State of Utah

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DIVISION OF WASTE MANAGEMENT
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Director

April 17, 2019

Sandra Ross
Rio Algom Mining LLC
P.O. Box 218
Grants, NM 87020

RE: Summary of Review Findings and Request for Additional Information Regarding the Rio Algom Mining LLC August 30, 2018 Hydrogeological Supplemental Site Assessment and Tailing Impoundments Water Balance Modeling Report
Radioactive Material License Number UT 1900481

Dear Ms. Ross:

The Utah Division of Waste Management and Radiation Control (Division) has completed review of the following Rio Algom Mining LLC (RAML) documents (all documents dated August 30, 2018):

a. Tailings Impoundments Water Balance Modeling Report
b. Hydrogeological Supplemental Site Assessment Volume I: Text, Figures, and Tables
c. Hydrogeological Supplemental Site Assessment Volume II: Appendix 2A to 3A
d. Hydrogeological Supplemental Site Assessment Volume III: Appendix 4A to 6B

All of these documents pertain to the RAML Hydrogeological Supplemental Site Assessment (HSSA) for the Lisbon Uranium Milling Facility located in the Lisbon Valley, San Juan County in southeastern Utah (Facility). A summary of the Division review and findings is included in this letter below.

Overall, the geological and groundwater data has been greatly expanded allowing an updated, better understanding of the site geology, groundwater flow, and contaminant fate and transport.

(Over)

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Per review and as noted in sections of the HSSA, uncertainty still exists and additional site characterization and remediation activities are needed in order to complete groundwater modeling and develop target action levels and alternate concentration limits for incorporation into the Facility Radioactive Material License (License) and Long-term Groundwater Monitoring Plan. Additional actions need to be discussed and agreed to between the Division and RAML to ensure that potential groundwater exposure of contaminants from the Facility does not pose a substantial present or potential hazard to human health or the environment as required by Federal Standards, and State Laws, Regulations, Permits and Licenses.

Tailings Impoundments Water Balance Modeling Report Review Summary and Findings:

Per the summary and conclusions of the Tailings Impoundments Water Balance Modeling Report (Tailings Model), a mean percolation rate of 1.58 in/yr was calculated in the HELP model after 100 years of simulation. The simulation was based on model input from site specific data from the upper tailings impoundment (UTI) and lower tailings impoundment (LTI) collected during 2016. The 100 year simulations calculated a range of percolation rates from 0.70 in/yr to 3.24 in/yr. Conclusions of the Tailings Model further estimate, based on configurations of the final covers and water balance, long term percolation values between 0.5 and 5 in/yr, and a recommended value of 1.6 in/yr for use in the initial groundwater flow and transport modeling. However, the Division notes that per Part 7.3.3 of the HSSA it was recommended that, in order to complete the flow and transport model completion, the evaluation of tailings leakage rates needs to incorporate additional evaluation to reduce uncertainty in the model boundary conditions.

The Tailings Model discusses that the top rock layer of the UTI and LTI covers act as mulch and is effectively limiting evaporation from the surface and increasing deep percolation as a result. The HELP model is not sensitive to changes in cover slope (potential to increase surface runoff) with the current cover configuration and the Tailings Model concludes that the runoff curve number remains low due to the current rock layer surface conditions. The Tailings model concludes that in order to reduce deep percolation rates, the evaporative zone depth (EZD) of the covers needs to be increased.

Per the Division review of the Tailings Model, it seems reasonable to discuss and determine improvements to the cover performance which may be appropriate to increase the EZD and reduce the deep percolation rates of pollutants from the tailings wastewater.

Hydrogeological Field Investigations and Conceptual Modeling:

The Division review of the HSSA conceptual model notes that the field investigations and data interpretation have provided a better understanding of the Facility area geology including impacts of unsaturated portions of the Burro Canyon Aquifer (BCA), the Lisbon Valley Fault (LVF) mineralogical and faulting zone, surface-groundwater interaction along the northern Long Term Surveillance Monitoring Boundary (LTSM), seasonal impacts of Coyote Creek, regional recharge and discharge zones, groundwater flow directions and rates, and source term concentrations, recharge and transport. Additionally, potential adsorption reactions in the BCA were included in the HSSA. The findings and RAML interpretations of the data, per review by the Division, are discussed in sections below.

