided has been reviewed. This figure does not provide a current map of the tanks and the tank solutions that are depicted by the DUSA letter dated July 15, 2009, subject: Tank Layout and Update. Please revise and update Figure 3.2.3-1 in accordance with this latest information, to ensure that it is complete and representative of current site conditions.

Denison Response:

The revised Figure 3.2.3-1 of Revision 4.0 of the Reclamation Plan is included as attachment E to this letter. The two accompanying copies of the revised Figure are to be inserted as replacement Figures into the two copies of Revision 4.0 of the Reclamation Plan that were previously provided to the Executive Secretary.

2.6 INTERROGATORY STATEMENT - The Reclamation Plan:

I-G DRC Round 1 dated July 2, 2009:

In the DRC copy of the Reclamation Plan, Appendix [Attachment] G, Attachment 9, Rainfall-Duration Curve for One-Hour PMP at White Mesa Mill is illegible. Please provide a readable copy of the graph....

DUSA Response dated August 14, 2009:

"A readable copy of Reclamation Plan, Appendix [Attachment] G, Attachment 9, Rainfall-Duration Curve for One-hour PMP at White Mesa Mill is attached as Appendix Q to this letter."

DRC Response:

We note this submittal. The response is acceptable. The subject rainfall duration curve has been integrated into the submitted Reclamation Plan Version 4.0 as well as the current Reclamation Plan.

Per Appendix F, Table 1C of the Tailings Cover Design White Mesa Mill 1996, by Titan Environmental Corporation, the minimum D_{50} for the rip-rap diameter for top portion of the cover is to be 3.4 inches.

Drawing A-5.1-3 in the Reclamation Plan Rev 4.0 lists the D_{50} as 0.3 inches. Please correct this error on the drawing.

Denison Response:

Figure A-5.1.3 of Revision 4.0 of the Reclamation Plan has been revised to specify a D_{50} of 0.34 inches for the rip-rap diameter for top portion of the cover. This is consistent with Appendix F, Table 1C of the Tailings Cover Design White Mesa Mill 1996, by Titan Environmental Corporation. Revised Figure A-5.1.3 of Revision 4.0 of the Reclamation Plan is included in Attachment C to this letter. The two accompanying copies of the revised Figure are to be inserted as revised Figures into the two copies of Revision 4.0 of the Reclamation Plan previously provided to the Executive Secretary.

2.7 INTERROGATORY STATEMENT - The Reclamation Plan:

I-I DRC Round 1 dated July 2, 2009:

In the Reclamation Plan on pp. B-2 and B-16, the Final Construction Report is referred to. This report is important to independently document the completion of the reclamation and decommissioning work. In that regard, please revise the Reclamation Plan to include the following:

- 1. Please remove any reference to NRC/DRC field presence in the Reclamation Plan.*
- 2. The report must be submitted to the DRC within 180 calendar days after the apparent completion of Construction, for Executive Secretary review and approval.*

Basis for the Interrogatory:

There is no current distinct requirement in the license for a Final Closure Report. There are many regulatory and administrative needs for such a report.

Regulatory Basis:

- 1. R313-24-4. Uranium Mills and Source Material Mill Tailings Disposal Facility Requirements -Clarifications or Exceptions incorporate 10CFR40 Appendix A with some exceptions and substitutions.*
- 2. 10CFR40, Appendix A, Criterion 9 requires an Executive Secretary approved reclamation plan for the White Mesa Mill.*
- 3. R313-24-1(3)*
- 4. R313-22-36(10)*
- 5. R313-22-34(7)*
- 6. R313-22-34(1)*

References:

Reclamation Plan, Attachment B, Quality Plan for Construction Activities White Mesa Project Blanding, Utah.

DUSA Responded by Submitting a Revision 4.0 of the Reclamation Plan on November 24, 2009:
The Reclamation Plan, Revision 4.0 made most of the appropriate changes to the specified verbiage.

DRC Response:

References to the NRC appear to be removed from the Reclamation Plan, Revision 4.0. However, the verbiage on the last sentence on page B-2 needs correction. Please correct this sentence and resubmit this page as a revision to the current Reclamation Plan Version 4.0. This change will need to be included as part of this License Renewal Application.

Denison Response:

No revision is needed to page B-2 of Revision 4.0 of the Reclamation Plan. Included in Attachment F to this letter are each of the revised Forms Nos. F-23, -25, and -26 of Revision 4.0 of the Reclamation Plan. These revised forms reflect the requested updating edits. The two accompanying copies of these revised forms are to be inserted as replacement pages 20, 21 and 22, Attachment B, into the two copies of Revision 4.0 of the Reclamation Plan that were previously provided to the Executive Secretary.

2.8 INTERROGATORY STATEMENT - The Reclamation Plan:

I-L DRC Round 1 dated July 2, 2009:

“The tailings cell cover design found in the Reclamation Plan provided with the February 28, 2007 License Renewal Application is not the same as that provided in the November 21, 2007 Infiltration and Contaminant Transport Modeling (ICTM) Report, White Mesa Site, Blanding, Utah, prepared by MWH Americas Inc. It will be DUSA’s responsibility to amend the License Renewal Application and the Reclamation Plan to ensure that the tailings cells cover design, plans, specifications and construction ultimately authorized conforms to the approved ICTM Report.”

