Montana Department
of Environmental Quality

Certified Mail

December 15, 2016

Tintina Montana, Inc.
Black Butte Copper Project
Attn: John Shanahan
PO Box 431
White Sulphur Springs, MT 59645

RE: Second Deficiency Review, Pending Operating Permit 00188

Dear Mr. Shanahan:

The Department of Environmental Quality (DEQ) has reviewed the response to comments received on September 16, 2016. The DEQ appreciates the additional time allowed to review the rather extensive response. The additional material presented has generated numerous comments, largely due to parts of the application that were either missing or where data was still being generated, in particular the sections on hydrology and geochemistry. The response to comments has provided a more accurate indication of what is being proposed, as well as potential impacts and mitigations for those impacts. Please address the following comments contained in the attachment.

Summary of Major Concerns:
Geochemical testing and modelling is on-going. The final results will need to be incorporated into the application before it can be considered complete.

Hydrological modeling needs to be revised to account for void spaces left underground (such as the main access decline and ventilation shafts) as well as incorporating new data. The results of the modelling will need to be resubmitted before the application can be considered complete.

Information will need to be provided on how estimates were derived for how long water treatment may be needed after mine closure (temporary and final), as well as the use of a maximum of 10% brine in the cemented tailings and backfilled underground workings.

Steve Bullock, Governor | Tom Livers, Director | P.O. Box 200901 | Helena, MT 59620-0901 | (406) 444-2544 | www.deq.mt.gov

The potential need for a NCWR (Non-Contact Water Reservoir) has yet to be determined or approved as part of a mitigation plan to be negotiated with DNRC. Therefore, some components of the NCWR design remain conceptual and on which other portions of the plan are based.

Some of the permits that Tintina will need to apply for include an air quality permit, a Public Water Supply permit, and most likely a MPDES permit, Underground Injection Control permit (EPA), a wetlands permit (Army corps of engineers), and a MDT permit for an easement. Please inform us on the progress made in working with the DNRC on water rights issues.

If you have any questions, please call.

Sincerely,

Herb Rolfes
Operating Permit Section Supervisor
Hard Rock Mining Bureau
Department of Environmental Quality
P.O. Box 200901
Helena, MT 59620-0901
(406)444-3841 or email at hrolfes@mt.gov

Attachment: Electronic copy of deficiency comments
Cc: Alan Kirk, Geomin

File: Pending 00188.350

OP\OP_Applications\Black Butte Copper Project 00188 \Application Deficiency Reviews\ Second Deficiency Review\Cover Letter

Second Deficiency Review, Pending Operating Permit 00188

The Department of Environmental Quality (DEQ) has reviewed the response to the first deficiency letter received on September 16, 2016. This second review is extensive due to submittal of new and voluminous material that was lacking in the initial application, in particular sections on hydrology and geochemistry. The Bureau appreciates the additional time allowed to review the response to comments

The notations after each deficiency comment refer to the Metal Mine Reclamation Act or rules and in a few cases to MEPA (75-1-201, MCA). Errors, needed clarifications, or simply incorrect statements, have been noted that should be corrected, although there is no corresponding rule to cite.

Please address the following comments:

<u>Summary of Major Concerns:</u>

Geochemical testing and modeling is on-going. The final test results and additional modeling will be need to be incorporated into the application before it can be considered complete.

Hydrological modeling needs to be revised to account for void spaces left underground (such as the main access decline and ventilation shafts) as well as incorporating new data. The additional modeling will need to be submitted before the application can be considered complete.

Information will need to be provided on how estimates were derived for the length of time water monitoring and treatment may be needed after mine closure (temporary and final), as well as the use of a maximum of 10% brine in the cemented tailings and backfilled underground workings.

The potential need for a NCWR (Non-Contaminated Water Reservoir) has yet to be determined or approved as part of a mitigation plan. Therefore, some components of the NCWR design remain conceptual and on which other portions of the plan are based.

Some of the permits that Tintina will need to apply for include an air quality permit, a Public Water Supply permit, and most likely an MPDES permit, Underground Injection Control permit (EPA), and a wetlands permit (Army corps of engineers).

<u>Deficiency Review Comments:</u>

Page 26, Section 2.1.3, paragraph 1, second sentence: The text reports a mean annual evapotranspiration of 17.4 inches and cites the corresponding Table 2-3. However, Table 2-3 indicates a PET (precipitation evapotraspiration) of 17.1 inches. Which value was actually used for modeling and calculations? The data from June 2012 and August 2013 are omitted, which is presumably why the annual average is not calculated for those years. However, other data from those years are then used to calculate an average for each month. Please include any additional data from 2016 to support the calculations. ARM 17.24.116(3)(a)

Page 30, Section 2.2.1 Water Resources Study Area and Method of Study, last paragraph, last sentence: Please refer to Figure 14 in Appendix B, Baseline Water Resources Monitoring and

Hydrogeologic Investigation Report to illustrate the synoptic surveys. Also, please update this paragraph with references to any water resources reports produced in 2016. ARM 17.24.116(3)(a)

Page 50, Section 2.2.4.7, paragraph 3, first and last sentences: The “two surface water locations where gossan is exposed in outcrop in the streambed” (G-1 and G-2) are discussed briefly in the application (Section 2.2.4.7) and in Appendix B (same text on p. 2-21). However, the site locations are not shown on any maps or figures, or included in monitoring site tables in either document. What surface water body/bodies are they associated with? How do these sites tie in with the baseline understanding of the site? Please include these two sites in the summary figures and tables. Each site was sampled once in 2011, why were these sites removed from any other baseline sampling? ARM 17.24.116(3)(a)

Page 54, Section 2.2.6.1 Groundwater – Surface Water Interactions: The results of the August and October 2012 synoptic survey should be augmented with a high water analysis, as well as (page 58, Section 2.2.6.2) Brush Creek and Coon Creek in which the results of the August and October 2012 synoptic survey should be augmented with a similar spring runoff survey. ARM 17.24.116(3)(a)

Page 62, Section 2.3.6, Wetland Delineation Summary: The map (Figure 2.10, Wetland Delineation and Functional Assessment Map) refers to direct impacts to wetlands. Please discuss in the text indirect impacts to wetlands and mitigations for indirect effects. 82.4.335(5)(m), MCA

Page 68, Section 2.4.1, Introduction, paragraph 1, third sentence: “Results are reported through August 2016, with one test ongoing.” This disagrees with the company response in Section 9 (original comment IDEQ-30), which indicates that there are four humidity cell tests on-going. DEQ acknowledges that these tests were terminated between August and November 2016 and this omission is not relevant any longer, but the revised application under current review is still considered incomplete. The remaining test data should be included into the pertinent geochemical models (e.g. sensitivity analysis with all HCT weeks, etc). The summary discussions, tables, and figures should be updated within application Section 2.4, Appendix D, Appendix N, etc. ARM 17.24.116(3)(a)

Page 69, Section 2.4.2.1, Static Testing of Waste Rock, paragraph 1, second sentence: “A total of 5,858 samples of relevant waste rock, including 5,642 samples of the four dominant waste rock types, were statistically analyzed to characterize overall geochemical variability…” The previous application reported that “a total of 7,497 samples were statistically analyzed to characterize overall geochemical variability.” Why has the total number of analyzed samples decreased by 1,639? Was this based on a statistical evaluation? How can the omission of these samples improve the representativeness of these subsets and how does it affect the characterization of geochemical variability? ARM 17.24.116(3)(a)

Page 77, Section 2.4.3.2, Kinetic Testing of Waste Rock, paragraph 3, third and fourth sentences: Based on Figures 2.15 and 2.16 and summary Table D-3 in Appendix D-D, DEQ disagrees with some of the generalized statements made in this summary and suggests that objective edits be made to the interpretation. “Metal concentrations in effluent from the 4% paste cement backfill were lowest, and only exhibited isolated groundwater exceedances for Cu, Ni, and Tl." In both cases, the groundwater standards for copper and nickel were exceeded in 6 out of 10 samples, during the last 20 weeks of the 28 week tests (i.e. about 70% of the test period). Thallium concentrations exceeded the groundwater standard in 4 out of 10 samples (for 12 weeks), and the surface water standard in 4 other samples. DEQ recognizes that the surface water standard exceedances (Al, Be, Cd, Tl, Zn) are less relevant in the proposed operational setting, with the 4% binder backfill being placed underground. However, rather than exhibiting "isolated" exceedances, copper, nickel, and thallium frequently exceed their respective groundwater standards. The concentrations of arsenic and chromium that exceed groundwater standards in the final 8 weeks of the test are not mentioned, but seem to be better described as isolated. These conditions (unsaturated 4% binder backfill) would likely be encountered throughout the life of underground operations and prior to the washing/flooding proposed for closure. Disaggregation would be expected on surfaces that are not confined or laterally supported (e.g. face at access tunnel), subsequently affecting water quality in the sump. The underground water quality model that includes all weeks of HCT data is likely more representative of this scenario than the model using the early weeks of testing. "Similarly, the 4% cemented paste with waste rock exceeded the groundwater quality standard for Tl in all weeks of testing, with isolated exceedances of Cu and Ni." Again, the groundwater exceedances for copper and nickel occur during 6 out of 9 samples (20 of the 24 weeks) and cannot be considered isolated. The thallium exceedances were only observed during weeks 0-4, not for "all weeks of testing." Groundwater exceedances are also noted for arsenic, beryllium, and chromium in later weeks. Please address these concerns. ARM 17.24.116(3)(a) and 82-4-336(10), MCA

Page 82, Section 2.4.4, Near-Surface Materials: The response to comment 1DEQ-51 replied that paste discharged to the CTF in winter will not flow over deposited snow, but will rather melt or be dammed up. DEQ questions whether the paste would be sufficiently warm to melt snow during extended periods of cold weather. Regardless of the temperature of the paste at the point of discharge, paste is expected to flow across the tailings surface for as far as ½ mile from the discharge point to the far side of the impoundment, and would rapidly lose heat to both the atmosphere and the frozen tailings surface. Furthermore, snow would often not be present in a uniform uncompacted layer, but is likely to form drifts. Freeze-thaw cycles may result in deposits of ice on the tailings surface that would be buried by paste deposition. Non-uniform tailing deposition, and void spaces or areas of retained ice within the tailing deposit are likely to occur during cold weather. Please discuss whether/how these conditions would influence tailings management and/or geochemical weathering. 82.4.336(10), MCA

Page 92, Section 2.4.5, Environmental Chemistry Conclusions, paragraph 2, fifth sentence: "…the 4% cemented paste tailings Tintina plans to use for backfill is unlikely to become acidic and has potential to release only Tl in concentrations above groundwater standards under the saturated conditions at closure." See also comment on p. 79, Figure 2.14, regarding the reversal in alkalinity/acidity conditions and the drop in pH at the end of testing. Does this preview a potential long-term trend for this material in closure? Based on Figures 2.15 and 2.16 and summary Table D-1b in Appendix D-D, it seems that the water quality interpretation is not correct. The thallium concentrations measured from the 4% binder diffusion test do not appear to exceed the groundwater standard, but the surface water standard is exceeded in all but 3 samples. Instead, the thallium groundwater standard is exceeded during every week of the 4% binder plus

ROM sample. In contrast, the groundwater standard that is exceeded in the 4% binder sample is for arsenic, which is exceeded in 11 of the 14 samples. Please ensure that the correct interpretation and data are being applied to the geochemical models. How much of the stope backfill would also contain ROM rock? Can the two scenarios actually be separated, or is it likely that backfilled stopes would exhibit properties of both tests (i.e. influence from ROM along stope ribs or lower level near the floor)? 82.4.336(10), MCA

Page 93, Section 2.4.5, paragraph 4, second and third sentences: "The Ynl Ex also appears unlikely to produce acid, despite a temporary spike in sulfate concentrations that are declining. These rocks will meet groundwater standards when exposed to precipitation." Even though the HCT results for the Ynl Ex indicate that groundwater standards would not be exceeded, the surface water standard for selenium was exceeded during weeks 1-4. When excavated and placed at the surface, this material has the potential to contaminate surface water if sediment and storm runoff are not managed sufficiently. More importantly, this also indicates that the shallow, weathered bedrock that would be encountered by construction of the UIGs has the potential to leach selenium. The near-neutral pH and oxidized nature of the water that would be discharged through the UIG would be ideal for selenium transport. Without more information about the UIGs, regarding flow paths, transit times, and potential connection to surface water, it cannot be assumed that surface water would not be impacted by Ynl Ex leachate, sourced from the UIG. 82.4.336(10), MCA

Page 95, Section 2.5, Soil Resources, Baseline Soil Survey Map: It is noted that few soil test pits are located in areas where the major facilities such as the CTF, PWP, and portal pad are proposed to be located. Soil map units are the basis for calculating soil salvage volumes and there is limited soil test pit data for areas where soil would be salvaged under proposed facilities. Please commit to having a soil scientist on site during facilities construction to identify areas where soil salvage would take place and confirm that the maximum possible depth of soil is salvaged. The on-site soil scientist would also be responsible for tracking salvaged volumes and ensuring that salvaged soil is placed in appropriate stockpiles as defined by slope and rock content. See comment below on Table 7-2. ARM 17.24.116(3)(b)

Also, please commit to having signage on all soil stockpiles so they are not compromised during the life of mine. ARM 17.24.116(3)(b)

Page 104, Section 2.7.1, Aquatics Study Area and Methods, third paragraph, last sentence: The updated information from 2016 baseline aquatic surveys needs to be submitted. ARM 17.24.116(3)(a)

Page 104, Section 2.7, Aquatic Resources, third paragraph, last sentence: The Aquatic Resource baseline is incomplete. It is noted that the summary report on 2016 baseline aquatic surveys and assessment of streams will not be prepared until after the October 2016 sampling event. Please update this section when the information is available. ARM 17.24.116(3)(a)

Page 128, Section 3.1.2, List of Facilities with Surface Disturbance Acres: A total of 268.49 acres are proposed for disturbance in the permit area. This acreage calculation agrees closely with the acres proposed for soil salvage in Table 7-2 (268.3 acres). However, Table 3-2 (Acres of

Surface Disturbance Consolidated by Major Facility) adds 10% additional disturbance to the total proposed for salvage in order to account for additional areas that would be disturbed during construction. The soil salvage of this additional 26.85 acres is not addressed in Soil Salvage Section 7.3.4, page 387-388, or Table 7-2. The 10% (26.85 acre) construction buffer is sufficient and needs to be addressed in the text. ARM 17.24.116(3)(b)

Page 129, Section 3.2.2.1, Johnny Lee Development Workings, paragraph 1: Please provide the initial point coordinates for the decline that would be used to locate all the underground facilities. Most mines use N10,000 E10,000 coordinates for their initial point to make calculations easier. 82.4.335(5)(e), MCA

Page 129, Section 3.2.2.1, Johnny Lee Development Workings, last paragraph: Please discuss the environmental geochemistry and water quality implications of leaving primary underground development access ramps and four ventilation raises open throughout mine life. 82.4.336(10), MCA

Page 139, Section 3.2.2.5, Mining Rates and Schedules, top of page, first full sentence: The plan is to control the inflow into the mine to 500 gpm. If greater flows are encountered and cannot be controlled, what, if any, contingencies would be used? 82.4.335(5)(m), MCA

Page 139, Section 3.2.2.5, Mining Rates and Schedules second paragraph, third sentence: The application states earlier in the geochemistry sections, that acid-generating rock would be exposed for a minimal time to avoid weathering and water quality degradation. In Section, 3.2.2.5, Tintina indicates it would possibly store copper-enriched rock in secondary access stopes which means these stopes would remain open and not be backfilled to reduce weathering. Please discuss the implications of underground storage of this material versus surface storage in the temporary waste rock stockpile. It is preferable that all secondary access stopes in acid-producing materials be closed as soon as possible. 82.4.335(5)(m), MCA

Page 141, Section 3.2.25, Mining Rates and Schedules, first paragraph, last sentence: The section states that about one percent of the mining stopes would be exposed to atmospheric oxygen and underground weathering conditions for about 60 to 90 days each at any given time in the entire mine life. How much additional percentage do the primary access ramps and ventilation raises add to this total? 82.4.336(l0), MCA

Page 146, Section 3.2.2.8, Blasting Agents, second paragraph, first sentence: The plan notes that during the main decline drive, Tintina would monitor ground vibrations or shaking when the underground workings are within 300 feet of any land owner structures. What structures are within this radius? ARM 17.24.116(3)(e)

Page 151, Section 3.3.2.4, Flotation Circuits, fourth paragraph: Please provide SDS sheets and describe the potential environmental (water quality) effects of the reagents left in in the tailings going to the CTF and underground. Also, where would the spent flotation solution be disposed? ARM 17.24.116(3)(j)

Page 154, Section 3.3.2.5, Copper Concentrate Dewatering and Handling, first paragraph, first sentence: Please provide a SDS sheet and describe the potential environmental effects of the flocculent in the tailings going to the CTF and underground. Also, second paragraph, third sentence: Please provide SDS sheets and describe the potential environmental effects of the cement, slag, and/or fly ash proposed for use in the process. ARM 17.24.116(3)(j)

Page 154, Section 3.3.2.5, Copper Concentrate Dewatering and Handling, first and second paragraphs: Where would solutions liberated from the filter press and tailings thickener be disposed? ARM 17.24.116(3)(i) and (k)

Page 154, Section 3.3.2.5, Copper Concentrate Dewatering and Handling, first paragraph and Figure 3.10, Detailed Process Flow Sheet: Where would the copper concentrates be placed after the filter press (shown in Figure 3.10) prior to loading into a shipping container? Can the enriched ore be covered to reduce wind erosion? ARM 17.24.116(3)(i) and (c)

Page 154, Section 3.3.2.5, Copper Concentrate Dewatering and Handling, third paragraph, third and fourth sentences: The third sentence states that the effects of high brine concentrations of chloride, sulfate and other deleterious ions in the brine would be minor if the RO brine makes up 10% of the paste backfill water content. The fourth sentence states that the 10% brine addition would have no effect on the final strength or structure of the cemented tailings. As the amount of brine addition is critical, how would the 10% be verified? At what percentage of brine would it start having adverse effects on the cemented tailings? ARM 17.24.116(3)(k)

