
*Promoting Healthy Communities by*
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September 15, 2022

Jerry Schoeppner, Director
Mining and Minerals Division
New Mexico Energy, Minerals, and Natural Resources Department
1220 South St. Francis Drive
Santa Fe, NM 87505

Via e-mail: Gerard.Schoeppner@state.nm.us

**RE: GR010RE Tyrone Mine – Emma Expansion Project**

Dear Mr. Schoeppner:

On behalf of the Gila Resources Information Project (GRIP), I am submitting the following comments on the Emma Expansion Project, Tyrone Permit No. GR010RE.

As you know, the New Mexico Mining Act regulations requirement for new units is that "the mining operation and the reclamation plan shall be designed and operated using *the most appropriate technology and the best management practices* (emphasis added)" (NMAC 19.10.5.508A) and "the mining operation and completed reclamation shall meet .....requirements established to assure protection of human health and safety, the environment, wildlife and domestic animals " (NMAC 19.10.5.508B).

GRIP and its technical consultants, Jim Kuipers of Kuipers and Associates and Dylan Duvergé of Stratus Environmental, have reviewed the Emma Mining Act permit application and closure/closeout plan and evaluated Freeport's proposal against industry best practices according to the International Council on Mining and Metals (ICMM) and the Initiative for Responsible Mining Assurance (IRMA), and provided examples of most appropriate technologies and best management practices for mining and similar industrial-scale projects.

The industry-led International Council on Mining and Metals (ICMM) has defined the good practice environmental, social and governance requirements of company members through a comprehensive set of performance expectations and position statements.

The Initiative for Responsible Mining Assurance (IRMA) is an internationally-accepted set of standards and benchmarks for socially and environmentally responsible mining developed through a multi-stakeholder governance framework. Anglo American, Ford, BMW, Microsoft, Tiffany, and Corning have all joined IRMA, recognizing that using responsibly-sourced metals in their supply chain is an important societal goal and critical to their bottom line. GRIP is a member of IRMA.

Our comments focus on demonstrating how Freeport-McMoRan's Emma Expansion Project Mining Act permit application and closure/closeout plan are deficient with regards to incorporating most appropriate technology and best management practices. We also provide recommendations for additional analysis and permit conditions that we believe MMD should require in order to ensure that the Emma operation and closure/closeout plan employ most appropriate technologies and best management practices.

**Water Supply**

NMAC 19.10.5.508B(4) requires that "Operations shall be planned and conducted to minimize negative impact to the hydrologic balance in both the permit and potentially affected areas." Daniel B. Stephens and Associates prepared for Freeport an analysis of the hydrogeologic impacts of Emma pit dewatering on groundwater hydrology entitled "Hydrogeologic Report for Proposed Emma Expansion Project" dated October 22, 2021.

As described in the attached technical review of the hydrogeology report by GRIP technical consultant Dylan Duvergé, the report does not present sufficient baseline data and analysis to fully understand the presence or strength of the hydrologic connection between the mine pit and the nearest domestic wells, or to confidently conclude the closest wells would not experience impacts over the long term from mine pit dewatering.

In its water rights application to the Office of the State Engineer, Tyrone claims it is applying for a temporary 10-year water rights permit that requests an additional point of diversion so that seepage and storm runoff "amounts can be adjusted based on operational experience over time" (OSE File No.4979). However, this does not reflect the reality that the additional point of diversion will have to be a permanent feature. It is critical for permit support documents to include the whole action, including its permanent nature, for OSE and ultimately MMD to make a fully informed decision. An analysis of drawdown over ten years when pumping will need to occur in perpetuity will not fully capture the extent of groundwater drawdown.

Tyrone personnel claimed at the August 16th public hearing that the Project would not increase water use, relying on the fact that the total permitted diversion volume at M-04979 would not change. This makes convenient use of "paper water" to avoid having to give an actual (metered) water balance (inclusive of Tyrone's existing operations) demonstrating that Project-related dewatering would not increase the consumptive use of groundwater. Groundwater seepage estimates for the Emma Project have varied from 16.4 acre-feet/year to 100 acre-feet/year, demonstrating the enormous uncertainty involved. The obvious question is if the Project does not increase water use as claimed, where in Tyrone's existing operation would 100 acre-feet/year of groundwater no longer be pumped? This basic information on the water balance is essential to addressing the hydrologic balance question under NMAC 19.10.5.508(4). Without it, the incremental and cumulative impacts of Tyrone's operations, inclusive of the Emma Project, on the underlying aquifer cannot be accurately evaluated.

Please refer to Stratus Environmental's two technical memos dated June 8, 2022 and September 6, 2022 for a more detailed discussion of our comments and recommendations.

<u>Recommendations</u>

GRIP recommends that Tyrone prepare and implement a Groundwater Monitoring and Mitigation Plan (GMMP) that establishes current baseline groundwater conditions at rural residential properties to the south, proactively selects appropriate wells (i.e., from Tyrone's existing monitoring wells and select domestic wells) to monitor for potential impacts as mining progress, identifies appropriate water level

thresholds for each monitored well (i.e., Lowest Practical Pumping Level, LPPL), and commits to corrective action should impacts be detected.

At a minimum, this should include the following:

- Establishment of baseline conditions for as long a period as feasible prior to interception of the water table;
- A well inventory/survey at the Apache Mound Subdivision, Butterfield Trail and Collum Ranch that includes current static water levels and pump settings;
- Establishment of LPPLs based on actual well construction/operation, inclusive of dynamic drawdowns, and incorporating exercise of all domestic water rights;
- Identification of at least two representative monitoring locations: (1) closest to the Emma Project, and (2) the well within at least 2 miles whose current water level is closest to its LPPL;
- A plan of action to mitigate for any detected impacts (could include well deepening, water trucking, or other measures at FMI's expense); and
- Agency reporting and verification procedures.

GMMPs are best management practices that are standard in the industry and routinely utilized by permitting agencies nationwide to monitor and mitigate for potential drawdown impacts. For example, the U.S. Forest Service and Bureau of Land Management have both required GMMPs for projects that would pump far less water over much shorter timeframes and in situations where the nearest groundwater user was farther away. As one of many examples, nearly all renewable energy projects (both solar and wind) being permitted by the BLM are including GMMPs as mitigation measures despite these projects requiring very little water in the long-term.[1]

**Fugitive Dust**

The local community will potentially be impacted by fugitive dust emissions from the Emma project. Fugitive dust emissions can be reduced through application of most appropriate technology and best management practices. A dust control plan was not provided to the public for review as part of the Emma application.

Please refer to Jim Kuipers' technical comments for a more detailed discussion of fugitive dust impacts, best management practices for dust control, and recommendations.

<u>Recommendations</u>

GRIP recommends that MMD include the following requirements in the Mining Act permit that are consistent with the Initiative for Responsible Mining Assurance standard for air quality[2]:

- Conduct an analysis of dust impacts on the local community to determine if public health will be impacted by fugitive dust from Emma operations.
- Develop a formal dust control, monitoring and mitigation plan utilizing best practices.
- Install portable air monitors in areas where the public lives in close proximity to the mine site.

[1] https://www.blm.gov/programs/planning-and-nepa/plans-in-development/california

[2] https://responsiblemining.net/wp-content/uploads/2018/08/Chapter_4.3_Air-Quality.pdf

**Light Trespass/Viewshed**

The Lighting Study concluded that no light trespass is anticipated, and once constructed, the new light will not be perceptively different from the existing Tyrone Mine operations. The lighting plan assumed that the closest residence to the Emma project is 1 mile away, when in actuality it is a half mile away. The report concludes that given the distance of the Emma project from the closest residence that there won't be any light trespass. However, Freeport's Little Rock Mine had to mitigate light trespass on residents at the Oak Grove Subdivision 4.5 miles away – 9 times farther away than the closest residence at the proposed Emma project.

Moreover, the study concluded that no mitigation measures were deemed necessary assuming the use of best lighting practices as implemented for the Tyrone Mine. However, the Lighting Study did not reference a lighting plan that outlines the best lighting practices used by Tyrone and what will be implemented at the new Emma project. Therefore, there is no way for the public to evaluate whether Freeport is currently implementing best lighting practices or what specific measures will be implemented at Emma.

Similarly, with viewshed issues, there is no discussion of how the project will minimize impacts to the viewshed.

Recommendations

- MMD should require a lighting plan as part of the application. The lighting plan should outline what best lighting practices will be used at Emma, a mitigation plan, and a formal grievance process that includes accountability to the local community (see Grievance Management System below).

- MMD should require Freeport to develop a formal written community impact mitigation plan with the backing of senior level management that provides detailed and publicly accessible information as to how open communications will be established, how concerns will be acknowledged and addressed, the process for problem solving, and how impacts will be mitigated or remedied.

The Stillwater Mining Company Northern Plains Resource Council Good Neighbor Agreement is an example of a mitigation plan best management practice.

**Noise and Vibration**

The local community has concerns with respect to encroaching mining and potential impacts from noise and blasting in terms of their safety, property, and quality of life. Current best practice recognizes that noise and blasting is a significant issue and that to address public concerns, and perception, it is an important part of being a responsible corporation and requires a reasonable and dedicated effort.

GRIP recommendations are consistent with IRMA's Standard for Responsible Mining Chapter 4.4 Noise and Vibration, intended to provide measures to preserve the health and well-being of nearby noise receptors and the amenity of properties and community values, and to protect offsite structures from vibration impacts. [3]

Recommendations

- MMD should require an updated noise study that includes the noise impacts of blasting.

[3] https://responsiblemining.net/wp-content/uploads/2018/08/Chapter_4.4_NoiseVibration.pdf

- MMD should require Freeport to provide a noise plan that outlines the best management practices that will be implemented at Emma, including best practices for operation and maintenance of noise generating equipment.

- MMD should require Freeport to develop a formal written community impact mitigation plan with the backing of senior level management that provides detailed and publicly accessible information as to how open communications will be established, how concerns will be acknowledged and addressed, the process for problem solving, and how impacts will be mitigated or remedied.

The Stillwater Mining Company Northern Plains Resource Council Good Neighbor Agreement is an example of a mitigation plan best management practice.

**Grievance Management System**

Freeport's 2021 Annual Report on Sustainability states: "Transparency and accountability are crucial to building and maintaining trust. Trust takes time. It also takes transparency, authenticity and a two-way dialogue. We are committed to openly engaging with and listening to our stakeholders. We are also committed to transparently sharing our progress and to being held accountable for our commitments."[4]

We appreciate that Freeport has put in place a grievance management system over the past several years. It consists of four ways in which residents can contact the company to report and provide information on a grievance associated with its mines. See the graphic below from a recent Freeport Community Partnership Panel meeting. This system, however, does not hold the mine operator accountable for the negative impacts it may be causing in the community, as the nature of the grievance, how the grievances were addressed, and if they were mitigated is not made public. There is no mechanism for evaluating the effectiveness of Freeport's Environmental Management Systems.


Recommendation

MMD should require that the grievance management system is integrated with a mitigation plan for fugitive dust, light trespass, noise/vibrations and reporting in order to evaluate effectiveness. This information should be provided to the public so that there is accountability in its operations.

[4] https://www.fcx.com/sites/fcx/files/documents/sustainability/2021-annual-report-on-sustainability.pdf

**Closure/Closeout Plan**

Please refer to Kuipers and Associates' extensive comments on the Closure/Closeout Plan prepared for GRIP. We will not include them here.

**Reclamation Cost Estimate and Financial Assurance**

Ensuring there is adequate financial assurance available to monitor, maintain, operate and protect the performance of engineered source control measures, such as soil covers and storm water conveyances and ensure they prevent impacts from occurring in the future is critically important from a public interest and financial liability standpoint.

We have serious concerns with the reclamation cost estimate upon which financial assurance will be based. We believe the cost estimate is significantly underestimated in the following areas:

- The Emma project basis and cost estimate for the long-term monitoring, maintenance and operations is grossly inadequate to ensure the long-term viability of the new unit's reclamation and closure. Worst-case cost estimates have not been estimated or provided at all for contingency and emergency response plan tasks, inspection of pit walls and mitigation of instabilities, drilling and completing additional monitoring wells, vegetation maintenance, erosion control and monitoring, and road maintenance.

- Freeport has not provided information in support of diminishing costs for monitoring, maintenance and operations in the future based on achieving water quality objectives.

<u>Recommendations</u>

- MMD should require that Freeport provide costs for those elements not currently included in the reclamation cost estimate.

- MMD should require conservative, worst-case assumptions to arrive at cost estimates that lower the risk that financial assurance will be insufficient to cover future environmental liabilities at the Emma project.

- MMD should not allow for the assumption of diminishing costs in the financial assurance estimate until such time as the assumption can be justified with results from the monitoring, maintenance and operation of the mine itself.

**Third-Party Guarantee**

Although the form of the financial assurance for the Emma Expansion Project has not been made public yet, GRIP strongly objects to any use of a third-party guarantee (TPG) to cover Freeport's financial assurance. Just because the Mining Act allows Freeport to use a TPG to cover up to 75% of the reclamation cost estimate, doesn't mean the company should propose it.

Use of self-bonding, parent company, and corporate guarantees for financial assurance are not a best management practice. The Bureau of Land Management and the US Forest Service do not allow parent company guarantees. IRMA does not allow self-bonding or corporate guarantees.[5]

[5] https://responsiblemining.net/wp-content/uploads/2018/08/Chapter_2.6_ReclamationClosure.pdf

Indefensibly, parent company Freeport-McMoRan Inc. is allowed to serve as the third-party guarantor for part of the financial assurance at the Chino and Tyrone mines. It is irresponsible to the public and to future generations to use a risky parent company guarantee to cover liabilities at Grant County copper mines that could leave the public sector bearing most of the cost of cleanup and reclamation should the parent company default.

The company says on its website:

> "FCX understands that effectively reclaiming disturbed land and *responsibly closing* (emphasis added) our mining and processing sites is critical to maintaining the trust of our local communities, governments, and other interested stakeholders, and as such, reclamation and mine closure processes are integral to our site planning and ongoing operations."[6]

Shirking responsibility for its environmental liabilities does not maintain trust and only furthers the public's distrust of the company.

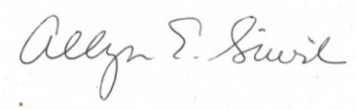
Freeport will reap tremendous profits given the importance of copper to the renewable energy transition. Goldman Sachs estimates that copper demand will increase by 600 - 900% by 2030, with prices reaching as high as $7.50/pound by 2025, spurring increased production.[7] Freeport cannot credibly use financial reasons to justify shifting responsibility for its environmental liabilities onto the public.

The company says that it is "Foremost in Responsible Copper." If that is true, then the company should take responsibility for its environmental liabilities and propose a cash trust, letter of credit or surety bond to cover the financial assurance for the Emma Expansion Project.

Finally, we reserve the right to request a public hearing under the Mining Act regulations NMAC 19.10.9.904E if any new information comes to light related to the financial assurance proposal, given that the form(s) of the financial assurance are not yet publicly available.

Thank you for your consideration of our input.

Sincerely,



Allyson Siwik
Executive Director

Cc: Jim Kuipers, Kuipers and Associates
Dylan Duvergé, Stratus Environmental
Holland Shepherd, EMNRD/MMD
David Ohori, EMNRD/MMD
Brad Reid, NMED/MECS

[6] https://www.fcx.com/sustainability/environment#mine

[7] https://www.goldmansachs.com/insights/pages/gs-research/copper-is-the-new-oil/report.pdf

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June 8th, 2022

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*Subject: Review of Hydrogeologic Report for the Proposed Emma Project*

Thank you for the opportunity to review the *Hydrogeologic Report for Proposed Emma Expansion Project* (report) dated October 22, 2021, prepared by DBS&A. The focus of this review is on potential pumping interference impacts by the proposed project on adjacent users of groundwater (e.g., Apache Mound Subdivision and others).

While the methodologies and assumptions used in the report are generally appropriate and standard in the industry, there is insufficient site-specific baseline data available to be confident in the results of the drawdown analysis provided for the nearest domestic wells. Furthermore, the report does not actually refute the concerns that neighboring domestic well owners could suffer impacts in the long term. DBS&A compares predicted drawdown (2 feet) to available water columns (100 feet or more at the time those wells were drilled), which suggests that the impacts from mine pit dewatering would be insignificant. This implies that changes in the total water column should be the metric by which to measure potential impacts; however, changes in the depth of water above the well pump (rather than the bottom of the well) is the more meaningful and appropriate metric. Assuming the 2-foot prediction is accurate, if any pumps in the domestic wells are currently set just below the pumping water level (which may be much lower than the static water level), even a decline of 2-feet could be significant (i.e., could require hiring a contractor to deepen the location of the well pump). Without current water level data at Apache Mound, or information about where pumps are set within each of the domestic wells, the report does not address the critical question of whether residents will suffer from loss of well yield over the long term because of mine pit dewatering.

Furthermore, given that there is only one long term record of water levels onsite and no long-term water level data for Apache Mound, we can only speculate as to the nature of the hydrologic connection (or lack thereof) between the two locations at this time. What is known—based on geologic mapping and borehole data—is that the dewatering sump within the open pit surface drainage area (OPSDA) would pump an appreciable amount of water from the same Precambrian granite aquifer accessed by most of the wells at Apache Mound. If DBS&A's estimate of groundwater inflow is accurate, it could represent a loss from the aquifer of up to 26 acre-feet per year (afy) initially during active mining, decreasing to an average of 16 afy post-closure. DBS&A uses a numerical model (MODFLOW) to estimate how this removal of water and resulting cone of depression would propagate, but validates the model with less than 10 years of data from only one groundwater well (MB-44). Well MB-44 is completed in a different geologic unit than that underlying the OPSDA, and the model doesn't accurately predict the general water level trend in MB-44.

My specific comments are provided below.

- **Section 3, first paragraph:** The report claims that Cherry Creek and Oak Grove Creek/Wash are ephemeral and disconnected from the groundwater aquifer. However, they are designated by the U.S. Geological Survey as intermittent creeks. The presence of two mapped springs along Cherry Creek means that certain reaches of Cherry Creek may have semi-permanent baseflow that consists of groundwater. Although such baseflow is likely minor or absent during periods of drought, it does indicate a hydrologic connection to the underlying groundwater.

- **Section 3, second paragraph**: The report claims that springs do not exist at Emma. While accurate, the report omits the presence of two mapped springs along Cherry Creek. The closest spring mapped by USGS is located roughly 2,000 feet south of the Emma Project boundary. The potential for long-term dewatering at the OPSDA to have an impact on spring flow is not addressed.

- **Section 4.1.1/4.1.2**: Given the importance of fracture-flow (i.e., secondary porosity) in how groundwater moves through the aquifer, there should be some site-specific information given about the prevailing geometry of fractures. Furthermore, site-specific evidence is needed to confirm whether mapped dikes and/or the Sprouse-Copeland Fault act as impediments to groundwater flow. Just because they act as such at the Little Rock/Tyrone mine doesn't mean they do at the Emma Project site. The increase in hydraulic conductivity values closer to the fault does not lend credence to the idea the fault acts as a groundwater barrier.

- **Section 4.2.1**: The potentiometric surface may not be representative of prevailing conditions, because it is based on only three monitoring locations, and more importantly, on just one snapshot in time (May 2021). Monitoring well MB-44 is completed in a different geologic unit (Tertiary quartz monzonite/granodiorite) than the OPSDA (Precambrian granite), raising the possibility that the potentiometric surface shown may obscure the effects of the geologic contact between the two units. There is no concurrent monitoring data at Apache Mound, which would be necessary to assess the presence or strength of a hydraulic connection between the OPSDA and Apache Mound wells. There is also no explanation given for the anomalous drop in water levels in MB-44 between 2007 and 2012.

- **Section 4.2.2**: Some of the pump tests were so short that the resulting hydraulic properties should be considered order of magnitude estimates. The wells were pumped at a much higher rate than their actual yield, preventing a longer more thorough test from being run. The transmissivity values are recognized as low, but were different by many orders of magnitude across the three wells tested, demonstrating the heterogenous nature of the aquifer. DBS&A didn't utilize observation wells during the pump tests, which would have improved the determination of hydraulic properties.

- **Section 4.2.3**: Table 1 does not include TSS, which is important to gauge compliance with 19 NM Admin Code 19.10.5.508 [Section B.(4)(b)]

- **Section 4.2.4/Appendix G**: The calibration period for the MODFLOW model ends in 2010, which happens to be during a period when MB-44 had an anomalous 10-foot decline in water level (the hydrograph is otherwise stable). Figures 3 and 4 in Appendix G of the report provides the only visual depiction of predicted versus observed groundwater levels. By including the anomalously low water level readings in MB-44 from about 2007 through 2012, it appears as though the model is accurately predicting a declining trend. However, the actual trend observed in MB-44 very stable. This casts doubt on the validity of model predictions.

- **Section 5.1.3**: The anisotropy of the aquifer is well demonstrated by the range of well yields and water levels apparent in OSE logs for domestic wells at Apache Mound (Appendix F), where yields are generally low (i.e., single digits), but up to 60 gallons per minute (gpm). The initial inflow rate of 16.3 gpm (decreasing to 9 gpm), with an average 10.2 gpm (or 16.4 afy) would be reasonable if one were to ignore the heterogenous nature of the aquifer. Since it cannot be predicted if high-yielding fracture zones would be intercepted, it would be prudent to assume a higher inflow rate, which would impact the drawdown analysis. It may be more accurate to use data about observed inflow rates in the neighboring mine pits rather than deriving an inflow rate from the MODFLOW model.