Basis for the Interrogatory:

Provisions in the existing License Renewal Application and Reclamation Plan will need to be adjusted to ensure that the tailings cells cover design, plans, specifications and construction conforms to the approved ICTM...

DUSA Response:

The Reclamation Plan, and to the extent applicable the 2007 License Renewal Application, will be amended to ensure that the tailings cell cover design, plans, specifications and construction ultimately authorized conform to the approved ICTM. Denison expects that the resulting changes to the Reclamation Plan may be significant, and may justify the creation of Revision 5.0 of the Reclamation Plan in order to properly incorporate the changes into the Plan.

DRC Response:

We agree that depending on the approval date for the ICTM Report, DUSA will probably need to issue a future revision to the Reclamation Plan for approval, incorporating the approved ICTM plan provisions, rather than incorporate such provisions in the submitted Reclamation Plan Revision 4.0. So, at a future date, an approved Reclamation Plan incorporating the approved ICTM study would then need to be included as part of next license amendment after approval of the current License Renewal Application.

However, it is imperative that Revision 4.0 of the Reclamation Plan be reviewed and approved by DRC to reflect the most currently available design for closure conditions. To this end, it is important DUSA complete all present issues in this Interrogatory, so that DRC review of the License Renewal Application can move forward.

Denison Response:

No response is required.

2.9 INTERROGATORY STATEMENT- Correct Version of Documents

II-D DRC Round 1 dated July 2, 2009:

The edition of the White Mesa Mill Tailings Management System and Discharge Minimization Technology (DMT) Monitoring Plan (DMT Plan) provided as tab 3.1 of Appendix A of the License Renewal Application, is not the approved version. Please replace it with the approved "09/08 Revision: Denison-6" version of the plan and attachments...

DUSA Response dated August 14, 2009:

"Attached as Appendix E is the approved 09/08 Revision Denison-6 version of the White Mesa Mill Tailings Management System and Discharge Minimization Technology (DMT) Monitoring Plan."

DRC Response:

We have reviewed this response, and find the correct document was submitted, and is acceptable. The currently approved DMT Plan, approved by the DRC on September 17, 2008 has been incorporated into the License Renewal Application.

Denison Response:

No response is required.

2.10 INTERROGATORY STATEMENT- Omission of Document

II-E DRC Round 1 dated July 2, 2009:

The License Renewal Application appears to not contain the Cell 4A BAT Monitoring, Operations and Maintenance Plan (O&M Plan). Please include the latest approved edition in the application...

DUSA Response dated August 14, 2009:

“Attached as Appendix L is version 09/08 Revision Denison 1.3 of the Cell 4A BAT Monitoring Operations and Maintenance Plan which is the latest approved edition of that plan.”

DRC Response:

We have reviewed this response and find the document submitted acceptable.

However, the Index to Appendices in the February 28, 2007 License Renewal Application need to be added for the O&M Plan. A tab sheet should be submitted to place the O&M Plan into the appropriate License Renewal Application appendix volume.

Denison Response:

Included as Attachment A to this letter are copies of:

- The Index to Appendices in the 2007 License Renewal Application revised to add Revision 4.0 of the Reclamation Plan as Appendix P and the Cell 4A BAT Monitoring, Operations and Maintenance Plan as Appendix Q;
- Tab Sheets; and
- Place Holder Sheets, stating the location of the new Appendices P and Q.

The two accompanying copies of the Index, Tab Sheets and Place Holder Sheets should be inserted into the two copies of the 2007 License Renewal Application that were previously provided to the Executive Secretary. In the case of the revised Index to Appendices, it should replace the existing Index to Appendices in each of those copies of the Application.

An electronic version of this letter and Attachments is included on the accompanying disk.

If you should have any questions or require additional information, please contact the undersigned.

Yours very truly,

DENISON MINES (USA) CORP.

By:


David C. Frydenlund
Vice President, Regulatory Affairs and Counsel

cc: Ron F. Hochstein
Harold R. Roberts
Jo Ann Tischler
David E. Turk

Attachment A

INDEX TO APPENDICES

Appendix	Description
A	Environmental Protection Manual
B	Release and Shipping of Vanadium Blackflake, Standard Operating Procedure
C	Stormwater Best Management Practices Plan
D	Emergency Response Plan
E	Radiation Protection Manual
F	Ore Receiving, Feed and Grind Standard Operating Procedure
G	Uranium Precipitation, Drying and Packaging Standard Operating Procedure
H	SERP Standard Operating Procedure
I	ALARA Program
J	Training Program
K	Security Program
L	Respiratory Protection Program
M	GWDP Quality Assurance Plan
N	Transportation Accidents Plan
O	Inspection Reports and Notices of Violation
P	Reclamation Plan, Revision 4.0
Q	Cell 4A BAT Monitoring Operations and Maintenance Plan