Page 158, Section 3.3.3.1, Truck Shop and Administration Building: The plan notes that there would be heavy vehicle repair bays designated for service and repair of major equipment. These would include hose reels for dispensing engine oil, transmission fluid, hydraulic oil, air, solvents, diluted coolant and grease. Given the pollution potential of these products, how would drips/ spills and contaminated water from snow melt and other sources be controlled? Would the concrete flooring be poured in sections or in one continuous pour with the pour transitioning from floor to vertical walls to eliminate floor seams/leakage points? Please submit conceptual drawings showing the floor plan. ARM 17.24.116(3)(e)

Page 158, Section 3.3.3.2, Fuel Storage and Dispensing, fifth sentence: The plan notes that two 13,000 gallon doubled-walled fuel tanks would be erected during the construction stage. Please submit engineering drawings of the tank cradles and containment berms. ARM 17.24.116(3)(e)

Page 158, Section 3.3.3.2, Fuel Storage and Dispensing: As it is assumed that the two 13,000 gallon tanks would be ASTs, has the local Fire Marshall been contacted? Would any of the fuel dispensing piping be run through the containment berm? Please submit conceptual engineering plans for the fuel system(s) and containment berm. ARM 17.24.116(3)(m) and (e)

Page159, Section 3.3.3.3, Lube and Oil Storage and Dispensing: The plan notes that the lube and oil storage area would consist of refurbished cargo containers, and would be located approximately 40 feet from the truck shop and would hold a two week supply of lubricants and oil. How would the supply lines to the shop be installed? If underground, the Underground Storage Tank section of DEQ would need to be contacted prior to any installation. It is recommended that any supply lines be placed in a concrete trench covered with heavy removable grating the entire length to allow for visual inspection and access for any issues. ARM 17.24.116(3)(e)

Page 162, Section 3.4.2, Construction of Surface Facilities: Construction of the CTF (Cemented Tailings Facility), PWP (Process Water Pond), and other facilities would require on-site processing of excavated materials to produce construction rock products to meet engineering specification for liner subgrade, filter rock, and other specialized uses. Please locate the crushing/screening plant and material stockpiles on the facilities site plan (Map 1). Also, include a discussion of the operations and reclamation of the construction materials crushing/screening and stockpile areas in the document. Please include a table that shows the volume of processed engineered materials such as crushed and sized materials that would be needed to construct each facility and note if this material would be placed above the liner system or below the liner system. Based on HCT and metals leaching test results granodiorite would be the preferred material for constructing subgrade bedding below the liner system on the CTF as this area has the potential for groundwater exposure. Granodiorite would also be the preferred material for basin drain layers constructed above the liner due to its durable nature. ARM 17.24.116(3)(e) and (4)

Page 166, Section 3.4.2.7, Cut/Fill Material Quantities: Table 3-14 predicts a surplus of 377,000 cubic meters of material would be excavated beyond the quantities needed for construction of facilities. It is assumed that this material would be stockpiled for use at closure (Also see, Appendix K, Section 12.1, Reclamation and Closure, page 47-55, Table 9-1). Appendix K, Table 9-1 predicts a deficit of 88,000 cubic meters of fill material at closure. Please reconcile these two tables and explain how sufficient material would be available for constructing the cap over the CTF and for other activities at closure. ARM 17.24.116(3)(b)

Page 173, Section 3.5.5.4, CTF Stability Analyses, bottom of page: The CTF stability analysis is based on the maximum cross-section of the CTF embankment. Shouldn't the embankment failure analysis typically be based on the minimum rather than the maximum cross-section? Also, the same question for page 176, Section 3.5.5.5, PWP Stability Analysis and page 176, Section 3.5.5.5, PWP Stability Analysis. 82.4.335(5)(l), MCA

Page 174, Section 3.5.5.4, CTF Stability Analysis: Intercepted groundwater quality is proposed to be monitored in the foundation drain pond. Please provide water quality baseline data for monitoring wells 10, 11, 12, and 13 located in the CTF footprint (Also see page 49, Groundwater Quality, Section 2.2.4.6). Please include information on shallow groundwater intercepted under the CTF. Also see Cemented Tailings Facility Closure, 7.3.3.6, page 381, third paragraph, fifth sentence for how baseline water quality of CTF monitoring wells, MW 10 through MW 14, would be compared to water quality in CTF drain at closure. ARM 17.24.116(3)(a)

Page 184, Section 3.5.7.3, NCWR Seepage Analysis, and p. 242, Section 3.6.9.3, NCWR Embankment Fill Zones, first paragraph, fourth sentence: The seepage analyses completed for the NCWR does not appear to consider the excessive hydraulic gradient that would form at the edge of the HDPE liner. Please discuss this potential failure mode. 82.4.335(5)(k) and (m), MCA

Page 184, Section 3.5.8, Tailings Characteristics, last paragraph: The application states that RO brine may be used as a fraction of the water needed to make cemented paste backfill (CPB). "RO brine will not comprise more than 10% of the total water addition necessary," which equates to ~18.9 gpm (based on Water Balance- Figure 3.44). The assertion that "the 10% brine addition will not affect the final strength, very low transmissive character, or structure of the cemented tailings" is not supported by any reference citations, case studies, or laboratory evidence. How was the 10% brine component determined? Acknowledging that water from the proposed project is not available for treatment, what theoretical brine chemistry was considered for that analysis? These data are not presented elsewhere in the application. Appendix K-5 reviews variations in the solids content and the ratio of Portland cement, fly ash, and slag being used as binders, but no discussion of brine usage or the effects of make-up water chemistry is included. ARM 17.24.116(3)(k)

The CPB investigations were focused on achieving desirable strength and stability during the timescale of mining and backfilling stopes (i.e. months), but it does not appear that the designs considered the long-term chemical stability of the material. In particular, the cement would be highly susceptible to sulfate attack, from the oxidation of fine sulfides (~25% content) and the high sulfate concentrations in the make-up water. Although structural strength may not be important after a portion of the mine is backfilled and abandoned, the disaggregation of backfill would continue along exposed faces in the access tunnels, and degrade mine water quality during operations and at closure. This is more likely simulated by the later weeks of 4% binder testing. Since submitting this response application, the company has clarified through personal communications that the backfilled stope faces would be sealed along the access tunnel wall by a bulkhead and (non-tailings) cement. This would further prevent the degradation of the backfilled tailings surface during operations and closure. However, this secondary encapsulation is not discussed in detail in the application and should be included in the company's written response. ARM 17.24.116(3)(k) and 115(1)(d)

Page 185, Section 3.5.8, Tailings Characteristics, second paragraph, last sentence: Please commit to notify DEQ when binder mixes are changed over the life of the mine. ARM 17.24.116(3)(k)

Page 193, Section 3.6.1.2, Main Access Road, and Stream Crossings, first paragraph, second last sentence: Please provide a conceptual design for the haul roads with MSHA berms and how Tintina would divert stormwater off the roads to prevent excessive erosion and turbidity to ephemeral draws. ARM 17.24.116(3)(r)

Page 196, Section 3.6.1.4, CTF Road, fifth sentence: Please provide information on the lining proposed for CTF road ditches. ARM 17.24.116(3)(h)

Page 198, Section 3.6.3, Portal Pad: The response to comment 1DEQ-127: Tintina replied that the ventilation raises were not incorporated into the groundwater model, in part because simulation of open shafts would cause the model to become numerically unstable. Furthermore, little to no inflow to the ventilation raises would be anticipated because they would be constructed after the declines and access ramps (which would dewater overlying geologic units prior to construction of the raises). However, in other responses (e.g. 1DEQ-210; 1DEQ-306) Tintina states that "dewatering of the underground is unlikely to drain all overlying fractures. At most, the overlying rock would be drained partially and locally…" Regardless of actual groundwater flow patterns and degree of dewatering, DEQ concurs that model-simulated dewatering using drain cells at the elevations of the ramps and declines is likely to accurately estimate mine inflow rates during operations. DEQ is more concerned with the groundwater model's ability to predict flow directions and velocities, as well as water level recovery rates and equilibrium conditions, after mining has ceased and the underground workings flood. Heads within all geologic units that are near open, interconnected mine workings would equilibrate due to proximity to these voids. Maps of the baseline potentiometric surface above the Upper Johnny Lee deposit indicate groundwater flow from west to east, with heads nearly 200 feet higher in elevation near the western edge than the eastern edge. If these regions of the deposit were to remain connected by open tunnels and raises after mine closure and flooding, equilibration of pressure throughout the open tunnels would result in permanent changes to the potentiometric surface that cannot be characterized by the existing groundwater model. However, if one assumes for the sake of discussion that this equilibration results in a permanent drawdown of the potentiometric surface above the western portion of the Upper Johnny Lee deposit by 100 feet and an equal rise in the potentiometric surface above the eastern portion of the deposit, then the head within the eastern portion of the proposed workings would be above land surface post-closure, potentially resulting in the formation of springs in that region. Faults or fractures intercepted by mine workings near the eastern edge of the Upper Johnny Lee deposit could convey mine water under pressure to the surface, if such structures exist and have the appropriate orientation and dimensions. Installation of wells into or near mine workings within the region where the head could rise to near surface should be avoided to prevent artesian flow conditions. DEQ recommends that either the existing groundwater model be revised to incorporate mine workings that would remain as voids post-closure, or a local scale groundwater model be developed that can simulate groundwater flow conditions in the vicinity of the open raises, declines, and access ramps that are proposed to remain after closure and flooding of the mine. Please discuss the feasibility of preparing a numerical model that includes the simulation of underground voids. Are there alternate methods that could reasonably evaluate the effects of mine workings on groundwater flow? 82.4.335(5)(k), MCA

Page 199, Section 3.6.3.1, General, second paragraph, first and second sentences: The text states the portal pad would drain by sheet flow across a gently sloping surface. It also states that a safety berm would be constructed at the edge of the pad. Please discuss how the flow would be routed through the berm to lined diversion ditches without eroding the 2.5:1, or angle of repose slope flowpaths, and how fill slope materials would not be contaminated. ARM 17.24.116(3)(g)

Page 202, Section 3.6.3.2, Fuel/Oil Storage, Power Supply Wash/Lube Pad and Shop Building, third sentence: The plan notes that the entire concrete pad for the building would slope to a perimeter foundation curb on the outside and toward one end of the pad. Please provide conceptual drawings showing the sloped grade for both the concrete pad and perimeter foundation curb. ARM 17.24.116(3)(g)

Page 202, Section 3.6.3.2, Fuel/Oil Storage, Power Supply Wash/Lube Pad and Shop Building, fourth through eighth seventh sentence: The plan notes that the wash pad would slope to a sediment sump built into the concrete pad. Please provide conceptual engineering drawings for this sump and interconnecting piping. Would it be a single pour or poured in sections? If in sections, if the sectional pours are compromised, how would any spillage/leakage be contained and cleaned up? ARM 17.24.116(3)(g)

Page 204, Section 3.6.3.4, Portal Location and Alternative Locations Evaluated: Please consider paving or the use of concrete for the portal pad surface to help with snow removal during winter operations. Fines generated from snow removal operations often end up in ditches, ponds, and snow storage areas and much of the sediment from the portal pad may contain acid-generating materials. Stormwater and snow management would be an important part of daily operations on the site and these operations. ARM 17.24.116(3)(g)

Page 205, Section 3.6.4, Ventilation Raises and Secondary Escape Way, first paragraph below Table 3-32, third sentence: The plan notes that all areas of excessive water inflow would be grouted. If grouting doesn't totally limit water inflow, how would this water be captured? Would it be allowed to run down the inside of the shaft, or channeled and collected? ARM 17.24.116(3)(l)

Page 207, Section 3.6.5.2, Liner and Seepage Reclaim Water Systems, paragraph 1, third sentence: Would there be any ripping conducted on the upper lift surfaces, before other lifts are put in place? What measures would be taken to promote vertical drainage through the waste, rather than creating compacted terraces internally to interrupt or divert infiltrating water? ARM 17.24.116(3)(d)

Page 209, Section 3.6.5.3, Reclamation of the WRS, and Page 211, Section 3.6.5.5, Operational Copper-enriched Rock Storage Facility: Please consider leaving the waste rock storage facility unreclaimed after all waste rock has been removed to use as snow storage, copper-enriched rock storage, etc. The lined facility is a valuable asset to store materials, and can prevent discharge of acid-generating water to unlined facilities. The copper-enriched rock stockpile on the portal pad is proposed to be lined as well. Please consider paving the area under the stockpile as well. The portal pad as designed would result in contaminated runoff contacting MSHA berms and the slopes off the portal pad. ARM 17.24.116(3)(d)

Page 209, Section 3.6.5.3, Reclamation of the WRS: Please consider using the WRS as the mill feed ore storage area instead of reclaiming it and building a new and separate pad. ARM 17.24.116(3)(d)

Page 209, Section 3.6.5.4, WRS Percolation (HELP) Modeling, second paragraph and Table 3-33, HELP Model Simulated WRS Facility Percolation Results : The HELP model used Helena and Tintina climate data. The meteorological analysis in Section 2.1.3 used Tintina, Bozeman, and Millegan station data. Please discuss the changes in percolation data if the alternate sites had been used in both analyses. ARM 17.24.116(3)(a)

Page 211, Section 3.6.6.1, PWP Design Concepts, first paragraph, fourth sentence: The depth to the groundwater table under the PWP facility "ranges from 19.7 feet to 59 feet below the base elevation of the PWP excavation based on Figure 2.8 and Figure 3.28 and monitoring well number SC15-198." The nearby well SC15-198 was completed in the footprint of the SAG mill. It is important to note that this well was not used in generating the potentiometric surface displayed in Figure 2.8 though, and the water elevation reported (5,823.54) is more than 40 feet above the contour line shown adjacent to that location. Does this imply that the water measured in this well is in a perched system? ARM 17.24.116(3)(a)

Additionally, this geotechnical hole is completed on the opposite side of the Black Butte Fault from the PWP. Is there enough information to determine whether this feature acts as a hydrologic barrier? SC15-198 may not be the best proxy for the groundwater elevation beneath the PWP. Based on Figure 2.8, the closest groundwater monitoring points that are used to generate this figure are located within the CTF (to south) and the geotechnical hole SC15-194 (to north). A spatial data gap crosses the location of the PWP, and using the contour lines projected in Figure 2.8 does not seem sufficient for determining whether or not groundwater would be encountered in the PWP foundation drain. Figure 3.28 shows a sloped blue line for the groundwater table under the facility, which implies that there is enough information about groundwater elevations to indicate a gradient. However, there are no specific observation points shown in association with this line. How were the elevations estimated? ARM 17.24.116(3)(a)

More convincing evidence would include groundwater data collected from within the footprint of the PWP. Any data pertaining to groundwater in geotechnical holes SC15-197, 201, and 202 would be very useful, but the well logs in Appendix K do not mention encountering water. With total depths near 30 meters, it seems likely that these holes encountered water at some depth, even if only within a perched system. Some of the figures mention packer testing depths. Do these imply that water was encountered, or were unsaturated test methods performed? ARM 17.24.116(3)(a)

Site-specific information about groundwater elevation and flow would prove whether or not groundwater would be captured by the PWP foundation drain. Baseline elevation and water quality data would be useful for future comparisons and determining potential impacts from facility leakage. ARM 17.24.116(3)(a)

Page 212, Section 3.6.6.3, PWP Foundation Drain System, first paragraph, third sentence: What is the source of the drainage gravel that would be used in the PWP foundation drain (e.g. location and lithology)? What constituents have the potential to leach from this rock, as any groundwater and potential pond seepage would flow through the drainage system? ARM 17.24.116(3)(d)

Page 216, 3.6.6.3, PWP Foundation Drain System, sixth and seventh sentences: The sixth sentence states that a HDPE pipeline would convey the flows back to the PWP. The seventh sentence states the details of the PWP foundation Drain System is shown on Figure 3.26. A review of Figure 3.26 and Appendix K, drawing C3004 does not show this HDPE foundation drain pump back system. Please show the return line and pumping system for the foundation drain return line. How would power be supplied to the submersible pump? ARM 17.24.116(3)(d) and (p)

Page 216, Section 3.6.6.4, PWP Embankment Constructiion and Cross-section, third paragraph, second sentence: What is the source of the weathered bedrock fill? Is it a combination of Tgd, Ynl Ex, or other material? Completed geochemical test data for these materials should be included in the application. ARM 17.24.116(3)(d) and (a)

Page 219, Section 3.6.6.5, Process Water Pond Embankment Freeboard and Section 3.6.7.1, Contact Water Pond Embankment Freeboard: Please provide the type of armoring of the liner to protect the freeboard sections of the liner from wave action and ice. ARM 17.24.116(3)(g)

Page 224, Section 3.6.7.3, Management During Mine Start-up, last sentence: The plan notes that once the PWP is complete brine generated by the RO treatment system would be transferred directly to the PWP. Would any brine generated before the PWP is complete be transferred to the PWP, or would it stay in the brine section of the CWP? ARM 17.24.116(3)(k)

Page 224, Section 3.6.7.4, CWP Liner and Reclaim System, first paragraph: Please explain why the CWP is proposed as a single lined impoundment, when all the other impoundments are double lined? ARM 17.24.116(3)(g)

Page 229, Section 3.6.8.2, CTF Foundation Drain, first paragraph: The plan notes that the foundation drain would be in and functional shortly after construction starts on the CTF. This water would be collected and then pumped into the CTF. Page 239, Section 3.6.8.13, Hydrologic Assessment of the CTF, top of page 241, second and third sentences notes that the ambient groundwater flux is approximately 20 gpm and the dewatering analysis estimates the inflow rate to the foundation drain system at 15 gpm. This calculates to 21,600 to 28,800 gallons of water in a 24 hour cycle. As this water is proposed to be captured and placed into the mill circuit, what BMP's would be implemented to ensure the marshy/wet area of upper Brush Creek that is currently downstream of the proposed foundation drain collection pond would not dry up? 82.4.335(5)(m), MCA

Page 229, Section 3.6.8.3, CTF Embankment Construction and Cross Section, second paragraph, third sentence: The downstream slope of the CTF embankment is proposed as 2.5:1. Constructing the CTF downstream slope at 2.5:1 would result in a permanent landform being constructed that is much steeper than existing topography. Please submit a plan for reducing the slopes on the lower portion of the CTF embankment to be constructed to a more natural appearing 3:1 or less slope. See CTF Embankment cross-section Figure 3.36. Note that PWP and NCWR are proposed to be restored to pre-mining topography. The CTF should also be reclaimed to resemble pre-mining topography. Also, see similar comment on Figure 7.1. ARM 17.24.115(1)(b)

