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May 21, 2014

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-23 – Mayflower TSF Design, Stability and Operations and Monitoring Plan, and Modifications to the Tenmile TSF Operations and Monitoring Manual, Climax Mine, Permit No. M-1977-493

Dear Mr. Scott:

This letter is in response to your February 13, 2014 Adequacy Review letter for Technical Revision 23 (TR-23) consisting of the Mayflower Tailing Storage Facility (TSF) 5 Dam Operating Condition, Seepage and Stability Analyses and Operations and Maintenance Manual (OMM), and modifications to the Tenmile TSF Operations and Maintenance Manual. This letter with responses and attachment will be included as an addendum to the TR-23 documents.

The DRMS comments are in italic font followed by the Climax responses below. We also have revised the Mayflower TSF OMM (Revision 1.1) in response to your comments, and included a new section (Section 4.4) that describes the use of a cyclone at 5 Dam to better segregate tailing materials for dam construction. We will transmit an electronic version of the OMM to you over the internet and will provide you with a hard copy by separate delivery.

Monitoring/extension of existing sub-drain piping
Section 1, Page 1-2 of the seepage and stability analysis (SSA) describes the existing dam drainage system, including sub-drains of eight and twelve inch CMP in sand and gravel bedding. These drains are constantly exposed to low pH drainage, and failure of these CMP drains due to corrosion and/or collapse could result in significant issues that could jeopardize the stability of the dam. Therefore, DRMS would like Climax to commit to annual video inspections of the CMP sub-drains, if possible. What does Climax intend to do if any of the CMP drains show signs of degradation or failure?

Response: Climax has been monitoring the flow rate and quality of water that is collected by the existing 5-Dam seepage collection system. The water has an average pH of around 6.5-6.8, and the visual characteristics of the water do not indicate impacts from acid mine drainage. In 2013, Climax replaced the main collection pipe along the toe of 5-Dam to accommodate additional flows as the dam expands and to allow better access to the lateral piping for monitoring and maintenance. Drawings of these improvements are included in Appendix C of

the revised OMM (Revision 1.1). As part of this project, Climax installed flow meters on the main collection pipes to allow daily monitoring of flows in the system and will monitor flow rates in the system to detect potential problems. Changes in flow rates or water clarity would be an indication of a pipe restriction, pipe collapse or potential failure. This finding would be followed up by a physical investigation. If cloudy or increased seepage is observed, increased monitoring activities will be implemented. In an extreme case where a drain collapse occurs resulting in a discharge of tailing, filter systems can be installed ranging from the installation of a slotted pipe to filter the drainage to the addition of a reverse filter, depending on conditions encountered.

Climax recognizes the importance of these drains but believes that annual video inspections are impractical and unnecessary. If the sub-drains are experiencing degradation due to corrosion, entry with video equipment can accelerate the degradation of the drains and in some cases cause more damage than if the camera did not enter the drain. Video inspection will always be an available strategy implemented on a case-by-case basis, dependent on site conditions.

Section 3.1 of the Operations and Maintenance Manual for the Mayflower TSF (OMM) states that the sub-drain system will be extended as the dam is raised, and that a design will be prepared when extension activities are required. Due to the upstream raise deposition of the dam, it is unclear why this extension would be required. Figure 6-1 in the SSA does not depict a change in the toe of the dam or any extension of the drain system during the "life of mine" raise. Please clarify why extension of the sub-drain system is needed. If extension of the sub-drain is required, Climax will be required to provide an engineering design to DRMS for review and approval prior to construction. This design will be required to include inspection and evaluation of the existing drain to determine its suitability for extension.

Response: The TSF raise will be constructed upstream, so there is no change in toe. However expansion of the sub-drain system along the upstream flanks of the dam will facilitate the collection of seepage flow along the abutments and maintain the phreatic surface near the tailing/ foundation interface. The drain system extension will be connected into the existing sub-drain collection pipes. The water would then be pumped into Mayflower pond from the toe seepage collection ponds. The design of the expansion of the sub-drain collection system will be provided to DRMS for review and comment prior to construction.

Subsurface Material Characterization

Section 5.1.3 of the SSA does not expressly state the slimes are not susceptible to earthquake-induced liquefaction, and does not consider the potential for loss of strength due to elevated pore pressures, even though it appears that a substantial deposit of this material will underlie the dam at a significant depth. Please address.

