INTERA/RAML
Responses to Comments
Ambrosia Lake Work Plans 2017 and 2018

The following memorandum presents the original comments by United States Nuclear Regulatory Commission (NRC) reviewers of two work plans for the Rio Algom Mining LLC (RAML) Ambrosia Lake site (Site) and the responses to those comments prepared by RAML and INTERA Incorporated (INTERA). Smaller sized figures and tables are embedded; larger figures and tables are attached to this memo.

The following statement is from the NRC, prefacing their comments:

This file is formatted as brief numbered questions, with or without bullets of relevant information that may help getting to the crux of the concern or lack of available information. The topics of many of these comments have probably already been considered by Rio Algom Mining LLC (RAML), but the NRC staff have not readily found the relevant information. The list of documents provided at the end of the file provide an indication of the background documents available for this review. The purpose of these comments and questions is to help focus discussion, and is not intended as a formal review, nor as formal RAIs (requests for additional information).

1.0 Comments and Responses to RAML (2018)

RAML. 2018. Workplan for the Rio Algom Mining Ambrosia Lake Mill Site: Disposal Cells 1 and 2 Dams and Tailings Characterization. Radioactive Material License Number SUA-173 McKinley County, New Mexico. Prepared by INTERA Geoscience & Engineering Solutions. February 9, 2018. MLxxx.

Comment 1: *Will laboratory measurements of the particle size analysis of samples include hygrometer analysis for fines?*

Response to Comment 1: Selected samples of both the cover materials and tailings may be analyzed in the lab using a hydrometer (sedimentation) to determine particle sizes finer than the No. 200 sieve. Otherwise, and consistent with the objectives of the Work Plan, only dry sieve analyses will be performed to adequately classify the materials according to the Unified Soil Classification System (USCS) in conjunction with measurement of Atterberg limits.

Comment 2: *Will the model inputs-based laboratory samples for hydraulic properties reflect scale effects and cover evolution? Engineered covers tend to perform less than as designed due to scale effects and imposition of surficial processes over time (e.g., Benson, et al. 2010).*

Response to Comment 2: The Work Plan has been designed to sample the cover and tailings as-placed at several locations at both Disposal Cells 1 and 2. As such, the material samples and attendant laboratory analyses should represent current conditions at those locations. The final covers placed over Disposal Cells 1 and 2 at Ambrosia Lake will experience only limited loss of performance over time because of the design, construction, and maintenance controls associated with the closure of a uranium processing facility and mandated long design life of the closure. The final covers at Ambrosia Lake are hybrid water balance (WB) covers in that the growth of vegetation is controlled and limited, which also limits loosening of the compacted materials from root penetration. The covers were designed and constructed with a 12-inch thick frost protection layer above the 18-inch-thick radon barrier. Loosening of the upper portion of the frost protection layer (increased saturated hydraulic conductivity) will be considered during sensitivity modeling. The engineering properties of the radon barrier are not expected to change significantly from placement conditions as it lies beneath both the rock erosion layer and frost protection layer.

***Comment 3:** Describe how the use of average precipitation and climatic conditions as input for the water balance model will reflect the episodic nature of the relevant processes. Recharge in the desert southwest is highly episodic, both inter-annually and seasonally. With the lack of data to support specification of the lower boundary condition, hence use of the assumption of a unit gradient, constraints for inferring recharge rates are left to properties and average climatic conditions. It is noted that the UNSAT-H model, which is suggested as an alternative approach that may be considered, could address this uncertainty.*

Response to Comment 3: The data collected during the field and laboratory testing portion of the project will facilitate performance modeling of the entire profile of the final cover and tailings for both Disposal Cells 1 and 2 using HELP and/or UNSAT-H. As such, the modeling will not only simulate the performance of the cover, but the entire disposal cell profile to provide information for associated solute transport modeling in groundwater. Both HELP and UNSAT-H can provide useful information in this regard. HELP is a quasi-two-dimensional model that uses porosity, volumetric moisture contents at field capacity and wilting point, and saturated hydraulic conductivity (Ksat) as input soil data. UNSAT-H uses information developed from moisture characteristic curves (MCCs), determined from laboratory analyses of material samples, for soil input data. So, while UNSAT-H will produce simulation output derived from MCCs, HELP output can be compared to the MCCs as a check on the reasonableness of the output data. So, while the objective of the modeling is to estimate flux of tailing fluids from the base of the disposal cells for use in future solute transport modeling, several tools will be available (HELP, UNSAT-H, and the field and laboratory data) to consider a range of possible flux values from the tailings useful for solute transport modeling in groundwater.