Appendix P

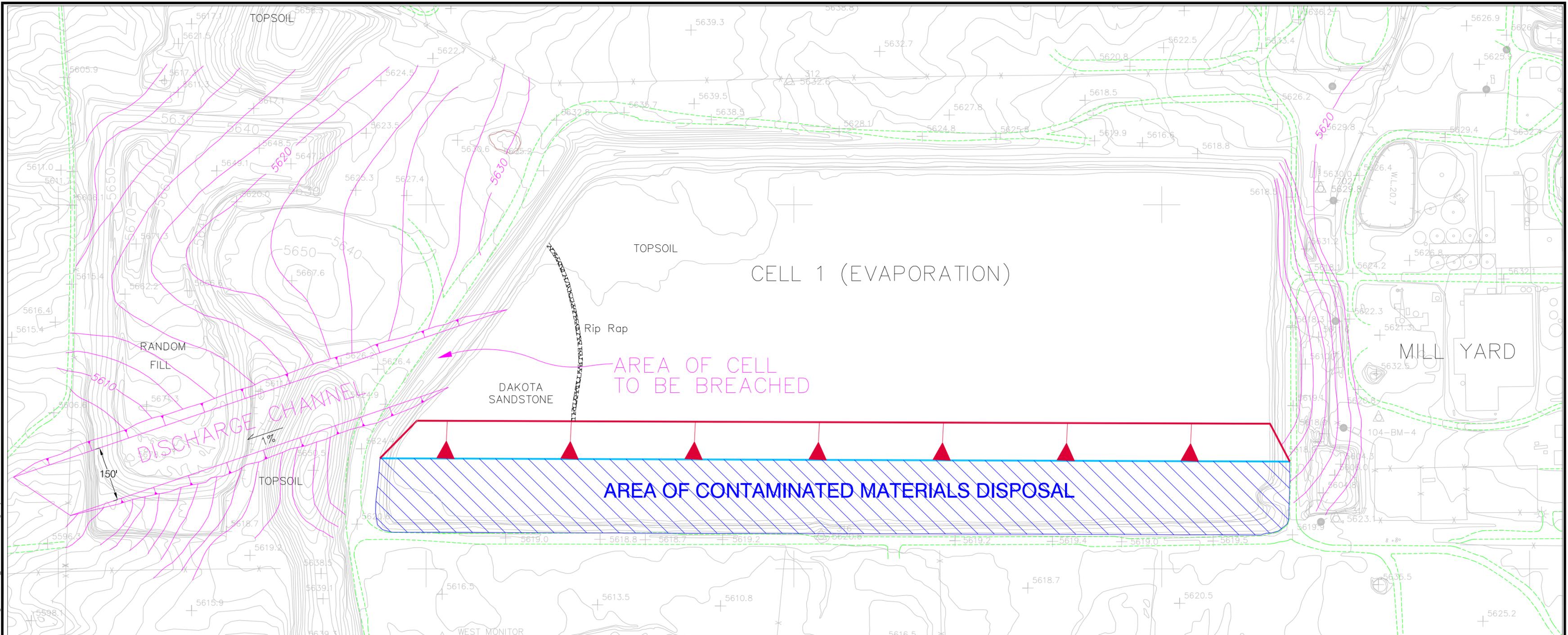
Reclamation Plan, Revision 4.0

Appendix Q

Cell 4A BAT Monitoring Operations and Maintenance Plan

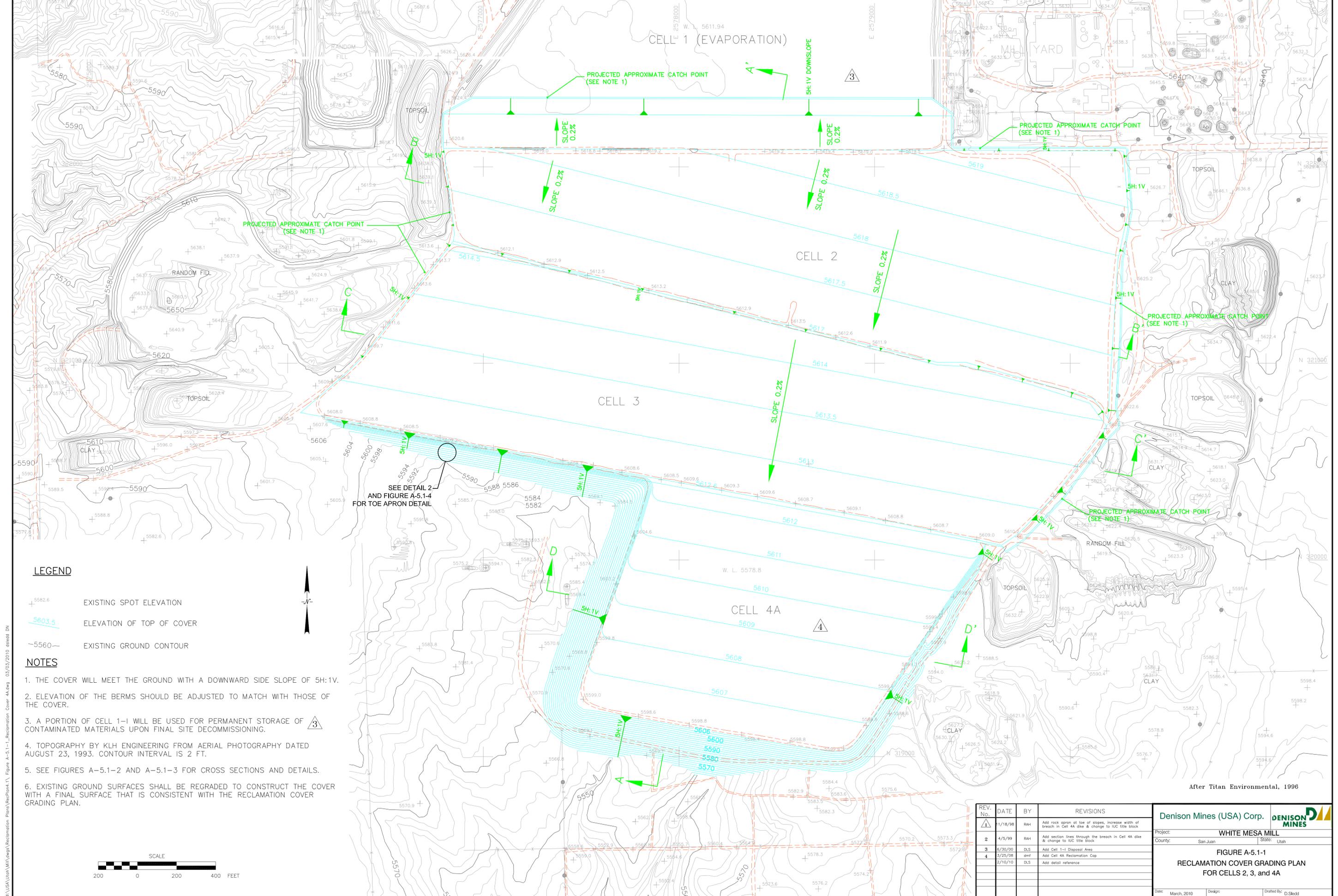
Attachment B

W:\USA\Utah\Mill\dwgs\Reclamation Plans\RecPlan4.1\Figure A-2.2.4-1_R4 Cell 1 Reclam.dwg Layout1 10/02/2010 dsleidd



Denison Mines (USA) Corp.		DENISON MINES	
Project: WHITE MESA MILL			
Date: 6-30-00		County: San Juan State: Utah	
By: DLS		Location:	
10-30-09 DLS		FIGURE A-2.2.4-1 SEDIMENTATION BASIN DETAIL	
2-10-10 DLS			
Author: unknown		Drafted By: D.Sleidd	