Page 231, Section 3.6.8.6, Embankment Staging, last sentence: Would all the material required to construct Stage 2 of the embankment be placed and compacted on top of the Stage 1 lift? Would additional material to construct the Stage 2 embankment lift be stored in the excess material stockpiles? Where would this material be stockpiled while the Stage 1 embankment is being constructed? ARM 17.24.116(3)(d) and (g)

Page 236, Section 3.6.8.7, CTF Lining System and Seepage Control: Would a flow meter be placed on the CTF basin drain line, or on the foundation drain line? ARM 17.24.116(3)(l)

Page 236, Section 3.6.8.8, CTF Seepage Reclaim Sump: The first paragraph notes that the seepage reclaim system would collect any seepage through the upper HDPE geomembrane (liner) and direct it vie the geonet to a sump. From there it would be pumped through a raise to the PWP. Per Drawing C6200, Appendix K, the seepage drain reports to the CTF basin drain and from there, to the PWP. Please clarify as referenced Figure 3.38 does not show this. ARM 17.24.116(3)(g)

Page 236, Section 3.6.8.8, CTF Seepage Reclaim Sump, second paragraph, third sentence: As indicated by the discussion in Appendix N and associated Table 3-1, quite a few mineral phases are predicted to precipitate in the CTF and/or sump. Besides having an additional drain pipe for redundancy, are there other plans that could be implemented to clean or maintain the system if the sump operation is hindered by the buildup of mineral precipitates? ARM 17.24.116(3)(l)

Page 238, Section 3.6.8.9, CTF Reclaim System, second paragraph, second sentence: The plan notes that the pipes (drain sumps), would be placed in a channel that would run up the inside of the impoundment. Please provide a conceptual drawing of this channel. ARM 17.24.116(3)(g)

Page 238, Section 3.6.8.9, CTF Reclaim System, last paragraph, second sentence: The plan notes that the well will have a high/low water level switch. At what elevations will these levels be? How much water does that calculate to in gallons? 82.4.335(5)(m), MCA

Page 238 Section 3.6.8.10, CTF Delivery System, first paragraph, third sentence: The plan notes that at certain locations, the tailings delivery system would be double walled. Please provide details, including conceptual engineering drawings, of the double-walled sections. Where the tailings delivery piping transitions back to single wall, how would the ends of the double-walled be constructed? How would corrosion inspections be done in the double-walled sections? 82.4.335(5)(l), MCA

Page 238, Section 3.6.8.10, CTF Tailings Delivery System, fourth paragraph, third sentence: The plan notes that the (tailings) pipeline would be flushed with water and drained when not in use to prevent freeze/set up. How much water would be required? Would this flushed water be discharged into the CTF? 82.4.335(5(l), MCA

Page 239, Section 3.6.8.11, CTF Waste Rock Co-disposal during Operations: The response to comment 1DEQ-150 indicates that waste rock would initially be crushed and screened on the WRS pad to create the material for the cushion layer over the CTF liner. Later the crushing and screening plant would be moved to the floor of the CTF to generate the remainder of the required cushion layer from ROM waste rock transported to the CTF from the WRS. Crushing and screening would produce various material size fractions, including plus 3/8-inch reject and minus 3/8-inch material. Would all of this crushed material be used for the cushion layer, or would only some size fractions be suitable? Does the cushion layer need to be composed of low permeability material dominated by fines, or higher permeability material from which the fines have been separated out by screening? If the crushing and screening process would generate material size fractions unsuitable for cushion material, how would this unsuitable material be managed and where would it be disposed? ARM 17.24.116(3)(d)

Also, instead of reclaiming the temporary WRS and constructing a new ore storage pad, can the WRS be used to store the stockpiled ore? ARM 17.24.116(3)(d)

Page 239, Section 3.6.8.13, Hydrologic Assessment of the CTF, third paragraph, first sentence: The plan notes that the foundation drain system is sufficient to dewater the groundwater beneath the CTF without creating hydrostatic head beneath the liner system. Please see above comment (Page 229, Section 3.6.8.2, CTF Foundation Drain). 82.4.335(5)(l), MCA

Page 241, Section 3.6.9.1, NCWR and Water Rights: The response to comment 1DEQ-152 states that the potential need for a NCWR will be determined as part of a mitigation plan to be negotiated with DNRC. Therefore, some components of the NCWR design remain quite conceptual. DEQ notes that Tintina's proposal relies on construction and/or operation of the NCWR for some portions of the operating plan that are not directly associated with water rights mitigation (examples include: water to be discharged to infiltration galleries adjacent to Coon Creek to maintain wetlands and to maintain stream flows within non-degradation limits; storage of excess excavation material from the CTF footprint as the NCWR embankment). If negotiations with DNRC do not result in the need for construction of the NCWR, then Tintina would need to propose alternate means of achieving these goals. 82.4.335(5)(l), MCA

Page 241, Section 3.6.9.2, NCWR Overview, first paragraph, second sentence: Since the NCWR is over 50 acre feet, it would be considered as a high hazard facility and trigger MT DNRC Dam Safety Act upon mine closure. Please discuss the impacts the Dam Safety Act would have on the NCWR if the pond volume is not reduced at closure. 82.4.335(5)(l), MCA

Page 248, Section 3.6.10, Soil and Excavation Material Stockpiles, first paragraph: The volume of soil to be salvaged is incorrectly calculated. Please see comment on page 388 (corrected Table 7-2). The volume of soil salvaged is incorrectly calculated on Table 7-2. The correct volume of salvaged soil is 235,624 CY based on the acres to be salvaged and the proposed salvage depths, plus a 12% swell factor. Note that a smaller volume of subsoil is to be stockpiled compared to topsoil (212,496 CY topsoil vs. 23,129 CY subsoil) yet the maps show a larger footprint for the subsoil stockpile. Please explain. What is the source of the material placed in the subsoil/reclamation material stockpile? Please see the comment above on page 166, Section 3.4.2.7, Cut/Fill Material Quantities and comment below on page 388, Table 7-1, volume corrections. ARM 17.24.116(3)(b)

Page 248, Section 3.6.10, Soil and Excavation Material Stockpiles, second paragraph: Please clarify what materials would be stockpiled on the 7.1 acre excess reclamation material stockpile located adjacent to the WRS. Would this stockpile contain salvaged soil or only excess excavation material? ARM 17.24.116(3)(b)

Page 350, Section 4.3.3.1, Seepage Analysis using HELP Model, Embankment Seepage Hydraulic Analysis Results, third paragraph, second sentence: The plan notes that embankment seepage will not significantly impact the regional groundwater system. What is the estimate for the amount of seepage? 82.4.336(10), MCA

Page 255, Section 3.7.1, Water Supply, first paragraph, last two sentences: Please supply the application for the PWS well when completed. ARM 17.24.116(4)

Page 256, Section 3.7.2.1, Model Methodology, second sentence: The plan notes that the volume of water in the CTF, PWP…were estimated on a monthly basis over 15 years…. Were the predicted CTF foundation drain flows of upwards of 28,000+ gallons/24 hour cycle factored in? ARM 17.24.116(3)(g)

Page 257, Section 3.7.2.2, Model Assumptions and Scenarios: Please commit to developing an operational water balance model that regularly updates the proposed water balance inputs listed in Table 3-37. This would identify potential problems before they occur. ARM 17.24.116(3)(l)

Page 259, Section 3.7.2.3, Model Results, third paragraph, third bullet: The plan notes that the surface water and precipitation reporting to the CTF would report directly to the PWP. Is the referenced surface water coming from the foundation drain system? ARM 17.24.116(3)(g)

Page 261, Section 3.7.3, Water Treatment, fifth paragraph, first sentence: It is stated that the maximum combined flow of groundwater and process water that is expected to require treatment is 510 gpm. Elsewhere in the document, the maximum combined flow is reported at 500 gpm, or 492 gpm (p. 276), and the capacity of the treatment system is reported at 510 gpm. Which is a more accurate or updated estimate of combined flow? Please update these discussions so figures are consistent throughout the application. It seems unfavorable to run a treatment system at the maximum capacity (i.e. maximum wear and tear?), unless supporting information is provided that indicates treatment is optimized under that condition. What options are available if this system is undersized and treatment demands exceed this design? Please include additional discussion about the optimization of flow through the RO, and the ability of this system design to handle fluctuations in flow, whether through excess storage potential in holding pond/tank or the use of additional RO units. ARM 17.24.116(3)(j) and (k)

Page 261, Section 3.7.3, Water Treatment, fifth paragraph, second sentence: During operations, liquid and solid treatment residuals would be disposed on-site using the PWP and CTF, respectively. Please include an analysis and discussion about the disposal of RO brine in the PWP, which would increase the TDS of the facility. It's noted that this component is not included in the geochemical model/water balance for the PWP. Would the TDS increase to a point where the water contained in the PWP is no longer suitable for use in the mill? Can an estimate be provided for the volume of solid residuals that would be disposed of in the CTF? Assuming this material would be placed intermittently through operations, does it change any of the assumptions about the chemical reactivity of the cemented CTF waste or the water quality reporting to the sump? 82.4.336(5)(m) and 336(10), MCA

Page 268, Section 3.7.3.3, Raw Water Quality, Treatment Goals, and Treatment Parameters, first paragraph, first sentence: The three locked cycle tests were used to estimate the expected raw water quality for the treatment of process water during mine closure. Was water from the underground at closure included in the closure treatment scenario? Were water quality predictions from the 2016 geochemical modeling used as inputs to the WTP model? This would include water being cycled through the underground, as part of the flushing/flooding and treatment methods. 82.4.336(10), MCA

Page 268, Section 3.7.3.4, Water Treatment Selection Process: Details are lacking in the discussion on RO treatment. To limit the “black box” perception of the proposed system, please provide more details about the projected influent water quality (based on geochemical model?), the models that were used to estimate treatment efficiency, permeate water quality, etc. Please describe the pressures that would be applied to the treatment system, with comparison to the upper limits for the technology (1,200 psi). During periods where the VSEP would be used, the two-phase membrane treatment results in a concentration factor greater than 140 for reject. What is the resulting TDS concentration, and does it approach the limit where there might be osmotic pressure issues (80,000-120,000 mg/L)? 82.4.335(m), MCA

Page 269, Section 3.7.3.5, Water Treatment for the Construction Phase, sixth paragraph, third sentence: The estimated recovery for the RO system is reported to be 93%, which seems unrealistically high compared to the functionality of historic RO systems. Please include more discussion (either here or in a separate appendix) that gives examples and track-records of modern RO systems that can achieve such a high recovery, with similar influent water quality. How would the treatment approach and brine handling change to accommodate a decrease in RO efficiency (e.g. 80% recovery)? Would the discharge comply with non-degradation standards with reduced RO efficiency? Please provide modeling information for the primary RO step. The same examples and details are requested for the high-efficiency VSEP system which is also proposed. 82.4.335(m), MCA

Page 269, Section 3.7.3.5, Water Treatment for the Construction Phase: Please provide a detailed cost estimate for the design, construction, and operation of the water treatment plant during the facility construction phase, as the plant might not be available to the agency at closure. 82.4.338(1)(a), MCA

Page 270, Section 3.7.3.5, Water Treatment for the Construction Phase - Polishing Phase: Since the polished water would be free of organic matter and nutrients, what affect would long term discharge into the LAD system have on the ground water chemistry? 82.4.336(10), MCA

Page 270, Section 3.7.3.5, Water Treatment for the Construction Phase, first paragraph, second last sentence: Please discuss the potential for buildup of chlorine in groundwater from the use of HCl in the RO system. Also, please add chlorine, EC, and SAR to the parameters of concern being monitored. 82.4.336(10), MCA

Page 272, Section 3.7.3.5, Water Treatment for the Construction Phase, first paragraph, second and third sentences: How were the estimates for nitrate and ammonium removal derived? Temperature ranges are considered here, but not discussed elsewhere. Please include supporting documentation for the WTP modeling that was conducted.82.4.335(5)(m), MCA

Page 272, Section 3.7.3.6, Water Treatment for the Operational Phase: Please provide a detailed cost estimate for the design, construction, and operation of the water treatment plant during the operational phase, because the plant might not be available to the agency at closure. 82.4.338(1)(a), MCA

Page 273, Section 3.7.3.6, Water Treatment for the Operational Phase, last paragraph: The paragraph is confusing about the preferred method of brine disposal during operations. Is it the PWP or the paste plant (by way of mill thickener)? It seems like disposal of brine in the paste is preferred, but the water balance (with 36 gpm brine) does not seem to match the statement that 10% of the water used for cement would be brine (approximately 18 gpm), leaving about half of the brine going to the PWP. More clarification is needed about the proposed dilution of the brine in the mill, how much of the brine could actually be used in the cement, and whether the resulting salt load going into the cement will have any adverse effect on backfill strength and stability (see related comments). 82.4.335(5)(m), MCA

Page 274, Section 3.7.3.7, Water Treatment for the Closure Phase: Please provide a detailed cost estimate for the design, construction, and operation of the water treatment plant during the closure phase, as the plant might not be available to the agency at closure. 82.4.338(1)(a), MCA

Page 275, Section 3.7.4.1, Underground Infiltration Galleries, first full paragraph, first sentence: The plan notes that Tintina plans to use three large areas of upland underground infiltration galleries to dispose of water below the frost level into the fractured bedrock. The only reference to this system is Figure 1.3. Please provide a more detailed drawing for the underground infiltration galleries and their interactions with the fractured bedrock. 82.4.336(10), MCA

Page 275, Section 3.7.4.1, Underground Infiltration Galleries, third full paragraph, fifth sentence: The plan notes that the depth to the groundwater table in this area (underground infiltration galleries) is approximately 160 feet based on Figure 4.6 and MW-13. MW-13 lies approximately 1250 feet to the northeast. Given the distance between the proposed infiltration galleries and MW-13, is the depth to groundwater a reliable measurement? ARM 17.24.116(3)(a)

Page 275, Section 3.7.4.1, Underground Infiltration Galleries, third paragraph, entire paragraph: Without monitoring points within the proposed facility footprint, there is very little information available about groundwater elevation and water quality under the southwest area UIG. Figure 4.6 is cited as a proxy for estimating groundwater elevation, but the contour lines do not extend across this area. Additional baseline information may be needed before considering impacts to groundwater from operation of the UIG. What consideration was given to locating the southwest UIG up-gradient from the CTF? How would additional infiltration contribute to groundwater flow in that drainage and what additional water may report to the CTF foundation drain (i.e. compare vertical and horizontal preference for flow under the UIG)? Similarly, there are no monitoring points displayed within the eastern UIG footprint, where depth to groundwater is reported to be between 59 and 266 feet. There are no contour lines displayed for this area (Figure 4.6 and Appendix M). Please explain how the groundwater elevation was estimated. Additional wells (MW-14 and 15?) were drilled in this area in 2016, but updated information was not included in this application. Please update monitoring data for this area, including infiltration data which may help clarify the groundwater flow direction, and possible connection to surface water in Brush Creek. ARM 17.24.116(3)(a)

Page 276, Section 3.7.4.1, Underground Infiltration Galleries, fourth paragraph, fifth sentence: The dimensions provided for the trenches and gravel fill indicate that 1,540 cubic yards of gravel would be needed. What is the source of the drainage gravel that would be used (e.g. location and lithology)? What constituents have the potential to leach from this material, as RO system permeate is discharged through the drain? ARM 17.24.116(3)(d)

Also, please consider more tests in the UIG areas to document leaching of existing parameters of concern using deionized water (RO Water and using RO water mixed with buffering compounds (calcium) as proposed. 82.4.336(10), MCA

Page 278, Section 3.7.4.2, Underground Infiltration to Sheep Creek Alluvium, second paragraph, first and second sentences: The alluvial infiltration gallery is a new feature in the September 2016 response. Given the connection between the alluvium and Sheep Creek, is Tintina proposing to meet non-degradation criteria for groundwater or surface water, for the water discharged into the alluvial infiltration gallery? What is the distance from the alluvial infiltration gallery to Sheep Creek? Based upon the reported infiltration rate and groundwater flux through the alluvium, at what distance from the infiltration gallery would water reach Sheep Creek? Does that correspond with the proposed mixing zone length (3,500 feet), and if not how was that figure estimated? Please discuss the components of that mixing analysis, i.e. estimated WTP permeate quality, and baseline data for the receiving alluvial groundwater and nearby surface water. 82.4.336(10), MCA

Page 280, Section 3.7.5.2, Surface Water Diversion Ditches, second paragraph, last sentence: The plan noted that steel pipe bridges would be constructed to allow tailings and reclaim water pipe lines to pass over the diversion channel. Please submit conceptual drawings for the design and location of these bridges. ARM 17.24.116(3)(g)

Page 280, Section 3.7.5.3, Stormwater Control and Management: Stormwater controls should include a discussion of how traffic and tracking of PAG across the portal and mill pad would be managed to prevent spreading contaminated material around the mine site. The discussion should include BMPs for management of tracked PAG material from the WRS to the CTF. The proposal should consider how employee parking and supply deliveries would be designed to prevent tracking PAG material from the portal and mill pad onto the county road. The design of mill pad and portal pad facilities should identify “hot zones” where PAG could be encountered on the surface during mining/milling and a plan where traffic and parking would be isolated to avoid contact with PAG. The design of the portal pad/mill pad may require BMPs, such as paving, to keep underlying foundation materials from becoming contaminated by 15 years of mining activity. 82.4.336(10), MCA

Page 311, Section 3.8.10, Hazardous Materials Disposal, third sentence: The plan notes that the Spill Prevention, Control and Countermeasures plan for the project would be submitted to the Waste and Underground Tank Management Bureau prior to initiation of construction. The Underground Tank section does not regulate aboveground tanks and piping, as that falls under the jurisdiction of the State Fire Marshall. If any portion of tanks and/or piping is placed below ground, the Underground Tank section must be contacted and the proposed installation drawings submitted and approved prior to start of any construction/installation. ARM 17.24.116(3)(m)