- **Sections 4.2.4, 5.2 and 6**: Presenting one scenario based on the extended MODFLOW model is misleading without a discussion of uncertainty. Until more data is gathered that further validates the MODFLOW model and confirms boundary conditions/assumptions, the results of the analysis should be considered highly uncertain. DBS&A should include a discussion of uncertainty, and present a range of possible outcomes (i.e., for pit lake, capture zone, domestic well interference impacts, etc.) based on that uncertainty.

- **Section 7**: There are no actual conclusions stated regarding impacts of water level drawdown on domestic wells or adjacent springs.

Despite the aforementioned comments, based on the general topography, geologic principles (particularly the presence of vertical dikes), and the distance to the nearest domestic well, it is reasonable to speculate that the risk of dewatering-induced well interference at Apache Mound is low. However, the report does not present sufficient baseline data and analysis to fully understand the presence or strength of the hydrologic connection between the mine pit and the nearest domestic wells, or to confidently conclude the closest wells would not experience impacts over the long term from mine pit dewatering.

## Recommendations

Based on review of the report and past experience, the following is recommended to ensure that the hydrogeologic environment at the Emma Project is fully understood, and that any adverse effects of pit dewatering on nearby domestic well owners are avoided:

- **Additional Monitoring Wells**: The Sprouse-Copeland Fault is a major geologic feature and model boundary condition at the Emma Project site. An additional monitoring well on the northwest side of the Sprouse-Copland Fault and a pump test (using Well No. 396-2021-02 as an observation well) would be recommended to evaluate whether or to what degree it acts as a barrier to groundwater flow (by comparing hydraulic properties and water level responses on either side of the fault). In addition, a monitoring well should be established at the Apache Mound Subdivision.

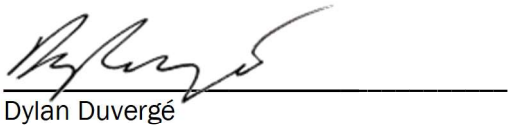
- **Apache Mound Well Subdivision Inventory/Survey**: The water level data used by DBS&A (i.e., OSE Logs) to evaluate drawdown impacts at Apache Mound is outdated. A survey of current water levels, as well as a determination of where pumps are set within each well column, would a) allow the determination of a quantitative threshold for impacts (based on the smallest distance found between pump and static water level), and b) help identify the most appropriate well to serve as a "representative" location for long term monitoring (most likely to be the closest domestic well screened in Precambrian granite).

- **Additional Baseline Water Level Data:** Water levels at the three quarry wells and at least one representative monitoring well at Apache Mound Subdivision should be concurrently monitored on a continual basis using pressure transducers to establish long-term water level trends, to further evaluate groundwater behavior under baseline conditions, and to better understand the hydrologic connection (or lack thereof) between the Emma Project site and Apache Mound. The baseline monitoring period can include the active mining phase, up until the dewatering sump becomes necessary (i.e., when the depth of the mining pit crosses the natural static water level).

- **Groundwater Monitoring and Mitigation Plan**: To protect the beneficial uses of water in the aquifer (i.e., domestic water supply and spring flow) it is recommended that a Groundwater Monitoring and Mitigation Plan be developed as a condition of the permit and implemented as soon as is feasible. The plan should a) synthesize relevant water level monitoring data gathered to date, b) conduct an analysis of groundwater level data together with meteorological data to describe how groundwater in the aquifer responds (or doesn't) to drought conditions, c) describe procedures for future monitoring of groundwater levels at both the mine pit and at Apache Mound Subdivision, d) identify the criteria used to determine when an impact is considered significant/substantial (e.g., loss of well yield), e) establish a quantitative threshold that would indicate whether well interference impacts are occurring, and f) describe the corrective actions that would be taken if monitoring indicates an exceedance of the threshold. Such actions could include temporary cessation of dewatering activities (if feasible), domestic well deepening or redrilling, and/or import of water from offsite sources.

To address further questions or concerns you may have, please don't hesitate to contact me at 575-342-1267 or dylan@stratusenviro.com.

Sincerely,



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September 6th, 2022

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**Subject: Groundwater Resource Comments for Emma Expansion Project (Permit No. GR010RE, Revision 21-1)**

This memo provides technical review comments related to operational and post-closure impacts to groundwater as requested by Gila Resources Information Project (GRIP) for Freeport-McMoRan Tyrone Operations (Tyrone) Permit Revision Application for the Emma Project Expansion (Project). Tyrone submitted the permit revision application to the New Mexico Mining and Minerals Division (MMD) Mining Act Reclamation Program in a letter dated October 22, 2021. Following updates and supplements in response to MMD and other agency comments, MMD held a public hearing on Tuesday, August 16, 2022, at the Grant County Veteran's Business & Conference Center to present information on Project and Closeout Plan and obtain public input. On July 22, 2022, the New Mexico Office of State Engineer (OSE) issued a public notice for Temporary Permit M-04979 for an Additional Point of Diversion of Groundwater in the Mimbres Underground Water Basin. This additional point of diversion (SP-05197-POD1) would be for a not-to-exceed amount of 116 acre-feet annually (AFA) (100 AFA groundwater and 15.7 AFA surface runoff) and represent an additional point of use for the existing right at M-04979, meaning both points of diversion combined could not exceed the existing right of 635 AFA[1].

Although the responsible regulatory agency with respect to groundwater rights is OSE[2], these comments pertain to NMAC 19.10.5.508, which besides requiring use of the most appropriate technology and the best management practices during mine operation and reclamation, also requires minimizing negative impact to the hydrologic balance. The MMD should recognize this standard and work with the NM OSE to ensure that operational and post-closure impacts to groundwater are addressed in the application and in future monitoring and mitigation. Besides water right issues under the purview of OSE, pit dewatering drawdowns could also have impacts to surface waters under the purview of NMED. There are two springs mapped by the U.S. Geological Survey along Cherry Creek—one located about 0.3 miles south and the other located 0.6 miles southwest of the Project's southern boundary. Both springs are mapped as supporting perennial flow (of up to 1,600 feet long) in downstream reaches. Neither of these springs, nor their potential to support perennial flow, have been acknowledged or addressed in Tyrone's discharge permit application (Part II.C.2) or any other document, including the hydrogeologic reports. The MMD should work

[1] JSAI (John Shumaker & Associates, Inc.) 2022. *Hydrogeologic Effects Due to Dewatering the Proposed Emma Open Pit Mine at FMI Tyrone Mining Operations*. Memorandum to Freeport-McMoRan Tyrone, Inc. Dated June 7, 2022.

[2] The New Mexico Mining Act does not specifically address surface and ground water quantity and likewise the New Mexico Environment Department through the Copper Rule does not address water quantity issues but rather water quality. The OSE is the responsible regulatory agency with respect to groundwater rights and therefore impacts to groundwater quantities/levels from mining activities from development through post-closure.

with Tyrone and NMED to address and resolve this factual inaccuracy in the renewal/modification application for DP-396.

Aside from the technical comments to follow, there are two central concerns with how Tyrone has portrayed its water use in regulatory permit applications and public hearings:

- **Pit dewatering is not temporary**. Tyrone claims it is applying for a temporary 10-year permit so that seepage and storm runoff "amounts can be adjusted based on operational experience over time" (OSE File No.4979). However, this does not reflect the reality that the additional point of diversion will have to be a permanent feature. It is critical for permit support documents to include the whole action, including its permanent nature, for OSE and ultimately MMD to make a fully informed decision. Because a pit lake cannot be allowed to form, Tyrone cannot adaptively manage its pumping volumes should "operational experience" show greater seepage volumes or unanticipated impacts. When the temporary 10-year permit expires, how could OSE practicably evaluate another renewal if there is evidence that adjacent water rights are being impacted? If Tyrone wants to adaptively manage its water use, it should apply for a permanent water right at M-04979, and concurrently implement a Groundwater Monitoring and Mitigation Plan (GMMP) designed to detect potential impairments to other water rights over the long term and commits to mitigating any impairments caused.

- **Pit dewatering represents an increase in consumptive water use**. Tyrone personnel claimed at the public meeting that the Project would not increase water use, relying on the fact that the total permitted diversion volume at M-04979 would not change. This makes convenient use of "paper water" to avoid having to give an actual (metered) water balance (inclusive of Tyrone's existing operations) demonstrating that Project-related dewatering would not increase the consumptive use of groundwater. Groundwater seepage estimates for the Emma Project have varied from 16.4 AFA[3] to 100 AFA[4], demonstrating the enormous uncertainty involved. The obvious question is if the Project does not increase water use as claimed, where in Tyrone's existing operation would 100 AFA of groundwater no longer be pumped? This basic information on the water balance is essential to addressing the hydrologic balance question under NMAC 19.10.5.508. Without it, the incremental and cumulative impacts of Tyrone's operations, inclusive of the Emma Project, on the underlying aquifer cannot be accurately evaluated.

Technical comments on Tyrone's evaluation of impacts to groundwater have been presented in a previous memo dated June 8th, 2022[5] as well as a presentation at the Project's public hearing[6]. The primary findings of these reviews are summarized as follows:

- **The analyses do not rely on a complete hydrogeological conceptual model**. Both analyses of groundwater impacts, one in support of the discharge permit[7] and the other in support of the OSE water rights

[3] DBS&A (Daniel B. Stephens & Associates, Inc.) 2021. *Hydrogeologic Report for the Proposed Emma Expansion Project*. October 22, 2021.
[4] JSAI 2022.
[5] Stratus Environmental, LLC. 2022. *Review of Hydrogeologic Report for the Proposed Emma Project*. Memorandum to Gila Resources Information Project. Dated June 11, 2022.
[6] Stratus Environmental, LLC. 2022. *Protecting Neighbor's Access to Water: Technical Review Comments on Emma Project Hydrogeological Assessments*. PowerPoint Presentation prepared on behalf of the Gila Resources Information Project. Dated August 16, 2022.
[7] DBS&A 2021.

application[8], simply extended existing groundwater model domains (from Tyrone's current operation including the Little Rock Mine) without developing sufficient baseline data specific to the Project site and rural residential areas to the south. Baseline data regarding groundwater levels and trends; boundary conditions (i.e., faults); fracture zones/orientations; and surface springs is inadequate to have confidence in the accuracy of the models used. Neither analysis acknowledged or evaluated the uncertainties inherent in model predictions, or in predicting groundwater flow in a highly complex and heterogeneous bedrock aquifer. Because of this and the differing assumptions use, the two analyses present substantially different predictions of drawdown.

- **Predicted drawdowns are compared to inappropriate thresholds for impairment**. Both analyses suggest drawdowns would have minor/negligible impacts by comparing the predicted drawdowns to the available water column in domestic wells, based on data from OSE logs which do not reflect current groundwater levels. OSE guidelines state that "the lowest practical pumping level (LPLL) is typically assumed to be 20 feet above the base of the water column for domestic wells *unless a different value is supported [emph. added]*."[9] Furthermore, it states that "It will be unnecessary to determine the dynamic drawdown for domestic wells if a minimum water column of 20 feet is assumed as the column required for operation (see Physical Drawdown Constraint section), *unless data availability allows the estimation of dynamic drawdown and other components affecting the lowest practical pumping level [emph. Added]."*[10] The extremely low domestic well yields, the resulting high dynamic drawdowns within them, and the availability of sufficient information to estimate those factors justifies a well-by-well determination of the LPLL rather than a blanket threshold. It is critical that these more appropriate thresholds be determined—based on measurement of current water levels and an inventory of existing wells (including pump setting)—in order to make a defensible determination of water right impairment.

Collectively, the aforementioned comments mean that substantial knowledge gaps persist within Tyrone's permit revision application with regard to groundwater resources. If these are left unaddressed, approval of the permit application, as-is (without additional revision or conditions of approval), means that dewatering impacts if they occur could not be corrected or reversed, given that once dewatering starts, it cannot be stopped.

## Recommendations

It is recommended that Tyrone prepare and implement a Groundwater Monitoring and Mitigation Plan (GMMP) that establishes current baseline groundwater conditions at rural residential properties to the south, proactively selects appropriate wells (i.e., from Tyrone's existing monitoring wells and select domestic wells) to monitor for potential impacts as mining progress, identifies appropriate water level thresholds for each monitored well (i.e., LPLL), and commits to corrective action should impacts be detected. At a minimum, this should include the following:

- Establishment of baseline conditions for as long a period as feasible prior to interception of the water table;

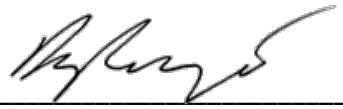
[8] JSAI 2022.
[9] Morrison 2017. *Guidelines for the Assessment of Drawdown Estimates for Water Right Application Processing*. New Mexico Office of the State Engineer, Hydrology Bureau Report 05-17. May 10, 2017.
[10] Ibid.

- A well inventory/survey at the Apache Mound Subdivision, Butterfield Trail and Collum Ranch that includes current static water levels and pump settings;
- Establishment of LPPLs based on actual well construction/operation, inclusive of dynamic drawdowns, and incorporating exercise of all domestic water rights;
- Identification of at least two representative monitoring locations: (1) closest to the Emma Project, and (2) the well within at least 2 miles whose current water level is closest to its LPPL;
- A plan of action to mitigate for any detected impacts (could include well deepening, water trucking, or other measures at FMI's expense); and
- Agency reporting and verification procedures.

NMAC 19.10.5.508.A requires that the "mining operation and the reclamation plan shall be designed and operated *using the most appropriate technology and the best management practices [emph. Added].*" GMMPs are best management practices that are standard in the industry and routinely utilized by permitting agencies nationwide to monitor and mitigate for potential drawdown impacts. For example, the U.S. Forest Service and Bureau of Land Management have both required GMMPs for projects that would pump far less water over much shorter timeframes and in situations where the nearest groundwater user was farther away. As one of many examples, nearly all renewable energy projects (both solar and wind) being permitted by the BLM are including GMMPs as mitigation measures despite these projects requiring very little water in the long-term.[11] The screenshot on the next page provides a current example from BLM's Record of Decision for the Crimson Solar Project.[12] When located in fractured rock aquifers with unpredictable groundwater flow it is even more critical to implement GMMPs in situations where residents rely on low-producing aquifers as their sole-source of water.

To address further questions or concerns you may have, please don't hesitate to contact me at 575-342-1267 or dylan@stratusenviro.com.

Sincerely,



Dylan Duvergé
Professional Geologist (CA License No. 9422)

[11] https://www.blm.gov/programs/planning-and-nepa/plans-in-development/california
[12] https://eplanning.blm.gov/public_projects/88925/200202547/20039043/250045238/Crimson%20Solar%20Project%20ROD_508.pdf

# Example of a mitigation measure / condition of approval that is protective of adjacent water rights

## Water Resources

WAT-1: **Groundwater Monitoring, Reporting, and Mitigation Plan.** If the Project Owner or its contractors will use groundwater pumped from any well (onsite or offsite) that extracts water from the Chuckwalla Valley Groundwater Basin (CVGB) or Palo Verde Mesa Groundwater Basin (PVMGB), then prior to such groundwater use the Project Owner shall retain a BLM-approved qualified hydrogeologist to develop a Groundwater Monitoring, Reporting, and Mitigation Plan (GMRMP), in coordination with the BLM, to ensure that groundwater wells surrounding the Project site and Project supply well(s) are not adversely affected by project activities. The Project Owner shall submit the GMRMP to the BLM for review and approval. Additionally, although no Groundwater Sustainability Agencies (GSAs) has been established for the Riverside County portions of the CVGB and PVMGB, in the event that such agencies have been established when the GMRMP is developed, the Project Owner also shall submit the plan to the GSAs. The Project Owner must obtain BLM approval for the GMRMP prior to the start of construction of any groundwater well or prior to the start of pumping from any existing well in the CVGB or PVMGB, and shall implement the approved GMRMP throughout any Project phase that pumps groundwater for consumptive use.

The GMRMP shall provide detailed methodology for monitoring site groundwater levels and comparisons for levels within the basin including identification of the closest private wells to the Project site. Monitoring shall be performed during pre-construction, construction, and operation of the project, with the intent to establish pre-construction and project-related groundwater level and quantitatively compared against observed and simulated trends near the project pumping wells. The GMRMP shall include a schedule for submittal of quarterly data reports by the Project Owner to the BLM and the GSAs, if established, for the duration of the construction period. These quarterly data reports shall be prepared and submitted for review and approval, and shall include water level monitoring data and effect on the nearest offsite private wells. The BLM and GSAs, if established, shall determine whether groundwater wells surrounding the Project site and Project supply well(s) are adversely affected by Project activities in a way that requires additional mitigation and, if so, shall determine what measures are needed. Examples of additional mitigation could include cessation of pumping at the Project site until groundwater levels return to levels that allow nearby wells to resume pre-Project pumping levels or compensation for whatever additional equipment is necessary to lower nearby pumps to levels that can adequately continue pumping, if approved by the BLM. After the completion of construction, the Project owner and the BLM shall jointly evaluate the





effectiveness of the GMRMP and determine if monitoring frequencies or procedures should be revised or eliminated.

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September 13, 2022

To: Allyson Siwik, Gila Resources Information Project

From: Jim Kuipers P.E., Kuipers & Associates

Re: **Technical Review Comments on Tyrone Emma Expansion Project Permit Revision Application, Closure/Closeout Plan, and Financial Assurance Cost Estimate**

The following comments are provided in response to Freeport-McMoRan Tyrone, Inc.'s (FMTI's) proposed Emma Expansion Project Permit Revision Application and Emma Project Closure/Closeout Plan (CCP)[1] which also includes a financial assurance cost estimate. The comments are relative to the requirements of the applicant under the New Mexico Mining Act Rules, 19.10 NMAC, and the Water Quality Act Rules, 20.6.2 NMAC.

**Permit Revision Application and Supporting Documents**

NMAC 19.10.5.508.A. **Most Appropriate Technology and Best Management Practices** requires that *The mining operation and the reclamation plan shall be designed and operated using the most appropriate technology and the best management practices.*

The International Council on Mining and Metals (ICMM)[2] and the Initiative for Responsible Mining Assurance (IRMA)[3] are primary examples of the most appropriate technology and best management practices as they apply to operational impacts to surrounding landowners and residences. ICMM's Mining Principles define good practice environmental, social and governance requirements for the mining and metals industry through a comprehensive set of performance expectations. IRMA's Standard for Responsible Mining defines good practices for what responsible mining should look like at the industrial scale. MMD, and FMTI, should both consider ICMM and IRMA as noted in our comments as examples of most appropriate technology and best management practices to address operational impacts from mining to surrounding landowners and residences.

The permit revision application addresses this requirement in Attachment 2. The attachment responds to this requirement by citing the Emma Material Characterization and Handling Plan, Emma blasting plan, and Tyrone Storm Water Management Plan. As noted in further comments herein, the application fails to recognize that the requirement for most appropriate technology and best management practices is not limited to addressing waste rock, providing a blasting plan, and storm water management, but should also be applied to all other aspects of their mining operations. In particular this should include those identified as part of Section 69-36-5.B of the Act:

[1] Golder Associates, *Emma Project Closure/Closeout Plan, Freeport-McMoRan Tyrone, Inc.*, November 12, 2021.
[2] https://www.icmm.com/
[3] https://responsiblemining.net/about/

*The mining operation site assessment for new and existing mining operations shall describe in detail the mining operation's existing permits and regulatory requirements pursuant to the standards for mining operations pursuant to existing state and federal environmental standards and regulations. To the extent that they are applicable, the permit applicant may incorporate documents on file with state agencies. The mining operation site assessment shall include:*

*( 1) identification of a proposed permit area for the mining operation;*
*(2) a description of the location and quality of surface and ground water at or adjacent to the mining operation and an analysis of the mining operation's impact on that surface and ground water;*
*(3) a description of the geologic regime beneath and adjacent to the mining operation;*
*( 4) a description of the piles and other accumulations of waste, tailings and other materials and an analysis of their impact on the hydrologic balance, drainages and air quality;*
*(5) an analysis of the mining operation's impact on local communities;*
*(6) a description of wildlife and wildlife habitat at and surrounding the mining operation and an analysis of the mining operation's impact on that wildlife and wildlife habitat; and*
*(7) for existing mining operations, a description of the design limits for each unit, including waste units, impoundments and stockpiles and leach piles.*

The following comments are intended to address particular aspects of the site assessment and the requirement for the use of most appropriate technology and best management practices, particularly with respect to Sections 69-36-5.B (4), (5) and (6) of the Act.

Fugitive Dust

In addressing requirement 69-36-5.B(4) with respect to an analysis of impacts to air quality, the Site Assessment Summary states “Tyrone’s Title V and NSR air quality permits contain requirements that ensure fugitive dust and other air pollutants do not violate State air quality standards.” It goes on to suggest that “These air quality limits are designed to protect the most sensitive members of the public, including the very young and elderly.”

The local community will potentially be impacted by fugitive dust emissions. Fugitive dust emissions can be reduced through application of most appropriate technology and best management practices. As suggested by Reed and Organiscak[4] and as identified by the Centre for Excellence in Mining Innovation’s Fugitive Dust Best Practices Manual[5] control measures to reduce fugitive dust emissions must take into account: a) identification and classification of fugitive dust emission sources; b) identification of the sources of fugitive dust emissions; c) fugitive dust characterization; d) development and implementation of the BMP plan; plus training and inspection/ maintenance.