Attachment C



- LEGEND**
- + 5582.6 EXISTING SPOT ELEVATION
 - 5603.5 ELEVATION OF TOP OF COVER
 - 5560- EXISTING GROUND CONTOUR

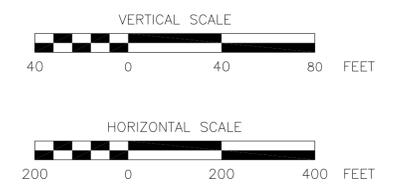
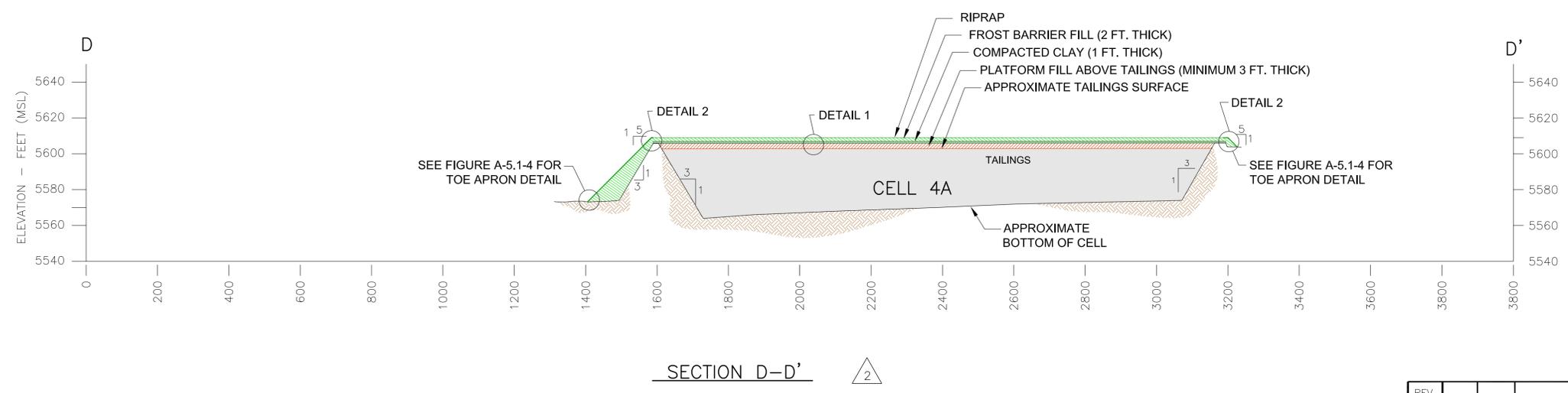
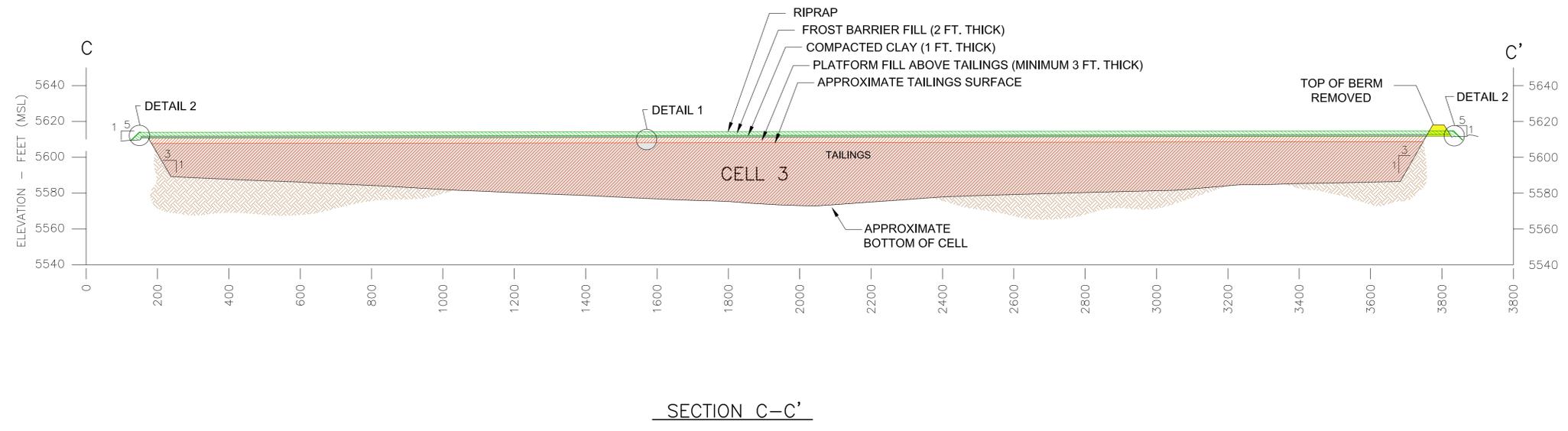
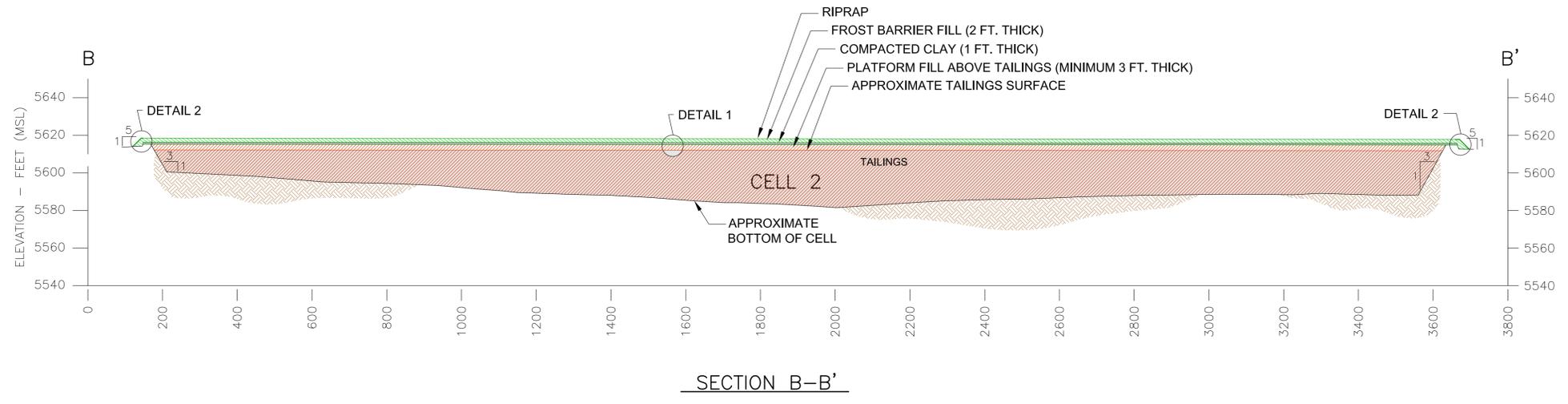
- NOTES**
1. THE COVER WILL MEET THE GROUND WITH A DOWNWARD SIDE SLOPE OF 5H:1V.
 2. ELEVATION OF THE BERMS SHOULD BE ADJUSTED TO MATCH WITH THOSE OF THE COVER.
 3. A PORTION OF CELL 1-I WILL BE USED FOR PERMANENT STORAGE OF CONTAMINATED MATERIALS UPON FINAL SITE DECOMMISSIONING.
 4. TOPOGRAPHY BY KLH ENGINEERING FROM AERIAL PHOTOGRAPHY DATED AUGUST 23, 1993. CONTOUR INTERVAL IS 2 FT.
 5. SEE FIGURES A-5.1-2 AND A-5.1-3 FOR CROSS SECTIONS AND DETAILS.
 6. EXISTING GROUND SURFACES SHALL BE REGRADED TO CONSTRUCT THE COVER WITH A FINAL SURFACE THAT IS CONSISTENT WITH THE RECLAMATION COVER GRADING PLAN.

