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March 21, 2012

Mr. Eric Scott
Environmental Protection Specialist
Division of Reclamation, Mining and Safety
Department of Natural Resources
1313 Sherman St. Room 215
Denver, Colorado 80203

RE: DRMS Adequacy Review of TR-20 – Tenmile Tailing Storage Facility, Climax Mine, Permit No. M-1977-493

Dear Mr. Scott,

This letter is in response to your March 7, 2012 email to me with adequacy comments on Technical Revision 20 (TR-20) for the Tenmile Tailing Storage Facility (TSF) Stability Analysis and Operations/Maintenance Plan. Our responses to the comments in your email are provided below.

- Who is the "Engineer of Record" and what is their review frequency for the monitoring data collected in the weekly/event reports?

Response: URS is the Engineer of Record. URS will review monitoring data on a weekly basis beginning at facility start-up. The review period may be reduced to a monthly basis based on initial weekly readings. Piezometer data also will be reviewed after documented events.

- Will there be an in-depth inspection (similar to the "annual inspection" or better) conducted to document pre-operational baseline conditions before deposition begins?

Response: An inspection in the manner described in Section 6.5 is not planned prior to facility start-up at Climax due to snow. However, annual inspections conducted in the past 2 to 3 years (including last year) have been performed with consideration that a restart may occur in the near future and is considered similar to an in-depth inspection. Climax also performed multiple improvements (including installation of horizontal drains, placement of a beach fill to protect the tailing beach, etc.) over the past year to prepare the Tenmile TSF for new deposition activities. URS has reviewed these improvements.

- In Table 3-6 (and a few others) is the "post earthquake" FOS evaluation for the OBE or MCE?

Response: Table 3-6 of the O&M manual (Tables ES-1 and 4-3 in the Stability Analyses Report) includes FOS values for the OBE. The post-earthquake analysis performed by AMEC in 2009, and summarized in Table 2-2 of the Stability Analysis Report, did evaluate the maximum credible earthquake (MCE).

- Sec. 4.4.4 Are there any environmental concerns associated with using a petroleum based dust suppressor (Coherex) in this application?

Response: Coherex is an emulsified petroleum resin, diluted with water for application and specifically developed to stabilize soil against wind erosion. It is composed of semi-liquid natural petroleum resins

and wetting solution, is not identified as a hazardous substance, and contains no volatiles or cutback solvents. Coherex (typically mixed with water at a ratio of 1 part Coherex to 5 parts water) has been applied in the past at Climax and is currently applied annually to exposed tailing at the Henderson Mill to control dust, with no known or identified environmental concerns. Coherex will be stored in a tank, within secondary containment, near the west abutment of 2 Dam in accordance with the Climax Spill Prevention Control and Countermeasures (SPCC) Plan/Materials Containment Plan (MCP).

- Sec 5.2.1 Will there be surveyed markers placed for visual assessment of the required 6ft of freeboard and/or minimum 500ft beach width to make sure upper operating level is not exceeded?

Response: Freeboard will be monitored using water pool level measurements at the Tenmile Decant Structure that are collected and recorded on a daily basis and dam crest elevation, which will be determined by surveying after each lift of the dam crest is completed. These measurements are currently recorded manually, but the installation of a water level probe to automatically record the water level is planned for 2012. As described in Section 6.2 of the O&M Plan, the minimum beach width will be monitored using an electronic distance meter or other suitable method, which could include marker posts installed 500 feet upstream of the dam crest.

- Sec 5.3.2 Are there plans to install a flume to monitor the flow rate of discharge from South Portal of the Tenmile tunnel as suggested?

Response: The installation of a flume at the South Portal is currently scheduled for the summer of 2012.

- Sec 6.1/6.2 The trigger levels for the piezometer monitoring program need to be specified.

Response: The text has been revised to state, "...system will trigger notification at designated fluctuations. The notification indicates review is required when phreatic elevation increases greater than 5 feet in a one-month period, greater than 5 feet in a three-month period, and greater than 10 feet in a one-year period. See and insert attached replacement Section 6 pages for updated text (revised text included on page 6-1).

- Sec 6.3 What is the expected response time for the URS on-call support if there are anomalies observed?

Response: URS representatives are available 24 hours per day and are generally mobilized to the site within 2 to 4 hours after notification and request of on-site support from Climax.