Response: The concept of an upstream method tailing dam is predicated on subsequent raises that occur over the previously emplaced tailing, with the crest continually moving upstream as the impoundment gains elevation. The dam's stability is established through the construction of a sand shell that provides for drainage. Construction of the sand shell utilizes strategic tailing deposition to maximize hydraulic sorting of the coarse tailing fraction. This strategy, along with seasonal rest periods, allows pore pressures in the dam shell to dissipate.

Conversely, the generation of excess pore pressure within the fine tailing, or slimes, is expected to be possible as part of the normal tailing dam deposition. The pore pressure conditions contained in the fine tailing can vary depending on site conditions. Normal upstream raises to the dam may potentially induce pore pressures depending on the raise rate. The existing bottom drainage and constructed sub-drains can provide needed drainage and result in pore pressure conditions that are less than hydrostatic under static loading conditions. Furthermore, seismic loading can often result in elevated pore pressures.

Though a variety of factors may affect pore pressure conditions within the fine tailing, stability of the dam is maintained through the free draining shell, which extends through the identified critical failure surfaces. The sand shell along with a managed pond provides for stability for all model conditions including drained and undrained/post-earthquake conditions. From a stability evaluation standpoint, the lowest characterized strengths are applied to the impoundment tailing assuming that it exists in an undrained or post-earthquake condition.

Section 5.1.4 of the SSA: The description of the sludge layer location is somewhat confusing. The layer is estimated to be up to 3' thick at the beach at the upstream end of the current pond (1200' from the dam), increasing to about 30' thick at the "back" of the pond. Figure C-1 (Appendix C) shows the "back" of the pond to be farther upstream than the beach upstream of the dam, so the sludge layer does not appear to underlie the projected final dam. Please clarify.

Response: The location of the sludge layer is a significant distance from the crest of the dam and outside any critical failure surface. The term "back of the pond" refers to the furthest distance from the crest and well into the decant area.

Seepage Analysis

Section 6.3 of the SSA: The description of the calibrated model as using a phreatic surface 1 foot below the latest reading from Piezometer TH2006-5-1 (upstream of the blanket drain) but 8 feet above the highest reading for Piezometer P-4 (downstream of TH2006-5-1, and which appears to penetrate the blanket drain) is somewhat confusing. Is the highest reading in P-4 the latest reading? Using a higher phreatic surface would be conservative, but the description appears inconsistent. Piezometer locations are not shown on the model results. Please clarify.

Response: The seepage model was calibrated to observed piezometer readings and measured seepage outflow. The model represents a "best estimate," which is higher than some historic "high reading" observed piezometric levels. This approach results in a conservative evaluation of the tailing storage facility, which in turn makes the model conservative for estimating future conditions.

Stability Analysis

In a seismic stability design criteria recommendation submitted by Climax to DRMS dated January 22, 2008, the proposed design criteria stated that existing and future TSF design would be evaluated for stability under two levels of design earthquake events: the OBE (Operating Basis Earthquake) for the operational period of the facility, and the MDE (Maximum Design Earthquake) for the post closure period; with the MDE being set equal to the MCE (Maximum

Credible Earthquake). These criteria were accepted by DRMS in an approval letter to Climax dated February 14, 2008.

The proposed seismic design criteria submitted for the Mayflower TSF are based on a magnitude 7.0 OBE event with a return period of 475 years. The calculated seismic acceleration from the selected OBE event is 0.06g. From Table 2-1, the calculated peak horizontal acceleration during a 5,000-year event (required for a large high hazard water impoundment dam) would be 0.20g and the peak acceleration for a 10,000-year event (generally equated with the MCE) would be 0.27g. No data have been provided to show how the TSF design would withstand a post-closure MCE event. Please provide a suitable evaluation as was done with the OBE event.

Section 7.4 of the SSA, Table 7-3, lists the factors of safety against failure of the design slope under steady-state and post- OBE earthquake loading. The post-earthquake analyses appear to have modeled the dam under static loading conditions using the undrained soil strengths listed in Table 7-2. While the design OBE and MCE ground accelerations are listed, there is no discussion in the report of any analysis performed under transient seismic loading. Please evaluate the stability of the existing and proposed Mayflower TSF under the OBE and MCE seismic load, as approved in 2008, using undrained soil strengths. Please also evaluate the TSF under a varying seismic load to determine what level of earthquake shaking the TSF will be able to withstand (if the TSF cannot be shown to withstand the MCE).