Hydrogeology of the Burro Canyon Aquifer in the Vicinity of the Facility:

The installation, logging, sampling, and hydraulic testing of HSSA borings and monitoring wells generated more data to characterize groundwater flow in the BCA. Additionally, the incorporation of existing well data in the regional area into the HSSA was important to clarify the regional recharge and flow in the BCA. The collected data helps to clarify previously unknown impacts to groundwater flow due to unsaturated zones of the anticline, impacts of fractures and friable rock, and the interaction of the BCA with the LVF zone block faulting. Groundwater flow directions needed to be clarified regarding the southern plume in the area of the Lisbon Valley Fault to determine if the plume was migrating westward towards the fault or on a different path closer to the unsaturated BCA and whether observed elevated concentrations of uranium and other constituents along the LVF are plume derived or due to other geochemical processes. Migration of the northern plume needed clarification around the unsaturated BCA, which necessitated an understanding of the hydraulic properties and extent of saturation of the anticline. Determinations of plume flow directions and rates are also dependent on a clear conceptual representation of regional flow directions, recharge and discharge zones, and water balance.

Based on Division review of the HSSA conclusions regarding region recharge, the regional water level contours depicted on Figure 3.16 of the HSSA appear to be based on adequate data points to draw the contours. Data and contours depicted indicate a flow divide; based on the contours east from the Lisbon Facility, flow east from this divide flow to the southeast away from the site. The interpreted line of this divide constitutes the southern and eastern flow boundary. The northern flow boundary was determined to be Coyote Wash where groundwater flow is parallel to the drainage as depicted by groundwater elevation contouring. The southern and western boundary was determined to be the main Lisbon Fault line as determined by trench and core data. In general the HSSA has provided adequate clarity to better conceptualize the flow system and plume migration directions, although several uncertainties exist and additional information is needed regarding the LVF zone and West Coyote Wash.

Site Water Balance:

Two approaches to calculating a water balance were used:

1. Estimation of fluxes across two section lines near the lower ends of both the northern and southern aquifers, using monitoring well data on the section line to inform the data, and:
2. Estimates of recharge from precipitation only.

For the first method the hydraulic gradient was based on water level data from wells on the section line and hydraulic conductivity was based on field slug and pump test data.

Conclusions of the site water balance found that the estimated recharge for the southern aquifer is one-tenth that of the northern aquifer. Estimations including flux into the system from the tailings cells (using a value of 1.6 in/yr flux out of uniform tailings cell bottoms) were 81 acre-feet per year for the northern aquifer and 7 acre-feet per year for the southern aquifer. Based on data and using estimated K values, the recharge rate for the northern aquifer was calculated at approximately 0.2 in/yr and the southern aquifer at 0.02 in/yr.

The HSSA states that "*the highest uncertainty is attributed to the hydraulic conductivities used in the calculation, since many of the K values are from traditional slug tests, which may not represent accurate estimates of the actual formation properties*." It is also noted that the BCA is highly variable in K values due to its depositional characteristics and that this was noted in the HSSA and verified by slug and pump tests. The HSSA also compared these recharge rates relative to the average recharge rate of 0.25 in/yr for the Moab-Spanish Valley area and notes that, in the case of the northern aquifer recharge, the rates are similar.

Methods using the second method of precipitation found similar results regard flux and recharge rates in the northern aquifer but noted a difference in the southern aquifer. Based on review of the methodology the estimations appear to be reasonable for modeling purposes but are considered estimates.

Burro Canyon Low K Zone:

Based on core and chip logging and a barometric response analysis (15 wells) it was determined that a zone of lower hydraulic conductivity may exist in the BCA which acts as an aquitard. The barometric testing indicated that the aquifer is confined in most areas of the Lisbon Valley with an exception in areas adjacent to the anticline where the confining layer has been eroded away and eastern areas where the low K layer is not in contact with the water table.

Data was imported into a Leapfrog model to determine areas where the BCA may be flowing hydraulically as a confined or unconfined aquifer (Figure 3.17 of the HSSA). Impacts of the low K zone, reducing specific yield, will be included in future modeling. The impacts to specific yield are sensitive regarding impacts from historical pumping of the BCA to remediate the plume.