Regarding meteorological data for water balance simulations, either HELP or UNSAT-H will consider period-of-record data for nearby weather stations, such as Milan/Grants or Thoreau. HELP would generate daily precipitation data stochastically, to produce the statistical characteristics entered from actual normal mean monthly precipitation values from the weather station location. Both models would use climatological data reflecting variations both inter- and intra-annually from weather stations near the Ambrosia Lake site.

Comment 4: *Is the source fluid exiting from the tailings pile to be used as input for reactive transport to the Point of Compliance (POC) and Point of Exposure (POE) wells? If so, then explain the possible disconnect between the use of acidity measurements on the tailings pore fluids in RAML (2018), and the use of pH measurements for the reactive transport pH neutralization analysis between the POC and POE wells, such as in RAML (2017). Will there be a sufficiently complete analysis of species contributing to the acidity data in the tailings fluids such that a pH can be inferred?*

Response to Comment 4: The list of analytes to be measured in tailings pore fluids (RAML, 2018) includes those that will be measured in the laboratory. Field parameters will be measured at the time of sample collection using a portable multimeter for temperature, pH, specific conductivity, dissolved oxygen, and oxidation-reduction potential. Thus, the pH of the pore fluids will be measured directly, rather than be inferred. Tailings pore fluid chemistry will be used as source term input for reactive transport modeling either directly, or as a comparison to inverse-modeled values from downgradient POC wells.

2.0 Comments and Responses to RAML (2017)

RAML. 2017. Workplan for the Rio Algom Mining Ambrosia Lake Mill Site: Data Collection Work Plan in Support of Additional Alternate Concentration Limits, McKinley County, New Mexico. Prepared by INTERA Geoscience & Engineering Solutions. November 17, 2017. ADAMS Accession Number ML17340A805.

Comment 1: *A description of the reactive transport model would help shed light on the information needs of the model in relation to the 2017 supplemental Alternate Concentration Limit (ACL) characterization and monitoring work plan.*

- *2001 Alluvium ACL application utilized PHREEQC in batch-reactor mode to answer questions about sorption, mineral precipitation, and pH neutralization extent (mass-wise, not spatial-wise). While validated, the model relies on a couple significant assumptions, most notably surface area and percent of a mineral available for sorption, which would be expected to substantially control the results. A description of the validation concept (or plan) for the reactive transport model mentioned in the 2017 work plan would help understand how the assumptions will be addressed.*
- *Based on the "transport" part of reactive transport model, the supplemental 2017 ACL work plan may be pointing to the 1D transport component of PHREEQC, or linking PHREEQC to some transport code (e.g., HST3D, the linked code available as PHAST on the PHREEQC website).*
- *Is there supporting information that iron hydroxides are the primary or only contributor for the pH neutralization mechanism? Other sites have seen several fronts delineated by neutralization mechanisms related not only to iron hydroxides, but also calcite dissolution (and the interplay with gypsum precipitation), and aluminum hydroxides.*

Response to Comment 1:

The model approach will be to use the simplest model that accurately predicts attenuation over the flow path. We expect this to be a 1-D partition-coefficient (Kd) based model, rather than more complicated models such as fully coupled reactive transport models. The relation between the information needs of the reactive-transport model (including simplified versions of such models that may be used in the hybrid approach), ACL characterization, and the Work Plan were considered as part of the Data Quality Objective (DQO) process. The results of the DQO process were summarized in Table 3 of the RAML (2017) Work Plan. A table listing model parameters and their sources (site specific, literature, etc.) will be included in the ACL application. Uncertainties in conceptual models and model parameters will be reduced to the extent possible by site-characterization investigations. The effects of remaining uncertainties on the selection of appropriate ACLs will be evaluated in sensitivity/ uncertainty analyses.