Response: A site-specific probabilistic seismic hazard analysis (PSHA) was completed for Climax in 2006 to estimate the ground shaking hazard e.g., peak ground acceleration (PGA) for specified return periods (or annual exceedance probabilities). The January 22, 2008 letter states the PGA for the 10,000-year return period earthquake equates to the Maximum Credible Earthquake (MCE) ground motion. The MCE is a deterministic earthquake and so this statement combines incorrectly both probabilistic and deterministic terminology into the seismic design specification. The current state of the practice has moved towards the probabilistic approach for estimating seismic hazard and developing seismic design criteria.

As discussed previously with DRMS, Climax will use the PSHA approach to characterize the seismic hazard at the site and develop seismic design ground motions for the post-closure condition. The state of Colorado stipulates the minimum seismic criteria for water retention structures and provides both deterministic and probabilistic criteria. Climax utilized a probabilistic criteria and approach and the 5,000-year return period as the basis for defining the MDE for the tailing storage facility. A letter report from URS with the results of this analysis is attached to this letter.

The current post-earthquake analyses for estimated future conditions utilize a calculated phreatic surface that represents estimated conditions under deposition and strengths that are equivalent to undrained strengths. A reduction in strength was not utilized because cyclic testing performed for this SSA report showed the tailing materials did not lose strength under the simulated OBE event shaking. Parameter evaluations of CPT data indicating dilative behavior coupled with CPT-based liquefaction calculations further support this conclusion under OBE loading.

SSA Recommendations and Monitoring/Reporting

DRMS will require that all bullet items listed in section 8.2 of the SSA be implemented and incorporated into the monitoring and reporting program for Mayflower TSF. DSB has recommended that pore pressures in the slimes under the construction of new berms and beaches also be closely monitored to minimize the risk of buildup of excess pore pressure. Please describe how Climax intends to address this issue.

Response: DRMS made a similar comment during its review of TR-20 – Tenmile TSF, and at that time it was agreed that the details could be included in the SSA. However, Climax also agrees that it would be useful to include this information in the OMM. All bullet items listed in Section 8.2 of the SSA will be implemented and have been incorporated into the monitoring and reporting program for Mayflower TSF in Sections 4.6, 5.2, 6.1, 6.2, and 6.4 of the revised OMM.

The generation of excess pore pressure of the fine tailings can be expected as part of the normal process of tailing dam deposition. We do not believe there is any reason, based on past experience at this site and within the industry, to monitor pore pressures in the fine tailing during construction of the tailing dam raises. Rather, it is most important to monitor pore pressure conditions in the free draining shell which provides for stability of the tailing storage facility. This monitoring is currently provided by the automated piezometers located in the dam shell. The slope stability analyses assume these pore pressures develop in the tailing slimes and, as a result, lower shear strength is applied to the fine tailing. Climax will continue with the installation of piezometer as the dam increases in height. The new piezometer will be located to monitor critical areas of the dam. The new piezometers will be added to our existing piezometer automation system and monitored.

Closure of Historic Decant System

Page 3-2 of the OMM states that the historic decant system will be closed with grout in the future. DRMS supports this idea, but will require that the plan for abandonment of these features be submitted to DRMS as a TR for approval prior to construction, and that the results of the closure be provided to DRMS following abandonment.

Response: Climax will provide a plan for closure of the decant structure under separate cover to DRMS. The final decant closure will be designed during the spring of 2014 and implemented during the fall of 2014. A summary construction report, including "as-built" drawings, will be generated post-closure and provided to DRMS.

Monitoring of Decant Pond Operation

Section 5.2.1 of the OMM, Decant Pond Operation, states that the success of the tunnel system to act as an emergency spillway to safely route extreme flood events relies on maintaining the level of the decant pond according to the operating limits outlined in this section; the 800-foot beach width, 2,000 acre-feet of flood storage, or 6-feet below the dam crest. However, there is no reference or discussion of how these parameters are physically measured to ensure the "prescribed upper operating level" is maintained at or below this level. Please clarify how each of these parameters will be physically measured/monitored, recorded and reported.