Lisbon Valley Fault:

The LVF was studied to determine if it is acting as a barrier to flow and if pathways of flow exist along the fault. The HSSA included evaluation of conditions on the west site of the primary fault and tested the hydraulic response between wells adjacent to the fault on the west and east sides. Based on findings, it was noted that although one well on the west side of the fault had water in it after an higher than normal precipitation period, any such groundwater would not be adequate to sustain an established aquifer and that any potential migration of cross-fault groundwater from east to north would not be a potential exposure pathway based on generally year round dry conditions in wells west of the fault.

The HSSA discusses that BCA fractures are not present in zones close to the Lisbon Valley Fault; however there does appear to be downward groundwater flow along the fault zone which is likely complicated by fault blocking in the zone. It is concluded that in general it appears that groundwater flows from both sides of the Lisbon Valley Anticline generally flowing northwest until the northwestern point of the anticline and then converges and flows west towards the fault in the area of the northern LTSM northwest corner.

Section 4.3.3 of the HSSA is a summary of field work, geochemical interpretation, and geochemical modeling of the LVF. The study was conducted to clarify groundwater chemistry along that zone and determine whether elevated concentrations of uranium and other constituents in ground water were due to the plume or to natural geochemical processes.

Based on the findings, a conceptual model was developed to help clarify the chemical characteristics of groundwater along the fault zone. Overall, the HSSA interprets that groundwater in this zone is affected by the weathering of hydrothermal sulfide mineral deposits along the LVF. Weathering and oxidation of these deposits affects the BCA groundwater due to the production of acidic solutions which dissolve metals and other constituents in the mineral deposits, as well as potentially other minerals in the nearby aquifer. These dissolved solutions are then transported and precipitated in the vadose zone and below the water table. The HSSA clarifies these process zones as follows: 1. The "leached zone," zone of oxidation, 2. The "blanket zone," zone of secondary sulfide enrichment, and 3. The "hypergene zone," zone of primary, unoxidized mineralization.

The LVF geochemical conceptual model was evaluated using numerical modeling and, based on model outcomes, it was concluded that the observed constituent concentrations could potentially result from the conceptualized natural processes; this is described in the HSSA as an ordered system of oxidation, solution, and precipitation events. It was noted that, according to the HSSA modeling descriptions, the observed groundwater concentrations are affected by processes either in the leached zone or the blanket zone individually during certain times or in combination. The system is driven initially by the oxidation of pyrite and to a lesser extent chalcocite in the leached zone resulting in low pH and high sulfate concentrations in the groundwater. After the available pyrite is oxidized, which is assumed to take about 30 years, the system is overtaken by the hydrolysis of kaolinite and adularia which results in a rise of pH which plateaus after approximately 120 years. Then the precipitated sulfate minerals become unstable and cause reactions which form a mildly acidic pH range in the groundwater due to long term sulfide oxidation.

Based on modeling, the HSSA concludes that, using conservative assumptions of in situ sulfide oxidation, the groundwater chemistry in the fault wells could be caused and could "*easily exceed maximum observed values*." The overall conclusion in the HSSA is that the source of elevated concentration along the LVF is due to natural geochemical processes and that this groundwater has a distinctive chemical fingerprint. Based on review of the HSSA, the Division agrees that the evaluation of background groundwater quality, including statistics, along the LVF should be conducted and included in a background groundwater quality report to be submitted for Director review and approval.

Plume Characterization:

Chloride is a conservative tracer (non-reactive tracer) in groundwater and, per the HSSA, it is noted that the monitoring wells which are known as the most impacted by tailings wastewater also show the highest concentrations of chloride. Also, the upgradient background monitoring wells, unimpacted by the plume, show relatively low chloride concentrations. Per these findings, the HSSA uses elevated chloride concentrations as an indicator of plume contamination and as an indicator of plume migration noting that wells farther from the source will have undergone more mixing with background groundwater.

In order to verify that other constituents are plume generated, or to potentially eliminate other elevated constituents in groundwater as being completely plume related, the HSSA notes that more reactive (less mobile) constituent concentrations will be present in lower concentrations than chloride if they are caused only by the plume. In order to evaluate groundwater concentrations the HSSA generates plots indicating a tailings-background mixing line for both the northern and southern aquifers. The mixing line is essentially a comparison of chloride concentrations, which should show a higher concentration in the plume, with other constituents which should in all instances show lower concentrations than chloride in the case of a tailings wastewater derived source. Mixing line constituents which plot above the mixing line for tailings wastewater must therefore have another or additional source contributing to that contaminant concentration.