- What are the plans to implement other recommendations, such as additional monitoring wells, monitoring/sampling tailings characteristics, etc. that are presented in these documents (specifically Section 5 of the Stability Analysis)? These processes need to be in place ASAP so that startup conditions can be monitored, and any required adjustments to the process as outlined can be made in a timely fashion.

Response: The following bullets are expanded process and implementation recommendations for the items included in Section 5.2 of the stability report (new text below is underlined). Note the third recommendation has been combined with the first recommendation.

- Perform beach profile sampling to evaluate newly deposited <u>tailing to verify the material properties are consistent with those envisioned in the design.</u> <u>This will include evaluating</u> the whole tailing gradation as it compares to past whole tailing gradations. <u>Profile sampling should be performed near the end of the first spigot season (estimated late summer/early fall 2012). The</u>

sampling includes collection of relatively undisturbed samples along 2 to 3 profile lines from the crest extending into the impoundment. Selected samples will be tested to measure index properties of the tailing.

- Evaluate the tailing beach and beach topography to verify *the beach slope is* consistent with that *envisioned* in the original design. The beach area should be surveyed near the end of the first spigot season. Evaluation of the differences with prior surveys should be performed on an annual basis.

- Maintain the decant pond at least 500 feet from the crest under normal conditions.

- Implement weekly review of the data from currently installed piezometers during start-up. Piezometric data review may be decreased to a monthly basis as deemed appropriate by the EOR and based on weekly reading reviews.

- Install additional piezometers, as deemed necessary, along the crest and face of the dam to evaluate the phreatic surface and changes resulting from tailing deposition. Frequency and location of piezometer installation will be established during regularly scheduled inspection and piezometric data review. Initial piezometric data generated at start-up will be reviewed with consideration to whether additional piezometers are required.

See and insert attached replacement pages 5-1 and 5-2, and ES-3, of stability report for updated text.

- Sec 6.4 Monthly monitoring inspections should not be entirely suspended in winter months, however, DRMS realizes that certain allowances may need to be made for access/safety reasons or snow cover. Conditions requiring exceptions to the normal inspection protocol should be well documented.

Response: Monthly visual monitoring inspections will not be entirely suspended in winter months but will be completed as on-site conditions allow. Operators will also be performing daily monitoring activities as part of deposition, regardless of the season. The operator inspections will also be limited by on-site conditions and what can be safely accessed. Piezometer readings will also continue and if an alarm is triggered a review of on-site conditions will occur, as appropriate.

Climax appreciates the Division's consideration of these responses and looks forward to receiving approval of Technical Revision TR-20. Please feel free to contact me should you have any remaining questions or comments.

Sincerely,

Raymond Lazuk
Environmental Manager

attachments

Inspections are essential in order to identify problems requiring maintenance or repair of the dam, and safety deficiencies that could threaten the dam, workers, visitors, and downstream populations, if not detected early. This Section is intended to identify personnel responsible for performing inspections, the frequency of the inspections, and the items requiring inspection. Complete and accurate records and reports of inspections provide information critical to proper operation of the dam. Records and reports provide important, continuous documentation of performance, and are valuable tools.

6.1 PIEZOMETER MONITORING PROGRAM

Twelve open well standpipe piezometers are arranged in three study sections at 3 Dam. The monitoring system has been changed from manual reading to vibrating wire piezometers with individual data loggers installed within the open well casings. Climax personnel also record manual readings if the data loggers are compromised.

A new automated telemetry system is being installed that will record piezometric levels twice daily. Designated Climax personnel will have access to the central data base to download recorded data. The system will trigger notification at designated fluctuations. The notification indicates review is required when phreatic elevation increases greater than 5 feet in a one-month period, greater than 5 feet in a three-month period, and greater than 10 feet in a one-year period.

6.2 CLIMAX STAFF INSPECTIONS

It is the responsibility of each tailing dam operator to observe the dam during his or her shift and report any unusual or abnormal conditions. An operator is a person with the most exposure to the tailing dam facility, who has the most intimate knowledge of "usual" conditions. The operator will also inspect his or her respective facility, area, and/or equipment during or after any intense storm or seismic event if he or she can do so safely. An intense storm event or major rainfall is defined as greater than 0.5 inches of rainfall in 24 hours. If safety precautions prevent inspection or observation during or immediately after an event, the facility or area will be inspected as soon as safely possible. Senior tailing engineers will also complete event-driven inspections, routinely inspect the tailing dam for cracking, seepage, signs of instability, and erosion, and inspect the dam following heavy precipitation or other unusual events (e.g., earthquakes).