W:\USA\Utah\Min\Reclamation Plans\Reclamation Plans\Reclamation Cover 4.dwg 03/03/2010 dlsled DN

After Titan Environmental, 1996

REV. No.	DATE	BY	REVISIONS
1	1/18/98	RAH	Add rock apron at toe of slopes, increase width of breach in Cell 4A dike & change to IUC title block
2	4/5/99	RAH	Add section lines through the breach in Cell 4A dike & change to IUC title block
3	8/30/00	DLS	Add Cell 1-I Disposal Area
4	3/25/08	dms	Add Cell 4A Reclamation Cap
	2/10/10	DLS	Add detail reference

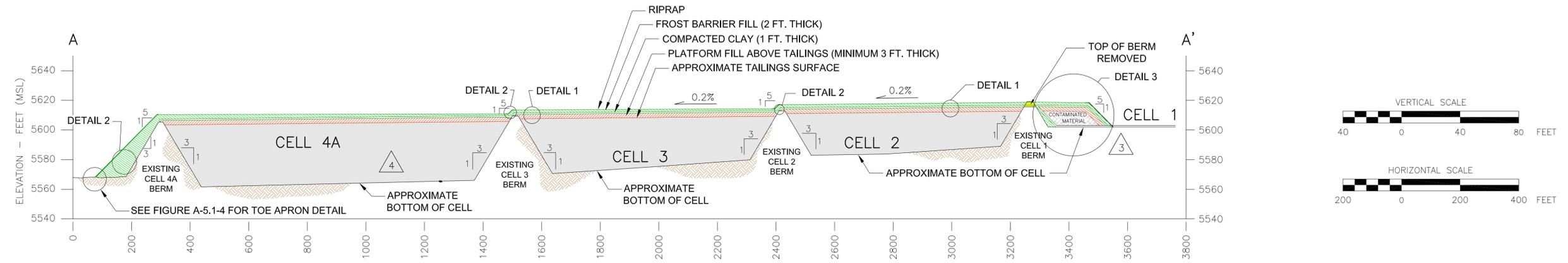
Denison Mines (USA) Corp.		
Project: WHITE MESA MILL		
County: San Juan	State: Utah	
FIGURE A-5.1-1 RECLAMATION COVER GRADING PLAN FOR CELLS 2, 3, and 4A		
Date: March, 2010	Design:	Drafted By: D.Sledd



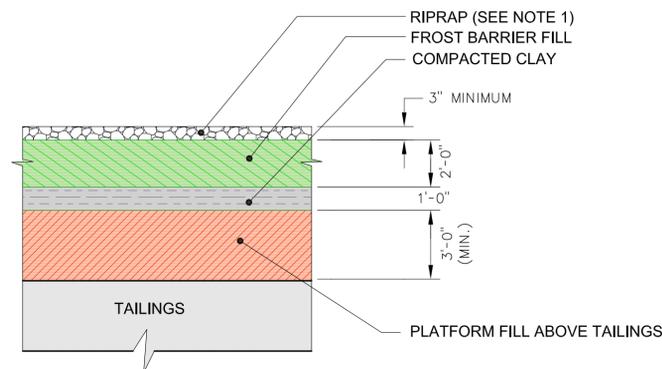
REV. No.	DATE	BY	REVISIONS
1	11/19/98	RAH	Delete clay layer from exterior side slopes, change layer names, & change title block
2	7/11/98	dmf	Add section D-D'
3	2/10/10	DLS	Add detail reference on section D-D'

Denison Mines (USA) Corp.	
Project:	WHITE MESA MILL
County:	San Juan State: Utah
FIGURE A-5.1-2 RECLAMATION COVER AND CROSS SECTIONS	
Date:	March, 2010
Design:	
Drafted By:	D.Sledd

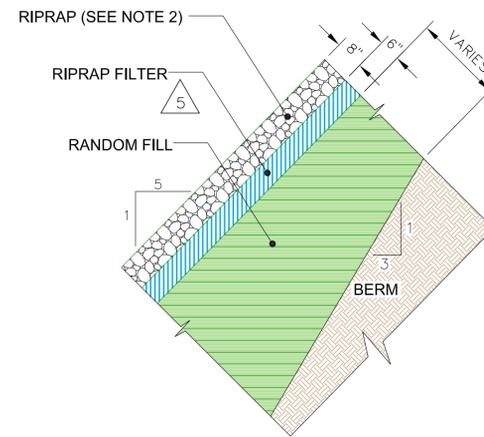
W:\USA\Utah\Mill\Reclamation Plans\ReclamPlan4_1\Figure A-5.1-2_Reclamation Cover_Cross Sections B-C.dwg 03/03/2010 dsledd DN



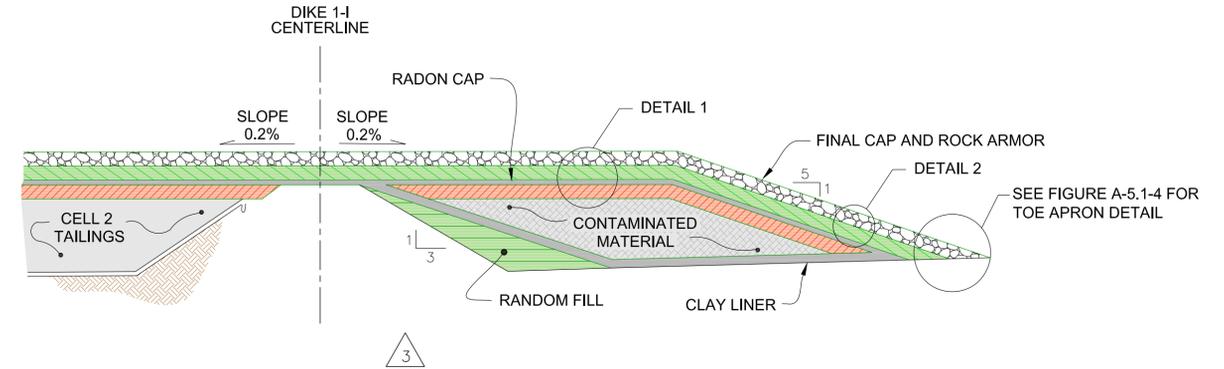
SECTION A-A' (WITH COVER ON CELLS 2, 3 & 4A)