Page 327, Section 4.1.6.1, Introduction (Groundwater Modeling Assessment), second paragraph, second sentence: The text notes that, ‘…it simulated the headwaters of both Coon Creek and

Brush Creek….indicate the headwaters of these two drainages are not connected to the deeper groundwater system.” The CTF foundation drain would divert ~25,000 gallons /24 hour of shallow groundwater from the head of Brush Creek into the mill circuit. What mitigation measures would be implemented to offset this diversion? 82.4.335(5)(m) and 336(10), MCA

Page 327, Section 4.1.6, Summary of Groundwater Modeling Assessment: Please provide a more in depth analysis of the permit area to illustrate the hydrogeological and geochemical processes anticipated in the mine workings and surrounding water bearing units and surface water during the life of mine. This local analysis may need to be performed using a separate model than the one used for the regional groundwater model. 82.4.336(10), MCA

Page 328, Section 4.1.6.2, Summary of Model Results, second paragraph, fourth sentence: The text indicates that the estimated maximum drawdown in the uppermost layer of the model is approximately 290 feet. Isn't the uppermost layer of the model the Qa? The text goes on to state that the alluvium would only experience 10 feet of drawdown near Coon Creek. This needs further discussion and clarification. 82.4.336(10), MCA

Page 328, Section 4.1.6.2, Summary of Model Results: In the response to comment 1DEQ-204: The numerical model assumes an average permeability of rock units, which includes both the primary porosity of the rock matrix and the secondary porosity associated with joints and fractures. Has geologic mapping of the project area determined whether the rock units have dominant jointing/fracturing orientations? A dominant fracture orientation could result in the bedrock having an overall higher permeability parallel to the fracturing than in other orientations, which could result in an extended cone of depression due to dewatering in that direction and potentially increased or decreased rates of inflow. Please address this concern. ARM 17.24.116(3)(a)

Page 335, Section 4.2.2, Modeling Methods: The response states that oxidation that might occur in bedrock units overlying the copper deposit is not considered in the water quality model. For clarity, please confirm that the model assumes altered geochemical conditions in bedrock only within one meter of underground workings, if that is the case. 82.4.336(10), MCA

Page 335, Section 4.2.2, Modeling Methods: The response makes reference to the USZ humidity cell producing neutral effluent through week 62. It should be noted that the humidity cell effluent later became acidic. 82.4.336(10), MCA

Page 335, Section 4.2.2, Modeling Methods: The original comment asked “please discuss whether there are mitigating technologies that can be applied to minimize oxidation at locations where the decline (and ventilation raises) penetrate high sulfide bedrock.” Tintina responded that the workings could be flushed with treated water at the end of mine operations. This would be an after-the-fact mitigation rather than one which might limit oxidation during operations. Are there technologies that could be applied locally to high sulfide bedrock to prevent or limit oxidation up front? 82.4.336(10), MCA

Page 335, Section 4.2.2, Modeling Methods: The last part of DEQ's comment noted that water quality compliance wells should be installed downgradient of the mine workings to document existing water quality and to verify that the groundwater is not degraded post-mining. The response refers to Tintina's response to 1DEQ-67, which does not address water quality monitoring. A citation to the appropriate responses should be included. ARM 17.24.116(3)(a) and 82.4.335(5)(m), MCA

Page 335, Section 4.2.2, Modeling Methods: The response states that it is not possible for the geochemical model to predict the length of time needed for groundwater treatment. However, the response then indicates that Tintina proposes to flush solutes from the bedrock by filling the underground workings with water, then draining and treating that water, three to six times. Can Tintina provide any supporting analysis and/or case studies that would corroborate that groundwater chemistry can be restored to background conditions with this level of rinsing? The response also indicates that it would require 3 to 6 months to drain and re-fill the underground workings 3 to 6 times. Please provide supporting calculations if available. Is the filling time derived from the groundwater model? If so, does the estimate also account for the time required to fill void spaces (i.e. access ramps, declines, etc. that would remain unbackfilled underground)? Note that the groundwater model currently does not account for these openings as void spaces. Rather, they are represented as drain cells for the purpose of analyzing mine dewatering, and when active dewatering would cease, modeling represents this by turning off these drain cells. The result is that the simulated mine workings in the model revert to being treated as solid bedrock of the same permeability and storativity as the surrounding rock, i.e. the model includes no void spaces that may act as conduits for groundwater flow post-closure. 82.4.335(5)(m) and 336(10), MCA

Page 337, Section 4.2.3.1, Underground Mine, second sentence: The plan notes that the highest local contributions of acidity, metals, and sulfate come from the UCZ, but the rate of groundwater flow is low so the net contribution is minor. Per Figure 4.10, Conceptual Model of the Hydro-stratigraphic Units with flow to Mine Sump, the USZ/UCZ is predicted to have flows up to 274 gpm. This flow is the highest of all the hydro units in Figure 4.10. Please clarify. 82.4.335(5)(k) and (m), MCA

Page 337, Section 4.2.3.1, first paragraph, second sentence: "The highest local contributions of acidity, metals, and sulfate come from the UCZ, but the rate of groundwater flow from the UCZ is low so the net contribution is minor." Figure 4.10 indicates that the USZ/UCZ contribution to mine inflow is 274 gpm, approximately half of the total flow in year 6. This cannot be considered a low flow source, or a minor contribution to the inflow chemistry. If a distinction is made between the hydrogeological and geochemical characteristics of the USZ and UCZ (and the UCZ is a small component), then that should be clarified in the associated figures and inputs to the model. Are there monitoring locations and/or geochemical laboratory tests that can be used to make that distinction? 82.4.335(5)(k) and (m), MCA

Page 340, Section 4.2.3.3, CTF Facility, second paragraph, first sentence: The plan notes that the facility would be finished with a final several foot thick lift of 4% cemented paste tailing. Please provide a minimum thickness. ARM 17.24.116(3)(d)

Page 341, Section 4.2.3.3, CTF Facility, first full paragraph, third sentence: The plan notes that the CTF surface would weather for approximately 1 week …under typical operations. Page 340, first paragraph, third sentence states that the upper surface may be exposed for as many as 30 days. What is the estimate of the average time a CTF tailings surface may be expected to be exposed before the next layer is placed? ARM 17.24.116(3)(d)

Page 341, Section 4.2.3.3, CTF Facility, second paragraph, entire paragraph: The reactive surface area of the CTF facility is limited to a discrete volume of flow, similar to the approach for the WRS. This may be appropriate for tailings seepage (predicted at 5% of tailings mass, or 29,029 m3/yr). Doesn't this underestimate the surface area that is exposed to weathering from precipitation? The concept of scaling surface area is one of the biggest factors controlling the modeled water quality. This concept is confusing, when combined with a description further down the page, where all of the precipitation "is assumed to contact and react with the top surface of the CTF." In that scenario, how does the CTF have a reactive surface area 4.75 times less than the surface area of the HCT test cylinders? ARM 17.24.116(3)(k)

Page 342, Section 4.2.3.3, CTF Facility, third paragraph, fifth sentence: How long would the CTF sump need to be pumped at closure? ARM 17.24.116(3)(f) and 82.4.338(1)(a), MCA

Page 342, Section 4.2.3.3, CTF Facility, second full paragraph, fifth sentence: The plan notes that the CTF sump would continue to be pumped in closure until all water quality and volume objectives are met. Would the discharge pipe be grouted at that time or left open for continued monitoring of sump conditions? 17.24.116(3)(i)

Page 341, Section 4.2.3.3, CTF Facility, last paragraph, entire paragraph: Please clarify this short paragraph. Does this mean that only 10% of the water would receive additional solute load from the waste rock in the drain and sump? The text seems to imply that only 10% of the run-off and dewatered paste water would flow through the drain, even though all of the water contained within the CTF would have to report through the drain and sump (113,029 m3/yr). ARM 17.24.116(3)(g)

Page 343, Section 4.2.4, Summary of Water Quality Predications, sixth sentence: The plan notes that water quality is expected to improve at closure for CTF water with higher pH and lower metal concentrations. Please provide the data or analysis used to predict improved water quality in the CTF at closure. 82.4.335(5)(k), MCA

Page 345, Section 4.3.2.1, Non-Significant Criteria Determinations: Please discuss how temperature affects the Non-Significant Criteria, and how it affects the discharge of water to the alluvium along Sheep Creek. 82.4.335(5)(k), MCA

Page 354, Section 6.3.1.1, Proposed New Operational Monitoring of Facility Sites: The response includes a proposal to install 4 monitoring wells into shallow bedrock beneath the Sheep Creek Hay Meadow, downgradient of the Upper Johnny Lee deposit. The response states that nested wells would not be necessary. DEQ notes that well pair MW-4A and MW-4B are already located in this area, and show an upward gradient from shallow bedrock into the Sheep Creek alluvium. DEQ recommends that monitoring wells in this area be paired, or twinned with more shallow piezometers, so that vertical gradients can be assessed. It is likely that mine dewatering will reverse the presently observed upward gradient in this area as bedrock groundwater drains toward the mine void. After mine closure and mine void flooding, the upward gradient indicated by the MW-4A/4B well pair would likely return. It would only be after this recovery of upward gradients in this area that any possible water quality impacts from the flooded mine workings might be detected at these compliance wells. Therefore, monitoring of the change in gradient in well pairs over time would be a valuable indicator of when the influence of the mine workings on groundwater quality may be detectable. ARM 17.24.116(3)(l)

Page 355, Section 6.3.1.1, Proposed New Operational Monitoring of Facility Sites, first paragraph, last sentence: Please commit to monitor piezometers in the UIG for increases in nitrates, EC, SAR, etc. ARM 17.24.116(3)(l)

Page 355, Section 6.3.1.1, Proposed New Operational Monitoring of Facility Sites, first paragraph, first complete sentence: There does not appear to be useful information to be gained from resampling PW-7, besides confirming that the well has been compromised by completion or drilling mud. Are there plans to drill a new well within the LCZ? ARM 17.24.116(3)(l)

Page 358, Section 6.3.1.1, first paragraph, last three sentences: Without more information about flow paths, infiltration rates, and groundwater transit time, it is difficult to make any conclusions about whether groundwater or surface water quality would be impacted by the UIGs. Even though water treatment discharge would likely meet non-degradation criteria, there is still potential to leach contaminants from the host rock, particularly selenium. Complete test results for shallow weathered bedrock materials (Tgd and Ynl Ex) need to be included with the application. ARM 17.24.116(3)(a)

Page 359, Section 6.3.1.2, Water Quality and Compliance Monitoring of Facilities, bullet 5: There is no mention of sampling water quality of the underground discharge, only measuring the dewatering rate. DEQ recommends that the underground discharge also be sampled periodically, even though the water would report to the WTP. This would verify the accuracy of modeling for the underground, guide modeling for future conditions in the mine, and allow for adjustment of the WTP systems. ARM 17.24.116(3)(l)

Page 361, Section 6.3.3, Facility Geotechnical Monitoring: Please discuss underground geostability monitoring. ARM 17.24.116(3)(l)

Page 362, Section 6.3.6, Wetlands Monitoring: Which piezometers would be used to measure the impact to upper Brush Creek once the CTF foundation drain is functional and ~25,000 gallons/24 hours of water is removed from the natural drainage of upper Brush Creek and pumped into the CTF foundation drain collection pond? ARM 17.24.116(3)(l)

Page 362, Section 6.3.6, Wetlands Monitoring, second paragraph, second sentence: The plan notes that Tintina plans to augment flows to wetlands, including those downgradient of the CTF from water stored in the NCWP. The NCWP is southeast of the CTF with a ridge line in between. How would waters from the NCWP offset any diminished flows in upper Brush Creek from the foundation drain diversion? ARM 17.24.116(3)(g)

Page 364, Section 6.3.9.1, Soil Erosion and Construction Monitoring, last sentence: Please remove the reference to the period of at least 3 years and commit to monitoring until such time MDEQ finds the results meets the established goals. ARM 17.24.116(3)(l)

Page 365, Section 6.4.1, Facility Closure Monitoring, first paragraph. Would trees be part of the self-sustaining productive vegetative cover on the CTF? ARM 17.24.115(1)(c)

Page 365, Section 6.4.1, Facility Closure Monitoring, second paragraph, second sentence: The plan notes that (surveying) monuments would require surveying at regular intervals. Please provide a schedule for such surveys. ARM 17.24.116(3)(l)

Page 365, Section 6.4.1, Facility Closure Monitoring, second paragraph, last sentence: Please remove the '36-month' reference and replace with a period to be determined in consultation with MDEQ. ARM 17.24.116(3)(l)

Page 365, Section 6.4.2, Water Quality Monitoring and Figure 2.2, Surface Water Resource Monitoring Sites: The response to comment 1DEQ-229 indicates that Tintina would install one of the newly proposed compliance wells in the Sheep Creek hay meadow during the EIS process, and the other three prior to construction of facilities. DEQ notes that Tintina should collect at least one year's baseline data from all of these wells prior to the initiation of mine dewatering. ARM 17.24.116(3)(l)

Page 367, Section 7.1, Category Descriptions: Tintina states that mine dewatering would cease if operations were temporarily suspended for 5 years because the cost of water treatment and brine management would become prohibitive. This scenario should then be part of bonding for closure water treatment requirements. The PWP would contain 52.8 million gallons of brine blended with process water, and additional water requiring treatment would be stored in the CWP. This water would be treated and used to flood the underground workings, with brine shipped offsite. The workings would be repeatedly drained and re-flooded as currently proposed by Tintina until background groundwater chemistry conditions are achieved. Please confirm these assumptions. 82.4.338(1)(a), MCA

Page 367, Section 7.1.1, Short-term Temporary Closure – Less than One Year: Tintina addresses short- and long-term temporary closure in the reclamation section. Short-term closure effects also need to be addressed for the underground workings, CTF, and other facilities. Also, the plan indicates that the underground workings would be continually backfilled to limit exposure of acid producing materials, but this would not happen during a temporary closure. Please address these concerns. 82.4.336(10), MCA

Page 368, Section 7.1.2, Longer-Term Temporary Closure, One to Five years, first paragraph, third sentence: The plan notes that in a 1-5 year temporary closure, a high cement content (~4%) lift would be placed on top of the existing surface of the CTF. What would be the thickness of this lift? ARM 17.24.115(1)(i)

Page 369, Section 7.1.2, Longer-Term Temporary Closure, One to Five years, last paragraph, first sentence: If the mine is put into long term temporary closure and dewatering is stopped, would the bulkheads proposed for final closure be installed to prevent/limit different aquifers from intermingling? 82.4.336(10), MCA

Page 369, Section 7.1.4, Permanent Reclamation and Closure, second paragraph, second sentence: Would any buildings be offered to the land owner(s), or would all buildings be removed at closure? 82.4.338(1)(a)

Page 376, Section 7.3.3.2, Underground Mine Closure: The response states that three of the four concrete plugs that are proposed for sealing the ventilation raises would be installed above the predicted static water table and one of the plugs could be installed below the groundwater table. Please identify which ventilation raise is proposed to have a plug installed below the predicted post-closure water table, and at what depth below the groundwater table. ARM 17.24.116(3)(e)

The response also notes that none of the ventilation raise plugs would be designed as hydraulic plugs, therefore groundwater could flow around the plugs via near-surface bedrock fractures, resulting in equilibration of water pressure on either side of the plugs. Please discuss how this design would prevent water within the mine void from entering shallow fractured bedrock (and potentially discharging to wetlands or surface water depending on the location of the ventilation raise that would be plugged below the water table). 82.4.336(10), MCA

Later in the response, Tintina states "hydrologic contractors conclude based on the hydrologic modeling that the groundwater table surface will not be permanently lowered or raised anywhere in the mine area (post-mining in closure) based on the proposed BBC mining activities." DEQ is concerned that the post-closure potentiometric surface may achieve equilibrium at substantially different elevations than the documented baseline condition due to equilibration of pressure via mine access ramps, declines, and ventilation raises that remain unbackfilled. DEQ believes that the current groundwater model is not capable of simulating this scenario because the model simulates mine dewatering via the use of drain cells. Actual tunnels, raises, etc., are not incorporated into the model. When these drain cells in the model are turned off, areas where void spaces would exist due to underground development revert to having the same properties as the surrounding bedrock rather than behaving as open, interconnected voids. This may cause the actual rates of water level recovery, the post-mining static water table, and rates of groundwater flux through underground workings to differ substantially from the model's predictions. 82.4.336(10), MCA

Page 367, Section 7.1.1, Short-term Temporary Closure – Less than One Year: The response states: "Modeling of underground bedrock exposure are considered in the geochemical modeling section and their impact has been included in the predictive groundwater closure chemistry modeling." DEQ notes that, although the model may include a reasonable volume of rock that would be geochemically altered by oxidation, it does not model that rock as being "exposed" in tunnel walls. Rather, those zones are modeled as occurring within rock of uniform permeability. This would limit the ability of the model to assess the potential for contaminant transport. Please address this concern. 82.4.336(10), MCA

Page 376, Section 7.3.3.2, Underground Mine Closure, fourth paragraph & Figure 7.3, Generalized Geologic Cross-Section A-A' Showing the Underground Mine Closure Plan: The plan calls for four hydraulic walls to be constructed. Two of the walls are to be constructed in the Volcano Valley Fault. The fault is reported to be of weak structural strength and potentially an unsuitable location. Please provide a secondary or backup location for these walls. ARM 17.24.116(3)(d)

Page 376, Section 7.3.3.2, Underground Mine Closure, fourth paragraph & Figure 7.3, Generalized Geologic Cross-Section A-A' Showing the Underground Mine Closure Plan : Please provide conceptual engineering drawings and a cost estimate to install each of the four walls. 82.4.228(1)(a), MCA

Page 378, Section 7.3.3.2, Underground Mine Closure, fourth paragraph, fourth sentence: The plan notes that at closure a rebar grid would be constructed across the width of the ventilation rises prior to pouring concrete plugs. As these plugs would have to last indefinitely, would rebar have sufficient strength? Would the use of I beams be more appropriate? 82.4.335(5)(l), MCA

Page 379, Section 7.3.3.3, Portal Pad Closure, second sentence: Tintina appears to have a shortage of reclamation materials. Please commit to salvage the excess portal pad materials to use in reclamation on other facilities and add these volumes to the material balance table. ARM 17.24.116(3)(b)