IRMA’s Standard for Responsible Mining Chapter 4 Air Quality Requirements address the following:

1.3.1. Air Quality Screening and Impact Assessment

[4] W.R. REED AND J.A. ORGANISCAK, Haul Road Dust Control: Fugitive dust characteristics from surface mine haul roads and methods of control. https://stacks.cdc.gov/view/cdc/8897/cdc_8897_DS1.pdf
[5] http://www.cemi.ca/SustainMine/fugitive-dust-best-practices-manual/

1.3.2. Air Quality Management Plan
1.3.3. Air Quality Monitoring
1.3.4. Protection of Air Quality
1.3.5. Reporting

Specific to fugitive dust IRMA requires the following:

> 4.3.4.3. Dust deposition from mining-related activities shall not exceed 350 mg/m2 /day, measured as an annual average. An exception to 4.3.4.3 may be made if demonstrating compliance is not reasonably possible through ordinary monitoring methods. In such cases the operating company shall utilize best available practices to minimize dust contamination.

**Recommendations:**

- MMD should require that Freeport conduct an analysis of dust impacts on the local community.

- FMTI should comply with IRMA's Standard for Responsible Mining's Air Quality Requirements to address those impacts to surrounding landowners and residences by developing and submitting to MMD a formal dust control, monitoring and mitigation plan utilizing best practices. This formal plan should be incorporated into the Mining Act permit. The plan should outline the following: air quality monitoring plan; the dust control measures that will be implemented as part of routine operations; the ambient air quality concentrations or wind speeds that will trigger specific actions on the operator's part e.g., cessation of specific operations during a high wind event; a formal mechanism for community members to report problems; evaluation of mitigation measures; a reporting mechanism to inform the local community about performance of Environmental Management Systems to control fugitive dust and how grievances were mitigated.

- We also recommend FMTI install portable air monitors in areas where the public lives in close proximity to the mine site. I have found the Met One portable E-BAM PM monitor[6] to be one of the most effective, accurate, and easy to operate portable particulate monitors and have used it successfully for tailings fugitive dust monitoring in Montana. The E-BAM system offers the user real-time data reporting capability and links to EPA's AIRNOW website to provide the public with near real-time air quality information.

Economic Impacts Assessment

In addressing requirement 69-36-5.B*(5) an analysis of the mining operation's impact on local communities* the Site Assessment Summary cites a 1994 Site Assessment which focused on economic impacts. FMTI provided an Appendix A containing an updated Economic Impacts Assessment consisting of three pages of high-level economic data without any referenced source for the majority of the information provided.

Rather than an analysis of the mining operation's socio-economic impact on local communities, the information provided instead focuses solely on economic benefits.

[6] http://metone.com/air-quality-particulate-monitors/

As has been noted by Nautiyal and Goel (2021)[7]:

> "Socioeconomic impact assessment is a methodical procedure in which pros and cons for a whole community or various processes are shown and studied. The objective is to explore and evaluate the objective of a given plan/program along with associated eventual impacts (Ramanathan and Geetha, 2012). Basically in this technique socioeconomic cost is evaluated against the socioeconomic benefit. The method is used to evaluate the economic and social impacts associated with product and processes. Moreover, it tries to consider all types of social, economic, and environmental impacts and consequences for all users in a community or society. It considers the view of stakeholders and policy makers before making the decisions. In this method both items, that is, social and economic are incorporated in an environmental impact. The procedure allows one to recognize and include various impacts to make decisions; however, there are some constraints associated with it. If the potential impacts are found serious and adverse, then the assessment can aid the planner or developer in environmental impact assessment to find alternatives to mitigate or eliminate these impacts (Berkhout and Hertin, 2000). The important socioeconomic components are health and wellbeing, sustainable wildlife harvesting, land access and use, protection of heritage and cultural resources, business and employment opportunities, sustainability of population, services and infrastructure, ample sustainable income and lifestyle, etc. (Socio-Economic Impact Assessment Guidelines, 2007).
>
> The main aspect of socioeconomic impact assessment is that all identified impacts are expressed in economic terms. Therefore, this method may differ from other methods in the essence of scientific and technical prospect. Depending on the scope of the problem to be handled and data availability, socioeconomic impact assessment may produce different levels of outcomes that may somehow affect the decisions- and policies making processes. However, some constraints pertaining to prediction of impacts, their definition and evaluation, monitoring, application of specific methods, etc. still exist in socioeconomic impact assessment (Brandon and Lombardi, 2011). In addition, socioeconomic impact assessment tries to avoid and mitigate adverse impacts and gives a platform for planning to increase the favorable impacts associated with the proposed plan."

In FMTI's May 23 2022 FMI response #13 to MMD's question about why an assessment of negative economic impacts of the proposed Emma Expansion Project was not included, FMTI responded, "The only negative economic impact to the area Tyrone has identified would be caused by the delay or denial of the permit, which could cause premature closure of the Tyrone Mine and loss of the significant positive economic impact presented in the assessment."

There are a number of studies that demonstrate the economic impacts of adverse effects of hardrock mining on local communities.[8,9,10] For Freeport to claim that there are no negative socioeconomic impacts to local residents is wishful thinking at best

[7] Himanshu Nautiyal, Varun Goel, in Methods in Sustainability Science, 2021. https://www.sciencedirect.com/topics/earth-and-planetary-sciences/socioeconomic-impact

[8] Kim, H.S. and D. Harris. 1996. "Air quality and view degradations due to copper mining and milling: Preliminary analysis and cost estimates for Green Valley, Arizona." Nonrenewable Resources 5, no. 2: 91-102.

[9] Impacts of mining on property values in Kalgoorlie-Boulder, Western Australia https://www.sciencedirect.com/science/article/abs/pii/S0301420719308803

[10] The Value-Undermining Effects of Rock Mining on Nearby Residential Property: A Semiparametric Spatial Quantile Autoregression https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3064867

**Recommendation:**

- MMD should require FMTI to conduct an actual *analysis of the mining operation's impact on local communities* by requiring the company conduct a socioeconomic impact assessment consistent with the above cited information. MMD could include this requirement as a condition of the permit, and the condition should require the analysis to consider both the existing conditions as well as the additional impacts from the proposed Emma project and ways to mitigate those impacts. As noted by Mancini and Sala[11] there are a number of frameworks for conducting socioeconomic impact assessments. We recommend MMD require that the socioeconomic impact assessment recognize the requirements of the National Environmental Policy Act (NEPA) as best practice and that in particular the assessment should address Environmental Justice issues. As noted by EPA[12] "Generally, standard socioeconomic models are employed to predict shifts and changes in particular socioeconomic indicators such as employment, income levels, and housing quality upon a large geographical area or population center, often a standard, pre-defined economic trade area. The data and information provided as inputs to the model and assumptions made in employing the model (including economic conditions and multipliers) broadly characterize the entire population of the large geographical area or population center surrounding the proposed project. The results of these modeling efforts may include potential impacts to various categories within the overall population characterized by income level or by housing category. However. these models generally do not allow (or at least have not been used so as to allow) for a distributional analysis of potential impacts to specific communities, individual populations, or to small geographical areas." EPA recommends options to address this including developing an index or ranking systems for identifying and scoring potential disproportionately high and adverse effects to minority and/or low-income communities.

**Lighting Study and Viewshed Analysis**

FMTI also conducted a Lighting Study for the Emma Project CCP (*Lighting Study – EMMA Expansion Project, Closure/Closeout Plan*, Golder Associates USA Inc., November 3, 2021) and a Viewshed Analysis (*Viewshed Analysis – EMMA Expansion Project, Closure/Closeout Plan*, Golder Associates USA Inc., November 3, 2021) as part of meeting requirement 69-36-5.B*(5) an analysis of the mining operation's impact on local communities.*

The Lighting Study concluded that no light trespass is anticipated, and once constructed, the new light will not be perceptively different from the existing Tyrone Mine operations. The lighting plan assumed that the closest residence to the Emma project is 1 mile away, when in actuality it is a half mile away. The report concludes that given the distance of the Emma project from the closest residence that there won't be any light trespass. However, Freeport's Little Rock Mine had to mitigate light trespass on

[11] Mancini, L., and S. Sala, Social impact assessment in the mining sector: Review and comparison of indicators frameworks, Resources Policy, Volume 57, 2018, Pages 98-111, https://www.sciencedirect.com/science/article/pii/S0301420717301484

[12] Guidance for Incorporating Environmental Justice Concerns.in EPA's NEPA Compliance Analyses, EPA, April 1996. https://www.epa.gov/sites/default/files/2014-08/documents/ej_guidance_nepa_epa0498.pdf

residents at the Oak Grove Subdivision 4.5 miles away – 9 times farther away than the closest residence at the proposed Emma project.

Moreover, the study concluded that no mitigation measures were deemed necessary assuming the use of best lighting practices as implemented for the Tyrone Mine. However, the Lighting Study did not reference a lighting plan that outlines the best lighting practices used by Tyrone and what will be implemented at the new Emma project. Therefore, there is no way for the public to evaluate whether Freeport is currently implementing best lighting practices or what specific measures will be implemented at Emma.

The Viewshed Analysis concluded that the vast majority of visual impacts from the Emma project will be limited to a newly created line-of-sight with the top of the proposed EMW waste stockpile.

Lights and other visual impacts on the viewshed from the proposed mining operations will impact the local community. Mining operations in terms of lighting impacts are similar to that of other industrial activities. Mitigation measures for utility-scale energy projects can be used as an example of most appropriate technology and best management practices for industrial activities in general. As noted by Donaldson[13], visual mitigation measures for energy projects fall broadly into three categories: siting, design, and special circumstances. The measures are further described as:

- Siting measures for visual mitigation generally entail effective siting that either avoids visually sensitive areas entirely or limits the magnitude of visual impacts through locating the project so that it blends with its surroundings or is fully or partially screened from important views.
- Design measures for visual mitigation generally entail applications of various treatments, techniques, materials, or finishes that help blend project features with their surroundings or screen them from important views.
- Measures for special circumstances entail various techniques that may be applied in unique situations or limited areas to avoid, minimize, or offset visual impacts.

**Recommendations:**

- MMD should require a lighting plan as part of the application. The lighting plan should outline what best lighting practices will be used at Emma, a mitigation plan, and a formal grievance process that includes accountability to the local community.

- MMD should require FMTI to develop a formal written community impact mitigation with the backing of senior level management that provides detailed and publicly accessible information as to how open communications will be established, how concerns will be acknowledged and addressed, the process for problem solving, and how impacts will be mitigated or remedied. An example of a mitigation plan that provides the type of information recommended from the Stillwater Mining Company Northern Plains Resource Council Good Neighbor Agreement is provided as Attachment 1.

[13] Joseph J. Donaldson, MITIGATING VISUAL IMPACTS OF UTILITY-SCALE ENERGY PROJECTS, Visual Resource Stewardship Conference Proceedings https://www.fs.fed.us/nrs/pubs/gtr/gtr-nrs-p-183papers/23-donaldson-VRS-gtr-p-183.pdf

**Noise Study**

FMTI also conducted a Noise Study for the Emma Project CCP (*Noise Study – EMMA Expansion Project, Closure/Closeout Plan*, Golder Associates USA Inc., November 3, 2021) in addressing requirement 69-36-5.B*(5) an analysis of the mining operation's impact on local communities.* The study considered noise based on sound pressure level measured in decibels (dB). The study included baseline sound data from various monitoring locations surrounding the proposed Emma mine site.

The study concluded that noise generated from the Emma project would be "…well below all EPA and HUD guidelines for interference with human activities both outside and inside residences and buildings. The Emma Project, therefore, is unlikely to generate nuisance complaints or excessive noise negatively impacting the surrounding area." It goes on to suggest due to already existing nuisance noise from the mine and Highway 90 traffic, it is unlikely the Emma Project will generate noise complaints as operations fit in with existing noise sources in the area. As no adverse impacts were identified, no mitigation measures were proposed. The report assumed the use of best practices for operation and maintenance of noise generating equipment as implemented for the Tyrone Mine.

In response to MMD questions about blasting not being addressed by the Noise Study FMTI in their June 9 2022 response stated that "Blasting was not included in the noise model, consistent with standard practice for similar studies around mines." However, IRMA standards require that blasting is included in the noise study.

The local community has concerns with respect to encroaching mining and potential impacts from noise and blasting in terms of their safety, property, and quality of life. Current best practice recognizes that noise and blasting is a significant issue and that to address public concerns, and perception, it is an important part of being a responsible corporation and requires a reasonable and dedicated effort.

McKown[14] addresses the subject in great detail and provides the principals of blasting as well as identifying the impacts of blasting. He notes that blasting has multiple side effects other than flyrock, including vibrations, blast pressure, and permanent ground deformations, such as cracks or slides. He addresses the adequacy of the U.S. Bureau of Mines safe limits and addresses a number of protective measures and mitigations which might be used. This includes the need to provide for a public relations plan that includes meetings with residents to review blast impacts, mitigation measures, likely things they will notice when blasting takes place, and answer any questions or address concerns they might have. In addition, he recommends that pre-blast condition surveys take place and that there be periodic progress meetings with residents.

IRMA's Standard for Responsible Mining Chapter 4.4 Noise and Vibration is intended to provide measures to preserve the health and well-being of nearby noise receptors and the amenity of properties and community values, and to protect offsite structures from vibration impacts. It includes the following Noise and Vibration Requirements:

**4.4.1. Noise and Vibration Screening**

[14] http://www.brooklinema.gov/DocumentCenter/View/6563

4.4.1.1. The operating company shall carry out screening to determine if there may be significant impacts on offsite human noise receptors from mining project's noise and/or vibration. Screening is required at all new mines, and also at existing mines if there is a proposed change to the mine plan that is likely to result in a new source of noise or vibration or an increase in existing noise or vibration levels.

4.4.1.2. If screening identifies potential human receptors of noise from mining-related activities, then the operating company shall document baseline ambient noise levels at both the nearest and relevant offsite noise receptors.

**4.4.2. Management and Mitigation of Impacts on Human Receptors**

4.4.2.1. If screening or other credible information indicates that there are residential, institutional or educational noise receptors that could be affected by noise from mining-related activities, then the operating company shall demonstrate that mining-related noise does not exceed a maximum one-hour LAeq (dBA) of 55 dBA during the hours of 07:00 to 22:00 (i.e., day) and 45 dBA at other times (i.e., night) at the nearest offsite noise receptor. These hours may be adjusted if the operating company can justify that alternative hours are necessary and/or appropriate because of local, cultural or social norms.

4.4.2.2. The following exceptions to 4.4.2.1 apply:
a. If baseline ambient noise levels exceed 55 dBA (day) and/or 45 dBA (night), then noise levels shall not exceed 3 dB above baseline as measured at relevant offsite noise receptors; and/or
b. During periods of blasting the dBA levels may be exceeded as long as the other requirements in 4.4.2.4 are met.

4.4.2.3. If screening or other credible information indicates that there are only industrial or commercial receptors that may be affected by noise from mining-related activities, then noise measured at the mine boundary or nearest industrial or commercial receptor shall not exceed 70 dBA. 4.4.2.4. If screening or other credible information indicates that noise or vibration from blasting activities may impact human noise receptors, then blasting operations at mines shall be undertaken as follows:
a. A maximum level for air blast overpressure of 115 dB (Lin Peak) shall be exceeded for no more than 5 % of blasts over a 12-month period; b. Blasting shall only occur during the hours of 09:00 to 17:00 on traditionally normal working days; and c. Ground vibration (peak particle velocity) shall neither exceed 5 mm/second on 9 out of 10 consecutive blasts, nor exceed 10 mm/second at any time.

4.4.2.5. Mines may undertake blasting outside of the time restraints in 4.4.2.4.b when the operating company can demonstrate one or more of the following: a. There are no nearby human noise receptors that will be impacted by blasting noise or vibration;
b. Alternative hours are necessary and/or appropriate because of local, cultural or social norms; and/or c. Potentially affected human receptors have given voluntary approval for the expanded blasting hours.

4.4.2.6. If a credible, supported complaint is made to the operating company that noise or vibration is adversely impacting human noise receptors, then the operating company shall consult with affected stakeholders to develop mitigation strategies or other proposed actions to

resolve the complaint. Where complaints are not resolved then other options, including noise monitoring and the implementation of additional mitigation measures, shall be considered.

4.4.2.7. All noise- and vibration-related complaints and their outcomes shall be documented.

**4.4.3. Reporting**

4.4.3.1. When stakeholders make a noise-related complaint, the operating company shall provide relevant noise data and information to them. Otherwise, noise data and information shall be made available to stakeholders upon request.

We appreciate that FMTI has provided a noise study and blasting plan for the Emma Project. However, the blasting plan, and in particular when blasting will occur, has not been provided to the community. To the extent reasonably possible the blasting should occur at preset times more specific than "most often between 11am and 3pm." Additionally, will blasting happen Monday through Friday only or on weekends too?

Sound pressure levels resulting in decibel levels of noise is not a true measure of nuisance noise. It does not answer the question "Will the mine create "new" noise such as backup alarms audible to residents at night?" We also appreciate that FMTI has suggested it invites and receives open communications with neighbors to acknowledge and address their concerns, solve problems, and mitigate or remedy impacts, including noise.

**Recommendations:**

- Freeport should provide an updated noise study that includes the noise impacts of blasting.

- Freeport should provide a noise plan that outlines the best management practices that will be implemented at Emma, including best practices for operation and maintenance of noise generating equipment.

- MMD should require FMTI to develop a formal written community impact mitigation plan with the backing of senior level management that provides detailed and publicly accessible information as to how open communications will be established, how concerns will be acknowledged and addressed, the process for problem solving, and how impacts will be mitigated or remedied. An example of a mitigation plan that provides the type of information recommended from the *Stillwater Mining Company Northern Plains Resource Council Good Neighbor Agreement* is provided as Attachment 1.

**2.3.3 Climate**

According to Freeport, Phase 1 of the Precipitation Analysis required in the Tyrone discharge permit is completed. It is important that this information is provided as part of the CCP to evaluate designs for stormwater management.

See comments and recommendations re Section 4.1 EMW Waste and 6HW Waste Stockpiles, Stockpile Erosion and Drainage Control, 5.1 Stockpiles.

**2.3.7 Material Characteristics**

The extent to which the Emma project will become a future source of contamination that requires significant additional mitigation is in part determined by the recognition of the potential for acid drainage and metals leaching to occur as a result of waste rock placement at the Emma Project site. This is dependent on the characterization, identification and separation of potentially acid generating (PAG) material as described in Sections *2.3.7.1 Material Environmental Behavior* and *2.3.7.2 Material Segregation and Handling* of the CCP. The CCP suggests that 80% of the waste rock will be non-PAG waste rock and 20% will be PAG waste rock and the materials will be segregated, with any PAG waste rock going to the Tyrone Mine for storage with other PAG materials already being managed under the Tyrone Mine permit. The proposed material characterization and handling procedures are described in a recently completed plan by LCG that was included as an attachment to the DP-396 Permit renewal and modification application submitted to NMED in October of 2021.

We appreciate the work that FMTI and NMED have undertaken to recognize and address waste rock characterization and planning and the approach taken for the Emma project is consistent with best industry practice in terms of characterization as well as the approach to material segregation and handling. However, the approach is entirely dependent on the actual effective implementation of and strict adherence to the requirements of the plan so that PAG materials can in practice be segregated from non-PAG materials and properly directed to the Tyrone mine facilities.

**Recommendations:**

- NMED should require that FMTI conduct an annual audit of the material characterization and handling procedures implementation, quality assurance and quality controls, and effectiveness.

- NMED should also require that FMTI have an independent third-party audit performed for the same purpose at least every three-years. The third-party audits should include random field sampling of both placed PAG and non-PAG waste rock as a means of verification of the results.

- The audits should be provided to NMED and made available to the public.

**2.3.7.3 Borrow Materials**

According to the CCP, the average soil depth for the Emma Project ranges from 21 inches to 3 feet and the estimated volume of salvageable soil is 547,600 cubic yards (CY). The CCP goes on to say that the reclamation cover material (RCM) requirement for Emma is approximately 320,720 CY and any excess material will be available for reclamation of the Tyrone mine.

**Comments:** Further comments are provided on the proposed reclamation cover depth of one-foot that would be placed over the non-PAG waste rock that is reclaimed at the Emma Project in subsequent sections. However, specific to this section, the existing natural conditions at the site are dependent on the present geomorphology, vegetation and other pre-mining conditions at the site including soil characteristics including depth. Please explain why, particularly given the compromise of a one-foot reclamation cover as described later in our comments, the existing condition of from 21 inches to 3 ft of natural soil depth is not used as the basis for the reclamation cover, or all the reclaimed soil from the site would be used as the basis for the depth of reclamation cover, as might otherwise be expected if this new unit was not connected to the Tyrone mine?

**3.1 Emma Pit, 5.6 Water Management and Treatment**

We appreciate that FMTI has taken our recommendation and proposed to eliminate the multiple small open pit water sources that pose a risk to wildlife due to uncertain water quality. It should be noted however that our recommendations also included the main Emma Pit where according to the CCP a "pit sump" will be located. According to the CCP the pit water management sump is designed to minimize the size of the water surface, but still allow effective water management including large storm events.