DETAIL 1: COVER DETAIL FOR POND SURFACE AREAS
(NOT TO SCALE)



DETAIL 2: COVER DETAIL FOR SIDE SLOPES
(NOT TO SCALE)



DETAIL 3: COVER DETAIL FOR CELL 1 CONTAMINATED MATERIAL
(NOT TO SCALE)

NOTES:

- RIPRAP PLACED ON THE TOP OF COVER WILL CONSIST OF ROCK WITH D50 MINIMUM OF 0.34 INCHES.
- RIPRAP PLACED ON THE SIDE SLOPES OF COVER WILL CONSIST OF ROCK WITH D50 MINIMUM OF 3.5 INCHES.
- POND BOTTOM ELEVATIONS INFERRED FROM 'CELL 4 PHASE A AND PHASE B PLAN', WESTERN ENGINEERS INC., (JANUARY 17, 1989).
- SEE FIGURES 1 AND 2 FOR CROSS SECTION LOCATIONS.
- EXISTING GROUND SURFACES SHALL BE REGRADED TO CONSTRUCT THE COVER WITH A FINAL SURFACE THAT IS CONSISTENT WITH THE RECLAMATION COVER GRADING PLAN.

REV. No.	DATE	BY	REVISIONS
1	11/19/98	RAH	Delete clay layer from exterior side slopes, change layer names, & change title block
2	5/20/99	RAH	Add Rock apron at toe of 5:1 slope
3	6/30/00	DLS	Add Cell 1-1 Disposal Area
4	7/09/08	dmf	Add Cell 4A Cover
5	2/10/10	DLS	Add riprap filter and detail references

Denison Mines (USA) Corp.			
Project: WHITE MESA MILL			
County: San Juan		State: Utah	
FIGURE A-5.1-3 RECLAMATION COVER DETAILS AND CROSS SECTION			
Date: March, 2010	Design:	Drafted By: D.Sledd	

Attachment D



TO: Doug Oliver

DATE: January 29, 2010

FROM: Roslyn Stern

SUBJECT: Evaluation of need for filter layer on side slopes of Denison's White Mesa Mill Tailings Cell Cover

The following evaluation was performed to evaluate the need for a filter layer under the rock layer on the side slopes of the tailings cells cover for the White Mesa Mill. Supporting assumptions, calculations, and discussion are provided following the conclusions and recommendations.

Conclusions and Recommendations

The calculated interstitial velocities on the top slope and the toe apron are sufficiently low that a bedding layer is not necessary. However, the interstitial velocity within the erosion protection on the side slopes is within the range of values where bedding is conditionally recommended. Because of the wide difference in grain size distribution between the erosion protection and the random fill, it is recommended that a 6-inch layer (for constructability) of bedding material be placed between these two materials. The bedding material should be medium sand with the following specifications:

<u>Sieve Size</u>	<u>Percent Passing</u>
3 inches	100
No. 4	65-100
No. 20	20-70
No. 200	0-5

The need for a rock layer on the sideslopes and underlying filter zone can be evaluated as part of the detailed cover design. The rock layer on the sideslopes could be replaced with a rock mulch (gravel-amended topsoil) that has the appropriate median size for erosion protection. A rock mulch (gravel-amended topsoil) is being proposed for the cover surface.

Supporting Documentation and Discussion

Problem Statement

Evaluate the need for bedding layer between cover soils and erosion protection material (rock) by estimating interstitial pore velocities using method proposed by Abt et al. (1991). This evaluation is being completed for the currently permitted rock cover design.

Assumptions

- Reclamation cover, as described in Section 3.2.2 of the 2000 Reclamation Plan (International Uranium Corp, 2000) consists of six-foot soil cover. The cover consists, from bottom to top, of a minimum of three feet of random fill (platform fill), one foot of clay, and two feet of random fill (frost barrier).
- Cells 2 and 3 will have final cover placed at a 0.2 percent grade, with 5H:1V side slopes (Section 3.2.2.3).
- Erosion protection on the top surface of the cover will be provided by placing a minimum of 3 inches of riprap with a median diameter (D_{50}) of 0.3 inches (Section 3.3.5) and a D_{100} of 0.6 inches (Section 6.2 of Attachment A – Plans and Specifications). The overland flow velocity calculated for the top of the cover is less than 2.0 ft/sec (Section 3.3.5).
- Erosion protection of the side slopes of the cover will be provided by placing a minimum of 8 inches of riprap with a D_{50} of 3.5 inches (Section 3.3.5) and a D_{100} of 7 inches (Section 6.2 of Attachment A – Plans and Specifications). The calculated flow velocity on the side slopes is 4.9 ft/sec (Section 3.3.5).
- Erosion protection of the toe apron will be provided by placing riprap with a D_{50} of 6.4 inches (Section 3.3.5) and a D_{100} of 12 inches (Section 6.2 of Attachment A – Plans and Specifications).
- As described in Section 5.2 of Attachment A (Plans and Specifications), the random fill used as platform fill and frost barrier protection is specified to have at least 30 percent of the material finer than the number 40 sieve, with a D_{100} less than 8 inches.
- The peak unit discharge from the tailings cells is 1.8 cfs/ft (Attachment 12 to Attachment G – Channel and Toe Apron Design Calculations)