Page 381, Section 7.3.3.6, Cemented Tailings Facility Closure, second paragraph, last sentence: Please describe the source and stockpile location for the four feet of graded fill to be used on the CTF and add these volumes to the material balance table. ARM 17.24.116(3)(b)

Page 381, Section 7.3.3.6, Cemented Tailings Facility Closure, second paragraph, fifth sentence: The water quality of the foundation drain system would be compared to the baseline water quality from CTF monitoring wells (MW-10 through MW- 13) to verify if it is un-impacted groundwater. These wells were recently installed within the CTF footprint to investigate the depth to groundwater under the facility, which would be built into the groundwater table. Although water elevations are presented in the application, there is no discussion of water quality for MW-10 through MW-13. Details about water quality should be discussed in sections pertaining to baseline hydrology and the CTF foundation drain, even if only briefly, rather than only in the report in Appendix B-1. The water quality data also need to be included in the spreadsheets contained in Appendix B-A, Baseline Water Quality Data. ARM 17.24.116(3)(a)

Page 385, Section 7.3.3.10, Pipeline, Underground Infiltration Galleries, and Well Closures, both paragraphs: Please discuss the removal or reclamation of the septic system pipe, and plugging the underground pipelines with cement rather than removing them at closure. Also, the septic system drain field is shown on other facility maps, but not in Figure 7.5. ARM 17.24.116(3)®

Page 387, Section 7.3.4, Soil Salvage, Handling, and Redistribution: Please provide a Vegetation Removal and Disposition Section. Describe the potential use of salvaged vegetation materials on site. Please indicate which materials would be stockpiled with the soil. ARM 17.24.116(3)(b)

Page 387, Section 7.3.4.1, Soil Salvage, second paragraph, second sentence: DEQ guidelines call for use of soils with 50 percent coarse fragments or less. At this site, large amounts of coarse fragments naturally occur in the soil profiles. DEQ is reviewing the soil pedon descriptions and would recommend additional salvage of materials to ensure adequate volumes of soils. ARM 17.24.116(3)(b)

Page 387, Section 7.3.4.1, Soil Salvage, fourth paragraph: The listed volume of salvageable soil (263,899 CY) is incorrect. There appears to be an error in the spreadsheet used to create the upper portion of Table 7-2 on page 388. The correct volume of salvageable soil should be 235,624 CY including the 12% swell factor used in the calculations. This is a difference of -28,275 CY. See corrected Table 7-2 below. The volume of soil salvaged plus swell, if applied evenly across the 141.3 acres proposed for soil salvage, would result in approximately 12 inches of soil being applied over the disturbed area. Also see comment above on Page 248, Section 3.6.10, Soil and Excavation Material Stockpiles. ARM 17.24.116(3)(b)

Revised Table 7-2 - Acres of disturbance and estimated soil salvage volumes

Soil map unit	Total disturbance per map unit (acres)	Depth salvage 1st lift (inches)	Volume salvage 1st lift (CY) (+12% swell)	Depth salvage 2nd lift (inches)	Volume salvage 2nd lift (CY) (+12% swell)	Sum of soil volume (CY)	Volume in application Table 7-2 Page 388	Difference (CY)
Ch-b	29.8	6	26,923	0	0	26,923	30,154	-3,231
Cp-c	14	6	12,649	0	0	12,649	14,166	-1,517
Hl-b	4.5	12	8,131	0	0	8,131	9,107	-976
Kp-c	36.4	12	65,772	0	0	65,772	73,665	-7,893
Pn-b	45.9	12	82,938	0	0	82,938	92,891	-9,953
Wa-b	5	12	9,035	12	9,035	18,070	20,238	-2,168
Wg-b	3.9	12	7,047	24	14,094	21,141	23,678	-2,537
DL	1.8	0	0	0	0	0	0	0
Totals	**141.3**		**212,495**		**23,129**	**235,624**	**263,899**	**-28,275**

Note: The lower half of Table 7-1 does not include the 12% swell factor in volume calculation.

Page 389, Section 7.3.4.3, Soil Redistribution, second paragraph: Some of the facilities may need cover systems using clean fill, subsoils, etc. Please prepare a table of facilities and the cover systems proposed for each based on slopes and the need to cover acid-generating materials. This would help facilitate review of the application and help identify which reclamation material stockpiles are needed, where, and how large they need to be. ARM 17.24.116(3)(b)

Page 389, Section 7.3.5, Revegetation: Historically the mining industry has not had difficulty revegetating mine land disturbances with grasses. The challenge has been to implement reclamation practices that lead to shrub and tree dominated landscapes. The proposed plan attempts to ensure dominance by shrubs and trees by reducing grass seed rates and by recommending ripping to relieve compaction in some areas. The Canadian experience has shown the competition from traditional grass dominated reclamation, and that seed mixes, compaction, rock content, aspect, and other factors are curtailing the natural succession of sites to shrubs and trees (Polster, 2016). Please discuss how Tintina selected the proposed vegetation types in the locations proposed and how it proposes to ensure the success of those sites to other than grasses. ARM 17.24.115(c)

Page 392, Section 7.3.5.2, Seedbed Preparation and Seeding Method, last paragraph, first sentence: Please show the conceptual locations of woody debris stockpiles on the figures. ARM 17.24.115(c)

Page 393, Section 7.3.5.3, Tree Planting Rates and Methods, second paragraph: The text references Revegetation Map Figure 7.6, Revegetation Map, which indicates that trees are proposed to be planted on the reclaimed CTF. Given the depth roots can achieve and that trees can be blown over, uprooting the ground, please change the cover design to prevent meteoric water infiltration. ARM 17.24.115(c)

Page 400, Section 8.0, References, DEQ 1998: DEQ has updated the soil, overburden, and regraded spoil guidelines. A new draft copy is available for inclusion in the reference section. ARM 17.24.115(c)

Please include additional information in the appendices for: The 2016 tracer test and any additional 2016 hydrological monitoring that has occurred. ARM 17.24.116(3)(a)

Tables:
Pages 34-36, Table 2-7, Water Sampling Summary for Baseline Monitoring Sites: Please include location data and sampling summary data for the monitoring wells completed in the CTF (MW-10 to 13). If making the distinction between piezometers and monitoring wells, ensure that the categorization is consistent, especially for the geotechnical holes that continue to be monitored. Based on diameter and testing/sampling capability, are they wells or piezometers? See MOPA p. 167 and Figure 6.1, compare to Appendix B, Figure 3. ARM 17.24.116(3)(l)

Pages 47-48, Table 2-10, Well Completion Data: Include completion data for the monitoring wells completed in the CTF (MW-10 to 13). ARM 17.24.116(3)(l)

Page 99, Table 2-25, Summary of Recommended Salvage Depths: Soil salvage depths are limited as soils are skeletal with limitations due to high coarse fragment content and shallow depth to bedrock. All available soils would need to be salvaged to meet the reclamation needs of the project. Suitability guidelines may need to be reviewed in order to obtain the volumes needed for mine closure. Soil salvage should consider appropriate soils for placement on steeper slope areas such as the CTF embankment face which would require a higher coarse fragment content to stay in place on the proposed 2.5:1 slopes. Three separate topsoil stockpile locations or cells should be constructed based on the original slope where soils would be salvaged:

1. Kp-c; Cp-c: 78,421 CY to be salvaged and stockpiled for reclamation; slopes >33% (>3:1)
2. Wg-b, Wa-b, Hl-b, Ch-b: 74,265 CY to be salvaged and stockpiled for reclamation; slopes 10-33%
3. Pn: 82,938 CY to be salvaged for reclamation; slopes 0-10%

ARM 17.24.116(3)(b)

Page 160, Table 3.13, Complete List of Surface Disturbance Acres: Please cite the map that was used to generate the surface disturbance acres so DEQ can verify the acreages. For example, there is no road listed for access to the reclamation material stockpile. ARM 17.24.116(4)

Page 267, Table 3-40, Estimated Water Treatment Standards Based on Groundwater Non-Degradation Criteria: Please discuss the potential for parameters to increase over time in the infiltration gallery area with long-term discharge over mine life. With surface applications DEQ has seen increases in salinity; with groundwater percolation there is potential increases in nitrogen compounds, electrical conductivity, SAR, etc. Please discuss the need for a groundwater mixing zone, the need for additional pumpback systems, etc., to prevent exceedances over time in the UIG soils and groundwater. 82.4.335(5)(m), MCA

Page 273, Table 3-41, Operational Phase Parameters of Concern: The table shows parameters of concern during operations, and the estimated influent and effluent water quality for select parameters. The influent chemistry is based on water quality data from the UCZ (wells MW-3, PW-8, and PW-9), and the estimated pH is reported to be 10.4. Please review as all of the measured pH values for those three wells are between 6.11 and 7.88 (Appendix B-A). More discussion is needed about the mixing analysis performed to determine WTP influent, which should be updated to correspond with the updated geochemical model predictions for each phase of mine life (Section 4.2 and Appendix N). Please include more information about the operational temperature ranges, as temperature can have a large effect on the efficiency of RO systems. In general, more details are needed about the modeling performed to estimate effluent quality from the various water treatment scenarios that were considered. What programs were used, and what sensitivity analyses were performed? With a range of flow rates reported throughout the text, which flow rates were actually used in the WTP analysis? Include the range of input data for these models. 82.4.335(5)(m), MCA

The footnote for nitrate+nitrite indicates that 11.3 mg/L (as nitrogen) is used as an input for WTP modeling. Why is this concentration used, rather than the 18 mg/L assumed in the geochemical models? The WTP model inputs should correspond to the water quality predictions found elsewhere in the application, or provide mixing models that resulted in dilution. 82.4.335(5)(m), MCA

Page 303, Table 3-48, Summary of Assumptions Used for Noise Predictions: The assumptions used for the construction phase did not include equipment used for construction material production such as the crusher/screening plant. Please include the temporary crusher/screening plant and associated loaders in noise assumptions. ARM 17.24.116(3)(s)

Figures:

Figures 2.7, Generalized Geologic Cross-Section A-A' Showing Well Locations, Section 3.9, Plan Map Showing Mill Facilities, and Section 4.6, Surface Water Flow with Water Rights Mitigation: The response to comment 1DEQ-288 (original pages 41, 143 and 262) states that there is insufficient information to extend the mapped potentiometric surface beyond the Brush Creek Fault. Now that Tintina is proposing the installation of additional drainfield areas beyond the Brush Creek Fault and has begun collection of baseline data in that region, please update the potentiometric maps to include coverage of this area. ARM 17.24.116(3)(a)

Figure 2.8, Potentiometric Surface Map: The groundwater elevations shown for the CTF monitoring wells (MW-10 through MW-13) deviate slightly from elevations calculated by the measuring point elevation and static water levels provided in Appendix B-1 (Tables 2, 4, and 5, respectively). Although the differences are small (-0.17 to +0.47 feet), it raises questions about the potential for seasonal fluctuations in groundwater under the CTF (and other facilities). The water levels provided for MW-10 through 13 were measured on 3/29/2016. Were there other water levels used to create this figure? What seasonal water level trends have been noted in the CTF wells? What observation time period is represented by the groundwater elevations shown in Figure 2.8, i.e. are these groundwater elevations contemporaneous? ARM 17.24.116(3)(a)

Figure 2.11, NP:AP for Sulfides Sulfur, Log Scale: This figure truncates the extent of the x-axis to the left, eliminating the samples with an NP:AP ratio < 0.01 (compare to Figure 2.10 in the December 2015 application). Please explain why these samples were omitted. Are these associated with the 1,639 samples that were removed from consideration (see p. 69 comment)? With very low NP:AP ratios and NAG pH values near 2, these samples should be included in the characterization of geochemical variability. ARM 17.24.116(3)(a)

Figure 2.13, Comparison of Select Parameters for Waste Rock Kinetic Humidity Cells: The graphs for sulfate, acidity, and alkalinity from the waste rock HCTs are displayed in units of mg/kg, which are inconsistent with the units of the other analytes that are displayed (mg/L). This method reduces the magnitude of each dataset and skews the presentation and interpretation of results. One example: for weeks 1-20 of the 2015 USZ-HCT results, displaying sulfate values in mg/kg results in a 39-46% reduction of the measured sulfate value in mg/L. There may be an advantage to this method when sample masses are variable between tests, but without an explanation of such conditions, a direct comparison of resulting leachate chemistry is preferred. For the weekly water quality graphs, please use liquid concentration terms for the resulting leachate, rather than scaling the results to the sample mass. The use of scaled concentrations seems more appropriate for the graphs of cumulative data and should be continued. Similarly, the scales that are used to display acidity and alkalinity data prevent a direct comparison of these parameters. The results for rock types with little/no acidity (e.g. LZFW, YnlB) are indistinguishable from measurable acidity (e.g. USZ), and it is not possible to compare graphs and identify when the acidity exceeds alkalinity (e.g. USZ). ARM 17.24.116(3)(a)

Figure 2.14, Kinetic Test Results for Tailings with pH, Alkalinity, Acidity, and Sulfate: Please see comment on Figure 2.13, regarding selective use of mg/kg. DEQ acknowledges that the scales used for the diffusion test graphs make for direct comparison to the HCT results below (e.g. sulfate, acidity, alkalinity). However, the scales make it difficult to discern any trends in the diffusion tests for some parameters. The text on page 76 gives little attention to the trends in sulfate or acidity for these samples, except that “sulfate and acidity were low in diffusion tests of both materials.” During the first 100 hours of testing both samples, sulfate concentrations increased to values more than double those encountered near the end of the test. This trend in sulfate production during diffusion testing is worth noting, but it is indistinguishable as displayed. The 4% plus ROM sample produced acidity that exceeded alkalinity for every sample during the test, another trend that is indistinguishable between the adjacent graphs as displayed. Acidity ranged from 5-34 mg/L, while alkalinity peaked at 3.8 mg/L. The 4% binder sample produced little to no acidity for all samples, except for the final sample (22 mg/L), which exceeded the alkalinity of 9.4 mg/L, and produced the associated drop in the final pH (decrease of 1.7 s.u.). Was this final sample affected by disaggregation of the material or an increase in reactive surface while saturated? How would the sample continue to degrade under those conditions? This suggests that this is likely the outcome for some of the cemented tailings mass along exposed faces/backfill boundaries (e.g. access tunnel margin), even when saturated. Please address these concerns. ARM 17.24.116(3)(a)

Figures 2.14, Kinetic Test Results for Tailings with pH, Alkalinity, Acidity, and Sulfate, and 2.15, Kinetic Tests Results for Tailings showing Select Metals (set 1): See additional comments on Figure 2.13 and 2.14. Please define the red and blue lines at least in the caption which needs to be done for many of the figures in the application. There seems to be variability between the sample datasets that are used to generate these summary graphs. DEQ did not investigate each parameter in detail, but discrepancies were initially noted in common parameters like sulfate and iron. Although the "HCT Unsat" sample does not represent a disposal condition proposed by the company, the data are more easily identified due to the scale shown in these figures, and it is merely used as an example of DEQ's concerns about graphing and interpretation. The sulfate concentrations for "HCT Unsat" (Figure 2.14) are derived from the weekly McClelland Lab data (Appendix D-2A). The sulfate concentrations for the same sample in Appendix D-3A are not graphed (Energy Labs, 4-weekly). While the 4-weekly data show a similar trend, concentrations are generally lower and the variability observed between consecutive weeks is lost. ARM 17.24.116(3)(a)

In contrast, the graph for iron data for the "HCT Unsat" sample is derived from the 4-weekly data in Appendix D-3A (Figure 2.16). This display removes the variability observed in the weekly data in Appendix D-2A, and only indicates a peak concentration of 7,680 mg/L. The weekly data include many measurements above 7,600 mg/L, with a peak of 20,812 mg/L. DEQ recognizes that not all parameters were analyzed by both laboratories, particularly trace metals, but in cases where there is overlap, why are some datasets presented over others? With regard to this issue and other comments on Figures 2.13 through 2.16, the importance of graphical accuracy in the application may be argued, but it creates doubt about the selective process for interpretation and modeling. Which datasets were used as geochemical model inputs? The upper values (from whichever lab) should be considered and incorporated for completeness. Please address these concerns. ARM 17.24.116(3)(a)

Figure 2.15, Kinetic Tests Results for Tailings showing Select Metals (set 1): Why is a significant amount of iron data omitted from the HCT graph? The HCT for 2% binder had iron concentrations from <0.02 to 2,200 mg/L (Appendix D-2C), but only 1 point is discernible on the graph around week 10, and it does not appear to be correct (Fe > 200 mg/L by week 5). The HCT for 4% binder had iron concentrations from <0.02 to 390 mg/L (Appendix D-2C), but only 1 point is discernible on the graph around week 10, and it does not appear to be correct (Fe < 10 mg/L until week 14). The HCT for 4% binder plus ROM had iron concentrations from <0.02 to 720 mg/L (Appendix D-2C) during 24 weeks, but the trend shown on the graph ends around week 10, and it does not include the complete dataset. ARM 17.24.116(3)(a) and (k)

Figure 2.16, Kinetic Test Results for Tailings showing Select Metals (set 2): Please include the blue line for thallium, indicating the groundwater standard of 0.002 mg/L. This line is shown in the graph of diffusion test results, but not in the HCT graph. ARM 17.24.116(3)(a)

Figures 3.1, Mine Permit Boundary Plan, and Section 3.2, Plan Map of Underground Workings and Mining Stopes: The response to comment 1DEQ-306, (original pages 111 and 112) states that there will be little to no groundwater flow into most portions of the ventilation raises because they will be constructed after the decline and access ramps, and these voids are assumed to effectively dewater the bedrock in the vicinity of the raises prior to their construction. DEQ notes that in other responses (e.g. 1DEQ-210; 1DEQ-306) Tintina states that "dewatering of the underground is unlikely to drain all overlying fractures. At most, the overlying rock would be drained partially and locally…" Furthermore, the response does not address the post-closure scenario, in which the recovering groundwater table would result in water within the mine void rising up the ventilation raises and then migrating outward through fractures that become re-saturated. The response acknowledges that the groundwater model did not include the presence of ventilation raises and therefore cannot simulate their potential effects on groundwater flow in the post-closure scenario. DEQ recommends the development of a groundwater model that can simulate flow conditions associated with open declines, access ramps, and raises in a post-closure flooded mine scenario. 82.4.335(5)(k), MCA