INTERA agrees that the PHREEQC model used in the 2001 Alluvial ACL Application (Maxim, 2001) relied on the assumptions stated in this comment. The 2001 PHREEQC model was not accepted by the NRC as the sole basis for the alluvial ACLs.

Based on recently obtained data characterizing the ferrihydrite content of the Dakota Sandstone (KD), iron oxyhydroxides such as ferrihydrite are expected to play a significant role in attenuation of constituents of potential concern (COPCs) on-site. Site-specific ferrihydrite concentrations will be evaluated for each hydrostratigraphic unit (HSU) at each corehole based on the ammonium oxalate extraction step of a selective extraction procedure (Loeppert and Inskeep, 1996). Previous work has shown an average ferrihydrite content of 0.025 wt. %. INTERA/RAML believes estimates of iron oxyhydroxide concentrations based on the ammonium oxalate extraction will be conservative estimates of the iron oxyhydroxide concentrations, as more crystalline forms of iron oxyhydroxides require more aggressive digestions to dissolve (Dold, 2003). The surface area and sorptive site densities for each sorbent phase will be taken from peer-reviewed literature. In the case of ferrihydrite, we plan to start with a standard surface area of 600 m^2/g and site densities of 0.005 mol site/mol mineral and 0.2 mol site/mol mineral for strong and weak sorptive sites, respectively (Dzombak & Morel, 1990). Parameters used in the model may change based on the results of the field sampling program. A table listing model parameters and their sources (site specific, literature, etc.) will be included in the ACL application.

The presence of carbonate minerals in the KD are likely to influence the pH change between 36-06 KD and 30-48 KD. The change in pH between these two wells (~3.5 to 7.5) is too great to solely be due to sorption to iron and aluminum oxyhydroxides. Mineralogical characterization of corehole samples should support the presence of calcareous material. Incorporation of sorption to aluminum oxyhydroxides into our modeling efforts may occur if the results of the field sampling program or preliminary modeling identify aluminum oxyhydroxides as an important control on COPC sorption and attenuation at the site.

Comment 2: *Why does the groundwater gradient in the TRA differ from that of the TRB and Dakota? The direction of groundwater gradients may influence site-wide groundwater conceptualization, and in particular the placement of wells.*

- *Dakota and TRB groundwater gradients are to the NNE, while TRA gradient is currently drawn to the WNW.*
- *In earlier years, the groundwater gradient of the TRA was more northerly, and was based on 5 or 6 wells. In the past several years, the WNW direction of the TRA gradient was based on three wells that fall along a line – a situation that leads to high uncertainty in determining groundwater flow direction and magnitude. The proposed TRA wells in the work plan should help alleviate this problem.*
    - *Also, the most easterly well, 33-01TRA, may not be hydraulically connected to the TRA wells to the west. It is located on the eastern side of the fault that traces the Arroyo del Puerto. The offset on this fault large enough such that the TRA unit would not appear to have hydraulic connection across the fault (cross-section of Figure 1.3 in Maxim, 2001); the TRA on the west connected with KD on the east.*
- *If the WNW gradient in the TRA is real, then the Point of Exposure well for the TRA should not be to the NNE*

Response to Comment 2:
It is agreed that one or more wells are needed within or close to the Long-Term Surveillance and Maintenance (LTSM) area and located relative to existing wells to provide a more reliable estimate of the hydraulic gradient within the LTSM area for the Tres Hermanos A Sandstone (TRA) aquifer. It is not clear what the offset is of the fault underlying Arroyo del Puerto since an offset is not provided on the USGS geologic map (Santos and Thaden, 1966). See the Response to Comment 3 below for additional discussion.