The mixing line evaluation of constituents is used to indicate contribution of contaminants coming from tailings wastewater or mineralized zones along the margins of the Lisbon Valley Fault and relative mixing with background water. Therefore, this analysis is a simplistic tool to differentiate source contributions, and anticipated mixing of tailings wastewater and background groundwater, to approximate the extent and transport distance of the plumes. Figures 4.8 through 4.13 of the HSSA include charts of the mixing analysis for various constituents.

Groundwater monitoring data at monitoring well MW-124 has shown results above the Utah groundwater quality standard for uranium. Results have been in the range of 0.136 mg/L which is more than 4 times the groundwater standard of 0.03 mg/L. Monitoring well MW-124 is located on the boundary of the northern LTSM and is plotted within the plume in the HSSA (Figure 4.5). The Division also notes that monitoring well RL-3 which is a current compliance well with significant historical data is hydraulically upgradient from MW-124 and is showing a significant upward concentration trend for uranium.

The HSSA states that the elevated uranium concentrations in MW-124 may not be due solely to impacts from the plume. The HSSA states that "*the geochemistry of water at MW-124 indicates a background/mixture type water which could represent a mixture between upgradient and tailings-impacted water, upgradient and fault-impacted water, or a mixture of all three types of water*" (HSSA p. 99). Regarding MW-124, the HSSA finds that more investigation of the source of uranium is warranted based on:

- Sinusoidal testing at MW-124 indicating a highly permeable zone,
- Numerical modeling plume simulations indicating that the plume has not reached MW-124,
- Assumptions of limited plume movement due to past Corrective Action Plan groundwater pumping, and
- Results of the northwest data gap sampling at groundwater and surface sampling locations and ongoing investigation.

The Division notes that the data results from monitoring wells along the contaminant flow pathway, from the upper tailings source to MW-124, show consistently decreasing uranium concentrations indicating a continuity from the tailings source; OW-UT-9 → MW-102 → MW-101 → RL-1/RL-3 → MW-119 → MW-124. Visually, and based on monitoring well data, it would appear that the uranium in MW-124 is associated with the northern plume; however, the Division agrees that additional study is warranted regarding the source of elevated uranium in MW-124. However, until Rio Algom can prove otherwise, the Division's position is the northern plume is the source of the uranium concentrations seen in MW-124.

Background Groundwater Quality:

Appendix 4D.1 through 4D.8 of the HSSA provides tables of current data for background monitoring wells MW-5 and MW-13 to demonstrate that background concentrations need to be re-evaluated. Per review, the Division agrees that an updated background report is warranted, and agrees with statements in the HSSA that the data should be statistically evaluated according to applicable criteria in the 2009 U.S. Environmental Protection Agency Statistical Guidance.

The HSSA also notes that groundwater sampled from upgradient background well MW-125 in the LVF zone, has a different chemistry than that of other License designated background wells, MW-5 and MW-13, which are not located within the LVF zone. Statistical analysis conducted as part of the HSSA provides that monitoring wells along the fault zone are distinctive due to their interaction with the mineralized zones and are related based on the geochemical processes along the LVF zone. Based on this, the HSSA recommends the development of distinct background concentration for monitoring wells along the LVF zone and also recommends several criteria for determination of background based on the 2009 U.S. Environmental Protection Agency Statistical Guidance.

The HSSA outlines several follow-up issues regarding the recalculation of background groundwater concentrations. These issues are included in the Request for Information Section of this letter below.

K_d Evaluation:

In situ Kd values were obtained through rock core analysis (MW-102, MW-109, MW-117M and MW-118) using sample crushing and digestion prep and analysis for major and trace elements by methods USEPA 6010B and 6020A. Kd values were calculated using the equation Kd = $C_{solid}/C_{aqueous}$, with $C_{aqueous}$ values being "median" values from recent sampling events. The $C_{aqueous}$ values are summarized on Table 4H.1 of the HSSA. Per review, the monitoring well data used for the evaluation was from monitoring wells MW-102, MW-109, MW-117M and MW-118. Use of these wells to determine Kd is limited since this only includes two wells in each of the plume flow regimes. This represents a lateral distance of approximately 3,500 feet between wells in the southern plume (distance between MW-117M and MW-118) and a lateral distance of approximately 2,000 feet between wells in the northern plume (distance between MW-102 and MW-109). This is effectively providing data for only two wells in each of the northern and southern flow regimes.