**Recommendation:**

- In order to minimize risk to wildlife, workers, and the public, we recommend that FMTI eliminate the pit lake by backfilling it using coarse non-PAG waste rock to create enough void space to provide for effective water management including large storm events, and to maintain the level of the groundwater to maintain a hydraulic sink similar to what FMTI's pit sump accomplishes. Given the anticipated poor water quality of the Emma Pit water, it would be desirable to eliminate the potential impacts to wildlife by eliminating the open water feature. Any sump, but particularly one with a barge mounted pump, presents potential hazards to workers and serves as an attractive nuisance to wildlife. Our recommended approach would have the advantage in that access by wildlife, workers and the public would be eliminated. FMTI suggests a barge pump is the best system for maintaining an operational system for water management based on their experience, however we would note that many of the existing and future water management system features at Tyrone presently rely on standard groundwater pumping methods such as turbine pumps, and those same methods are utilized for pumping of water in sumps at Tyrone. These same concerns and suggestions are echoed by comments from the New Mexico Dept. of Game and Fish with regard to FMTI's proposed pit sump. MMD should require that FMTI further consider our recommendations by requiring FMTI to conduct a more detailed technical analysis that identifies and weighs the pros and cons of various methods to handle the Emma Pit lake. As this same issue exists for other potential pit lakes that have adverse water quality at the Tyrone as well as Chino mines, the study should be expansive and consider the same situation with respect to the end pit lakes and the minimization, if not elimination, of hazards to wildlife, workers and public safety.

**3.1.1.1. Water Balance Modeling Results**

According to the CCP, the estimated groundwater inflow rate decreases from 13.8 to 9.0 gpm. The CCP provides some limited description of the basis for the model used for the estimate (e.g., FAO-56 monthly Penman-Monteith method and climate data for the period 1981 through 2010) and suggests maximum annual and daily inflow rates.

**Recommendations:**

- According to Section 69-36-5.B of the Mining Act, "the mining operation site assessment shall include….an analysis of the mining operation's impact on that surface and ground water" and "an analysis of the impact on the hydrologic balance."

- Given the public's interest in and the importance of both the water balance modeling in terms of water use or consumption and impacts on hydrology, and recognizing climate change and its

potential impacts, the agencies should require that FMTI provide additional information and consideration of climate change with respect to this subject.

- Additional information on the model and climate data should be provided including how the model treats the data such as on an average basis or whether it utilizes actual past daily data, as the latter approach provides a much more realistic and useful climate analysis. Did the model include consideration of extended dry or wet periods and how and what (e.g., 100-yr, 1000-yr) storm events and/or dry and wet periods were considered in the model? Also, the agencies should require FMTI to utilize current climate data, such as an updated climate study that the agencies have already required for Little Rock, and not approve the Emma Project permit until that study is provided by FMTI and applied to Emma.

**3.2 EMW Waste Stockpile, 3.3 6HW Waste Stockpile, 4.1 EMW Waste and 6HW Waste Stockpiles**

According to the CCP, the EMW waste rock pile "will be used as a source of RCM for both Emma closure/closeout material needs and for the Tyrone mine in the future" (3.2) and "the materials in the stockpiles are valuable resources of RCM that will be available for use in reclamation of the southern mine areas of Tyrone in the future."

**Comments:** Please see comments on 2.3.7.3 Borrow Materials regarding reclaimed soils volumes and the use of excess reclaimed soils. It does not appear the EMW waste rock material is necessary as RCM for Emma, and unclear how the waste rock from either stockpile would be utilized at the Tyrone mine in the future. The CCP should provide further discussion of the potential uses of waste rock material at Tyrone and include a materials mass balance that shows how all mined and reclaimed materials would be redistributed pre-mining, during mining, and post-reclamation.

**4.1 EMW Waste and 6HW Waste Stockpiles, *Structural Stability***

The CCP contains the following description of the waste rock piles "The… stockpile will be… placed on 30-to-50 foot high lifts… at angle of repose that results in benches with overall slopes less than angle of repose with catch benches on each lift." It goes on to say that "The gross stability of the stockpiles at Tyrone was previously determined to be adequate and is expected to remain stable under post-closure conditions."

**Comments:** As a qualified professional engineer I am unable, without some assumptions, to understand the description of the stockpiles following dumping as provided in the CCP. It is unclear from the description, but might be assumed, that each stockpile lift will be backed off from the previously lift by an unspecified distance, creating a bench of an unspecified width, and that as angle of repose slopes assumed a stable shape, the benches would ensure the overall stockpile stability. FMTI should be required to further clarify their description and a figurative drawing showing what the piles would look like post-mining, and over time as they are geo-morphically reshaped. The basis for "gross stability" should be provided and explained in light of angle of repose by definition meaning that the slopes will waiver between stable and unstable for a long period before becoming permanently stable.

Is there some technique that they should be using to ensure slope stability?

**4.1 EMW Waste and 6HW Waste Stockpiles, *Stockpile Erosion and Drainage Control,* 5.1 Stockpiles**

The CCP describes storm water conveyance channels and down drains in addition to other engineered features, yet as previously noted in some past CCPs produced for Tyrone, the CCP does not identify in this section or elsewhere the design storm event for the drainage control system. Table 1-1 does suggest the intention is to address Copper Rule Section 20.6.7.33.A Design Storm Event in the Emma CCP in Sections 4.1, 5.1.2, and Table 4-1. However, the sections mentioned do not identify the design storm event required by the Copper Rule (e.g., 100-yr 24-hr).

**Recommendations:**

- It is our understanding based on financial assurance discussions of stormwater tasks, without that commitment being described or otherwise contained in the CCP, that Emma, Tyrone, and all of Freeport McMoRan Inc.'s U.S. mines are designed based on a 100-yr 24-hr design storm with an appropriate regional peak rainfall distribution. The agencies should require that the stormwater design basis be clearly provided where drainage controls are described in the CCP and as it applies to any other information contained in or supporting the CCP such as the pit lake water balance.

- The current NOAA statistics for storm events are not highly accurate and events greater than predicted for 100-year events have occurred on a much more regular basis than can readily be explained. We can argue as to the cause or whether meaningful predictions for the future can be made, but in our experience that would not lead to progress on this issue. Instead, we recommend that FMTI conduct an engineering trade-off and risk analysis that compares 100-yr, 200-yr, 500-yr, and potentially the PMF, and first consider the results internally, and then provide the study to the agencies and GRIP as justification for either the existing criteria or for new criteria. In light of climate change variables, we believe FMTI might realize internally that the incremental cost of constructing to a 500-yr design event offsets the potential risk to valuable assets and from a business standpoint, at least in some circumstances such as where conveyances are critical for the protection of covers or other reclamation features, application of a more conservative storm event should be performed. We also believe this is an example of where the Copper Rule and other regulations that include design criteria need to be revisited periodically to determine whether they reflect current regulatory and industry best practices.

- It is our recommendation that the MMD Director recognize that the current design standards in the NMAC are grossly inadequate to protect public safety as well as to ensure the mining facilities are not impacted by stormwater resulting in both property loss as well as potential water quality impacts as well as impacts to reclamation post-closure. Executive Order 11988[15] was issued "as part of a national policy on resilience and risk reduction" consistent with the President's Climate Action Plan. The resulting Federal Flood Risk Management Standard defines one way of determining a floodplain as "(iii) the area subject to flooding by the 0.2 percent annual chance flood." Given that New Mexico's existing stormwater design criteria are antiquated with regard to climate change considerations, we recommend that the NMED recognize a 500-yr storm event standard as a measure of risk reduction related to both public

[15] https://www.whitehouse.gov/the-press-office/2015/01/30/executive-order-establishing-federal-flood-risk-management-standard-and-

and worker safety as well as minimization of property damage. The MMD Director should require at least a 200-yr/24-hour storm event and preferably a 500 yr/24-hour storm event and should adopt it as an executive action given the department's direct experience with the current standard being inadequate and the Department's own frequent observations of significant stormwater events exceeding the 100-yr standard at mine sites in New Mexico.

- However, we would also note that as we have previously commented, others have found it is not possible to quantify the future effects of climate change on flood flows with any confidence, and instead have recommended an uplift of 10% to 20% applied to design storms or peak flows in response to this uncertainty (EGBC, 2018)[16]. If the agencies were to address the matter of climate change proactively, instead of the 100-yr 24-hr event presently used as the basis for the Copper Rule, they would adopt the use of a 200-yr 24-hr flood event going forward as the stormwater design standard.

- Additionally, we have noted FMTI's June 9, 2022 response to MMD – Response #10. As noted by MMD, "Page 21 of the CCP, states that stormwater will be controlled using conventional terrace channels integrated to down drains." Since these waste stockpiles have not yet been constructed and the EMW Waste Stockpile is largely in the New Unit area, was consideration given to using geomorphic regrading and drainage designs versus conventional terrace channels and down drains? Please explain why geomorphic designs were not proposed in the CCP for the EMW Waste stockpile." FMI responded with "Geomorphic designs may be considered during final design/Construction Quality Assurance Plan phase, not during the conceptual design as required in the CCP." FMTI's response suggests they do not understand or appreciate the concept of geomorphic reclamation as evidenced by their response and the fact that without question, the best time to consider geomorphic designs is during the conceptual design stage, so that in terms of dirt-moving and waste pile landform design it can be incorporated from the outset of construction. If consideration is only given at the final design stage, then the degree to which geomorphic reclamation can be implemented without significant additional cost is limited. Please find Attachment 2 which provides further information on geomorphic landform design. As MMD is aware, geomorphic reclamation is a best management practice for coal mine reclamation and this approach has been utilized elsewhere in NM for mine reclamation. MMD should require that FMTI seriously consider implementing geomorphic reclamation during the conceptual design phase.

**4.1 EMW Waste and 6HW Waste Stockpiles, *Stockpile Cover and Revegetation***

The CCP sheds some additional light on the use of waste rock for RCM, suggesting "…approximately 4 to 7 million CY of… material mined from the Emma Pit and stored within the EMW Waste stockpile have been conservatively identified for use as RCM and backfill at Emma." The CCP goes on to suggest "Since the material placed in both the 6HW Waste stockpile and EMW Waste stockpile is a valuable segregated resource for potential future RCM, Tyrone proposes to treat these stockpiles similar to the 9AX stockpile at Tyrone and the performance objective and design criteria would be the same until the stockpile material is evaluated and MMD has accepted the material as RCM."

**Recommendations:**

[16] Engineers and Geoscientists British Columbia (EGBC), 2018. *Legislated Flood Assessments in a Changing Climate in BC, Professional Practice Guidelines*. August 28. Version 2.1. British Columbia.

- The CCP should include a gross material balance and clarify what portion or percent of the EMW and 6HW waste rock piles might be used as RCM at Emma or elsewhere as reclamation materials. The CCP should also make it clear that if such activities were to occur, they would extend and change the period of post-reclamation activity. As the CCP raises the possibility, FMTI in the CCP should provide a description of how such activities might impact final reclamation of the Emma site, and provide a provisional time-frame for those activities if they were to occur. While in general the use of non-PAG waste material from the Emma project as reclamation material for Tyrone could have benefits for both sites, FMTI and the agencies should ensure that doing so does not come at the expense of impacts to the Emma project including an extension of the time during which additional impacts will occur on local residents.

- In this section and elsewhere in the CCP reference is made to utilization of a one-foot reclamation cover. The parties need to examine a particle size analysis of run-of-mine (ROM) open pit waste rock, which shows variability in size up to 3 ft or greater and consider the use of large equipment for cover spreading such as a D-10 dozer, and then explain from a practical standpoint how a one-foot cover is effectively implemented from a construction standpoint using ROM material. They should also provide examples of how successfully a one-foot cover has been at providing long-term revegetation and resisting erosion (e.g., for decades rather than only 12 years).

**4.2 Emma Pit**

The CCP does not recognize or address Emma Pit highwall stability. Over time the highwalls of the pit will assume a different geometry with some areas of the highwall failing more immediately and to a greater extent, while others will fail over a longer time period and to a lessor extent over time. This describes the post-mining geological evolution of the pit walls that can be expected to occur resulting in mass wasting into the pit, and extension of the pit perimeter. This will occur over time, but it may occur soon after mining ceases as provided in example contained in Attachment 3. These same attributes at nearly all open pits to varying degrees will result in safety related hazards for workers within and around the pit as well as the public despite signing or fencing, make pit water accumulation and management challenging if not problematic, and threatens the very concept of a self-sustaining ecosystem. This suggests a need for long-term care and maintenance to address the potential impacts of highwall stability.

Recommendations:

- MMD should require FMTI to produce a highwall pit stability and long-term subsidence report. The report should evaluate the potential for highwall failure and long-term subsidence and provide an estimate as to the eventual nature and extent of the pit features over time. The information should be used to develop mitigation plans and ensure funding in terms of financial assurance to address safety, operational, access and other issues that will result from subsidence of the pit highwalls post-reclamation.

**6.0 Closure and Post Closure Monitoring**

As noted in the cost estimate, the methodology used for closure/post-closure monitoring is consistent with the financial assurance resolutions agreed to by FMTI, the agencies and GRIP in 2019. Additionally,

Telesto Inc. performed the Emma cost estimate and, as FMTI's contractor, were highly involved in reaching the 2019 financial assurance resolutions. We have reviewed the cost estimate and find it is consistent with the agreed upon approach and estimates previously provided for the Chino, Tyrone and Cobre mines CCPs. We appreciate FMTI continuing this approach is we can defer any comments on the details of most aspects of the cost estimates to agency staff who are more familiar with the site-specific aspects of the Emma project.

Successful reclamation and closure/closeout of a metal mining site is rarely a one-time event resulting in a year-12 "self-sustaining ecosystem", but instead in nearly all cases, requires on-going monitoring, maintenance, and in some cases operations such as groundwater pumping and treatment, like for the Emma project, for thousands if not tens of thousands of years in the future. It is also necessary to ensure that future land uses that could compromise the required mitigation measures be controlled so as not to compromise the actions described in the CCP but also to protect public health.

The following comments specific to various sections in the CCP or otherwise, make recommendations intended to ensure that the agencies have a robust Closure/Post-Closure plan and the funds necessary to continue its implementation if, or realistically when, FMTI is no longer able to continue to conduct and fund the necessary tasks as described.

**6.1 Erosion and Drainage Control Structures**

According to the CCP, a contractor will conduct inspections and submit reports of the reclaimed facilities monthly for the first year and quarterly thereafter until the end of post-closure monitoring. Additional erosion inspections will also be conducted after a one-inch or more precipitation event within a 24-hour period. If there is evidence of excessive erosion and/or structural failures a written report detailing the nature and extent of the problem and a corrective action plan will be developed. The CCP describes the contractor as inspecting and maintaining "…all drainage channels, diversion structures, retention impoundments, and auxiliary erosion control features in accordance with professionally recognized standards, such as the Natural Resources Conservation Service."

**Recommendations:**

- The CCP should state that the corrective action plan will be approved by the agencies and implemented as soon as reasonably possible after it is developed. The CCP should also include the contractor inspecting and maintaining the soil covers that are intended to both support vegetation but also to limit infiltration of meteoric water through the underlying waste rock and minimize the contamination of groundwater and corresponding capture and treatment requirements.

- FMTI should provide the referenced Natural Resources Conservation Service (NRCS) professionally-recognized standards for inspection and maintenance applicable to engineered reclamation or remediation covers intended for source control purposes, as we would be very interested in applicable standards from NRCS, or any other reliable source, to address these matters.

**6.2 Groundwater and Surface Water Control Facilities**

According to the CCP, a contractor will perform quarterly inspections and annual evaluations of all groundwater abatement systems, including the Emma Pit dewatering system, and perform maintenance as necessary to ensure that all water contaminants are managed in a manner that is protective of groundwater quality. Contingency Plans and Emergency Response Plans have been prepared for addressing potential failures of individual components of the Emma closure plan, including an increase in the extent or magnitude of ground water and/or surface water contamination, potential failures associated with the Emma Pit dewatering system, and potential failures of various components of closed lands. A contractor will perform corrective actions.

Sampling will be conducted over the 100-year closure/post-closure period in accordance with the DP-396 Facility Monitoring Plan (DBS&A 2021c). According to the DP-396 application submitted by FMTI to NMED, the Emma Water Management Sump would be sampled annually in the third quarter of each year.

While we appreciate that Contingency Plans and Emergency Response Plans have been prepared for addressing potential failures of individual components of the Emma closure plan, they have not been identified as being applicable to the financial assurance estimate. Inevitably, no different than other maintenance, it will be necessary to implement various aspects of those plans to ensure compliance with DP-396. It would also be advisable to conduct preventative maintenance practices in order to minimize the frequency and cost of implementing the plans.

The rationale for only requiring annual sampling of the Emma pit sump in the third quarter of each year is not provided by FMTI in the DP-396 Facility Monitoring Plan. Sampling in the midst of New Mexico's monsoon season seems inadvisable given the variation of water input that could occur depending on when in the third-quarter sampling was performed. Instead, we recommend that sampling be performed twice annually, with one event in the second quarter prior to the monsoon season, and another in the fourth quarter following the monsoon season.

**Recommendation:**

- MMD should require that FMTI implement preventative maintenance practices in order to minimize the frequency and cost of implementing the Contingency and Emergency Response Plans.

**6.3 Post-Closure Monitoring of Ground Water and Surface Water**

According to the CCP, sampling for groundwater quality will be monitored throughout the post-closure period using the three existing monitoring wells at the Emma expansion area, and in any new monitoring wells installed after closure for compliance monitoring purposes. The monitoring will be done in accordance with the DP-396 Facility Monitoring Plan (DBS&A 2021c). According to the DP-396 application submitted by FMTI to NMED, groundwater would be sampled twice annually in the first and third quarter of each year. Surface water quality would also be sampled throughout the post-closure period according to the DP-396 Facility Monitoring Plan.

**Recommendation:**

See Section 8.4 below re cost estimate.

**6.4 Revegetation Success Monitoring, 6.5 Wildlife Monitoring**

**Recommendation:**
Both of these are tied to 12-year period and no post-closure. As discussed in comments on the cost estimate below, revegetation success monitoring and maintenance as required should be continued post-closure, and wildlife monitoring should likewise be continued post-closure beyond the 12-year period.

**6.6 Public Health and Safety**

The CCP describes berms and fences to accomplish this task. Quarterly visual inspections of the stability of the Emma Pit walls will be conducted to identify potential failure areas which may adversely affect the environment or public health. Areas of instability will be reported and mitigation measures proposed, and presumably implemented.

**Recommendation:**

See comments re cost estimate.

**8.4 Operation and Maintenance Cost Estimates**

The costs for long-term monitoring, maintenance and operations of the Emma expansion for a 100-year period are summarized in Section 8.4 as follows:

Earthwork O&M Cost Summary

| Item | Subtotal Direct Costs | Subtotal Indirect Costs | Total Current ($2021) Cost |
|---|---|---|---|
| Road Maintenance | $422,985 | $74,022 | $497,008 |
| Erosion Control | $99,273 | $17,373 | $116,46 |
| Vegetation Maintenance | $50,654 | $8,859 | $59,483 |
| Groundwater Monitoring | $1,569,636 | $274,686 | $1,844,322 |
| Total Earthwork O&M | $2,142,519 | $374,941 | $2,517,459 |

As noted in the cost estimate, the methodology used is consistent with the financial assurance resolutions agreed to by FMTI, the agencies and GRIP in 2019. Additionally, Telesto Inc. performed the Emma cost estimate and, as FMTI's contractor, were highly involved in reaching the 2019 financial assurance resolutions. We have reviewed the cost estimate and find it is consistent with the agreed upon approach and estimates previously provided for the Chino, Tyrone and Cobre mines CCPs. We appreciate FMTI continuing this approach as we can defer any comments on the details of most aspects of the cost estimates to agency staff who are more familiar with the site-specific aspects of the Emma project.

As important as the reclamation measures described in the previous sections are to the success of CCP's to ensure protection of water quality and other resources, ensuring there is adequate financial assurance available to monitor, maintain, operate and protect the performance of engineered source control measures, such as soil covers and storm water conveyances and ensure they prevent impacts from occurring in the future is equally important from a public interest and financial liability standpoint.

Successful reclamation and closure/closeout of a metal mining site is rarely a one-time event resulting in a year-12 "self-sustaining ecosystem" but instead in nearly all cases requires on-going monitoring, maintenance, and in some cases operations such as groundwater pumping and treatment, like for the Emma project, for thousands if not tens of thousands of years in the future. It is also necessary to ensure that future land uses that could compromise the required mitigation measures be controlled so as not to compromise the actions described in the CCP but also to protect public health.

The following comments specific to various sections in the CCP or otherwise, make recommendations intended to ensure that the agencies have a robust Closure/Post-Closure plan and the funds necessary to continue its implementation if, or realistically when, FMTI is no longer able to continue to conduct and fund the necessary tasks as described.

Diminishing Costs Over Time

As noted in Section 3.5 of the cost estimate, O&M costs are assumed to diminish with time and are allocated over time periods of years 0 to 19, 20 to 39, and 40 to 99, coinciding with the Tyrone Mine O&M. As we previously noted on the Tyrone Mine CCP cost estimate, this is the primary remaining area where we continue to disagree with FMTI, and the agencies, and that was not addressed by the 2019 FA resolution among the parties. There is no justification or rationale for the assumption that costs will diminish with time. They may diminish, increase, or stay steady – however there is no way to predict what will actually occur because no one has previously experienced or studied what happens to similar engineered controls over an extended period of time, and the controls are subject to a wide variety of environmental and physical circumstance which may affect their performance.

As has been the accepted norm by the agencies, the company can provide information in support of diminishing costs for monitoring, maintenance and operations in the future based on achieving water quality objectives. When those objectives in terms of water quality standards have been achieved, and only then, should an assumption of costs diminishing over time be accepted and incorporated into the financial assurance cost estimate. The approach taken by FMTI puts the risk of their assumption entirely on the regulatory agencies and public liability.

**Recommendation:**

- We recommend MMD, and in particular NMED as they will be the agency ultimately responsible for all long-term monitoring, maintenance and operations, take a conservative approach and not allow for the assumption of diminishing costs in the financial assurance estimate until such time as the assumption can be justified with results from the monitoring, maintenance and operation of the mine itself.