Figure 3.6, Copper-rich Rock and Waste Rock Mine Production Schedule (in tonnes): The figure seems to indicate that waste rock would not be backfilled underground as gob. Is that accurate? Also, the total tonnage to be mined does not equal the total copper-enriched rock sent to the mill plus the total waste. Please correct. ARM 17.24.116(3)(i)

Figure 3.9, Plan Map Showing Mill Facilities: The figure does not show any stormwater controls on it. Please provide a conceptual contour plan for the site showing water routing from the site to diversions. ARM 17.24.116(3)(g)

Figures 3.19, Typical CTF Road Cross Section, 3.21, Portal Pad Plan and Cross Sections, Section 3.26, Process Water Pond, and Section 3.27, Process Water Pond Grading Plan: The responses to comments 1DEQ-314 and 1DEQ-319 (original pages 171, 174, 182 and 183) state that Tintina intends to extend the foundation drain systems beneath the PWP and CTF beneath the Basin Drain seepage collection sumps, and that it was just an oversight that these features were not portrayed on any plans or cross-sections. Please provide these details in the application text, and also on appropriate figures and cross-sections. ARM 17.24.116(3)(g)

Also, please define what materials would be used to build the MSHA berms. ARM 17.24.116(3)(h)

Figure 3-20, Plan Map of Portal Pad: Please provide the contours, diversion systems, and berms on the figure. It appears the slopes are too steep to allow runoff from the sides of the pads without built-in shallower ditches, as the berms would prevent sheet flow off the pad as proposed. Please address this issue. ARM 17.24.116(4)

Figure 3-25, Process Water Pond HDPE Liner and Seepage Collection Layout Plan: The figure shows facilities built with no buffer disturbances. For example the foundation drain collection pond cannot be built as shown without an access road. The diversion channels cannot be built on the steep slopes without disturbance adjacent to the ditches. It would help define the needed disturbance by taking a conceptual attempt to identify the amount of additional disturbance needed to create the facility on each figure. Please show a service road that goes around the perimeter of the pond for access, cleaning erosion control ponds, etc. Also, please show topographic lines on the cut and fill slopes and inside the pond. ARM 17.24.116(4)

Figure 3.38, Cemented Tailings Facility Basin Drain and Sump, note 7: It is stated that the haul ramp would be constructed using surplus from the CTF excavation. Where would excess excavation material be stored? What would the haul road be constructed of? ARM 17.24.116(3)(g) and (r)

Figure 3.45, Water Treatment Construction Phase Process Flow Diagram: Please indicate where and how filter cake would be stored until the CTF is constructed. ARM 17.24.116(3)(k)

Figure 4.8, Simulated Drawdown – Year 4: The response to comment 1DEQ-342 (original page 269) requested three cross-sections of the proposed mine workings, including representations of predicted water table drawdown at several time steps. Tintina responded that predicted drawdown conditions would be impossible to depict on cross-sections. Regardless, please provide the cross-sections requested, indicating the locations of mine workings, geologic units and structures, and the baseline water table surface. Three cross-sections are needed in order to visualize the relationship between the proposed mine workings, hydrogeologic features, and surface water resources. ARM 17.24.116(4)

Figure 4.10, Conceptual Model of the Hydro-stratigraphic Units, with Flow to Mine Sump: The groundwater flow displayed in the figure indicates that total mine inflow at year 6 is 544 gpm. Why is this inflow used, when elsewhere in the document, 500 gpm is the typical estimate for mine inflow? The company response to IDEQ-80 clarifies this: “the text did not mean to imply that the water pumping rate from the mine would be controlled to about 500 gpm, but rather that the mine inflow rate would be controlled to a maximum of about 500 gpm (by fracture grouting).” This also applies to the discussion and figures in Appendix N. 82.4.335(5)(k), MCA

Figure 4.10, Conceptual Model of the Hydro-stratigraphic Units, with Flow to Mine Sump The response to comment 1DEQ-325 (original page 273) states that 100% of the brine generated (about 30 gpm) would be sent to the mill for incorporation into the cemented paste tailings. Elsewhere, it is stated that the brine content of cemented paste tailings should not exceed 10% of the total water volume (which would be approximately 11.4 gpm according to Response to Comment 1DEQ-345). Please discuss. If all the brine cannot be incorporated into the paste, how would it be managed? The response should be revised accordingly. 82.4.335(5)(m), MCA

Figure 4.15, Water Balance for Process Water Pond: The water balance displayed for the PWP geochemical model does not include an input for the fraction of RO brine that may not be absorbed into the paste plant process (see related comment on water treatment discussion). If the

PWP is proposed as a potential disposal area for brine, then there should be some discussion of the increasing TDS in the PWP over time. 82.4.335(5)(m), MCA

Figure 7.1, CTF, PWP, NCWR and ROM Stockpile Post Closure Topographic Map: The Post Closure Topographic Map shows the CTF embankment retaining its 2.5:1 slope at closure. Retaining the CTF with a 2.5:1 embankment at closure is contrary to stated goals for other facilities which will be "graded to blend with surrounding topography." The CTF embankment should be reclaimed by placing embankment or other fill materials against the toe of this facility to create a self-draining surface approximating pre-mining topography of 3:1 or less. Reduction of the slope on the CTF embankment during operations and reclaiming concurrently would increase landform stability and reduce the visual impact of this facility. Please discuss how long term stability would be increased and visual impact reduced by filling against the toe of the embankment. Also see page 380, Section 7.3.3.6, Cemented Tailings Facility Closure. ARM 17.24.115(1)(b)

Figure 7.4, CTF Reclamation Section: The CTF embankment is shown to be reclaimed at a 2:1 slope. Please commit to reclaiming it at a more natural slope undulating between 2.5 and 3.5:1. This wedge should be placed during operations and not compacted like the engineered fill in the embankment. The slope should be concave (steeper at the top and shallower at the bottom). ARM 17.24.115(1)(b)

General Comments:

Please commit to post or mark all disturbance boundaries. ARM 17.24.116(3)(u)

In several places in the design documents, sandy loam and sand were used as the soil and geologic materials texture. The site is dominated by shales and many soils have clay loam textures. Please explain the rationale for using sand or sandy loam for materials texture in designs. ARM 17.24.116(3)(a)

There is a concern with salt effects on water quality from salting roads in the wintertime, especially on the portal pad and mill pad areas. Please commit to monitoring salts in the stormwater management plan to minimize potential salt effects. Please discuss the reverse osmosis plant's ability to mitigate salt concentrations in treated water. 82.4.335(5)(m), MCA

Snow removal would result in relocation of contaminated materials to snow storage and road side areas. Please provide a snow removal plan, especially in areas where snow could contain acid-producing materials. 82.4.335(5)(m), MCA

Please commit to installing the recommended 13 new monitoring wells and 20 new infiltration gallery piezometers during construction as indicated on page 4, Section 1.0, Introduction and Project Overview. 82.4.335(5)(k), MCA

Please discuss the potential for leaching metals from the naturally occurring soils in the UIG. It appears the shallow bedrock may contain some contaminants that could be mobilized by the treated water discharged in the UIG system. Please discuss the potential buildup of salts from the addition of $CaCO_3$ in the RO polishing phase process. 82.4.335(5)(m), MCA

Bonding, Response to Comment 1DEQ-498: The response concerning the estimated duration of post-closure water treatment (until background conditions are achieved in the aquifer downgradient of the underground workings) refers to Response to Comment 1DEQ-68. Tintina estimates that background (pre-mining water quality) conditions can be achieved by repeatedly flooding and draining the underground workings three to six times, which is projected to require 3 to 6 months. What is the basis for this estimate? Is it based upon geochemical modeling or other calculations? Are there case histories that can be cited to support the effectiveness of this rinsing strategy within a sulfide mine void? 82.4.338(1)(a), MCA

Appendix B:

Page 1-4, Figure 3, Groundwater Monitoring Sites: The wells recently installed in the footprint of the CTF are not labeled correctly compared to Figure 13 within the same document. The geotechnical drill holes which were completed as "piezometers" and classified as such (p. 167, Figure 6.1) are shown as monitoring wells instead of piezometers. Please clarify. 82.4.335(5)(k), MCA

Page 3.3, Appendix B-1, Section 3.3, Groundwater Monitoring Results, second and fifth paragraphs: See also comment on p. 46, Figure 2.8. The groundwater elevations are described as highly variable under the CTF (p. 3-3). How would seasonal variations in head affect the simulated groundwater flux and dewatering rate in the foundation drain (Section 4.0)? 82.4.335(5)(k), MCA

Appendix B-1, Hydrological Assessment of Proposed Cemented Tailings Facility, containing Appendix C, Laboratory Analytical Report: Sample results are included for Client Sample ID BBC-1603-407, BBC-1603-409, BBC-1603-410, and BBC-1603-411. Please identify the wells from which these samples were collected and explain their relevance to the Cemented Tailings Facility. 82.4.335(5)(k), MCA

Appendix D

Page vii: What is the potential for infiltration to change the groundwater classification? Please discuss this concern. Please consider a mixing zone below the UIGs to address concerns for groundwater changes over time. 82.4.336(10), MCA

Table of Contents: Information from the on-going 2015-2016 HCTs needs to be included in the sub-appendices of this document (e.g. report discussions, summary tables, etc.). ARM 17.24.116(3)(a)

Page 34, Section 3.2.2.3, 2015 USZ – Upper Sulfide Zone (28% Waste Rock Tonnage): The 2015 USZ tests were on-going at the time of this submittal. Recent memos regarding that test show a summary of whole rock data (ME-MS 61), where the sulfur % is cut off above 10% (presumably the analytical upper limit). A summary of the ABA and NAG pH data shows that total S% is much higher (peak around 42%, mean of 23%). When these data are incorporated into the models, please ensure that the full range of values are considered. This is particularly important when the models are most sensitive to oxidation rates, which are inherently tied back to the sulfide concentration in the rock, when calculating the reactive mass. ARM 17.24.116(3)(a)

Appendix D-D, Table D-3: HCT data for 2%, 4%, and 4% plus ROM are shown in Table D-3, but they do not correspond to the HCT results for the unsaturated and saturated tailings (Table D-3, opposite page). In particular, why are the iron data excluded for the cemented paste samples? See also comment on p. 80, Figure 2.15. Other differences between summary tables include B, Ca, Cl, Cr, Co, Mg, Mo, K, Na, and SO4. Were different analytical suites requested from the laboratories for the different HCTs, or are these differences due to selective data display? ARM 17.24.116(3)(a)

Appendix E:

Appendix E, Tailings Delivery System Design: The design submitted with the updated Operating Permit application is the same that was submitted with the original submittal. Please rewrite Appendix E with current data [(please include but not limited to: Paste Pump Station design); Section 4.0, Design Considerations; Section 5.0, Route Options; Section 6.0, Rheology (the first sentence states there is no information on the rheology of the cemented paste to be transferred to the CTF); Section 7.0, Pressure Based Sizing; Section 8.0, Costs (please pick one piping design and the base cost estimate on that size); Section 9.0, Recommendations and Conclusions (please re-write based on one final design)]. ARM 17.24.116(3)(a)

Appendix K

Page 15, Section 5.2, Embankment Staging, second last paragraph, last sentence: Please discuss the potential volumes and storage locations for the additional surplus materials. ARM 17.24.116(3)(i)

Please provide a material balance table for all facilities listing cut and fill volumes, where all the fill materials would be used (such as the embankments, liner cushion materials, etc.,), where the excess materials would be stored, etc. For example, subsoil stockpiles shown on the figures are larger than the topsoil piles even though the volume of subsoil to be salvaged is much less. ARM 17.24.116(3)(i)

Page 16, Section 5.3, CTF Lining System and Seepage Control, first paragraph, last sentence; and p. 17, Section 5.4, CTF Basin Underdrain System, second paragraph, first sentence: Please describe the type of processed waste rock and volume of materials to be used and the preparation needed to prepare the underlying prepared subgrade and basin drainage gravel. Please include the waste rock volume in the materials balance table mentioned above. ARM 17.24.116(3)(d) and (i)

Page 18, Section 5.6, Embankment Cross Section, first and second paragraphs: Please provide the conceptual cut and fill volumes for the CTF embankment and provide in the material balance table. ARM 17.24.116(3)(d) and (i)

Also, the 2.5:1 slopes are not appropriate for the CTF landform to blend in with the surrounding topography. The internal embankment face of 2.5:1 slope is acceptable but the external embankment should match the local topography at closure. Please consider building the core to 2.5:1, and meeting all the required compaction specifications etc., and then adding additional materials to produce a more natural shaped landform concurrently during operations that is reclaimed immediately after construction. ARM 17.24.116(3)(d)

Please provide the additional fill volume needed to create the more natural downslope face and where the materials would be sourced and stockpiled until the downstream embankment is reclaimed. Add the volume to the material balance table. ARM 17.24.116(3)(d) and (i)

Third paragraph, last sentence: Please provide a stockpile location and a conceptual volume of organics and loamy overburden. Please add the volumes to the material balance table and then provide a location where these materials would be used in the reclamation scheme. ARM 17.24.116(3)(d) and (4)

Fourth paragraph: Please provide conceptual volumes and sources for the subgrade bedding material. Is this borrow from the embankment footprint or crushed neutral waste rock? Please add the volumes to the material balance table. ARM 17.24.116(3)(i)

Page 19, Section 5.9, Water Reclaim System, second to last paragraph: Would the drainage gravel be sourced from select fill from impoundment shaping, pre-development waste rock, or quarried? This is the first mention of a potential quarry. Please provide a contingency quarry location in the mine plan if the material balance table shows the need for this feature. ARM 17.24.116(3)(i) and (4)

Page 20, Section 5.11.1, Waste Rock Characteristics: The section mentions that all pre-production and life-of-mine waste rock would be co-disposed in the CTF. Please explain which waste rock would be used to produce drainage gravel, bedding material, etc. DEQ wants to ensure material balances and potentially metal producing rock sources are not used in areas where contamination can occur. ARM 17.24.116(3)(d) and (i)

Page 20, Section 5.11.2, Temporary Waste Rock Storage and Ore Stockpile Pad, first paragraph: Please add the pre-production waste rock to the material balance table and show it being temporarily stored and then relocated to the CTF. ARM 17.24.116(3)(i)

Please list the source and volume of protective bedding layer materials for the temporary waste rock stockpile. ARM 17.24.116(3)(i)

Second paragraph: Please provide the source and volume of the drainage gravel listed for use in the sump, and indicate that the sump is lined with 100 mil HDPE, and not just drainage gravel. ARM 17.24.116(3)(i)

Third paragraph: Please provide the volume of waste rock that would be used to create the basin underdrain system in the CTF. ARM 17.24.116(3)(i)

Page 21, Section 5.11.3, Waste Rock Co-Disposal During Operations, first paragraph: Waste rock would be hauled to the CTF and placed around the water reclaim system. How would the waste rock be spread? Would the waste rock be cemented between the layers of tailings or left in piles? How would the liner be protected? How long before a truck loaded with waste rock could drive over the cemented tailings? ARM 17.24.116(3)(d)

Page 22, Section 6.2, PWP Liner and Seepage Collection and Reclaim System, first paragraph, last sentence: Please list the source and volume of underlying subgrade bedding layer materials for the process water pond. Please add the volume to the materials balance table. ARM 17.24.116(3)(i)

Second paragraph, first sentence: Please list the source and volume of the sump drainage gravel for the process water pond. Please add the volume to the materials balance table. ARM 17.24.116(3)(i)

Page 22, Section 6.3, PWP Foundation Drain System, last sentence on page: Please list the source and volume of the foundation drain system gravel for the process water pond. Please add the volume to the materials balance table. ARM 17.24.116(3)(i)

Page 23, Section 6.4, Embankment Cross Section, second and third paragraphs: Please provide the conceptual cut and fill volumes for the PWP embankment and provide in the material balance table. ARM 17.24.116(3)(i)

Second paragraph, last sentence: Please provide a stockpile location and a conceptual volume of organics and loamy overburden. Please add this volume to the material balance table and provide a location where these materials would be used in the reclamation plan. ARM 17.24.116(3)(i) and (4)

Third paragraph: Please provide conceptual volumes and sources for the subgrade bedding material. Is this material weathered bedrock, select fresh rock, and/or general rock fill from the embankment footprint or crushed neutral waste rock? Please add the volumes to the material balance table. ARM 17.24.116(3)(i)

Page 25, Section 7.2, Embankment Fill Zones: Please provide the conceptual fill volume for the NCWR embankment from the CTF footprint and provide in the material balance table. Please provide the soil salvage volumes from the embankment footprint and put in the soil balance table. ARM 17.24.116(3)(b) and (i)

Please provide the additional fill volume needed to create the more natural downslope face and where the materials would be sourced and stockpiled until the downstream embankment is reclaimed. Please add the volume to the material balance table. ARM 17.24.116(3)(i)

Page 26, Section 7.3, Spillway Configuration, first paragraph: Please commit to salvage soil from the spillway footprint and include the volume in the soil balance table. Please provide a storage location of the soil materials. ARM 17.24.116(3)(b)

Please propose a storage location for the excess cut materials removed from the spillway footprint. DEQ assumes these materials would be suitable reclamation materials. Please add the volumes to the material balance or reclamation materials stockpile balance as needed. ARM 17.24.116(3)(e) and (4)

Please provide the source, volume, and size specifications of the rip rap and add to the material balance table. ARM 17.24.116(3)(e) and (4)

Page 26, Section 7.5, Runoff Diversion, third paragraph: Please commit to salvage soil from all diversion footprints and identify where the soils would be stored based on the slopes from which the soils were salvaged. Please add the volumes to the soil balance tables. ARM 17.24.116(3)(b) and (4)

Materials removed from all diversion footprints should meet reclamation material specifications for at least subsoil. Please identify where materials would be stored and conceptually used. Please add to the reclamation material balance table. ARM 17.24.116(3)(b) and (4)

Please design the permanent diversions side slopes to 3:1 or less to enhance reclamation of the diversions and make them match the surrounding landforms. ARM 17.24.115(b)

Please commit to design all permanent diversions (assuming they would stay at closure) to match a natural looking stream channel using Rosgen or other stream design system. ARM 17.24.115(b)