Identified personnel will visually monitor the dam on a weekly basis. Observations will be recorded and are to include, at a minimum, the following:

- Date and time of inspection
- Inspection personnel
- Decant pond level
- Beach width
- General condition of the dam and appurtenances
- Equipment condition/status (if applicable)
- Signs of vandalism or damage (if applicable)

- Signs of erosion, displacement, or additional cracking (if applicable)
- Abnormal conditions (if applicable)

Additional detail for monitoring is included below.

Upstream and Downstream Slope and Dam Crest

Inspect all portions of the beach, dam crest, and downstream slope for erosion, distortion, or cracking. Visually inspect the downstream face for leakage and seepage and document any differences from normal leakage patterns in the inspection checklist. Inspect the slopes in the vicinity of the dam for any indications of impending landslides or other signs of distress.

Inspect the dam crest for debris. Remove debris as soon as removal can be conducted safely. Inspect the tailing beach area for erosion, distortion, or cracking. Additionally, check that the beach width has not become less than 500 feet using an electronic distance meter or other suitable method.

Decant Pond

Observe the general location of the decant pond and water elevation relative to the crest. The distance from the edge of the decant pond to the crest of the dam will be noted. Document obstructions or debris observed in the decant pond. A minimum of 6 feet of freeboard, as measured from the crest, should be maintained within the decant pond at all times under normal conditions. If the pond reaches a higher level, then the site will begin dewatering procedures until the level reaches the minimum freeboard requirement. Unusual discoloration of the water pool will be noted as this could be an indication of subaqueous sludge migration or sloughing. The water being discharged off the pond through the Tenmile Decant should be relatively clear and free of significant suspended solids and tailing slimes.

Abnormal Conditions

Contact management personnel immediately if any abnormal or unusual observation is made. Unusual or abnormal observations include, but are not limited to, the following:

- Wet spots or visible seepage (or increase in seepage in areas already identified) on the embankment
- Piezometric levels that trigger the system alarm (trigger levels pending)
- Variation in vegetation color or density that might indicate seepage
- Significant increase in measured levels of seepage
- Sink holes
- Sliding, slumping, or cracking of the downstream slope, crest, and abutments
- Significant erosion features on the face of the dam
- Unusual discoloration of the water pool
- Discoloration or evidence of tailing slimes in the Tenmile Decant.

Table ES-1
CALCULATED THEORETICAL FACTORS-OF-SAFETY

Loading Condition	Design Section	Failure Surface	Calculated Minimum FS	Minimum Recommended FS
Static Drained (Steady-State)	Existing Conditions (Elevation 11,107)	Circular	2.0	1.5
		Noncircular	2.1	
	Future Design Elevation (Elevation 11,120)	Circular	2.0	
		Noncircular	2.1	
Post-Earthquake	Existing Conditions (Elevation 11,107)	Circular	1.2	1.0
		Noncircular	1.2	
	Future Design Elevation (Elevation 11,120)	Circular	1.2	
		Noncircular	1.2	

CONCLUSIONS AND RECOMMENDATIONS

Our completed analyses confirm the results of the operating condition analyses performed by AMEC in 2009.

We recommend the following actions be taken upon the resumption of tailing deposition:

- Perform beach profile sampling to evaluate newly deposited tailing to verify the material properties are consistent with those envisioned in the design. This will include evaluating the whole tailing gradation as it compares to past whole tailing gradations. Profile sampling should be performed near the end of the first spigot season (estimated late summer/early fall 2012). The sampling includes collection of relatively undisturbed samples along 2 to 3 profile lines from the crest extending into the impoundment. Selected samples will be tested to measure index properties of the tailing.
- Evaluate the tailing beach and beach topography to verify the beach slope is consistent with that envisioned in the original design. The beach area should be surveyed near the end of the first spigot season. Evaluation of the differences with prior surveys should be performed on an annual basis.
- Maintain the decant pond at least 500 feet from the crest under normal conditions.
- Implement weekly review of the data from currently installed piezometers during start-up. Piezometric data review may be decreased to a monthly basis as deemed appropriate by the EOR and based on weekly reading reviews.
- Install additional piezometers, as deemed necessary, along the crest and face of the dam to evaluate the phreatic surface and changes resulting from tailing deposition. Frequency and location of piezometer installation will be established during regularly scheduled inspections and piezometric data review. Initial piezometric data generated at start-up will be reviewed with consideration to whether additional piezometers are required.