Road Maintenance

Road maintenance is assumed to be monthly during monsoon season (4 months/yr) and is assumed to consist of a motor grader for four hours per month.

**Recommendation:**

- FMTI should provide an inventory and map of the roads that would require maintenance and the cost estimate should be based on that information. Inherently the assumption of four hours per month, or sixteen hours yearly, does not seem adequate without additional information being provided.

Erosion Control and Monitoring

Erosion control and monitoring is estimated based on the cost of a crew engaged for four hours per year for years 0-19, three hours per year for years 20-39, and two hours per year for years 40-99.

The approach used by FMTI for erosion controls results in an annual cost of $1,532 for inspecting and maintaining "…all drainage channels, diversion structures, retention impoundments, and auxiliary erosion control features." In our experience the costs would not be adequate for inspections alone and are grossly inadequate to address the erosion control features listed on an annual "normal" basis, much less if a significant storm-event or other event occur compromising erosion controls. The costs do not include any materials or supplies. There is also no allowance for cover repairs in either this category or vegetation maintenance. This is also an area where we might expect costs to potentially increase over time as original measures constructed degrade and as erosional affects are compounded over time, particularly if preventative maintenance is not implemented, which is neither discussed or addressed in terms of costs.

**Recommendation:**

- We recommend using a more appropriate method of estimating the cost. FMTI should assume failure of 25% of the erosion controls every ten years, and failure of 10% of the cover system over the same period. This is also intended to at least somewhat address the potential for anthropogenic climate change to cause more frequent and severe storms. The total costs of the erosion controls and cover system could then be used to more realistically estimate the actual costs of repairs. If FMTI proves over time, such as the next 100-years, that this is not necessary, then in a less conservative approach may be justified.

Vegetation Maintenance

Vegetation maintenance of reclaimed areas assumes a 2% failure every year for a total of 12 years per facility.

At any time in the post-closure future the vegetation upon which engineered source control cover systems rely upon may be significantly compromised by weeds, drought, insects, fire or a combination of circumstances. It is also possible that the vegetation will evolve to a mono-culture or other outcome that no longer serves as a self-sustaining ecosystem.

**Recommendation:**

- The cost estimate should assume vegetation maintenance is required for the indefinite future until it is demonstrated for a period of at least 25 years beyond meeting MMD's 12-year criteria that it is no longer necessary. The cost of vegetation should also consider cover material enhancement or replacement as this might become necessary.

Water Quality Monitoring

The water quality monitoring cost estimate includes sampling and analysis of three monitoring wells, the pit sump, and two surface water samplers. The CCP suggests that additional monitoring wells may be added at closure.

**Recommendation:**

- The CCP cost estimate should assume, not only the additional monitoring of three new wells, but also the cost of drilling and completing the wells, as this is was not included in the cost estimate.

Contingency Plans and Emergency Response Plans

Continency Plans and Emergency Response Plans are described as critical components of the long-term CCP.

**Recommendation:**

- The agencies should require FMTI to provide cost estimates for Contingency Plan and Emergency Response Plan tasks and develop reasonable worst-case cost scenarios for implementation of the tasks. The costs should be scheduled in a conservative manner so as to ensure funds will be available in the future whenever their use may be required. The costs should consider preventative maintenance wherever practicable.

Public Safety

The CCP suggests inspections of the stability of the Emma Pit walls will be conducted to identify potential failure areas which may adversely affect the environment or public health and areas of instability will be reported and mitigation measures proposed, and presumably implemented.

**Recommendation:**

- The cost estimate does not include costs for inspections or for mitigation measures. FMTI should be required to develop reasonable worst-case cost scenarios for implementation of mitigation if required and that should form the basis of the financial assurance estimate. The financial assurance estimate, because it is difficult to predict the actual time when pit failures might occur, should assume the failure occurs in Year 1 of the estimate.

Long-Term Monitoring, Maintenance and Operations Conclusions

As suggested by our comments, the Emma project basis and cost estimate for the long-term monitoring, maintenance and operations is grossly inadequate to ensure the long-term viability of the mine sites reclamation and closure. As concerning as this may be for the Emma site and should be addressed, it presents an even more questionable outcome for the Tyrone and Chino mine sites, where a similar approach has been used.

**Recommendation:**

- As this same concern exists with many other sites MMD and NMED are presently administering under their regulations, NMED in particular should consider the development of financial assurance regulations and guidelines that specifically address the concerns raised in these comments.

**Attachment 1**

**Stillwater Mining Company Northern Plains Resource Council Good Neighbor Agreement, Appendix P, Hertler Mitigation Plan**

## APPENDIX P. HERTZLER RANCH PROPERTY AND PIPELINE MITIGATION PLAN

The SOC approved the final Hertzler Ranch Property and Pipeline Mitigation Plan. The final Plan is incorporated by reference herein as Appendix P.

# Hertzler Ranch Mitigation Plan

**by**
**Stillwater Protective Association,**
**Northern Plains Resource Council**
**and**
**Stillwater Mining Company**

**As part of the**
**Good Neighbor Agreement**

**May 14, 2002**

## 1.0 Purpose

This Hertzler Ranch Mitigation Plan has been developed in accordance with Section 13.11 and Appendix R of the Good Neighbor Agreement (GNA) by Stillwater Mining Company and Stillwater Protective Association, et al. (See Addendum A for relevant sections of GNA).

Mitigations for the Hertzler Ranch site are intended to: protect local residents from excessive noise, traffic, dust and nighttime illumination; preserve current use of the site by wildlife; reduce the likelihood of the spread of noxious weeds; maintain the predevelopment visual character of the site; and protect water and air quality from adverse impacts resulting from the construction, operation, and support of waste disposal facilities at the site, including the impoundment, pipelines, and land application disposal (LAD) systems.

The provisions are separate from and additional to mitigations required by SMC permits.

## 2.0 Provisions

Implementation of the Mitigation Plan is to take place by May 1st of 2001. In accordance with the GNA the parties agreed to address the following issues of concern in the Mitigation Plan:

1. Noise Pollution
2. Air Pollution
3. Water Pollution
4. Light Pollution
5. Traffic Congestion
6. Visual Impacts
7. Noxious Weed Impacts
8. Wildlife Impacts

The primary purpose of the Mitigation Plan is to:

> Minimize/manage the impacts associated with construction and operation of the Hertzler Ranch waste disposal facilities by implementing Best Management Practices (BMPs) and technologies to ensure that existing local resources are not unduly impacted by the facilities using every reasonable means possible.

## 3.0 Minimum Components

In accordance with the GNA the parties agreed to the following minimum components in the Mitigation Plan:

1. Establish the baseline conditions.

2. Establish specific, measurable performance objectives that are acceptable to NPRC/SPA and SMC. Oversight committee will resolve in case of dispute.
3. Establish trigger levels that indicate an exceedance of a performance objective.
4. Establish remedial actions that SMC must implement when a trigger level is exceeded that will return conditions to acceptable levels.
5. Establish criteria, including timeframes, for SMC to return conditions to acceptable levels.

## 4.0 Methods

The following general methods will be used to develop and carry out the mitigation plan:

4.1 Baseline Conditions. Baseline measurements or other suitable information will be established for each issue of concern to establish pre-development levels.

a. The purpose of baseline information is to establish a reference against which to measure and compare to baseline.
b. Baseline data must represent the site in its pre-operational state.
c. Baseline data must adequately characterize the site.
d. Existing information (such as from the EIS, Plan of Operations, Monitoring Data or other published source) may be used to determine baseline.
e. If sufficient baseline information is not available a "control" site will be established to allow a comparison of impacts with unimpacted or comparable areas.
f. Historical information from communities and individuals shall be considered.
g. All baseline information must be maintained in records accessible to the public.
h. If established procedures for collection and quality assurance/quality control of baseline data exist they shall be used.

4.2 Acceptable Level of Impact. Establish a level of impact above baseline pre-development conditions that is acceptable to the preservation of natural resources and potentially affected persons.

a. Establish air quality and water quality degradation limitations.
b. Survey potentially affected persons (Nye and Fishtail postal area) to establish their perceptions of values and acceptable/unacceptable impacts. SMC and Councils to jointly draft survey.
c. Identify and assess local land uses and resource values potentially impacted by issues of concern.
d. Conduct research from published sources on impact acceptance/unacceptance.

4.3 Establish BMPs. Research and determine reasonable Best Management Practices (BMPs) and technologies that might be used to address concerns.

a. Conduct research to establish potential BMPs and technologies relevant to issues of concern.
b. Establish those BMPs and technologies that are reasonable and should be included in initial Hertzler Ranch waste disposal site operations to address impacts in this plan.
c. Investigate and if reasonable implement those BMPs and technologies that might be used if necessary to better address issues of concern.

4.4 Action Triggers. Establish acceptable level and trigger actions to reduce impacts.

a. Establish action triggers at levels of unacceptable impact in order to prevent such occurrence.
b. Where reasonable include continuous monitoring and automated response to detect and minimize and/or correct exceedances of acceptable levels.
c. Provide a process where individuals can express to SMC management concerns and perceptions.

4.5 Action Implementation. Define those actions to be taken to address exceedances of acceptable levels and initiate a return to acceptable levels.

a. Establish audit procedure to be initiated when acceptable levels are exceeded.
b. Use qualified experts to review issues of concern, nature of exceedance, available BMPs and technologies, and make recommendations for mitigations.
c. Upon measurement or notification of exceedances, immediately return to acceptable levels or implement BMPs or technologies to return to acceptable levels. If immediate correction is not possible, establish and implement BMPs and technologies in the most expedient timeframe practically possible.
d. Provide short-term mitigations or relief where required in the plan.

4.6 Public Participation. Provide processes for potentially affected persons or parties to know about and participate in the implementation of the Hertzler Ranch Mitigation Plan by identifying issues of concern, and providing a means for public input directly to SMC management in order to voice issues and concerns.

## 5.0 Noise Pollution

| Background Condition | Action Trigger | Action | Implementation |
|---|---|---|---|
| • 40.0 – 108.6 dB (range at all monitoring sites from 30 October 2001 to 31 January 2002)<br>• During those three months the weighted 24-hour average noise level was 65.9 – 82.2 dB<br>• The 1998 EIS noted that noise was not measured on the Hertzler Ranch, but anticipated background noise of less than 50 dB which is consistent with undeveloped, rural sites.<br>• These measurements are meant to provide points of reference, not to preclude or trigger action. | • Any noise related complaint<br>• Complaint SMC related | • SMC initiates investigation to address source of noise pollution<br>• If immediate solution exists<br>• If no immediate solution exists | • Conduct noise investigation to ensure noise complaint is related to SMC activities, monitor if necessary, notify oversight committee of complaint and action.<br>• Terminate cause within 24 hours if practical or apply mitigation to reduce noise<br>• Contact Oversight members immediately, conduct internal investigation with SPA involvement, develop plan with timeframes for addressing cause of noise, report on implementation status at next scheduled meeting |
| | • Repeated noise related complaints after implementation of identified solution | • Contact Oversight members, terminate or reduce cause of noise – or identify phase-two solution | • Implement new solution or begin third-party audit plan within 30 days to make recommendations on the recommendation of the oversight committee members |
| | • Future planned noise | • If planned noise greater than baseline | • Defer to GNA oversight committee to develop mitigation plan including implementation of BMPs |

- A baseline monitoring plan (see Addendum B – Baseline Data, Noise) to monitor noise levels was developed to collect data on background noise and potential noise pollution from the operation and construction of the tailings impoundment facilities. Data on noise levels was collected on and around the Hertzler Ranch area and other comparison sites. Results of baseline monitoring for all sites are provided in Addendum B – Baseline Data, Noise.
- SMC shall implement BMPs during construction and operational activities to minimize noise pollution. Engineering noise reduction practices which may be implemented include: operating procedures such as proper maintenance of mechanical equipment, relocation of machine control systems, and use of noise barriers; administrative controls such as limiting hours of activity, and procurement of reduced-noise equipment; machine treatments such as vibration control, shields, enclosures, and silencers; room treatments to control reflected sound; and future best management practices.
- "A Best Practice is a process, technique, or innovative use of resources that has a *proven* record of success in providing significant improvement in cost, schedule, quality, performance, safety, environment, or other measurable factors which impact the health of an organization." (Source: BMP Center of Excellence, http://www.bmpcoe.org/faq/index.html)

## 6.0 Air Pollution

| Baseline Condition | Action Trigger | Action | Implementation |
|---|---|---|---|
| 20% or less opacity | >20% opacity | Implement BMP's | »within 30 days |
| • PM 10 baseline[1]<br>• no nuisance dust | • >20% opacity –Chronic exceedence – unaddressed exceedance for greater 30 days | • Implement additional BMP's and Install PM10 monitoring | »install PM10 within 30 days |
| | • >25% of PM10 Baseline | • address source of air pollution<br>  • if immediate solution exists<br>  • if no immediate solution exists<br>  • if pollution continues beyond 30 days | »terminate cause or apply other mitigation within 24 hours<br>»conduct internal investigation, report and make corrections within 30 days<br>»third-party audit to make recommendations within 30 days, implement mitigation within 30 more days |
| | >50% of PM10 Baseline | Terminate cause of air pollution or dust | »terminate cause or apply other mitigation within 24 hours<br>»conduct third-party audit to make recommendations within 30 days, implement mitigation within 30 more days |
| | future air pollution above baseline | If planned air pollution greater than baseline | »defer to GNA oversight committee to develop mitigation plan |

- A mitigation plan will be developed for future construction activities to ensure they do not result in unacceptable air pollution and nuisance dust impacts.
- SMC will conduct an investigation to substantiate and address nuisance dust reported by affected parties.
- Any new point source emissions from the Hertzler Ranch site will be addressed in the GNA.
- PM10 monitoring may be suspended at the discretion of SMC after a review of quarterly monitoring results documents a return to baseline conditions during any monitoring quarter.

[1] Section 3.4 Air Quality, Hertzler Tailings Impoundment FEIS (see Addendum B – Baseline Data, Air).

## 7.0 Water Pollution

Provisional language – to be replaced by Nye Project Baseline Water Quality Review report trigger level framework language approved by Oversight Committee or other modifications will be proposed and agreed upon.

| Baseline Condition | Action Trigger | Action | Implementation |
|---|---|---|---|
| Ambient surface water and groundwater quality values from EIS[2] | • >15% of ambient surface water confirmed by groundwater monitoring (> 2ppm Nitrate+Nitrite),<br>• any water pollution determined to cause negative impacts to fisheries or wildlife | • Address source of water pollution<br>• inform SPA<br>• if immediate solution exists<br>• if no immediate solution exists | »immediately<br>»terminate cause or apply other mitigation<br>»conduct internal investigation, and report within 15 days and implement corrections |
| | >50% of ambient surface water or groundwater values | • inform SPA<br>• emergency meeting and audit | »within 24 hours<br>»third-party audit to make recommendations within 15 days |
| | >Montana WQB-7 Aquatic and Human Health Water Quality Standards | • inform SPA<br>• emergency meeting and audit | »within 24 hours<br>»third-party audit to make recommendations within 10 days |
| | future water pollution above baseline | If planned water pollution greater than baseline | »defer to GNA oversight committee to develop mitigation plan |

- Water pollution provisions are also covered by Montana Water Quality Act, US Clean Water Act, MPDES permit and other requirements.
- The water pollution provisions of the Hertzler Ranch Mitigation Plan shall be consistent with the water program provisions of the Good Neighbor Agreement.
- An electronic database will be established and maintained of all historic baseline data and all data derived from SMC sampling and monitoring events. This will contain all baseline and operational water quality data for the Hertzler Ranch site. Councils will review the baseline water quality data. The review will examine the existing data and the baseline water quality conclusions in the EIS.

[2] Section 3.1.2 Surface Water Quality, Section 3.1.3 Groundwater, Hertzler Tailings Impoundment FEIS (see Addendum B – Baseline Data, Water).

## 8.0 Light Pollution

| Baseline Condition | Action Trigger | Action | Implementation |
|---|---|---|---|
| No nuisance lighting | Any verifiable report of nuisance light which is persistent and for which normal BMPs have not been implemented or have proven ineffective | • address source of light pollution<br>• if BMPs exist<br>• if no immediate solution exists | »terminate cause or apply other mitigation within 24 hours<br>»conduct internal investigation, report and make corrections within 30 days |
| | Repeated incidence of nuisance light (12 or more in any quarter) where normal BMP's have proven ineffective. | Conduct investigation | »third-party audit to make recommendations and implement mitigation within 30 days. |
| | future light pollution above acceptable levels | if planned light pollution greater than baseline | »defer to GNA oversight committee to develop mitigation plan |

- Current practices by SMC include the use of shielded lighting to minimize lighting impacts.
- Work in other areas where light is necessary will be provided by vehicles or temporary portable floodlights. Attempts will be made to minimize the impact of any/all lighting with the use of motion or time activated lights, operational controls and low-impact lighting.
- Actions will be taken to address any substantiated reports of nuisance lighting reported by affected parties.

## 9.0 Traffic

| Baseline Condition | Action Trigger | Action | Implementation |
|---|---|---|---|
| Existing traffic with mine related activities as measured at locations adjacent to the entrance to the Hertzler Ranch. | Operational traffic exceeding 10% of monthly average traffic along 420. | Implement Car-pooling, load consolidation or other applicable BMP's to reduce traffic | Within one week. |
| | Operational traffic exceeding 10% of quarterly peak traffic along 420. | Immediate action enforces car-pooling or other BMPs to reduce traffic. | Within one week. |
| | Construction traffic exceeding 15% of monthly average traffic along 420 during any month, or<br>Construction traffic exceeding 15% of monthly peak traffic along 420 more than twice during any month. | • Immediate action enforces car-pooling or other action to reduce traffic<br>• Defer to GNA oversight committee to develop mitigation plan | Within one week<br>Within 30 days |

- Existing traffic at the Hertzler Ranch is monitored with a Diamond Inductive Loop (TT-21) Traffic Counter. These counters are located on county road 420, and at the Hertzer Ranch access road. See Addendum B – Baseline Data, Traffic.

## 10.0 Visual Impacts

| Baseline Condition | Action Trigger | Action | Implementation |
|---|---|---|---|
| • no significant new visual impacts as viewed from valley floor or public travelways and roads.<br>• maintain rural landscape as it applies to the Partial Retention Objective | Planned construction that is not currently permitted and is not required to implement plans or mitigate impacts. | Notify SPA | defer to GNA oversight committee to develop mitigation plan |
| | New visual impacts identified by SPA which have not been previously approved under Plan of Operation or permit and is not required to implement plans or mitigate impacts. | Notify SMC | defer to GNA oversight committee to develop mitigation plan |
| | Future aesthetic impacts including those presently permitted/planned where interim reclamation and/or standard BMP's are not sufficient to mitigate visual impacts. | Notify SPA or SMC | »defer to GNA oversight committee to develop mitigation plan |

- The visual impact provisions of the Hertzler Ranch Mitigation Plan shall be consistent with the paste technology development and reclamation and closure plan provisions of the Good Neighbor Agreement.
- According to the EIS[3], the Visual Quality Objective (VQO) for nearby forest lands to Hertzler Ranch area is Partial Retention. Partial Retention means man-made alterations already exist in the area, but the natural appearance of the landscape is the dominant factor. Under the Partial Retention objective, management activities may introduce new form, line, color, or texture, but the changes should strive, to the degree reasonable, to blend into the existing landscape.
- An interim reclamation plan will be developed for future tailing impoundment reclamation and construction activities to ensure that the disturbed area be concurrently reclaimed and otherwise managed to minimize visual impacts.

[3] Section 3.7.1 Visual Resources, Hertzler Tailings Impoundment FEIS (see Addendum B – Baseline Data, Visual).

## 11.0 Noxious Weed Impacts

| Baseline Condition | Action Trigger | Action | Implementation |
|---|---|---|---|
| Some noxious weeds present, including spotted knapweed, houndstongue, black henbane, leafy spurge, Canadian thistle, and field bindweed[4] | • Verifiable increase in noxious weeds. | • Annual survey and control application.<br>• Management methods should include grazing, use of biological methods and spraying if necessary. | Develop plan to accelerate and increase combination of control methods and/or initiate alternative BMPs.<br><br>Annually »conduct chemical application if warranted. |
| | Verifiable increase in noxious weeds where over a three year period standard BMPs and chemical applications have proven ineffective. | Annual survey and control application. Consult with state, local, federal and private weed experts. Evaluate new methods. Management methods may include spraying, grazing with sheep, use of biological pests. | Accelerate applications of control methods and chemical and/or initiate alternative BMPs. |
| | • Cessation of pivot operations | • Maintain and/or establish vegetation consistent with post closure use | Monitor for weeds and evaluation of preferred growth for at least five years. |

- The noxious weed impacts provisions of the Hertzler Ranch Mitigation Plan shall be consistent with the reclamation and closure plan provisions of the Good Neighbor Agreement and with SMC's County Weed Plan.
- All heavy equipment (earthmoving) brought from the mine or from elsewhere must be washed before entering the Hertzler site to prevent infestation, and only certified weed free seed can be used. All contractors will be informed as to the need to conduct weed control procedures and receive information (see Addendum B – Baseline Data, Noxious Weeds).

[4] Section 3.9.2 Vegetation, Hertzler Tailings Impoundment FEIS. Additional baseline vegetation data is contained in Western Technology and Engineering Inc. 1996. Baseline Vegetation Inventory: Stillwater Mining Company Hertzler Tailings Facility and Tailings Line – 1996. Helena, MT (see Addendum B – Baseline Data, Noxious Weeds; also see Baseline Hertzler Weed Map (1992 and 2001 data)).