Most of the constituent groundwater sample results were below the Method Detection Limit ("MDL") and therefore, only a small, select list of constituents could be evaluated. Specifically, per the HSSA, only uranium and arsenic were evaluated at some locations. Per review it appears that arsenic was only evaluated in the southern flow regime. It appears that only uranium was evaluated in both the northern and southern plume flow regimes.

This limited data is used to justify and support calibration of the numerical flow and transport model and a Kd fit to historical COC concentrations. However, the evaluation was not robust, does not provide information regarding site specific Kd values of the Burro Canyon aquifer, and a fit cannot be made due to the limitations of detectable concentrations in the core samples.

Core samples from monitoring wells MW-102, MW-109, MW-117 and MW-118, from three specific depth intervals were also evaluated to determine an estimate of ferrihydrite concentration for input into a surface-complexation model. Details regarding the core intervals, sample preparation and analysis results are in appendix 4H of the HSSA.

It appears that insubstantial information regarding adsorption reactions was obtained during field studies to provide a reliable understanding of adsorption coefficients and provide adequate model calibration.

Numerical Flow and Transport Model

The HSSA discusses that additional study and data is needed to complete the conceptual model prior to completion of the flow and transport modeling. An initial numerical model was submitted in the HSSA Section 5.3.1 using the 3 dimensional finite difference code MODFLOW-SURFACT, version 3. Additionally, Groundwater Vistas Version 6 was used as a graphical interface and ArcMap 10, Excel and Python were used to develop and view model inputs and outputs. Two separate models were developed; a Bisco Pond model and a transient calibration model. The Bisco Pond model includes an initial head distribution and covers the years 1978 to 1989 when the Bisco Pond was in operation. The transient head model begins from 1990 and includes the initial groundwater mound formed by the Bisco Pond and subsequent declining water levels due to the removal of Bisco Pond in 1989 and Corrective Action Plan groundwater pumping that occurred from 1990 until 2003.

Horizontal differences across the site (recharge from natural and regional sources, tailings cell leakage and discharge) were simulated with separate zones reflecting geologic and hydraulic properties noted within those areas (e.g. zones of fracturing, restricted flow or internal flow barriers). A uniform grid spacing of 100 ft. by 100 ft. was used. Two vertical layers were included; 1. Layer 1 consisting of alluvium and upper portions of the BCA where alluvium is not present, and 2. Layer 2 consisting of all remaining BCA.

Lateral boundaries were specified as no flow boundaries in Layer 1 except at the northern boundary along Coyote Wash where seasonal draining conditions were simulated. West Coyote Wash was entered as seasonally changing based on the stage of draining conditions.

A portion of the Layer 2 boundary along the LVF was simulated as draining due to conceptual modeling indicating vertical flow along the fault zone in this area. The lower boundary was set at the elevation of the Brushy Basin Formation top and the upper boundary was specified as a flux boundary allowing recharge from precipitation and from the tailings impoundment leakage.

Initial conditions related to seepage and CAP pumping were based on available data and were assumed for the model to have been consistently applied rates with 27 different stress periods (constant rates simulated within each stress period). The initial numerical model was calibrated without the incorporation of the low K zone in the BCA, the HSSA notes that future incorporation of this layer and confined conditions at affected parts may provide for a better calibration fit regarding groundwater elevation and head. Generally, calibration of the flow model appears to be adequate to simulate historical and future groundwater directions and velocities. Final decisions regarding the representativeness of the model will be dependent on Director review of the revised model which incorporates all hydrogeological study findings.

The HSSA sections of Figures, Section 5, includes figures generated and depicting both conceptual model inputs into the numerical model and model calibration results, as well as long term predictions of plume movement based on physical and hydraulic input parameters (sorption and non-sorption scenarios). In general the depictions appear adequate to understand the methodology which will be used for the next round of numerical modeling. It is anticipated that more figures will be generated to depict breakthrough concentration curves (concentration vs. time) for individual constituents at each compliance and trend well used for long term monitoring. These types of figures will be needed in preparation of the long term groundwater monitoring plan and to incorporate concentration based License conditions.

As has been discussed during previous telephone conferences between RAML and the Division, it is the Divisions intention that ACL's at the LTSM for POE wells will be set uniformly as the Utah Groundwater Quality Standard for uranium (0.03 mg/L) or approved natural background concentration. In this case the LTSM boundary may need to be expanded to ensure that this condition can be met, unless there is specific approval from the Director that this is not feasible based on existing Facility conditions.