Response: The upper operating pond limit at Mayflower TSF will be controlled by the three criteria listed, with some clarification of monitoring methods described in OMM Section 5.2.2. The 800-foot beach width is generally measured visually by comparing pond limits to the leadoff berms, which extend approximately 800 feet from the crest. Climax performs semi-annual (or more frequent) LiDAR surveys of the beach area and echo sounding bathymetric pond surveys of the active TSF. Volume-elevation curves are generated from these surveys which provide an estimate of the water storage above and below a pond level within the TSF. A pressure transducer is used to measure the pond elevations every 6 hours and recorded in a database that is monitored daily. Between surveys, calculations are performed monthly to estimate changes in the total water storage capacity of the TSF based on mill production and estimated in situ tailing density.

The LiDAR surveys, routine observations by a tailings engineer of surveyed fill stakes in the beach area, and intermittent point surveys, continuously track the crest elevation. The recorded pond elevation is compared to the crest elevation to ensure a minimum of 6-feet. Generally if the 6-feet criterion is met, the 2,000 acre-feet is met based on surrounding topography and volume-elevation curves.

The three criteria discussed above were developed to provide safe operating criteria during extreme flood events. Furthermore, the Mayflower Tunnel side hill riser will be operated in conjunction with managed pond levels to ensure the pond is operated adequately below the weir plate to accommodate smaller storm events (50-yr return and smaller) without a release.

Monitoring and Inspection of the TSF

Section 5.3.1.1 of the OMM states that there is no instrumentation associated with the sub-drain system, however monitoring of flow from the sub-drains could be an important indicator of the safety and performance of the TSF. DRMS recommends that Climax implement some means to monitor the flow from the sub drain outfalls, and that this data should be included in the monitoring and reporting for the TSF.

Response: Historically there was no instrumentation installed specifically within the sub-drain system; however flows have been measured at the Mayflower seep pump station for many years. The measured flow rate potentially includes minor surface runoff that contributes to the seepage collection ponds, but generally reflects the seepage collected within the sub-drain system.

In 2013, Climax upgraded the sub-drain system including replacing the historic 24" CMP collector pipeline with a new corrugated HDPE pipeline, adding manholes at the sub-drain tie-ins, and installation of new flow measuring instrumentation. The new manholes along the collector pipe allow visual observations of flows at the sub-drain tie-in locations as well as remote inspection access. Instrumentation was installed to separately measure the flows from the right abutment groin, the left abutment groin, and the center portion of the dam. The three measured flows sum to the total seepage flows collected within the sub-drain system. The flows pumped from the Mayflower seep pump station continue to be monitored.

New instrumentation at the three areas (left groin, right groin, and center) consists of "Montana flumes" coupled with electronic pressure transducers to measure flow rate, which is then stored

in a local data logger, transmitted wirelessly through a radio signal, and stored on a server. The flow rate data is collected hourly and recorded in a database that is monitored daily. However, the center portion flow will only be measured during non-freezing months due to fixed invert elevations. The measured flow rates will be incorporated into the TSF monitoring and reporting. Regular monitoring for changes in clarity will also be completed as part of normal operation of the tailing storage facility. The new instrumentation is described in Section 5.3.1.2 of the revised OMM.

Section 6.1 of the OMM states that all piezometers and the inclinometer are, or will be, automated. Is there any remaining ability to manually measure these monitoring points? DRMS would like to see the ability to manually measure these monitoring points to confirm the automated data periodically if at all possible.

Response: The piezometers have been installed as open-well standpipes. The automated instrumentation installed at each piezometer consists of a vibrating wire transducer located at the base of the piezometer. No functionality for manual readings is lost with this configuration, and the piezometers are read manually at least once per year to verify automated readings. The current OMM calls for response testing of the piezometers annually and Climax will maintain the ability to manually read both piezometers. The inclinometer will not be automated but will be read manually and recorded on an annual basis.

Due to the importance and scope of the monitoring, recording and reporting requirements for the TSFs detailed in sections 6 and 7 of the OMM, it may be useful to somehow summarize the monitoring and reporting activities proposed in the OMM, perhaps in a table or some other format. The monitoring summary should include, but not necessarily be limited to:

Listing of instrumentation to be monitored and locations – piezometers, inclinometer, survey monuments, etc.
Parameters to be monitored – beach width, pool elevation, sub drain outflow, etc.
Frequency of monitoring – daily, monthly, event based, annually, etc. Type and frequency of reporting
Examination and interpretation of monitoring data

Climax will need to commit to maintaining all monitoring, reporting, and evaluation reports and data on site for the "life of operation" for review by DRMS upon request.