URS was requested by Climax to perform an independent check of the seepage and stability analyses for 3 Dam to satisfy the DRMS third-party review requirements prior to initiating deposition activities. Seepage analyses were completed for 3 Dam to calibrate the existing phreatic surface and predict future phreatic levels during active deposition. Slope stability analyses for 3 Dam included evaluating steady-state and post-earthquake loading conditions for the existing height and the future design height using current seepage analysis results under the operating conditions.

Presented below is a summary of conclusions followed by recommendations for further actions. Conclusions and recommendations were developed based on the results of the analyses and on our experience with these and other tailing dams.

5.1 CONCLUSIONS

Steady-state seepage and post-earthquake stability analyses were completed for the dam at its existing height for the operating condition. The phreatic surface was based on values calculated using a revised seepage model. Liquefaction analyses completed indicated the material has a low risk for liquefaction under the design earthquake. The stability results for the maximum dam section, presented in Table 4-3, indicate the dam meets or exceeds the minimum FS design criteria.

Steady-state seepage and post-earthquake stability analyses were also completed for the future design height for the design earthquake. The proposed future height is a 13-foot increase to the raise berm that is stepped back from the existing dam crest. The phreatic surface was based on the current seepage model that showed a slight increase in the phreatic surface due to active deposition. Liquefaction analyses completed indicated the material has a low risk for liquefaction under the design earthquake. The stability results for the maximum dam section, presented in Table 4-3, indicate the dam meets or exceeds the minimum FS design criteria.

Our stability analysis results confirm the dam meets steady-state and post-earthquake stability criteria for both existing height and future design elevations under operating conditions.

5.2 RECOMMENDATIONS

The operation of 3 Dam will depend on the proper management of the tailing facility and emplacing tailing with properties envisioned for this dam. With a new mill, it will be important to observe and capture the material properties and changes and evaluate potential impacts tailing operations may have on operation of the facility.

Comparing deposited mill tailing with those presently emplaced is important to the overall successful operation of the facility and part of what is known as the "observational approach." The observational approach consists of evaluating the in-place tailing properties with those modeled in the original analysis. It is an iterative process that occurs throughout the life of the dam. With this in mind, we recommend the following actions when deposition resumes:

- Perform beach profile sampling to evaluate newly deposited tailing to verify the material properties are consistent with those envisioned in the design. This will include evaluating the whole tailing gradation as it compares to past whole tailing gradations. Profile sampling should be performed near the end of the first spigot season (estimated late summer/early fall 2012). The sampling includes collection of relatively undisturbed

samples along 2 to 3 profile lines from the crest extending into the impoundment. Selected samples will be tested to measure index properties of the tailing.

- Evaluate the tailing beach and beach topography to verify the beach slope is consistent with that envisioned in the original design. The beach area should be surveyed near the end of the first spigot season. Evaluation of the differences with prior surveys should be performed on an annual basis.
- Maintain the decant pond at least 500 feet from the crest under normal conditions.
- Implement weekly review of the data from currently installed piezometers during start-up. Piezometric data review may be decreased to a monthly basis as deemed appropriate by the EOR and based on weekly reading reviews.
- Install additional piezometers, as deemed necessary, along the crest and face of the dam to evaluate the phreatic surface and changes resulting from tailing deposition. Frequency and location of piezometer installation will be established during regularly scheduled inspections and piezometric data review. Initial piezometric data generated at start-up will be reviewed with consideration to whether additional piezometers are required.

Should variations in the material properties be identified, the source or cause should be reviewed and it may be potentially necessary to revise the stability analyses. The need for updating the stability analyses should be reviewed by the engineer-of-record and implemented as needed in the future.

The recommendations provided above are common to any start-up, expected and planned for at this dam, and typical for construction of an upstream method tailing dam. The recommendations have been discussed with Climax and will be implemented as part of the operations strategy and as part of normal operation and maintenance. Implementation of the recommendations will be addressed in the Tenmile TSF Operations and Maintenance Manual.