Page 32, Section 8.2.3, NCWR Seepage Analysis, second to last paragraph, last sentence: Instead of routing seepage under the distal end of the grout curtain and the potential effects on stability, would it not be better to allow seepage to flow naturally versus concentrating it in one place? ARM 17.24.116(3)(e)

Page 33, Section 9.1, General: Please commit to having third party QA/QC contractors on site throughout facility construction and the supply QA/QC reports and as-built maps of all facilities. 82.4.335(5)(l), MCA

Second and third paragraphs: Please provide a detailed conceptual material balance table listing all sources of construction materials to be used for embankments, roads, liner bedding material, sand and gravel used for drainage sumps from local borrow areas, or from selective crushing of fresh unweather bedrock, etc. ARM 17.24.116(3)(i)

Pages 33 and 34, Section 9.2, Foundation Preparation, and 9.3, Basin Excavation, Shaping, and Subgrade Preparation: Please discuss the loam and organics that may have to be removed from under various facilities. For each facility, please provide a conceptual volume, storage area, and potential use for the materials. ARM 17.24.116(3)(b)

Page 35, Section 9.5, CTF Basin Underdrain: Please add the volumes of basin underdrain waste rock to the volume of the other waste rock to be stored in the temporary waste rock pad to the materials balance table. ARM 17.24.116(3)(i)

Page 35, Section 9.6, Stockpiles: Please list all the conceptual volumes of organics and deleterious materials to be removed from facility footprints and add them to the appropriate stockpiles. Please provide stockpile locations for the materials from each facility. Please provide conceptual locations where these materials would be used as reclamation materials. ARM 17.24.116(3)(b)

Page 35, Section 9.7, Material Quantities: Please detail the cut and fill volumes from each facility and the amounts to be used at each facility in Table 9.1. ARM 17.24.116(3)(b) and (i)

Third paragraph: Please provide more detail on potential borrow source locations or what would be classified as “suitable process fill from the mine.” ARM 17.24.116(3)(b) and (i)

Page 36, Table 9.2, Construction Material Quantities for Primary Facilities: Please provide additional detail on the volumes and sources of cut and fill for all mine facilities. ARM 17.24.116(3)(b) and (i)

Page 41, Section 10.2.2, Surface Water Diversion Channels: Please design all permanent site diversions using Rosgen style stream channel design systems. ARM 17.24.116(3)(g)

Third paragraph: Please design all slopes in the permanent diversions to 3:1 or less to match local topography. Also, excavated fill should not be placed alongside the permanent channel as berms but rather taken to reclamation material stockpiles. ARM 17.24.115(1)(b) and 116(b)

Pages 47 and 48, Section 12.1, General, first paragraph: Facility slopes should match local landform slopes as the reclamation plan is to return the mine area to pre-mine condition (slopes less than 3:1) and minimizing visual impacts by not creating facilities with slopes steeper than existing conditions. ARM 17.24.115(1)(b)

Cover bullet: Please describe the subgrade preparation needed at closure to prepare the tailings surface for the geomembrane. Please provide a conceptual volume of material that would need to be regraded and the volume of tailings that would need to be moved to create positive drainage off the impoundment to minimize potential for long-term seepage into the tailings over time and the volume of tailings needed to cover the waste rock ramp in the CTF. ARM 17.24.116(3)(d)

Please commit to report the tailings deposition grade in each annual report to show that tailings would be deposited such that bonded tailings grading volumes do not need to be increased. 82.4.338(1)(a), MCA

Capping bullet: Please provide the volume and source of the embankment freeboard materials and stockpiled capping materials to be used for the CTF in the material balance table. Please provide a drawing illustrating that the CTF would shed water at closure to limit potential for seepage into the tailings mass over the long-term. Please consider the effect of drifting snow patterns in the final shaping of the impoundment cap, so that snow would naturally blow off the surface at closure. ARM 17.24.116(3)(b) and (i)

Embankment Excavation and Contouring bullet: Please commit to regrade the PWP footprint to be mounded and free draining to limit potential for seepage into the cemented sediment mass in the bottom of the PWP over the long-term. 82.4.335(5)(m), MCA

Please provide conceptual volumes of the PWP embankment that would be used to regrade the PWP footprint and in the CTF capping layer. On page 48, please also provide a conceptual volume of NCWR embankment materials that would be used to create the capping layer over the CTF at closure. Please add all these volumes to the material balance table. ARM 17.24.116(3)(d)

Revegetation bullet: Please commit to reduce external slopes in the permanent facilities to 3:1 or less to match local topography. Rocky mosaic slopes are not needed if slopes are reduced to 3:1 or less and appropriate soils are placed based on slopes from which they were salvaged. ARM 17.24.115(1)(b)

Page 48, first paragraph after the bullet: Please indicate potential borrow sources. Please clarify whether or not borrow areas would be in facility footprints and not separate disturbance areas. ARM 17.24.116(4)

Also, reclamation material stockpile locations typically do not require soil salvage. Reclamation would include removing the salvaged materials at closure back to the buried soil, then ripping, and revegetation. ARM 17.24.116(3)(b)

Page A-1, Table A-1, Item Section 2.2, Closure Criteria Row, Value Column: Please discuss where the one meter of non-PAG fill would come from to cap the CTF at closure. Please clarify if the top layer (12 inches) would be topsoil from the topsoil stockpile. ARM 17.24.116(3)(i)

Please provide conceptual volumes of grading needed to make the CTF reclaimed surface free draining and to allow drifting snow to blow off the surface at various stages throughout mine life (i.e. assuming potential premature closure at Stage 1, and maybe at 10 years and 15 years). DEQ is concerned about low spots on the impoundment surface that would fill with water from precipitation and drifting snow, and create a head on the liner beneath the reclamation cap at closure. ARM 17.24.116(3)(d) and (i)

Page A-1, Table A-1, Section 2.1, Topsoil Row, Value Column: This is the first mention of 0.7 m used for volume calculations for topsoil and subsoil. This explains the size of the subsoil pile shown on figures and should be indicated earlier in the document.

Page A-2, Table A-1, Item Section 3.3, Closure Criteria Row and Spillway Design Row, Value Column: Please provide the area that would receive the embankment fill at closure. Please add this volume to the material balance table. ARM 17.24.116(4)

Page A-2, Table A-1, Item Section 4.2, Emergency Discharge Plan Row, Value Column: Please discuss the contingency to place the tailings underground in case the CTF pipeline is down. Would it be piped through the underground paste backfill plant pipeline? 82.4.335(5)(m), MCA

What would the potential cement/fly ash addition be to discharge full tailings underground rather than the sand fill tailings? ARM 17.24.116(3)(d) and (i)

Page A-3, Table A-1, Item Section 5.0, Surface Water Control Row, Value Column: Please change the culvert used to transfer stormwater/snowmelt run-off water from the temporary waste rock pad to the contact water pond to a pipeline for positive control of flows. 82.4.335(5)(l), MCA and ARM 17.24.116(3)(d) and (i)

Page A3, Table A-1, Item Section 6.0, Construction Materials Row, Value Column: KP assumes overburden is sand for a potential bulking factor. Most overburden is identified to be rocky and made of shale (clay), and therefore the bulking factor should be closer to the 20% used for rock fill. Please discuss. ARM 17.24.116(3)(i)

Sub-Appendix B, Plate B7 of 56, Cemented Tailings Facility Sections and Details: Please clarify Section A in the drawing. What is meant by the terms 'Basin Underdrain,' and 'Waste Rock'? Please provide construction material specifications for the drainage rock used in the water reclaimed seepage collection sump. ARM 17.24.116(4)

Sub-Appendix B, Plate B7 of 56, Cemented Tailings Facility Sections and Details: Since the water quality in the Process Water Pond is potentially harmful, please provide a conceptual drawing showing how bird netting would be installed. Also, a fence should be installed around the Process Water Pond to prevent access by wildlife. ARM 17.24.116(4)

Sub-Appendix B, Plate B8 of 56, Cemented Tailings Facility Waste Rock Co-disposal Platform Plan: With respect to the PWP foundation drains, before placement of the drainage gravel, why are the trenches not proposed to be lined with a non-woven geotextile fabric to prevent a separation layer? ARM 17.24.116(4)

Sub-Appendix B, Plate B9 of 56, Cemented Tailings Facility Foundation Drain Sections: Please provide construction material specifications for the rock used in the drainage layer. ARM 17.24.116(4)

Sub-Appendix B, Plate B10 of 56, Cemented Tailings Facility Waste Rock Co-Disposal Platform Plan, , Note 7: Please add surplus fill from the CTF to be used for haul ramp construction into the CTF on the materials balance sheet. ARM 17.24.116(3)(i)

Sub-Appendix B, Plate B11 of 56, Cemented Tailings Facility Instrumentation Plan, Stage 2: The crest arrow is shown pointing to the toe of the fill slope. Please correct. ARM 17.24.116(4)

Sub-Appendix B, Plate B10 of 56, Cemented Tailings Facility Waste Rock Co-Disposal Platform Plan: What is meant by the dashed line "waste dump toe"? Is that the limit of waste rock placement? Would cemented tailings be placed north of this line? According to the drawing, the haul road into the CTF would be constructed out of surplus fill excavated during construction of the CTF, not waste rock. Would underground mine trucks haul waste directly out of the mine to the CTF? Would the waste rock be dumped off the ramp? Please explain how waste rock would be delivered and spread in the CTF. ARM 17.24.116(4)

Sub-Appendix B, Plate B18 of 56, Process Water Pond Instrumentation Layout Plan and Details: Please provide construction material specifications for the rock used in the drainage layer of the Process Water Pond. Is it the same material as specified in Drawing C0003? ARM 17.24.116(4)

Sub-Appendix B, Plate B21 of 56, Non-Contact Water Reservoir Sections: The seepage analysis completed on the NCWR does not appear to consider an excessive hydraulic gradient that may form at the edge of the HDPE liner. Please discuss this potential failure mode. 82.4.335(5)(l), MCA

Sub-Appendix B, Plate B55 of 56, CTF, PWP, NCWR and ROM Stockpile Post Closure Topographic Map, and 56, CTF Reclamation Section, of 56, drawing number C8001 and C8002: Please show the diversion channel and spillway around the NCWR as reclaimed on the drawing. ARM 17.24.116(4)

Please show the CTF diversion as revegetated as it would be constructed concurrently during operations, assuming it would stay at closure. ARM 17.24.116(4)

Please provide detailed sections of how the CTF would be graded at closure to allow water to run off the surface at closure. ARM 17.24.116(4)

Please show the CTF embankment reclaimed to more natural slopes during operations or at closure to match local topography. ARM 17.24.116(4)

With respect to the CTF foundation drains, before placement of the drainage gravel, should trenches not be lined with a non-woven geotextile fabric to prevent a separation layer? ARM 17.24.116(4)

Sub-Appendix E, Tailings Delivery System Design, MG Report, Section 4.0, page 4 of 17, first paragraph: Please discuss the manner in which the line would be flushed after each paste pour. 82.4.335(5)(l), MCA

Sub-Appendix E, Tailings Delivery System Design, MG Report, Section 4.0, page 5 of 17, first paragraph: Please discuss the manner in which the line would be drained at the end of each flushing operation. 82.4.335(5)(l), MCA

Appendix M:

Page 3-20, Section 3.4, Mining Simulations: Tintina responded comment 1DEQ-446 by referring to prior responses to comments 1DEQ-125 and 1DEQ-127. Please refer to DEQ's comments on the response to 1DEQ-127. 82.4.337(1)(a), MCA

Page 5-6, Section 5.1.1, Mine Inflow and Disposal, second paragraph, first and second sentences: No updates have been made to this discussion of the UIGs and the areas shown in Figure 5-2 do not correspond with the application. More information is needed about the existing groundwater conditions under the UIGs, particularly the southwestern and eastern arrays. Updated monitoring data and results from infiltration tests and dye tracer tests are needed to demonstrate the flow paths for UIG discharge and any potential connection to nearby surface water. ARM 17.24.116(3)(a)

Page 5-6, Section 5.1.1, Mine Inflow and Disposal: The response to comment 1DEQ-447 discusses how the groundwater model predicted significant mounding in the infiltration gallery area in response to increased recharge. Did this occur because the increased rate of recharge was too great, or because the hydraulic conductivities used for Layer 1 of the model (0.033 feet/day for Ynl-O1 and 1.31 feet/day for YnlA_N1) are substantially lower than measured near-surface hydraulic conductivities? Responses to comments 1DEQ-39 and 1DEQ-448 indicate that the average hydraulic conductivity from test pits in the proposed infiltration gallery areas is about 8 feet per day. Please update the model to include this new information, which may allow for proper simulation of discharge to the infiltration galleries. 82.4.335(5)(k), MCA

Page 5-6, Section 5.1.1, Mine Inflow and Disposal: The response to comment 1DEQ-448 discusses the dissipation of a groundwater mound, as it relates to discharge to the proposed infiltration galleries. The response notes that a groundwater mound "seeks to level itself out with respect to the groundwater table by creating a vertical pressure gradient" which in turn causes downgradient water to flow laterally away from the mound. While this is true, DEQ notes that water molecules within the mounded groundwater would have both vertical and lateral components to their direction of movement, rather than just downward movement as implied in the response. Water discharged via a drainfield would result in some mounding of the groundwater table, and that discharged water would migrate downgradient toward surface water at approximately the velocity that groundwater flows through the system naturally (without the input from the drainfield or the resultant mounding). Please address this issue. 82.4.335(5)(k), MCA

Page 5-16, Section 5.3, Post Mining Recovery: The response to comment 1DEQ-451 did not address the second part of DEQ's question, "What volume of open underground workings in the lower zone was assumed in the model?" However, further review has clarified that, in fact, the model does not assume that any underground voids remain within the proposed mining area post-closure. DEQ questions whether post-closure groundwater flow can be adequately simulated without the inclusion of mine voids in the model. Please revise the existing model to include void spaces where open underground workings would remain. Alternately, could a different method of analysis, such as a simplified hydrologic model of the proposed mine workings and the bedrock in their immediate vicinity (e.g. beneath the Coon Creek watershed and the adjacent Sheep Creek alluvial system) be developed that could simulate how the mine voids would alter groundwater flow? 82.4.335(5)(k), MCA

Figure 5-9**,** Post Mining Project Area Water Table: The response to comment 1DEQ-452 has a new Figure 5-9 which shows a substantial groundwater mound beneath Brush Creek. Has such a mound been documented during baseline water level monitoring? What is the explanation for its presence in the post-closure simulation? 82.4.335(5)(k), MCA

Appendix N:

Page 15, Section 2.5, Environmental Geochemistry Data, first paragraph, last sentence: When the on-going tests are completed, the results need to be incorporated into the summary tables and graphs, report narrative, and relevant model inputs. ARM 17.24.116(3)(a)

Page 16, Section 2.5, Waste Rock Geochemistry, first paragraph, first sentence: "A total of 8,040 whole rock samples were analyzed to characterize overall geochemical variability within multiple rock units." This does not agree with the values given in the application on page 69 (5,858 in Sept-2016 submittal, 7,497 in Dec-2015 submittal). Are these values related to different analyses? Why has the total number of analyzed samples changed between reports? Was this based on a statistical evaluation? How can the omission of these samples improve the representativeness of these subsets and how does it affect the characterization of geochemical variability? ARM 17.24.116(3)(a)

Page 16, Section 2.5, Waste Rock Geochemistry, fourth paragraph, third sentence: Please qualify this statement by noting that the 2012 test was terminated before acidic conditions were observed. As written, it seems to imply that the 2012 test used USZ material that is non-acid generating. ARM 17.24.116(3)(a)

Page 23, Section 3.3, Sensitivity Analysis, first paragraph: "In the post-closure model for the UG, factors affecting modeled sulfide oxidation (oxidation rate, fracture density, rim thickness, etc.) are no longer relevant under suboxic conditions." The oxidation reactions that are modeled for a fully oxidized/open system may not be relevant at closure, but there would still be a small component of flow through the lower zones (see Table 4-3 comment). Is it possible to model the water-rock interactions within the flooded void space, perhaps using baseline data (for suboxic water) at those depths? How does the chemistry of mine void water change? 82.4.335(5)(k), MCA and ARM 17.24.116(3)(a)

Page 28, Table 4-3: "Lower zone surface areas have no effect at closure because the flow rate is assumed to be zero." The baseline hydrologic data and model scenario at year 6 indicate that groundwater flow is slow through the lower units (< 15 gpm), but not non-existent. Even with hydraulic plugs in the access decline, there would be migration of water out of the lower zones under the closure scenario, as conditions return to equilibrium. The conceptual hydrologic model indicates that even deep bedrock flow eventually exits the watershed through upwelling near Sheep Creek. How would the inclusion of water in the lower zone affect the geochemical closure model? 82.4.335(5)(k), MCA and ARM 17.24.116(3)(a)

Page 32, Section 4.5, Water Quality Prediction for Year 6 Operations, second paragraph, third sentence: The flow and metal loading from the UCZ is discussed as if this unit can be distinguished from the USZ. What data are used to make this distinction (see comment on p. 337 of application)? 82.4.335(5)(k), MCA and ARM 17.24.116(3)(a)

Page 34, Section 4.6, Water Quality at Closure, first paragraph, second to last sentence: There is only one location where the elevated carbon content of the Ynl shale is proposed to act as a potential oxygen sink (i.e. control pyrite oxidation) and aid in denitrification. Please provide a range of carbon concentrations measured in the shale units for context, whether in the discussion or in a citation to the location of those data. ARM 17.24.116(3)(a)

Page 22, Figure 4-1 and page 24, Table 4-1: These two figures indicate that approximately 25% of the lower access water quality predictions are based on only one sample from one well (PW-10). This seems insufficient to characterize the range of water quality that would be encountered in lower zones, over a depth of nearly 1,000 feet between the USZ and LSZ. Please address this concern. What unit is PW-10 actually completed within (Ynl B-UA, Ynl B-LD, or Ynl B-LA)? Have additional samples been collected from that well, or other wells within those units? 82.4.335(5)(k), MCA and ARM 17.24.116(3)(a)

Page 25, Section 4.2.2, HCT Data, first paragraph, second sentence: The sentence states that results from seven kinetic HCTs (including Ynl B 2012) and one diffusion test were used. Under what scenario were the data from the Ynl B 2012 tests used? Figure 4-1 does not indicate those results were incorporated into the models. ARM 17.24.116(3)(a)