Discussion

NUREG-1623, Appendix D, recommends a filter or bedding layer be placed under erosion protection if interstitial velocities are greater than 1 ft/sec, in order to prevent erosion of the underlying soils. Bedding is not required if interstitial velocities are less than 0.5 ft/sec, and recommended depending on the characteristics of the underlying soil if velocities are between 0.5 and 1 ft/sec.

Interstitial velocities are calculated by procedures presented by Abt et al. (1991) as given in the following equation. This method updates the Leps (1973) relationship that is presented in NUREG/CR-4620 (Nelson et al. 1986):

$$V_i = 0.23(g \times D_{10} \times S)^{0.5}$$

Where:

- V_i = interstitial velocities (ft/s),
- G = acceleration of gravity (ft/s²),
- D_{10} = rock diameter at which 10 percent is finer (inches), and
- S = gradient in decimal form.

The maximum D_{10} of the erosion protection is estimated based on D_{50} required for erosion protection, assuming the erosion protection will have a coefficient of uniformity (CU) of 6 and a band width of 5. Band width refers to the ratio of the minimum and maximum allowed particle sizes acceptable for any given percent finer designation. USDA (1994) recommends CU to be a maximum of 6 in order to prevent gap-grading of filters. Table 1 summarizes the results.

Table 1. Results of Bedding Requirements

Location	Top Cover	Cover Side Slopes	Toe Apron
Minimum D_{50} (inches)	0.3	3.5	6.4
Maximum D_{10} (inches)	0.35	1.24	3.73
Slope (%)	0.2	20	1
Interstitial Velocity (ft/s)	0.03	0.65	0.25



References

Abt, S.R., J.F. Ruff, and R.J. Wilter (1991). Estimating Flow Through Riprap, *Journal of Hydraulic Engineering*, v. 117, No. 5, May.

International Uranium (USA) Corp (2000). Reclamation Plan, White Mesa Mill, Blanding, Utah, Revision 3.0, July.

Johnson, T.L. (2002). Design of Erosion Protection for Long-Term Stabilization, NUREG-1623, U.S. Nuclear Regulatory Commission (NRC), February.

Nelson, J.D., S.R. Abt, R.L. Volpe, D. van Zyl, N.E. Hinkle, W.P. Staub (1986) Methodologies for Evaluating Long-Term Stabilization Designs of Uranium Mill tailings Impoundments, NUREG/CR-4620, U.S. Nuclear Regulatory Commission (NRC), June.

U.S. Department of Agriculture (USDA) (1994). Gradation Design of Sand and Gravel Filters, *National Engineering Handbook*, Part 633, Chapter 26, October.

Attachment E

REV. No.	DATE	BY	REVISIONS
1	2-10-10	DLS	Tanks added



Denison Mines (USA) Corp. **DENISON MINES**

Project: WHITE MESEA MILL
 County: San Juan State: Utah

FIGURE 3.2.3-1
 SITE MAP SHOWING LOCATIONS
 OF BUILDINGS AND TANKAGE

Date: March, 2010 Design: unknown Drafted By: D.Sledd

V:\USA\WhiteMesa\Reclamation Plans\RecPlan4_V\Figure 3.2.3-1_Site Map.dwg Layout 03/03/2010 csl:edd

Attachment F

COMPLIANCE REPORT

Project No. _____

Date _____

Construction Segment _____

Drawing No. _____

Specification No. _____

Description of Completed Construction Segment

By: QC Officer _____

Approvals

Site Manager _____

FIELD CHANGE ORDER

Project No. _____

Date _____

Drawing No. _____

Specification No. _____

Design Feature

Modifications

Reason

Initiated by: _____

Approved by: _____

Site Manager

DESIGN CHANGE FORM

Project No. _____

Date _____

Drawing No. _____

Specification No. _____

Design Feature

Change in Design

Reason

Initiated by: _____

Approvals:

Site Manager _____

DRC Project Manager _____

Design Engineer _____

Attachment G

SCHEDULE OF AMENDMENTS

The following is a schedule that identifies all amendments made to the Plan since its date of issuance on November 24, 2009:

Date of Amendment	Section, Page, Table, Figure, Attachment or Appendix, and Nature of Amendment	Revision Date or Revision No., if Applicable
March 3, 2010	Replaced Figure A-2.2.4-1 with revised version	March 2010
March 3, 2010	Replaced Figures A-5.1-1, A-5.1-2 and A-5.1-3, with revised versions	March 2010
March 3, 2010	Added January 29, 2010 Technical Memorandum from MWH Americas, Inc. to the end of Attachment G to the Plan	March 2010
March 3, 2010	Replaced Figure 3.2.3-1 with revised version	March 2010
March 3, 2010	Replaced Forms Nos. F-23, F-25 and F-26 of Attachment B, with revised versions	NA
March 3, 2010	Replaced Attachment C in its entirety	Revision 4.1