Climax will also be required to submit to DRMS within 30 working days of the inspection, the annual TSF inspection/evaluation report, certified by the engineer of record for the TSF, stating that the TSF is being constructed, maintained and monitored as designed and in accordance with the approved plan and applicable regulations.

Response: The recommended monitoring summary is included in Section 6 of the revised OMM. Climax also maintains all operational files and reports, and will continue to retain future monitoring and evaluations reports for DRMS review.

Climax will provide an annual letter report by the Engineer of Record (EOR) summarizing the review of data related to the dam performance throughout the year, and with the EOR's opinion

of how the dam is performing. Climax requests that the annual summary report be included as an attachment to the Annual Report for the Reclamation Permit that is submitted to DRMS every March. The annual TSF inspection evaluation report would cover the previous calendar year, like the Annual Report for the Reclamation Permit.

Plan(s) for extended period(s) of inactivity for TSF

Does Climax envision any changes to the submitted plans for TSF monitoring and maintenance if the operation were to enter into period(s) of extended inactivity (greater than 12 months)?

Response: Climax intends to maintain a consistent monitoring and maintenance approach during both active deposition and potential extended shutdown periods. Climax does not envision any changes to the plans submitted for TSF monitoring and maintenance.

Upset Condition or Emergency Notification Procedures

DRMS would like to see some discussion of, or reference to, possible TSF trigger conditions or scenarios that would require "emergency" actions and notifications by Climax in accordance with Rule 8.1 and 8.2. What is the notification process and timeline for an "upset", "slowly developing" or emergency situation? It was noted that neither DRMS nor the Summit County Emergency Manager were listed as contacts on the daily inspection checklist form. Is the Tailings Engineer/Supervisor responsible for appropriate emergency notifications?

Response: Climax has identified potential upset conditions in Section 6.2 of the OMM and has monitoring in place to detect these conditions. The tailing operations crews are responsible for daily inspections and are required to notify shift supervisors of unusual conditions. Climax also maintains an Emergency Response Action Plan (ERAP) for internal use that provides notification guidelines for tailing upsets. The ERAP lists local emergency contacts for Summit County.

Contingency Planning/Data Review

Has Climax conducted any failure scenario modeling/contingency planning to determine what the potential impacts/results of a partial or complete TSF failure would likely be? Have other failure modes such as piping or overtopping been considered during this design? If it has not already been done, is recommended that the owner and the engineer closely review all past records to identify any reports of unusual events that could affect the safety of the proposed dam and impoundment. Such events could include plugged or failed drains, unusual or uneven settlement, sinkholes or slumping on the dam or the beaches, elevated piezometer readings, episodes of increased and/or cloudy seepage discharge, etc. There is brief mention in the executive summary of the SSA that historical data was for the facility was reviewed in 2007, but there was no mention of any more recent comprehensive data review.

Response: Climax understands that a partial or completed TSF failure will have severe consequences, and contingency/notification planning is incorporated into the Climax ERAP. Climax and the EOR also have evaluated potential failure scenarios and risks. Climax's parent company, Freeport-McMoRan Copper & Gold, has an internal Tailings Stewardship Program that is directed by an inter-disciplinary group comprised of company management, internal technical experts and operators along with technical expert consultants, who are tasked with

operations and management of TSFs to ensure stability. The Tailing Stewardship Program conducts annual detailed field inspections of the active TSFs, which includes inspections, training and reviews of operational issues, phreatic level trends, deposition plans, hydrologic controls, seepage management, decant system, structural integrity and stability evaluations. Freeport maintains a strong corporate commitment to the safe operation of tailing dams at all of its facilities and will maintain a robust monitoring program at Climax.

Climax appreciates the Division's consideration of this letter and attachment. Please contact me should you have any questions on the responses or the revised OMM.

Sincerely,

Raymond Lazuk
Environmental Manager

Attachment: URS May 15, 2014 Letter Report - Mayflower Tailing Storage Facility (5 Dam) Post-Closure Condition Seepage and Stability Analyses