## 12.0 Wildlife Impacts

| Baseline Condition | Action Trigger | Action | Implementation |
|---|---|---|---|
| No project related wildlife impacts resulting from the operation of site facilities or equipment. | Any demonstrable negative impact to wildlife or wildlife mortality resulting from the operation of site facilities or equipment. | Address source of wildlife impact or mortality. | » terminate cause or apply other mitigation within 24 hours |
| | Repeated demonstrable negative impact to wildlife or wildlife mortality resulting from the operation of site facilities or equipment. | Correct action, or terminate cause of wildlife impact or mortality. | » either within 30 days. |
| | Excessive demonstrable negative impact to wildlife or wildlife mortality (more than 12 times in any quarter) resulting from the operation of site facilities or equipment. | Consultation with SPA and MFW&P and/or US FWS. | » within 30 days. |

- According to the EIS[5], two high-interest species occur at the Hertzler Ranch, bighorn sheep and mule deer. No sightings of bighorn sheep have been recorded at the Hertzler Ranch area. For the purposes of this plan, the existing information used in the EIS will serve as baseline population information. SMC will notify NPRC/SPA of any demonstrable wildlife impacts or mortality within 72 hours.

[5] Section 3.2 Wildlife, Hertzler Tailings Impoundment FEIS. Additional baseline wildlife data is contained in Western Technology and Engineering Inc. 1996. Terrestrial Wildlife Reconnaisance: Stillwater Mining Company Hertzler Tailings Facility and Tailings Line – 1996. Helena, MT (see Addendum B – Baseline Data, Wildlife).

## 13.0 Public Participation Plan

- Historical information from communities and individuals shall also be considered..
- All baseline information must be maintained in records accessible to NPRC and SPA.
- Survey potentially affected persons (Nye and Fishtail postal area) to establish their perceptions of values and acceptable/unacceptable impacts.
- SMC to provide for contact number and procedure for registering/responding to public questions or notice of issues.

**Attachment 2**
**Geomorphic Landform Reclamation**

**Questa Mine Rock Pile Landform Reclamation Option**

**Introduction**

Members of the TWG have recommended that "landform reclamation" be considered for the Questa Mine rock pile re-sloping alternatives developed by the Design Team on behalf of CMI. Landform reclamation involves the use of geomorphic design principles for regrading and reshaping the rock piles to mimic natural local landform features. Landform grading can potentially lead to improved stormwater and erosion control, and revegetation success on the re-sloped piles. The underlying principles and examples of the approach were presented by Horst Schor to the TWG and Design Team at Meeting #5 (July 23-25, 2013). At the time, it was agreed that this approach was to be recommended, but that it did not have to be addressed as a stand-alone option for purposes of the TWG evaluations. Rather landform reclamation was viewed by the TWG as a fine grading detail that could be incorporated into any of the final options if appropriate.

With the objective that landform grading be adequately documented as a TWG recommendation for rock pile remediation, it is addressed specifically through this supplemental memo to the final TWG report. Our concern, which is the rationale for preparing this memo, is that landform grading is distinct from both the geotechnical stability issues and considerations, which were the focus of the TWG, as well as from the cover and revegetation considerations which are the focus of separate investigations by others. Landform grading is therefore in a sort of "no man's land" with respect to the conventional engineering and reclamation studies that are being done at the Questa Mine. This memo is intended to emphasize that landform grading is considered by some members of the TWG as key to the long-term success of rock pile reclamation, and to encourage its implementation on the Goathill North pilot project and ultimately on the other rock piles.

**Executive Summary**

The Questa Mine rock piles present a challenge from a reclamation standpoint in terms of slope length, steepness, underlying scar and steep slope areas, and lack of ideal cover material for revegetation and erosion control. These challenges are compounded by a severe southern aspect for many of the rock piles and a climate prone to high-intensity but unpredictable weather events. The efforts of the TWG have been focused on addressing geotechnical slope stability and have only tangentially addressed covers and revegetation relative to stability. In focusing on geotechnical stability, the TWG considered landform design but decided to incorporate it as a secondary consideration associated with overall rock pile reclamation design objectives. It was agreed that, for purposes of the TWG process, landform grading principles would be considered as "finish grading" details that could be deferred to final design and applied to any of the identified options carried forward following the TWG process. Given that the rock pile design approach with respect to the TWG effort is an engineered design with geotechnical stability as the primary objective, it does not necessarily achieve all the closure objectives contained in the site ARARs, particularly with respect to the New Mexico Mining Act in terms of long-term sustainability.

Landform design represents an opportunity to use state-of-the-art geomorphological reclamation approaches to achieve both better revegetation and reduced erosion by mimicking the natural environment. Under conventional, agricultural-based approaches to reclamation uniform, evenly graded engineered slopes are typical. It has been shown, however, that the replication of mature and relatively stable natural geomorphic land forms, with all their variability and irregularity, can reduce the risk of

erosion while increasing the likelihood of both successful initial propagation of plants and sustained revegetation success over the long term. The principles of landform reclamation are compatible with standard engineering approaches as well as the stakeholder approach incorporated by CMI in creation of the TWG. However, the designers require a high level of understanding of geomorphic science and could be aided by incorporation of models designed for this purpose. In addition, absent the presence of revegetation success in prior test plots and lacking truly meaningful data from the new test plots for decades in the future, the presence of existing vegetation at the Capulin pile in particular should be further researched in regard to landform design principles and what it might tell us in terms of both approach and expectations.

Ultimately, the application of landform reclamation at Questa will require some compromise of both standard engineering approaches and strict regulatory interpretations, combined with a willingness by CMI to undertake a "leap-of-faith" and take the risk in demonstrating this approach. Given the site-specific challenges at this site, some members of the TWG strongly encourage the application of landform design on a pilot scale. The Goathill North (GHN) rock pile presents an ideal opportunity to implement landform design on a full-scale project. We strongly recommend and advocate that a detailed landform design be developed and implemented as part of the GHN pilot project reclamation process.

**Background**

As noted by Ayres et al (2006)

> "*Historically, final landforms for waste rock stockpiles consist of linear (in plan), planar slope surfaces with unvarying gradients and angular slope intersections. Slope drainage structures are generally oriented along contours and are highly engineered, while revegetation efforts follow artificial configurations. By contrast most natural slopes are characterized by a variety of shapes (typically concave), and drainage systems follow natural drop lines with catchment sizes defined by undulating relief on the slope. Vegetation on natural slopes grows in discrete vegetation units that are adjusted to hillside hydrogeology, incident solar radiation, and other microclimate effects.*
>
> *This lends itself to uniformity of design and construction, but does not necessarily achieve the mine closure objectives of minimum erosion and long-term sustainability (Sawatsky et al., 2000). Uniform landforms represent immature topography, and are poised to evolve to lower energy states by shallow slope failures or accelerated erosion. In contrast, the development of a sustainable landscape for mine closure involves the development of landforms that replicate natural landscapes. The replication of mature and relatively stable natural systems reduces the rate and risk of accelerated erosion. It also encourages replication of the self-healing erosion control systems that help preserve the stability of the natural analogue (Sawatsky et al., 2000)*."

For example, at Questa the ROD requires the following: "Each rock pile re-contouring will be initially designed to a minimum interbench slope of 3H:1V or up to 2H:1V, with slope break lengths provided approximately every 100 to 200 feet (i.e., designed to achieve the shallowest slope practicable between 3H:1V and 2H:1V)." However, Hancock et al. (2003) noted that these type of features are prone to failure and if failure occurs water is channeled into concentrated flow paths and can lead to severe gullying and even localized slope failure. This type of failure and effect has been noted by the TWG

during a 2015 site tour at the Questa rock piles on recently regraded areas both at Sugar Shack West and Goat Hill North.

**Principles of Landform Reclamation**

Ayres et al (2006) proposes the following general approach and guidelines for waste rock pile landform reclamation.

"The following generalized approach is proposed for developing a sustainable final landform design for existing waste rock stockpiles:

1. Determine the final land use for the rehabilitated site through consultation with all stakeholders, and an assessment of potential geologic or structural control elements for the landform;
2. Observe and collect data on a nearby natural landscape (a natural analogue) to determine hillslope forms and gradients, soil and vegetation types, drainage density, and watershed characteristics;
3. Determine the long-term eroded profile for the various slopes of the existing stockpile through erosion and landform evolution numerical modeling;
4. Based on the maximum slope length and gradient as determined from Steps 2 and 3, design a methodology for reshaping the existing stockpile to conform to these requirements (a horseshoe-shaped landform, which creates a small well-defined catchment, can be effective in reducing slope length and gradients without changing the footprint of an existing stockpile)
5. Design a surface water management system to safely convey meteoric water off the final landform, and ensure runoff reaches final discharge points in volumes and at velocities that will not cause unacceptable erosion or sedimentation;
6. Develop a final landform design following completion of Steps 2 to 5 inclusive, taking into consideration the long-term safe storage of reactive or hazardous materials.
7. Develop a revegetation plan suitable for the swales and ridges in the final landform based on data collected in Step 2; and
8. Review the final landform design with key stakeholders for general acceptance prior to implementation."

"The following guidelines are proposed to aid in the development of a sustainable final landform design for waste rock stockpiles.

- Design the final landform using natural analogues as described in Keys et al. (1995). The reclaimed landscape can be no more stable than the adjacent undisturbed landscape; therefore, the designer can assume that the reclaimed area will be less stable and design accordingly, with gentler slopes, higher density drainage and smaller drainage basins.
- Maintain the final landform height and slope angles for stockpiles in areas of low relief as low as possible. Where slopes compatible with the surrounding landscape cannot be achieved, an attempt should be made to visually soften steeper areas by avoiding straight "engineered" ridges and sharp changes of angle, and by careful planting of trees to break up views of the horizon (Environment Australia, 1998).
- The preferred reclaimed slope design is a "spur-end" slope plan with a concave or complex (convex-concave) profile. The use of terraces or contour banks should be avoided. It is very difficult in practice, particularly for stockpiles with long slopes, to construct concave slopes with

continual curvature on a waste rock stockpile. However, hillslope curvature can be obtained using a series of linear slopes or slope facets as shown in Fig. 3. Hancock et al. (2003) demonstrated through simulations with a landform evolution model that there is minimal difference in sediment loss between a hillslope constructed of linear facets and that constructed from continual curvature.

- Erosion and subsequent evolution of the proposed final landform design(s) should be predicted over a period of at least 100 years using state-of-the-art software packages.
- The thickness of earthen covers designed to minimize the entry of atmospheric oxygen and/or meteoric water to reactive or hazardous material should not only be based on soil-atmosphere numeric simulations, but should also take into consideration the predicted long-term erosion from the final landform (e.g. see Ayres et al. (2005)).
- The design of surface water drainage courses should be based on the discharge and sediment load of the receiving stream(s). Drainage channels used to convey surface water off the top of the landform should follow the slope gradient of the final landform as much as possible. The use of imported substrate as well as man-made materials such as pipes, gabions, and concrete should be avoided whenever possible.
- Design conservatively to account for excessive erosion resulting from extreme climatic events and differential settlement in the reclaimed landform.
- Reclamation of large waste storage facilities should include the construction of small lakes and wetlands upstream of final surface water discharge points, provided they are geomorphically compatible and stable. Such features will attenuate surface runoff to reduce peak flows and increase sedimentation prior to reaching receiving streams (Sawatsky, 2004)."

**Landform Reclamation Examples**

At La Revilla in Spain the principle was applied in 1995 and thirteen years of monitoring was reported in 2009 by Duque et al. The geomorphic model used had two very different sectors and objectives:

" (i) the highwall-trench sector allows the former quarry face to evolve naturally by erosion, accommodating fallen debris by means of a trench constructed at the toe of the highwall; (ii) the concave-slope base sector, mimicking the landforms of the surrounding undisturbed landscape, promotes soil formation and the establishment of self-sustaining, functional ecosystems in the area protected from sedimentation by the trench. The model improves upon simple topographic reconstruction, because it rebuilds the sutficial geology architecture and facilitates re-establishment of equilibrium slopes through the management and control of geomorphic processes.

Thirteen years of monitoring of the geomorphic and edaphic evolution of La Revilla reclaimed quarry confirms that the area is functioning as intended: the highwall is backwasting and material is accumulating at the trench, permitting the recovery of soils and vegetation on the concave slope. However, the trench is filling faster than planned, which may lead to run-off and sedimentation on the concave slope once the trench is full. The lesson learned for other scenarios is that the model works well in a two-dimensional scheme, but requires a three-dimensional drainage management, breaking the reclaimed area into several watersheds with stream channels."

**Additional Observations**

The following information from Ayres et al (2006) is analogous to the Questa site.

“Vegetation on natural slopes grows in discrete vegetation units that are adjusted to hillside hydrogeology, incident solar radiation, and other microclimate effects. Trees and shrubs are concentrated in concave areas, where moisture conditions are higher, while grasses / legumes generally dominate the drier convex portions.

Examination of analogues like Mount Wilkinson near Wiluna, Western Australia shows there is little vegetation or topsoil to be found on the upper sections of natural slopes. It is only once the slope flattens out in the lower third of the slope that vegetation approaches the density of the surrounding flats and that topsoil is found. The upper two-thirds of the slope are characterized by surfaces that are well armored and consist of coarse particles, any fines are found below this layer of coarse material.”

“The inventory shows that the greatest physical risk to the landscapes is associated with gully erosion and re-established surface water drainage courses. Gully erosion poses the greatest environmental threat to covered waste storage facilities containing hazardous materials such as acid-generating or radioactive materials. In addition, methods to reduce and control infiltration and leaching of acid drainage products or metals from minerals often work against measures to reduce erosion, which would rather promote infiltration and reduce runoff.

“It is well known that steep unarmored slopes will flatten, planar slopes will gully, straight drainage courses will start to meander, and linear or convex slopes will become concave. Unplanned, rapid changes in the reclaimed landscape could result in unacceptably high sediment loading of streams, gully scarring, and landslides (Keys et al., 1995). The incorporation of natural slope features into the final landform design for stockpiles not only improves aesthetics, but also emulates slopes that are in equilibrium with local conditions of rainfall, soil type and vegetation cover. The relatively small increase in costs for engineering and construction for creating natural landforms are more than offset by improved aesthetic impact, decreased slope maintenance costs, and improved long-term stability.”

“Various measures can and have been used in the reclamation of waste rock stockpiles that provide short-term stability, but are generally not a suitable means for long-term landform stability. These include terracing or contour banks, cross-slope or contour ripping of the surface, dozer basins or “moonscaping”, and placement of erosion control blankets in drainage channels. Provided these measures are properly implemented, they reduce erosion rates as a result of higher infiltration (i.e. lower runoff) and/or greater roughness on the surface (i.e. surface resistance). These techniques are prone to failure over the short term (i.e. 1 to 10 years), which explains why none of these measures are found on natural slopes. However, this time frame may be sufficient to allow a good stand of grasses and legumes to establish, thereby aiding in the long-term stability of a reclaimed slope.”

**Models**

Ayres et al (2006) describe the following models that could be used to aide in the Questa site design.

“The WEPP model provides a detailed description of the susceptibility of soils and spoils to rill initiation and transport. This aspect makes the model especially applicable to situations where soil erodibility is measured in the laboratory, and to consideration of materials (such as rocky spoils) for which erosion responses to slope length and gradient differ greatly from those of agricultural soils. However, being an agriculturally-based model, WEPP does not consider potential effects of erosion and deposition on landform development, nor does it deal specifically with gully development.”

"SIBERIA is a physically-based model for simulating the evolution of landforms over geomorphic timescales developed by Dr. Garry Willgoose at the University of Newcastle, Australia. It simulates runoff and erosion from a landform that evolves in response to predicted erosion and deposition. It is a three-dimensional topographic evolution model, which predicts the long-term evolution of channels and hillslopes in a catchment on the basis of runoff and erosion. The location and speed with which gullies develop are controlled by a channelization function that is related to runoff and soil erodibility (Willgoose et al., 1991). The model solves for two variables; elevation, from which slope geometries are determined, and an indicator function that determines where channels exist. An activation threshold governs channel growth. A surface may commence with no gullies, but when the activation threshold, which depends on discharge and slope gradient, is exceeded, a channel develops."

**Challenges**

Michael et al (2010) identified the following challenges to landform reclamation:

1. Existing reclamation-enforcement regulations that are focused on civil engineering principles and not explicitly supportive of geomorphic methodologies;
2. Regulatory agencies' current intent to limit the down-gradient reach of excess spoil fills in order to allay disruption or burial of natural streams;
3. Actual or perceived increases in reclamation costs; and
4. The challenge of designing and constructing "natural" landforms that are mature and stable in an otherwise youthful, erosional landscape.

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**Attachment 3**
**Montana Tunnels Pit Subsidence Report**

# *MONTANA TUNNELS MINE EVALUATION*

*James R. Kuipers, P.E.*

*January 24, 2017*

*Kuipers & Associates LLC, Wisdom, MT | prepared for Montana Trout Unlimited*

January 24, 2017

To: Bruce Farling, Montana TU
From: Jim Kuipers P.E., Kuipers & Associates

Re: **Montana Tunnels Mine Evaluation**

At your direction, I have reviewed the available information as referenced herein regarding the Montana Tunnels Mine. The following summarizes the current situation and my findings with respect to the present situation and compliance with the Montana Metal Mine Reclamation Act ("MMRA"). It includes the following sections: Executive Summary; Background; Major Site Features; Financial Assurance; MMRA Requirements and Conclusions; and Recommendations.

## I. Executive Summary

This memo reviews the history of the Montana Tunnels mine and the current situation with respect to site conditions, reclamation and closure, and financial assurance. The Montana Tunnels mine was originally permitted by Pegasus Gold in 1998 and consists of an open pit, waste rock piles, flotation processing facility, and tailings storage facility as well as other ancillary features. Mining was ceased in 2009 and although a plan to expand the open pit and other site features was approved in 2008, the plan has not been implemented, and the site has been on "care and maintenance" since that time. Ownership of the mine passed from Pegasus Gold to its predecessor Apollo Gold and then to the present owner Eastern Resources, and it represents the continuing saga of Pegasus Gold and the Montana Department of Environmental Quality ("DEQ") with respect to financial assurance almost 20 years after Pegasus Gold bankruptcy.

Current conditions at the mine site have the potential to negatively affect public safety and the environment. This includes:

- issues with the available and currency of site data and evaluations;
- significant signs of open pit stability issues including unravelling and block failures and subsidence outside of the current pit boundary;
- concerns regarding the tailings storage facility and conformance with current industry best practice;
- concerns with impacts to waste rock piles associated with open pit instability;
- concerns with impacts to water quality associated with the pit lake, tailings storage facility seepage, and waste rock seepage;
- concerns with the current financial assurance of $15.9M in cash and $2.5M in real estate versus the current liability of approximately $35.8M as calculated herein;
- concerns with the likelihood of operator default and reliance by DEQ on future mining to resolve shortfalls.

To address these issues the following measures are recommended:

- Audit report to collect and review all available data and evaluate the data in comparison to current water quality and other environmental standards or MMRA requirements.
- Open pit stability evaluation to determine the ultimate extent to which the pit walls are likely to unravel or otherwise fail and lead to further subsidence of natural ground features outside of the current active pit area. Additionally, a Failure Modes and Effects Analysis (FMEA) should be undertaken to better define the potential for catastrophic failure as well as other potential environmental and public as well as worker safety impacts.
- An evaluation of open pit conformance with the Montana MMRA addressing how this and other mines meet the requirements of the act with regards to utility to humans and the environment as well as other factors.
- Mitigation of impacts to Clancy Creek in an expedited manner and additional mitigation identified and implemented as soon as possible to prevent the loss of flow into the pit on a permanent basis.
- Update of the financial assurance estimate to a current basis and require them to provide the increased amount or otherwise suspend the operator's license consistent with the requirements of the MMRA. DEQ should also collect the existing financial assurance to ensure it is invested in an interest-bearing account.
- DEQ should provide a formal evaluation of the situation that has led to the current shortfall in financial assurance and revise its approach, including yearly reviews if necessary, to ensure this is the last mine that the State of Montana's taxpayers can expect to pay the costs of reclamation as a result of failure to maintain adequate financial assurance.