HSSA Conformance with the May 9, 2016 Stipulation and Consent Agreement

Based on Division review and findings of the HSSA, it appears that additional fieldwork, data collection, evaluation and modeling is needed to better develop a model of conceptual groundwater flow, geochemical processes and numerical modeling. Generally, the conditions of the May 9, 2016 Stipulation and Consent Agreement ("SCA") were met with the exception of the additional information needed to complete the numerical modeling and proposal for revised ACLs and TALs.

Based on the Division Request for Additional Information below, and findings in the HSSA of additional needed site investigation, it was agreed during a telephone conference between RAML and the Division on April 10, 2019, that the May 9, 2016 SCA will be superseded by a new SCA incorporating the additional site investigation and deliverables outlined in a RAML work plan. The approval of a new phase of Hydrogeological Investigation will be based on agreements included in a new SCA.

Division Request for Additional Information:

1. Per findings regarding the Tailings Impoundments Water Balance Modeling Report, it was noted that the final covers at the Facility are designed to meet performance objectives of limiting radon flux to the atmosphere but are not designed to provide an adequate EZD. Recommendations of the Tailings Report include a need to better characterize the percolation values for the tailings impoundments and to likely provide additional control to increase the EZD and decrease percolation through the bottom of the tailings impoundments.

Request for Additional Information: Per the tailings impoundments findings and discussion during a conference call on April 10, 2019, please provide a plan and time schedule to better characterize long term percolation values for the current cover, and proposed improvements (updated design) to the Facility tailings impoundment covers to reduce percolation rates into the groundwater.

The general goal or broad objective referenced in the Utah Administrative Code R313-24 and Criterion 1 of 10 CFR 40 Appendix A for siting and design decisions is the permanent isolation of 11e.(2) byproduct material by minimizing disturbance and dispersion by natural forces, and to do so without ongoing maintenance over a finite time frame, for at least 200 years as per Criterion 6. The primary emphasis of this Criterion is on the long-term isolation of 11e.(2) byproduct material, which is a function of both site conditions and engineering design, and shall be accomplished in a manner that no active maintenance is required. Proposed updates to the design cover should consider these long term maintenance issues and provide isolation of the tailings and reduction of tailings wastewater from percolation into the groundwater to the degree practicably achievable.

2. Per the HSSA Section 7.2, additional data needs to be collected to update the conceptual site model. The Division agrees that this information is needed in order to complete the flow and transport model. These issues are included in the request for additional information below.

Request for Additional Information*:* Per the HSSA Section 7.2, please provide a plan and schedule to complete the following bulleted items as recommended in the HSSA:

- Provide further evaluation of the LVF's influence on groundwater flow to the north and northwest of the Site to provide the basis for specification of the flow-model boundary conditions in this area.
- Provide further evaluation of potential localized flow conditions associated with the LVF and related subsidiary faulting. Specifically provide additional evaluation to support claims made that uranium concentrations in monitoring well MW-124 (nearly 4 times the uranium groundwater quality standard) are not being caused by the northern plume. Also provide additional study to support claims that downward leakage is occurring along portions of the LVF.
- Provide further evaluation of surface water/groundwater interaction at the north-northwestern boundary of the LTSM and related potential boundary effects. Specifically provide additional data in the north-northwest area to evaluate flow and clarify the source of water discharging from the seep to the north of the site.
- Provide further evaluation of local pumping on groundwater flow and transport at the northern LTSM boundary: Specifically provide additional evaluation regarding pumping well SW-1.
- Provide further evaluation regarding the impacts of natural mineralization on groundwater quality at the site. Specifically provide additional information regarding claims that uranium groundwater concentration above the State groundwater standard (approximately 4 times the groundwater standard) are due to totally or in part to natural background uranium concentrations.
- Provide additional evaluation regarding determination of groundwater background concentration and further evaluation of tailings leakage rates as discussed in the HSSA Section 7.2. These issues have been broken out into separate requests for information in this letter. It is noted, however, that these same needs for evaluation were identified by the RAML consultant.
- Section 7.3 of the HSSA outlines strategies for site investigation to fill these data gaps. The Division agrees that these investigations are appropriate and requests that the outlined supplemental site investigation and geochemical analysis be completed.