Pages 29 and 30, Section 4.3.2, Calculation of Reactive Mass: In general, the assumptions about fracture density and reactive-zone thickness have the greatest effect on predicted metal release, emphasizing the importance of these variables in the underground model. The calculations given for reactive mass seem to use two variables interchangeably between two pages, TRZ and TFZ, unless that is a typo. The reactive zone thickness (TRZ) grows outward from the mined surface, as a result of oxygen diffusion through and reaction with the rock. In some examples, active oxygen flux has been measured to depth of 15 m in rock, with evidence of oxidation 3 to 6 meters from the face. Active oxygen consumption was evident over the entire 15 meter interval in some cases (Radian, 1997 within Kempton and Atkins, 2009). This indicates that a TRZ may extend well beyond the blasted fracture zone (TFZ) thickness. In the Black Butte models, a TFZ of 1 meter is considered, based on case study examples from granite and basalt quarries (Kelsall, 1984; Siskind and Fumanti, 1974). Other rock types exhibit different values for TFZ, including dolomite (0.3-2.5 m), limestone (1 m), and sandstone/shale (0.5-1.3 m) (Case and Kelsall, 1987). The sensitivity analysis which extends the TFZ to 2 meters seems appropriate for Black Butte, considering the lithology. However, this seems to demonstrate that the reactive zone thickness and fracture zone thickness are not interchangeable concepts, and it is not appropriate to limit the reactive mass calculations (or the TRZ) to a predetermined fracture thickness. Kempton and Atkins (2009) also emphasize that small fracture zones (e.g. 1 m) "need to be supported with site-specific measurements to avoid systematic model underestimates of oxidation rates." Are any site-specific measurements available for Black Butte? In addition to addressing that question, please consider new calculations, and include a discussion of the reactive zone thickness values that result from the calculated reactive mass (based on mineralogy of the rock and assumed oxidation rates), without restricting the upper bound for TRZ (or TFZ?) to 1 meter. Please discuss how this might change water quality predictions. 82.4.335(5)(k), MCA and ARM 17.24.116(3)(a)

Pages 29 and 30, Section 4.3.2, Calculation of Reactive Mass: When considering the reactive surfaces within the UG model, the laboratory results are scaled to stope and access tunnel surfaces, and an important variable is fracture density (Fd). For this discussion, consider the geometry of the wall of an access tunnel, and the "S x Fd x TRZ" terms in the provided equation. When Fd is 0%, the rock surface is assumed to have no fractures and only the outer rock surface is reactive. When Fd is 100%, the rock is considered to be a finely ground, unconsolidated mass and the entire volume of rock is reactive. Using the provided equation, both of these extreme cases provide unrealistic results for reactive mass. However, it shows that Fd represents the degree of fractures or reactive surfaces within the wall rock volume. The effect that Fd has on the geometry of the reactive volume of rock can be visualized in a couple of ways. When the Fd is assumed to be 10%, the surface area (S) is greatly reduced but the actual reactive zone thickness (TRZ) is maintained. This greatly underestimates the reactive surface area of the exposed tunnel. If the actual S remains constant, then the TRZ is scaled by the Fd (10%) and greatly reduced, underestimating the TRZ. Neither representation seems realistic. As an alternative concept to consider, the surface area of the tunnel wall (S-tun) should remain constant, but the internal fracture surfaces (S-frac) should be scaled by the Fd. Should the effect of Fd be additive, rather than multiplicative? 82.4.335(5)(k), MCA and ARM 17.24.116(3)(a)

As an example: Rm = [S-tun + (S-frac x Fd)] x TRZ x ρ. This equation seems to provide a more realistic result when Fd is equal to 0% or 100%. It is recognized that S-frac would have a smaller effect on total reactivity, so while ignoring that term is somewhat problematic, reducing the entire S-tun by 90% seems more problematic. Please clarify why the equations presented in Appendix N do not underestimate the exposed surface areas, and thus the reactive volume of rock. If reactive mass is calculated with a different approach, how does that change the water quality predictions? 82.4.335(5)(k), MCA and ARM 17.24.116(3)(a)

Page 30, Section 4.3.2, Calculation of Reactive Mass, number 3: Please include a summary of the Y values (mass fraction of sulfur in rock) that were used for each unit, whether in the text or in a reference. Was an average value used, or a range considered? How many samples were used as the basis for analysis? 82.4.335(5)(k), MCA and ARM 17.24.116(3)(a)

Page 38, Section 5.3.1, Calculation of Reactive Mass and Surface Area: The equation that is given for Rmi seems to mix up English and metric units. The resulting reactive mass (Rmi) is given in tons, even though the conversion factors within the given equation would result in tonnes, e.g. "106 g rock/ton" (sic). Should this conversion be 907,185 g rock/ton instead, or is tonnes the preferred unit? DEQ does not have a preference for units, but wants to ensure that the 10% error is not propagated throughout the reactive mass and HCT scaling calculations. 82.4.335(5)(k), MCA and ARM 17.24.116(3)(a)

Page 40, Section 5.4, Predicted Water Quality at Year 2 of Mining, first paragraph, third sentence: Please clarify this brief assumption, as it seems conceptually counter-intuitive. An increase in precipitation would interact with a larger volume of rock and associated surfaces. Instead of assuming that the water is isolated and contributing to dilution, it seems like it would be equally likely to react with the waste rock as it infiltrates the dump. An additional sensitivity analysis seems appropriate for the WRS, where the conditions are doubled. This would represent twice the precipitation, surface area, or oxidation rate. 82.4.335(5)(k), MCA and ARM 17.24.116(3)(a)

Page 41, Table 5-1: The concentrations used for nitrate+nitrite (18 mg/L) were derived from another mine in Montana, but that concentration is measured in discharge from their underground workings, i.e. a combination of groundwater flow from multiple working faces. This is an appropriate approximation for the underground model, but not for the waste rock hauled to the surface. Within the WRS at the surface, nitrate concentrations are likely to be much higher, albeit for a shorter length of time. Can you obtain nitrate concentration data from surficial rock dumps as a comparison? As another example case, an underground mine in northwest Montana measured nitrate concentrations coming off of a pile of recently blasted waste rock, which was placed at the surface on a liner. Early nitrate concentrations in the captured seepage ranged from 200 to 400 mg/L, but concentrations dropped to < 2 mg/L within two years. However, it should be noted that newly blasted material was not added to the pile. If a similar situation were observed at Black Butte, would the proposed WTP be capable of treating nitrate concentrations at much higher concentrations? 82.4.335(5)(k), MCA and ARM 17.24.116(3)(a)

Page 45, Section 6.3.3, Water Balance, second paragraph, third sentence: A total of 113,029 m3/yr of water is expected to report to the CTF sump. This does not include the water that would be used to flush out the cemented paste pipeline (5,000 gallons per flush?). If this procedure were to be performed weekly, it would result in an additional 980 m3/yr of water entering the CTF, and potentially reacting with cemented surfaces and drain/waste rock. Was this volume of water overlooked in the water balance or was it considered to have a negligible effect? 82.4.335(5)(l), MCA

Page 49, Section 7, Process Water Pond Water Quality Model, second paragraph: The PWP model is a straightforward mixing model, but it does not include the addition of any excess RO brine that is not incorporated into the cemented paste. Please ensure consistency with the discussion of handling RO brine and resulting water balance (see related comments from application. 82.4.335(5)(l), MCA

Sub-appendix H, Mass-Load Inputs from the Base Case Underground Model at Closure: The table of mass-load inputs from the base-case UG model shows that all oxidized wall rock terms are shut off and the paste backfill becomes the only input. This appears to be inconsistent with the proposed conditions at closure, where the access tunnels and declines are left open. In particular, the upper zones would receive more rapid recharge and continued flow-through at closure, and likely higher oxygen flux considering the shallow recharge source. For a period of undetermined time, the water quality in those zones would likely be affected by continued oxidation, rather than returning to baseline conditions. Removal of this upper flow component also seems to conflict somewhat with the sulfide attenuation model, which assumed a flowrate through the USZ at post-closure of 190,784 L/week (5 gpm). 82.4.335(5)(k), MCA

Appendix P

Page 15, Section 4.1, Types of Spills and Releases: Please add a section to the appendix on handling spills of acid-producing materials onto unlined surfaces such as from the pipelines carrying contaminated water or from trucks hauling PAG material from the portal pad to stockpiles, the mill area, or the CTF. ARM 17.24.116(3)(n)

Page 26, Section 4.4.2, Underground Mine Operations Phase, fourth paragraph, first sentence: Please describe how the assay lab would dispose of hazardous wastes. 82.4.335(10), MCA

Page 29, Section 5.1, Storm Water Pollution Prevention Plan: Please add a section to the SWPPP on how PAG materials would be controlled to minimize contamination of unlined surfaces such as roadways, materials graded on road surfaces against berms, and fill slopes. 82.4.335(10), MCA

Plate1: Please show more detailed site controls for positive control of contaminated runoff from PAG surfaces. 82.4.335(10), MCA

Appendix T:

Page 2, Pressure Grouting Plan, third bullet: "Optimize the sustainable amount of water processed through the water treatment plant to about 300 gpm (1,136 Lpm) to minimize operational costs of water treatment and water and brine storage and disposal requirements." This appears to be the only place where optimizing the WTP to an inflow of 300 gpm is discussed. Have water treatment models been developed to show the efficiency at lower flow rates? 82.4.335(10), MCA

Editorial Comments – All Volumes:

Cover Page: Please replace "Environmental Management Bureau" with "Hard Rock Mining Bureau"

Page xx, Abbreviations: Change "AMU" to "AUM."

Page 1, first paragraph, second sentence: Please replace: "Permitting and Compliance Division – Hard Rock Program" with "Air, Energy & Mining Division – Hard Rock Mining Bureau"

Page 1, Section 1.0, first paragraph, first sentence: Please replace: "Permitting and Compliance Division – Hard Rock Program" with "Air, Energy & Mining Division – Hard Rock Mining Bureau"

Page 1, Section1.0, Introduction and Project Overview, second paragraph, second sentence: The proposed mine permit area is also located in sections 29 and 32 in Township 12 N, Range 7 E according to Figure 1.2. Please correct.

Page 1, Section 1.0, Introduction and Project Overview, fourth paragraph, first sentence, and Figure 1.3: The decline and upper and lower ramps are not shown on Figure 1.3 as stated in the text. Please correct the figure.

Page 4, Section 1.0, Introduction and Project Overview, third paragraph, third sentence: Please remove the sentence "No waste rock will be left on surface at closure" as the waste rock would be placed in the CTF.

Page 4, Section 1.1, Project Location, second sentence: The proposed mine permit area is also located in sections 29 and 32 in Township 12 N, Range 7 E according to Figure 1.2. Please correct.

Page 30, Section 2.2.1 Water Resources Study Area and Method of Study, Paragraph 1 1st bullet: Please add “Figure 2.2” at the end of this bullet and remove it from the second bullet.

Page 18, Section 1.5, Work Completed to Date under Exploration License, 1ast paragraph, second sentence: There is a calculation error in the sentence “… a copper price $2.75/pound ($0.45 per kg).” Please correct or explain ($2.75/lb X 2.2 lb/kg = $6.05/kg).

Page 32, Figure 2.3 Groundwater Monitoring Sites: Please add MW-14 and MW-15.

Page 35, Table 2-7 Water Sampling Summary for Baseline Monitoring Sites: Please add MW-10, MW-11, MW-12, MW-13, MW-14, MW-15 data to this table.

Page 58, Figure 2.10, and text throughout Section 2.3, Wetlands Resources: Stream segments have unique name references in the Wetland Resources section that do not correspond to names used elsewhere in the hydrology section. For example, Coon Creek is referenced as Sheep Creek Tributary 2 and Brush Creek is referenced as Little Sheep Creek Tributary 1. Please use consistent names or provide cross reference table for names of waterbodies.

Page 61, second paragraph, Section 2.3.5, Potential Waters of the US, first sentence: Please confirm that the changes in federal regulation for WOTUS (FR 80 124, June 29, 2015, page 37104) would not affect the analysis of wetland resources and WOTUS performed for project. Also see Figure 1.3, Facilities Site Plan, CFR citation at bottom right of page (33 CFR 328.3(e)). Part 328 was amended in the Federal Register cited above. The June 29, 2015 amendment included removal of paragraphs (d) and (e) and redesignating paragraph (f) as paragraph (d). Please provide the correct citation for jurisdictional features of streams within the project boundary. Also see page 60 Section 2.3.4, first paragraph, first sentence where the same amended CFR citation is referenced.

Page 126, Section 3.1.1, Mine Permit Boundary, second paragraph, sixth line: There appears to be a noun missing after “respectively.”

Page 128, Table 3-2, Acres of Surface Disturbance Consolidated by Major Facility: Please round these values to one decimal place and propagate that standard through the document.

Page 154 (spelling and clarity), Section 3.3.2.5, Copper Concentrate Dewatering and Handling, first paragraph, last sentence: This sentence fragment seems to be a subheading that got dropped.

Page 185, Section 3.5.8, Tailings Characteristics, last paragraph, last sentence: Please correct citation typo. The “results of the tailings characterization test work are presented in Appendix K of this document,” but the reference is given as Appendix C.

Page 189, Section 3.5.9.6, Paste Mixing Procedure, Testing Protocols and Test Methods, second paragraph: Please add CSP to glossary/acronyms.

Page 190, Section 3.5.9.6, Paste Mixing Procedure, first paragraph: Please add UCS to glossary/acronyms.

Page 224, Section 3.6.7.5, Brine Pond Liner and Seepage Reclaim, first paragraph, first sentence: The plan notes that Figure 3.30 shows the recycle system. Figure 3.30 shows cross-sections of the liner only. Drawing 9004 shows the recycle/reclaim system.

Page 231, Section 3.6.8.5, CTF Basin Drain System: Please include references to Drawings C6200, C6210, C6220 & C6230 found in Appendix K.

Page 237, Section 3.6.8.9, CTF Reclaim System, fifth paragraph, first sentence. Please remove Figure 3.38, Cemented Tailings Facility and insert Drawings C6220 and C6230, Appendix K.

Page 252, Section 3.6.13, Facility Siting Alternative Analysis, fourth paragraph, first sentence: "Water treatment processes were evaluated for their ability to effectively reduce the concentrations of the parameters of concern for each phase (see Section 0.)." Please include a correct, updated reference for this section.

Page 271, Section 3.7.3.5, Water Treatment for the Construction Phase, last paragraph, second sentence: Please spell out TRI, use another acronym for the company, or include it in the abbreviations list.

Page 272, Section 3.7.3.5, Water Treatment for the Construction Phase, first bullet: Please add WSR to glossary/acronyms.

Page 275, Section 3.7.41, Underground Infiltration Galleries, second paragraph: Please add UIC to glossary/acronyms.

Page 304, Section 3.8.6.3, Construction Noise, first paragraph: Noise modeling locations 2 and location 3 are both cited as "Butte Creek Road Gate." Figure 2.28 identifies the location of the noise measurement stations in relation to the proposed mine facility. Location 2 is Castle Mountain Ranch and location 3 is Butte Creek Road Gate. Please correct.

Page 311, Section 3.8.10, Hazardous Materials Disposal, last sentence on page: Clarification: DEQ has reorganized the Waste and Underground Tank Management Bureau to the Waste Management and Remediation Division (WUTMB is no longer in Permitting and Compliance Division).

Page 238, Section 3.6.8.10, CTF Tailings Delivery System, third paragraph: The plan references Appendix K Drawings C6100 & C6120 for the tailings delivery system. Drawing 6120 was not found and is not listed on Sheet C0001, Drawings List. Please clarify.

Page 278, Section 3.7.4.2, Underground Infiltration to Sheep Creek Alluvium, first full paragraph, second sentence, second to last word. Should 'surface' be changed to 'ground'?

Page 338, Section 4.2.3.1, Underground Mine paragraphs 1 and 2: The first full paragraph on the page is a duplicate of the following paragraph, and should be deleted. The following paragraph includes the addition of a reference to Appendix N, and should be retained.

Page 338, Section 4.2.3.1, Underground Mine, second and third full paragraphs: Aside from Table 4-4 in Appendix N these two paragraphs are identical.

Page 341, Section 4.2.3.3, CTF Facility, second paragraph: Please explain how the surface area of the CTF, as noted in the text, would be 4.75 times less than the surface of the HCT samples. Please clarify how this ratio was calculated,

Page 381, Section 7.3.3.6, Cemented Tailings Facility Closure, last paragraph: The text references Figure 7.4 for the reclamation topographic map for final reclamation of the CTF and the seepage collection pond. Figure 7.4 does not show a seepage pond.

Page 400, Section 8.0, References, DEQ 1998: DEQ has updated the soil, overburden, and regraded spoil guidelines. A new draft copy is available for inclusion in the reference section.

Appendix B, p. 2-14, Baseline Water Resources Monitoring and Hydrogeological Investigations Report, second paragraph, last sentence: The text notes that “The completion details of each piezometer are included in Table 5,” but they are missing. Please include the completion details of each piezometer in Table 5.

Appendix D, Table of Contents: The headings shown in the Table of Contents are incorrect. D-B is not the Wetlands Functional Assessment (it appears to be Appendix C-2 in a different volume). D-B is actually the “Waste Rock Static Data.” D-C should be listed as “Waste Rock Kinetic Data,” as the use of “Water” appears to be a typo.

Appendix D-D, p. 36: Please remove the approximately 20 pages of analytical reports that do not appear to be related to the Black Butte Copper Project. See Energy Lab sheets from 11/17/15 with Newfields listed as the client for the High Plains Motor project, pages 6-26 of 27. This is presumably a laboratory reporting error, as these analyses relate to petroleum hydrocarbon and volatile organic compounds.

Map Sheet 2, Wetland Delineation and Functional Assessment Map: Please add the pipeline to and infiltration gallery in the Sheep Creek Alluvium to this map.

Appendix E-1: Table 2 is missing (Steady-state infiltration rates for 2012-2015) from the document.

Figure 3.30, Brine and Contact Water Pond General Arrangement Sections and Details, and Figure 3.31, Brine and Contact Water Pond Grading Plan: The angle of repose slope off the portal pad slope is labeled incorrectly as 2.5:1 in cross section 2, and in Figure 3.31. Please correct.