## II. Background

The Montana Tunnels Mine was granted an Operating Permit (00113) by the Montana Department of Environmental Quality (DEQ) and an approved Plan of Operations (No. MTM 82856) by the U.S. Bureau of Land Management (BLM)[1] and started mining operations in 1986.[2] The mine was originally permitted by U.S. Minerals Exploration/Centennial Minerals and then shortly following start-up in 1987 was sold to Pegasus Gold Corporation. The mine was retained by Apollo Gold Corporation following the bankruptcy and reorganization of Pegasus Gold Corporation in 1997. Apollo Gold and Elkhorn Goldfields formed a Joint Venture partnership in 2006 and the mine became the property of Elkhorn Goldfields in 2010 and subsequently ownership was transferred to Eastern Resources, Inc. in 2012.[3]

The mine was originally permitted as an open pit mine with a production rate of 15,000 tons per day and expected to mine a total of 102 million tons of ore. The ore was processed using flotation and gravity milling processes which crush and grind the ore and separate the valuable minerals from the waste and produce concentrates containing gold, silver, lead and zinc that were shipped off-site for further smelting and refining. Originally cyanidation was also used but discontinued in 1987.[4] The mine was projected to disturb approximately 1,200 acres at the cessation of mining and would include waste rock storage areas (426 acres), cap rock and low grade stockpiles (66 acres), ponds and tailings dam top (23

[1] 2008 FEIS Montana Tunnels Proposed M-Pit Mine Expansion, p. 1-1.
[2] Since 1986, Montana Tunnels has applied for and received 32 amendments and revisions to Operating Permit 00113. 2008 FEIS p. 1-3.
[3] Schaefer, John, Montana Tunnels Mining, Inc. Mine Redevelopment: Part II., 2012.
[4] 2008 FEIS p. 2-5.

acres), tailings storage facility (259 acres), and mine pit and pit perimeter (264 acres) in addition to facilities, gravel pit area, soil and gravel stockpiles, and miscellaneous (roads, air monitoring station, scale).[5]

Mining and milling operations continued until 2009 and resulted in 98 million tons of ore being processed. The mine has been on "care and maintenance" since 2009. A Mine Expansion Plan (M-Pit) was permitted in 2008 that would result in the mining of an additional 38 million tons of ore and add 9 years to the mine life. It was estimated in 2012 that $75M would be needed to restart operations.[6]

## III. Major Site Features

The following section provides a general description, reclamation plans, and describes current conditions including recent photographs for the major site features (open pit mine, waste rock piles, tailings storage facility).

### A. Open Pit Mine

2008 FEIS

The mine pit was originally permitted to extend from the 6,430-foot elevation to the 4,250-foot elevation at the pit bottom. The pit rim daylight elevation (the lowest point on the rim) would be 5,670 feet on the southeast side of the pit.[7] The pre-mining water table ranged from 5,650 to 5,750 feet and the average monthly rate of mine pit dewatering has varied over the past 20 years of mining from about 25 gpm (gallons per minute) to 900 gpm.[8]

All pit highwalls have shown instabilities except the north highwall in Lowland Creek Volcanics. If pit highwall stability is adversely affected by hydrostatic pressure, the pit highwalls would be dewatered by installing and pumping wells peripheral to the pit, by drilling horizontal drains into the pit highwall, and by reducing the highwall slope angles.[9]

Reclamation

Reclamation of the mine pit would leave highwalls as rock faces. At closure, most of the mine dewatering system would be shut off, and the L-Pit would begin to fill with water. Because of stability problems in the northwest highwall of the pit, vertical pumping wells would be maintained on the north, northwest, and southwest highwalls for 5 years during closure to provide factors of safety of at least 1.2 during the early stages of mine pit flooding. The L-Pit would remain accessible above the water level by way of the pit access ramp. Montana Tunnels' plan is to allow the pit highwalls to naturally weather and ravel into the pit, cover pit benches, and form talus slopes above the pit lake. Montana Tunnels would revegetate the pit perimeter and conduct weed control. The pit would be fenced and signed.[10]

[5] 2008 FEIS p. 2-4.
[6] Schaefer, 2012.
[7] 2008 FEIS p. 2-4, -5.
[8] 2008 FEIS p. 2-5.
[9] 2008 FEIS p. 2-5.
[10] 2008 FEIS p. 2-22.

During the 5-year closure period a variety of sources were expected to contribute to the pit water inflow including groundwater, TSF surface runoff, drain and recover well seepage, south pond stored water, and runoff from within the pit catchment area. The total pit surface water catchment area including the area of the mine pit and surrounding natural and reclaimed surfaces would be approximately 241 acres. After the 5-year closure period, Montana Tunnels would cease pumping water from the south pond to the pit.[11]

The model predicts that the pit lake would reach equilibrium almost two centuries after mining ceases at the 5,610-foot elevation, approximately 60 feet from the lowest rim of the pit (5,670 feet). The pit lake at equilibrium would not overtop the pit, and no surface water outflow from the lake would be anticipated.

The Clancy Creek channel in the vicinity of the mine pit would not be excavated by expansion of the pit, and the flow regime in Clancy Creek would not be altered. No impact to the Clancy Creek channel would be predicted in the foreseeable future. A contingency channel for Clancy Creek would be constructed in the existing flood plain away from the pit highwall by the end of the 5-year closure period. This channel would not be used unless a future connection between the mine pit and the existing channel develops. A berm would separate the contingency channel and the mine pit and would accommodate maximum flood events (such as the 100-year flood) and limit the potential for migration of the Clancy Creek channel towards the pit. [12]

A catastrophic event such as (1) the probable maximum flood (PMF), (2) geologic transformation of the landscape resulting from a large seismic event, or (3) a large mass failure of the pit highwall in the vicinity of the Clancy Creek could possibly reroute Clancy Creek into the mine pit sometime in the future. While possible, the likelihood of such a large event is considered remote in the foreseeable future (one century or less), but higher for geologic timeframes (several centuries). If such a large event were to occur, flow entering the pit (annualized average of about 100 gpm [0.22 cfs]) would no longer be available to Clancy Creek downstream of the pit. The loss of 100 gpm flow from Clancy Creek into the mine pit, if it were to occur, would be an adverse and long-term impact.

After mining ceases, Montana Tunnels would no longer need to appropriate and divert surface water from Clancy Creek for mill makeup water. Therefore, 50 gpm (0.11 cfs) to 250 gpm (0.56 cfs) of flow would be available to augment existing instream flows in Clancy Creek, assuming the water rights are not used for another purpose. The impact to water availability after mining ceases would be a beneficial and long-term impact.[13]

Current Conditions

From the time that mining was discontinued in 2009 until present the pit has been allowed to fill with water. It is unclear what sources or variety of sources have been used to fill the pit lake, or the current pit lake elevation. The current pit lake is shown in Figure 1. The pit lake, in the foreground, appears to be blue-green in color and is at least several hundred feet from the lowest pit highwall elevation.

[11] 2008 FEIS p. 2-22.
[12] p. 3-128
[13] P. 3-129


**Figure 1. Montana Tunnels Mine Site Overview. (Photo by Christopher Boyer)**

In an unmaintained condition since 2009, the pit highwalls as shown in Figure 2 and as described in the reclamation plan, have been allowed to "naturally weather and ravel into the pit, cover pit benches, and form talus slopes above the pit lake." In addition, the pit highwalls as contained in Figure 3, show significant signs of instability, including what appear to be block failures potentially enhanced by hydrostatic pressure, as evidenced by the appearance of water ponded on the pit benches. The instability is apparent beyond the existing pit walls as is evidenced by tension cracks outside of the pit walls including in the area of the mine shop buildings as shown in Figure 3, and outside of the pit wall adjacent to Clancy Creek in Figure 2. As shown in Figure 4, the degradation of the pit has resulted in the elimination of any safe access to the pit including for the purpose of pit lake water quality sampling.

Clancy Creek, instead of being unimpacted as predicted in the original 1998 and subsequent 2008 FEISs, was significantly impacted and has been moved into a 16-inch pipe around the mine pit highwall, as shown in Figure 5. It is evident that pit highwall degradation that has occurred since 2009 has resulted in the need to reroute Clancy Creek sooner rather than centuries into the future as predicted. Additionally, the contingency of constructing another channel is no longer viable, and it is clear that the highwall instabilities are extensive as evidenced by tension cracks extending well beyond the pit perimeter, and it is likely that Clancy Creek will be problematic to restore to an alternative channel, and maintaining the existing flow in a pipe may prove to be problematic as well if the highwall sloughs further or a mass instability occurs.

**Figure 2. Montana Tunnels Pit Lake and Pit Highwall Unravelling. (Photo by Christopher Boyer)**

**Figure 3. Montana Tunnels Pit Highwall Instabilities. (Photo by Christopher Boyer)**

**Figure 4. Montana Tunnels Pit Entrance and Access Ramp. (Photo by Christopher Boyer)**

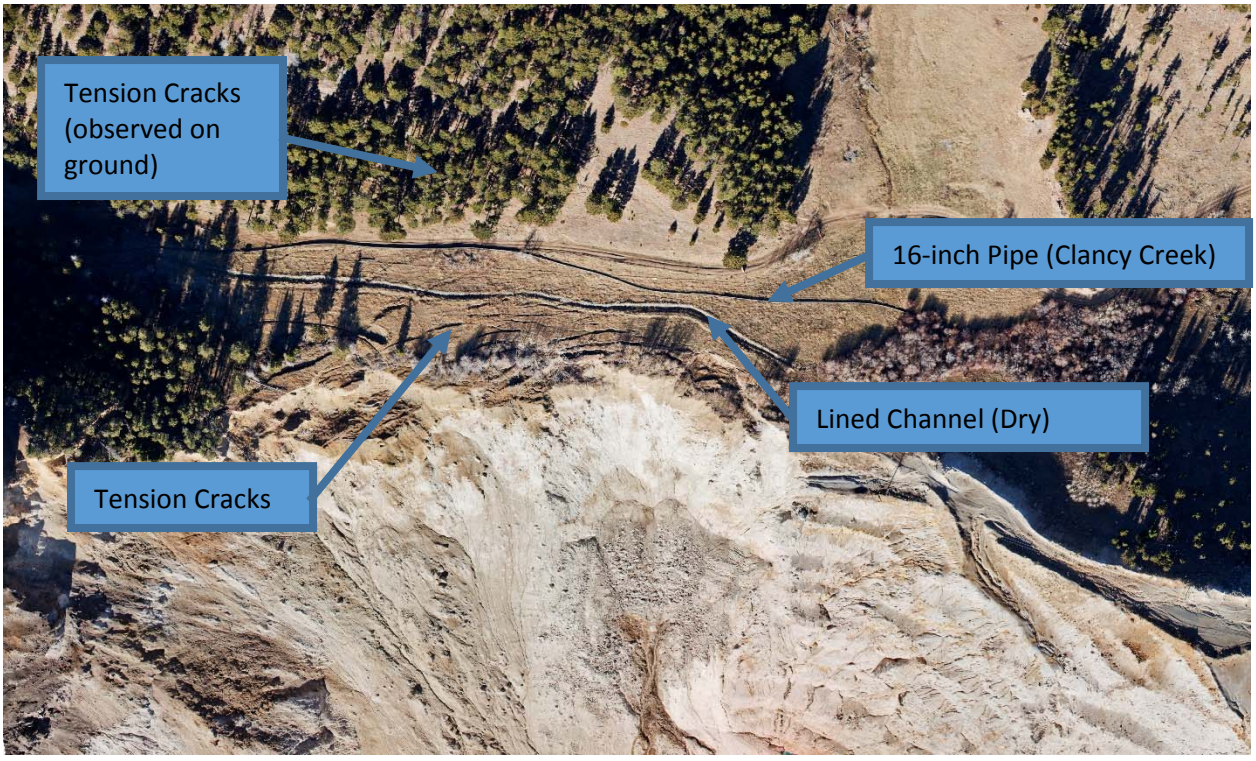



**Figure 5. Montana Tunnels Open Pit Highwall Failure Along Clancy Creek. (Photo by Christopher Boyer)**

### B. Tailings Facility

2008 FEIS

The tailings storage facility (TSF) was incrementally permitted to the current elevation of 5,660 feet which apparently is sufficient to contain all tailings volume and maintain contingency freeboard under current conditions. Structural performance of the tailings embankment would be monitored after mining and ore processing have been completed. Stability monitoring would involve a continuation of piezometer readings within the embankment, monitoring of flows from the embankment combined drain system, and monitoring of tailings settlement during the closure and post-closure periods.[14]

Construction was adjusted from a downstream method to a modified centerline method in 1990. A design modification in 1994 included engineered adjustments to incrementally raise the ultimate embankment. This was followed by an amendment in 2002 to raise the TSF embankment. Construction of a waste rock buttress against the downstream slope of the tailings storage facility embankment began in 2002 to enhance embankment stability (permitted in March 1998 as Minor Revision 97-004). The first phase of the buttress was a compacted fill from the embankment base to the crest elevation. The waste rock buttress has been constructed to the crest elevation of the tailings storage facility embankment as each additional embankment lift is constructed. Montana Tunnels plans to place a minimum of 19.3 million cubic yards of waste rock to improve embankment stability.[15]

Pseudo-static (seismic) analysis indicates that there would be no significant deformation of the embankment during an MDE (maximum design earthquake). Post-liquefaction stability analysis shows that the static factor of safety is not reduced by liquefaction of the tailings. This indicates that the embankment would maintain stability regardless of the condition of the tailings, and that there is no potential for a flow slide or large deformation of the embankment following earthquake loading and liquefaction of the tailings.[16] The EIS also notes factors relative to TSF stability including tailings density, a wick drain program to enhance tailings density and embankment stability, projected pore pressures and long-term settlement of the tailings surface.[17]

Seepage water from the TSF is collected by wick drains and a recovery well system and reports to the south pond. According to the EIS, five recovery wells from prior to 2002 are used to provide make-up water and also used for groundwater monitoring with a pumping rate ranging from 50 to 80 gpm. Six new wells (post-2001) were drilled but do not produce large quantities of groundwater and would be pumped during the 5-year closure period and the extracted groundwater would be directed to the mine pit to aid initial pit flooding. TSF seepage exhibits elevated concentrations of sulfate, iron, cyanide and manganese however no concentrations above DEQ-7 human health standards.[18]

[14] 2008 FEIS p. 2-11.
[15] 2008 FEIS p. 2-11.
[16] 2008 FEIS p. 2-12.
[17] 2008 FEIS p. 2-12, -13.
[18] 2008 FEIS p. 2-14.

Reclamation

Reclamation of the tailings storage facility would begin at the conclusion of milling operations and last for 5 years.[19] The ponded water on the tailings storage facility surface would be removed during the first years following cessation of mining. Portable pumps would be used to remove the ponded water from the tailings storage facility as needed. Ponded water would be pumped to the mine pit during the 5-year closure period. Construction of water runoff controls on the tailings storage facility surface would occur when adequate consolidation of the tailings has taken place. The final surface of the TSF would have a 0.5 to 5 percent slope to the east toward the spillway. Drainage ditches would be constructed to channel stormwater toward the spillway channel. To prevent surface erosion and limit infiltration, the channels would be constructed with synthetic liners across the tailings storage facility surface.

Dust control would be provided during reclamation of tailings by progressively capping the sandy beach areas of the facility following removal of the pond. Water spigotting or sprays would be used, if necessary, to control dust on exposed surfaces of the tailings storage facility.

The anticipated consolidation of tailings would leave a natural low point in the southeast corner of the tailings storage facility. Using fill and grading, the tailings surface would be sloped to promote drainage to the spillway at the east end of the tailings storage facility embankment. Surface runoff after the 5-year closure period would report to a percolation pond constructed in the reclaimed south pond. The tailings surface would be capped with 36 inches of nonacid-generating rock and covered with an additional 24 inches of soil which would then be seeded to minimize water infiltration and to complete= final reclamation. More soil would need to be placed if additional settlement occurred after soil placement.

A spillway would be constructed on the east end of the tailings storage facility embankment as part of the closure activities to route stormwater off the tailings storage facility surface and minimize flows into the tailings. The spillway is designed to pass the probable maximum precipitation event to a percolation basin constructed in the former south pond.

Seepage from the tailings storage facility is controlled by an underdrain constructed using a bentonite amended soil liner, by an embankment drain, and a recovery well system located downgradient of the tailings storage facility embankment and south pond. The south pond receives water from on-site and off-site sources, including the recovery well system and the combined drains. After cessation of mining, the south pond would be used to capture stormwater and seepage water coming from the tailings combined drains during the 5-year closure period. This water would be pumped into the mine pit to accelerate pit lake formation. The recovery well system would continue to operate and pump water to the south pond during the 5-year closure period.[20]

Current Conditions

From the time that mining was discontinued in 2009 until present the TSF has been managed primarily to manage water levels to ensure adequate freeboard, and to control dust. Figure 5 shows the TSF as of November, 2016. At that time the water in the TSF covered approximately half of the surface area and was primarily contained against the northward hillside and within a beach (dry) distance of more than

[19] 2008 FEIS p. 2-21.
[20] 2008 FEIS p. 2-23, -24.

100 ft from the perimeter. The TSF waste rock embankment added for stability is shown in Figure 6 to the right of the TSF surface area. The South Pond where TSF seepage and groundwater recovery is directed is shown to the far right of the picture. The features are similarly shown in Figure 7.

### C. Waste Rock Piles

2008 FEIS

122.3 million cubic yards of waste rock would eventually be placed in the 425.9 acres of waste rock storage areas. The primary waste rock storage area is adjacent to the west side of the tailings storage facility. A waste rock buttress downstream of the tailings storage facility embankment improves the stability of the tailings storage facility. The majority of the waste rock storage areas are permitted to have 2.5h:1v side slopes, although in some areas it is necessary to increase the steepness of the slopes to tie into original ground or minimize disturbance. Waste rock storage area slopes do not exceed 2h:1v in any situation.[21]

The waste rock storage plan for potentially acid generating (PAG) waste rock called for its placement within a perimeter of a 100-ft-wide lift of non-acid generating (NAG) rock. Top areas that contain PAG would be covered with 35 inches of NAG cap rock and then covered with 16 inches of soil. Where it is not possible to construct the outer perimeter with NAG, the slope is reduced and then covered with 36 inches of NAG and 16 inches of soil.


**Figure 6. Montana Tunnels Tailings Storage Facility. (Photo by Christopher Boyer)**

[21] 2008 FEIS p. 2-14.

**Figure 7. Montana Tunnels Tailings Storage Facility with Waste Rock Pile and Open Pit. (Photo by Christopher Boyer)**

Approximately every 100 feet in elevation, a wide bench is left for construction of a drainage ditch to minimize runoff and erosion on downgradient slopes. Unlined ditches are designed to pass a 100-year, 24-hour storm event. Final details of the design of all diversions and channels would be completed at the end of the mining operation. Use of riprap or other channel protection would be determined at that time and would be based on channel performance during the mining operation and functioning of the drainage and diversion system during post-closure.[22]

Reclamation

The waste rock storage areas are reclaimed incrementally as lifts are completed. Any reclamation of waste rock storage areas that cannot be completed concurrently with mining would be completed after closure.[23]

During reclamation, waste rock storage area slopes would be graded to a final slope of 2.5h:1v to enhance vegetation success and reduce erosion potential. Tops of waste rock storage areas would be essentially flat with less than 2 percent slopes. Waste rock storage area tops would be graded to eliminate depressions and to provide surface water flow away from the steeper side slopes. Three feet of cap rock would be spread over waste rock storage area tops or slopes if chemical testing indicates that the surface materials are PAG; the cap rock would not be added to slopes that did not exhibit PAG.

[22] 2008 FEIS p. 2-16.
[23] 2008 FEIS p. 2-21.

Sixteen inches of soil would be spread on all surfaces, regardless of whether the cap rock had been added or not. The surfaces would then be revegetated to minimize infiltration.[24]

Current Conditions

From the time that mining was discontinued in 2009 until present the waste rock piles left as they were when mining ceased. Figures 4, 5 and 6 show the unreclaimed and/or partially reclaimed waste rock piles as of November, 2016.

## IV. Financial Assurance

According to the 2008 FEIS A 5-year closure period is planned to reclaim all areas disturbed by mining activities. A post-closure period is also planned for monitoring and maintenance. Approximately 30 percent of areas disturbed by mining will have been reclaimed by concurrent reclamation prior to closure. Reclamation of all remaining facilities would commence at the conclusion of mining operations. Closure of the tailings storage facility surface would require a 5-year period to allow time for sufficient dewatering and settlement of tailings solids.[25]

The Montana DEQ last updated the Montana Tunnels Financial Assurance Cost Estimate in January, 2008. At that time the estimate was $23.4M as summarized in Table 1.

**Table 1. Montana Tunnels Closure Task Summary and Costs**
**Montana DEQ, January, 2008**

| Task | Cost |
|---|---|
| ITEM 1: Reclaim Waste Rock Dumps | $4,166,978 |
| ITEM 2: Reclaim Low Grade Stockpiles | $907,503 |
| ITEM 3: Reclaim Water Retention Ponds and Tailings Dam | $251,071 |
| ITEM 4: Reclaim Tailings Impoundment | $7,424,985 |
| ITEM 5: Reclaim Pit Perimeter | $106,474 |
| ITEM 6: Reclaim Facilities | $550,305 |
| ITEM 7: Reclaim Miscellaneous Areas | $1,271,625 |
| ITEM 8: Reclaim Open Pit | $841,751 |
| ITEM 9: Monitoring and Closure/Post Closure Care | $889,500 |
| ITEM 10: Miscellaneous Expenses | $429,500 |
| TOTAL CLOSURE TASK COSTS | $16,839,692 |
| 29% Contingency, Engineering, Mobilization, Inflation | $4,883,511 |
| 10% Reclamation Administration | $1,683,969 |
| TOTAL ESTIMATED COST OF CLOSURE | $23,407,172 |

[24] 2008 FEIS p. 2-24, -25.
[25] 2008 FEIS p. 2-21.

Open Pit

The cost includes reclamation of the pit perimeter (Item 5) consisting of 16 acres for $106,474 and pumping of water from tailings recovery systems to the pit ($747,983) and reclamation of the upper pit haul ramp ($93,769) for a total of $841,751.

TSF

The cost of the TSF reclamation (Item 4) includes dewatering the supernatant pond, haul and place settlement rock, reclamation of the tailings surface, and construction of an embankment spillway, and is expected to cost $7,424,985.

Waste Rock

The cost of the waste rock pile reclamation (Item 1) includes reclamation of the dump slopes and tops as well as roads, construction of drainage channels and misc. areas, and is expected to cost $4,166,978.