3. Per review of the HSSA and preliminary flow and transport modeling efforts, and regarding increasing uranium concentration trends at point of compliance and trend monitoring wells in the northern plume, this data supports a need for consideration of additional plume treatment or entrapment to the degree practicable. In conjunction with conceptual and numerical modeling, the data also supports the need to evaluate the adequacy of the current long term monitoring surveillance boundary as adequate to maintain a boundary with groundwater constituent concentrations at or below the groundwater standard or agreed upon background concentrations. This objective should be determined in conjunction with the further evaluation listed in the "request for information" no. 2 above. A passive reactive barrier system and or other potentially feasible treatment systems is requested to be evaluated and included as part of the hydrogeological assessment to determine if appropriate conditions exist for construction and implementation.

Request for Additional Information: Per the contaminant transport findings based on current data and modeling assumptions and discussion during the April 10, 2019 conference call, please provide a plan and schedule to include an evaluation of treatment of the north contamination plume and an evaluation of contaminant transport with and without additional potential passive treatment.

4. Flow and transport of contaminants in the south plume, as delineated in the HSSA, are migrating through fractured and friable bedrock and on a path adjacent to the BCA (See HSSA Figures 4.2 through 4.6 esp. figure 4.6 delineation of the uranium plume based on recent median uranium concentrations). It was noted that monitoring wells are not in place in proximity of the plume along the northern areas of the plume. Trend wells should be placed in areas agreed to for long term monitoring of the plume and potential "dry zones."

Request for Additional Information: Provide a plan and time schedule for additional evaluation and proposed locations to monitor northwestern migration of the southern plume adjacent to the unsaturated BCA. Area of concern is to the east of trend well RL-1 between the plotted leading edge of the uranium plume and monitoring well MW-129.

5. Per the HSSA findings it appears that geochemical processes along the LVF have created a geochemical environment of naturally caused high concentrations of certain constituents in groundwater. Site background conditions should be evaluated using an appropriate statistical methodology. Part 7.3.2 of the HSSA identifies this issue as a needed element of site and plume characterization.

Request for Additional Information: Provide a plan and time schedule for evaluation of Site background conditions and an updated statistical evaluation including proposed background concentrations. As recommended in the HSSA, groundwater background should be evaluated on an intrawell basis.

6. Per meetings and discussions between the Division and RAML, evaluation needs to be conducted regarding an updated list of monitoring constituents (most prevalent constituents in tailings solution and mobile constituents in groundwater) to use for the HSSA and for long term and License required groundwater monitoring. This issue is additionally included in Section 7.3.2 of the HSSA which notes that there is no available historical information clarifying why the

list of current list of "Constituents of Concern (COC's) (arsenic, molybdenum, selenium and uranium) was used.

Request for Additional Information: Provide a plan and schedule for evaluation and proposal for updated COC's to be used for groundwater monitoring at the site. Revised and approved COC's will be used for continuing hydrological assessment and as compliance based parameters to be used in the Facility License and Long Term Surveillance Monitoring Plan. The evaluation should consider the concentration and mobility of constituents in the tailings wastewater and/or LVF zone.

As discussed during a telephone conference call between RAML and the Division, a new Stipulation and Consent Agreement (SCA) regarding a new phase of site hydrogeological investigation will be implemented, including a revised list of study objectives and timelines. Per the conversation, RAML will provide a proposed work plan on or before June 21, 2019 for Director review and approval and incorporation into the new SCA. RAML will provide the work plan based on identified outstanding study needs discussed in the HSSA and based on the Requests for Additional Information included in this letter.

If you have any questions, please call Tom Rushing at (801) 536-0080.

Sincerely,

Ty L. Howard, Director
Division of Waste Management and Radiation Control

TLH/TR/kb

Enclosure: References

c: Kirk Benge, Health Officer, San Juan Public Health Department
Rick Meyer, Environmental Health Director, San Juan Public Health Department
Scott Hacking, P.E., DEQ District Engineer

References

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INTERA. August 30, 2018. Hydrogeological Supplemental Site Assessment, Lisbon Site, Rio Algom Mining LLC, Volume I: Text, Figures, and Tables. Prepared for Rio Algom Mining, LLC.

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INTERA. August 30, 2018. Tailing Impoundments Water Balance Modeling Report: Cover Performance Assessment of the Upper and Lower Tailing Impoundments. Prepared for Rio Algom Mining, LLC.