Monitoring and Closure/Post Closure Care

The $889,500 total cost estimate includes the following:

- Groundwater and surface water monitoring, 25-year period, $177,500 total ($7,100/yr average)
- Weed control, 10-year period, $312,000 total ($31,200/yr average)
- Inspections and Maintenance of Facilities and Drainage Systems, 30-year period, $200,000 total ($6,667/yr average)
- Overhead (supervision, engineering, consulting, costs), 30-year period, $200,000 total ($6,667/yr average)

Current Financial Assurance

According to MDEQ, the current financial assurance held by the State of Montana is $18.4M consisting of $15.9M in cash and $2.5M in appraised real estate. In conversations with Warren McCullough, head of the MDEQ Hardrock Permitting Bureau, he has stated that the department does not believe they can require the project owner, Eastern Resources, to provide an increased financial assurance amount commensurate with the current site liability without forcing the company to go bankrupt. MDEQ believes it is preferable to hope that the owner can require the necessary capital, including financial assurance, to mine the proposed M-Pit, permitted in the 2008 FEIS.

## V. Comments and Conclusions

The Montana Metal Mining Reclamation Act (MMRA) includes the following requirements relative to the current situation at the Montana Tunnels mine site.

General Requirements

According to the MMRA, MCA Section 82-4-336, Reclamation plan and specific reclamation requirements, (10) *The reclamation plan must provide sufficient measures to ensure public safety and to prevent the pollution of air or water and the degradation of adjacent lands.* As is discussed further in

these comments, the reclamation plan and specific reclamation requirements currently approved by MDEQ fail to consider existing site features that have developed which could threaten public safety including that of MDEQ employees inspecting and monitoring the site, and to ensure prevention of pollution of groundwater resources, and impacts to surface water resources.

Open Pit

MMRA, MCA Section 82-4-336 requires (9) (b) *With regard to open pits and rock faces, the reclamation plan must provide sufficient measures for reclamation to a condition:*

*(i) of stability structurally competent to withstand geologic and climatic conditions without significant failure that would be a threat to public safety and the environment;*
*(ii) that affords some utility to humans or the environment;*
*(iii) that mitigates postreclamation visual contrasts between reclamation lands and adjacent lands; and*
*(iv) that mitigates or prevents undesirable offsite environmental impacts.*

While the reclamation plan may have allowed for unravelling of the pit, as it is presently evidenced at Montana Tunnels, the result does not appear to meet the requirements of the MMRA. The evidence of various forms of mass failure, including erosion, unravelling and block failures, and extensive surface cracking showing the failures are likely to extend significantly further beyond the current pit boundary, suggests that current conditions are conducive to a significant failure of the pit walls potentially affecting the pit lake. This would certainly be a risk to public safety were access not restricted. However, the current financial assurance calculations do not identify tasks or include funds for either maintenance of fencing and signs, or any form of site security. Even if access is restricted, the pit and pit lake will be an attractive nuisance for trespassers. The risk relative to public safety will never be eliminated.

A significant mass failure of the pit walls could have several potential impacts including displacement of the pit lake water and/or impacts to pit lake water quality. Displacement of pit lake water such as that which has occurred on several occasions in the Berkeley Pit is likely to occur at Montana Tunnels which could endanger workers and/or equipment. Displacement of specific sections of the pit wall containing higher mineralized contents could impact pit lake geochemistry. The risk of a catastrophic release due to a failure may exist once the pit lake level reaches equilibrium if its elevation is proximate to that of the “daylight” pit level.

It is difficult to imagine how the current or ultimate pit and pit lake will afford any utility to humans or the environment. If the site operator becomes bankrupt the State of Montana would assume responsibility for the property and de facto ownership if no other party claims it as an asset, which is entirely probable. In that event the State of Montana and its citizens would own the pit and pit lake and instead of it being an asset in terms of affording utility, it would instead be a significant risk to public safety and a long-term liability.

Nothing has been proposed to mitigate post-reclamation visual contrast. This is likely to become more evident to adjacent property owners and even others more distant from the mine as the pit boundary is further expanded beyond the present configuration by the unravelling and/or collapse of the pit walls. Similarly, the plan as evidenced does nothing to mitigate or prevent undesirable offsite environmental impacts. Because no impacts were predicted off-site, no mitigation has been identified. However,

consideration of a number of failure modes, in particular related to pit water displacement and pit lake water quality, indicate that there may be relatively high potential for off-site impacts to occur in the future.

Stability issues and their potential impacts are highly evident at the Montana Tunnels Mine, and are also evident at other Montana mines including the Berkeley Pit and Golden Sunlight Mines. While to some extent they may be mitigated such as has been proposed for the Golden Sunlight Mine in terms of prevention of a pit lake, in other cases such as the Berkeley pit the risk to both human health in terms of both workers and the public, as well as to wildlife, have only been made all to evident by recent events. However, even at the Golden Sunlight Mine, risks to worker safety in terms of maintaining and monitoring the pit dewatering system will remain in perpetuity. And risks to public safety will similarly remain even if the sites are fenced and/or signed. In conclusion, it would appear that the MMRA in its present form fails to result in a clean and health environment when it comes to addressing open pits and rock faces, suggesting that consideration of requiring mitigation methods, including that of at least partial (e.g. to prevent pit lake formation and stabilize highwalls) if not complete backfill, should be considered.

The impacts that have occurred to Clancy Creek as a result of pit wall unravelling have already been significant in terms of requiring removal of the creek from its natural channel and use of a pipe to route the flow around the subsidence area that would otherwise have resulted in the loss of creek water to the open pit. Given present conditions, it is questionable whether the pipe will not be displaced by future subsidence that is occurring into the pit that extends well beyond the current fenced area. In that event the pipe will no longer function in its present location, and it is probable that a loss of flow from Clancy Creek will be permanent unless further and potentially costly additional mitigation is undertaken.

TSF

In response to and in acknowledgement of the potential for catastrophic release as evidenced by mine tailings storage facilities worldwide, Montana was the first and thus far only state to enact specific requirements for TSFs. While in the author's opinion the statute is not entirely consistent with the recommendations of industry experts and cannot replace the need for additional measures to ensure good corporate governance, it does contain requirements that should not only be applied to new TSFs and expansion of existing TSFs, but also requirements that should be equally applicable to existing TSFs to ensure they are operated, maintained, monitored and closed in a manner that is protective of public safety and the environment. This should include the requirements of Section 82-4-376, Tailings storage facility; Section 82-4-377, Independent Review Panel; Section 82-4-378 Quality Assurance During Construction; Section 82-4-379 Tailings Operation, Maintenance, and Surveillance Manual; Section 82-4-380, Periodic Review Required; Section 82-4-381, Annual Inspections. In addition, Section 82-4-336 (13) *The reclamation plan must include, if applicable, the requirements for post-closure monitoring of a tailings storage facility agreed to by a panel pursuant to 82-4-377*.

The present plan assumes that the TSF will not produce seepage with constituents that would impact groundwater quality. While geochemical testing and predictions suggest TSF seepage water quality may not be an issue, this needs to be verified given the potential for neutral or alkaline drainage resulting in Mine Influenced Water (MIW). Additionally, currently applicable non-degradation discharge standards,

which are significantly more stringent than when the permit was issued in 1998, need to be applied to both surface water and groundwater results.

Waste Rock Piles

The present plan assumes that the waste rock piles will not produce seepage with constituents that would impact groundwater quality. While geochemical testing and predictions suggest waste rock seepage water quality may not be an issue, this needs to be verified given the potential for neutral or alkaline drainage resulting in Mine Influenced Water (MIW). Additionally, currently applicable non-degradation discharge standards, which are significantly more stringent than when the permit was issued in 1998, need to be applied to both surface water and groundwater results.

In addition, given the apparent underlying geological conditions as well as evidence of pit highwall subsidence affecting waste rock stability as evidenced by stress cracks affecting waste rock features, there is reason for concern as to both waste rock stability and impacts to existing waste rock reclamation.

Financial Assurance

The MMRA requires the following with respect to financial assurance (e.g. bond).

82-4-338. Performance bond.
*(1) (a) The bond may not be less than the estimated cost to the state to ensure compliance with Title 75, chapters 2 and 5, this part, the rules, and the permit, including the potential cost of department management, operation, and maintenance of the site upon temporary or permanent operator insolvency or abandonment, until full bond liquidation can be effected.*
*(3) (a) The department shall conduct an overview of the amount of each bond annually and shall conduct a comprehensive bond review at least every 5 years. (c) If a licensee or permittee fails to post bond in accordance with subsection (3)(a) or (3)(b) in the required amounts by the required deadlines, the license or permit is suspended by operation of law and the licensee or permittee shall immediately cease mining and exploration operations until the required bond is posted with and approved by the department.*

Although the MDEQ has had exceptional knowledge of the potential cost of taking over a mine site in the event of temporary or permanent operator insolvency since 1998 when they and other agencies first took over several sites such as Zortman-Landusky and Beal Mountain resulting from Pegasus initial bankruptcy, inexplicably, the 2008 financial assurance estimate for the current mine configuration, summarized previously in Table 1 and totaling $23.4M, did not include the potential cost of department management, operation, and maintenance for the site. They did include the cost, typically termed “site management” by DEQ, in the financial estimate that was also performed in 2008 for the proposed expansion project for the site (M-Pit). That estimate, which totaled $4.1M, included interim maintenance and shut down for a one-year period followed by site management and maintenance for a three-year period. If that amount had been added to the 2008 financial assurance estimate for the current conditions as the MMRA requires, the total in 2008 dollars should have been $27.5M.

MDEQ has not conducted an overview of the financial assurance amount since January 2008 resulting in a nine-year lag between the estimated financial assurance and current costs. The accepted simplified

approach to updating the financial assurance amount, using an inflation cost indicator such as the Engineering News Record Construction Cost Indicator (ENR CCI), follows:

ENR CCI (January 2008) = 8,090
ENR CCI (January 2017) = 10,532

Current Cost = $2008 x [ENR CCI (2017)/ENR CCI (2008)] = $27.5M x (10,532/8,090) = $35.8M

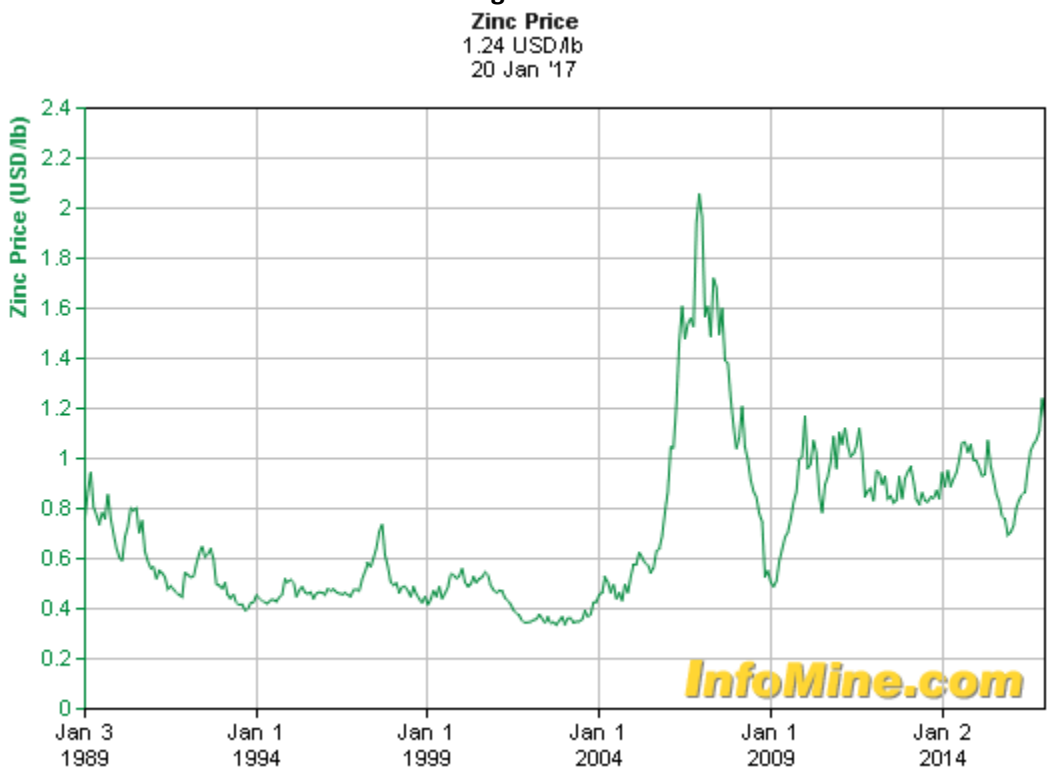
None of the costs reflect the likely long-term care requirements for the site including site security, maintenance and monitoring which will be required for hundreds if not thousands of years into the future.

Future Mine Feasibility

Smith and Nagle estimated Montana Tunnels required a zinc price of $1.10/pound and a lead price of 85-cents/pound to justify a restart.[26]

Figure 8 shows the historic price trend for zinc. The expansion project was proposed in 2006 and permitting was completed in 2008, coincidental to a historic high zinc price occurring during that period. Shortly following the high the price decreased significantly and then recovered to a range of $0.82/lb to $1.20/lb.

**Figure 8**



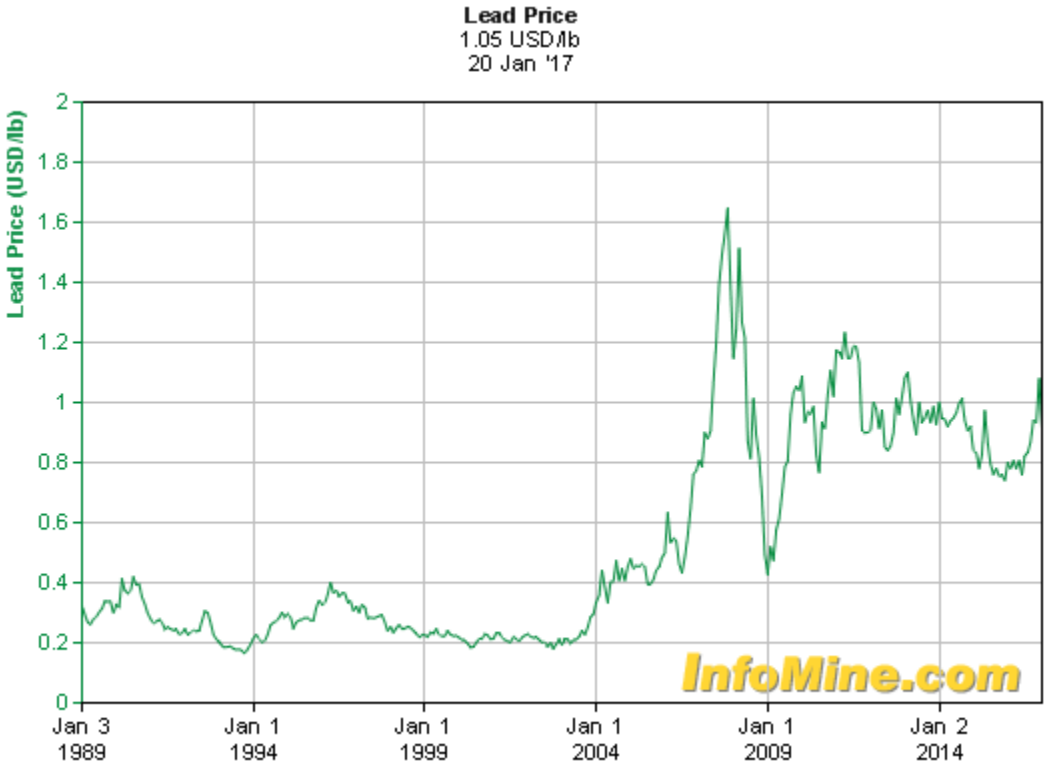

[26] http://www.mineweb.com/archive/haywood-gives-thumbs-up-to-apollo-golds-montana-tunnels-sale/

Figure 9 shows the historic price trend for lead. Similarly, the expansion project was proposed and permitting was completed coincidental to a historic high lead price occurring during that period. Shortly following the high the price decreased significantly and it has recovered in the $0.80/lb to $1.20/lb range.

Although prices have periodically been in the range of justification suggested for a restart, mining operations have yet to be restarted at the Montana Tunnels Mine. The mine's owners, Eastern Resources, have not announced a restart date and according to the company's website "are focusing our initial development efforts of the Golden Dream at the Elkhorn Goldfields."

Based on the apparent marginal economics, limited size of the existing ore deposit, and uncertainty of future zinc and lead prices, there is no assurance the Montana Tunnels mine will ever be re-opened. At the same time, the longer time passes, the likelihood similarly increases that the owner will go bankrupt and abandon the site to the State of Montana.

**Figure 9**



## VI. Recommendations

Based on the information presented herein and the requirements and conclusions related to the MMRA, the following recommendations are made with respect to the current and future situation at the Montana Tunnels Mine.

- **Audit Report.** An audit report that reviewed all aspects of the mine operation plan and the current mine status, including the below recommendations specific to the major site features, should be performed for the Montana Tunnels mine site. The current conditions and available data have not been collected and evaluated in a comprehensive manner relative to current water quality standards and best professional practice and otherwise provided to DEQ or conducted by DEQ and available for public review. The current situation at the mine site also supports the requirement for an audit report on a regular (3 year) basis conducted by a qualified independent consulting firm.

- **Open Pit Stability.** A mass stability evaluation needs to be undertaken to determine the ultimate extent to which the pit walls are likely to unravel or otherwise fail to retain their current shape and lead to further subsidence of natural ground features outside of the current active pit area. Additionally, a Failure Modes and Effects Analysis (FMEA) should be undertaken to better define the potential for catastrophic failure as well as other potential environmental and public as well as worker safety impacts that could result from failure of the pit walls both in the current condition, and also when the pit lake equilibrium level is reached. If the potential for significant impacts is determined, then appropriate mitigation measures should also be identified and implemented.

- **Open Pit Conformance with MMRA.** The unreclaimed open pit, together with the pit lake, present an example of how in many cases involving major open pit mines, and in some cases smaller mines, following the cessation of mining activities, no utility is afforded to humans or the environment. This may particularly be true where either a pit lake, or pit highwall instability, or in a worst case both, are present at the site such as Montana Tunnels. This example should be used to reconsider the requirements of the MMRA, or at least the predictions made by the industry and accepted by DEQ that open pits would meet the requirements of the MMRA.

- **Open Pit Water Quality.** The project owner or alternatively DEQ should provide and perform a comparison of originally predicted values, 2008 EIS data and predictions, and all additional pit lake water quality data up to present and provide trend analysis including a graph of the key values over time. The values should be compared to current applicable water quality standards. If data has not been collected for safety reasons, which is reasonable, it should have been and could be collected in the future using remote (e.g. drone assisted) means.

- **Clancy Creek Mitigation.** The current situation with Clancy Creek (pipeline) and the potential for additional highwall subsidence in the area of the creek channel and pipeline needs to be evaluated in an expedited manner and additional mitigation identified and implemented as soon as possible to prevent the loss of flow into the pit on a permanent basis. If necessary, DEQ should require the operator to conduct the activities or use the existing financial assurance, although it was not intended for the necessary mitigation because it was only identified as a potential contingency, to conduct the activities.

- **TSF Stability.** The requirements of the MMRA for expansion of existing and new TSFs should be used to ensure that the Montana Tunnels TSF is being maintained and would be closed if necessary in a manner the conforms with current industry best practice. This should include a failure modes effects analysis (FMEA) to better define the potential for catastrophic failure as well as other potential environmental and public safety impacts.

- **TSF Water Quality.** The project owner or alternatively DEQ should provide and perform a comparison of originally predicted values, 2008 EIS combined drain data, and all additional TSF drain and recovery well data up to present and provide trend analysis including a graph of the key values over time. The values should be compared to current applicable water quality standards.

- **Waste Rock Stability.** The impacts to existing waste rock piles including previously reclaimed piles from subsidence related to the pit highwall instability needs to be evaluated and additional mitigation if necessary identified and included in future financial assurance estimates. The evaluation should consider not only the current impacts but also long-term impacts associated with the long-term effects of pit wall subsidence.

- **TSF Water Quality.** The project owner or alternatively DEQ should provide and perform a comparison of originally predicted values, 2008 EIS combined drain data, and all additional waste rock monitoring well data up to present and provide trend analysis including a graph of the key values over time. The values should be compared to current applicable water quality standards.

- **Financial Assurance Estimation.** DEQ should undertake a current financial assurance calculation for the mine site and include both short-term site management and long-term site maintenance and management consistent with DEQ inclusion of those costs at other sites. DEQ should provide the new cost estimate to the operator and require them to provide the increased amount or otherwise suspend the operator's license consistent with the requirements of the MMRA.

- **Financial Assurance Administration.** Unless the existing financial assurance, $15.9M in cash and $2.5M in appraised real estate, is increasing in value at a rate greater than inflation as a result of accrued interest or increased worth respectively, then MDEQ should take whatever actions are available and necessary to claim the existing financial assurance. The cash could then be invested in an interest-bearing account and the real estate could be sold over time in a manner to optimize its value.

- **DEQ Administration.** The DEQ should be required to formally explain how the current situation with respect to both site conditions as well as financial assurance has come to result at the Montana Tunnels site. DEQ should also be required to formally explain its rationale for not requiring updated and current plans for reclamation of the mine site in its current condition as well as requisite financial assurance. Finally, DEQ should be required to provide a plan for ensuring that this will be the last mine site in the State of Montana to not be regularly reviewed and adequate financial assurance estimated as needed, including doing comprehensive evaluations and updates on a yearly basis if required.