Comment 3: *What are the roles of faults and paleotopography in transport pathways? Would leakage through faults change the monitoring strategy? Would transport pathways along faults or paleochannels change the monitoring strategy?*

- *The subcrop patterns of the sandstone units appear to strongly exhibit the influence of faults and paleotopographic features (e.g., paleo-channels).*
- *Transport pathways from POC to POE wells are crossing faults and ignoring paleosurfaces. For the latter, however, it is acknowledged that the topology of bottom surface of each sandstone unit is more relevant to the transport pathway than the top (subcrop). The bottom surface topology is not known, but would unlikely be flat.*
- *Only limited information was found in site documents on the hydraulic connection, or lack thereof, between the sandstone units that may be related to across-fault or along-fault transmissivity (or relative impermeability).*
    - *"The ability for faults to transmit water either along the fault due to fault-related fracturing, or for faults to limit cross-fault flow has not been documented with site-specific data for faults in the Ambrosia Lake area." [RioAlgom, 2017, p.]*
    - *Generally ~40 ft displacement (p.2-8, Bedrock ACL, Maxim, 2001)*
    - *"While the general direction of groundwater flow is well characterized by regional groundwater information, chloride concentrations, and groundwater levels, the groundwater levels and constituent concentrations at individual TRB wells downgradient of the Facility varies depending upon the structural features within the bedrock units, including fault displacements and fracture patterns." [Bedrock ACL application, 2000].*
    - *Low pH data in well 5-02KD during 2017 could only be fault related (south of the tailings, beneath the southerly flowing alluvial sediments in the main arroyo).*

Response to Comment 3:
Subcrop maps reflect the contacts between respective sandstone units and alluvium. The configuration of the subcrop may represent: (1) depositional processes that occurred during the Cretaceous; (2) erosional and depositional processes that occurred during the Quaternary; (3) faulting; and/or (4) geological interpretation based on data available at the time the maps were created. Therefore, it is not clear to what extent faults and paleochannels have influenced the subcrop pattern.

The bedrock ACL document (Quivira, 2000) reports: "Most of the faults are normal dip-slip faults with less than 40 feet of displacement." One fault near the LTSM area has an offset of 85 feet.

(**Figures 1** and **2** [attached]; Santos and Thaden, 1966). Offsets of other faults near the LTSM area range from 2 feet to 25 feet (**Figures 1** and **2** [attached]; Santos and Thaden, 1966). Offset is not indicated for many of the faults. Also evident from the USGS map is the limited extent of the faults in the area. It is unclear whether the limited extent of a fault was supported by data or whether data was not available with which to continue mapping the fault. If a fault is of limited extent, its influence on groundwater flow would likewise be expected to be limited.

For a confined aquifer, both the top and bottom aquifer surfaces would influence groundwater flow. For an unconfined aquifer, the bottom surface could exert a controlling influence on flow and would depend on several factors such as the size and orientation of variations in the lower surface. Contours of the base of the KD (Santos and Thaden, 1966) show that the base of the KD has a roughly uniform dip to the northeast. Based on available data, it appears that the orientation of the TRA and Tres Hermanos B (TRB) sandstone units are like that of the KD. Even though faults and paleotopography may be influencing groundwater flow near the LTSM area, effects from these features do not appear to be significant since groundwater flow in the TRB and KD is observed to generally align with the dip direction of the sandstone units and the regional flow direction to the northeast (**Figures 1** and **2**). It is anticipated that flow direction in the TRA is like that in the KD and will be confirmed once additional well(s) are installed.

An assessment of the influence of faults on groundwater flow is not available. However, water levels in wells screened in the TRA, TRB, and KD reflect the influence of faulting on groundwater flow and represent the flow conditions in each respective aquifer. Therefore, the hydraulic gradients determined using these water levels are considered representative. As noted, TRA needs at least one additional well to be able to accurately establish the hydraulic gradient within the LTSM area.

The current approach assumes that a one-dimensional model will adequately represent groundwater flow within the LTSM area. New wells proposed as part of the ACL Work Plan (RAML, 2017) are intended to provide data to support this assumption. Once new well data has been collected and evaluated, additional data needs will be assessed at that time should a one-dimensional model not be clearly supported.

Field pH is reported in all compliance monitoring reports, however a laboratory pH of 3.4 was reported for 5-02 KD (RAML, 2018b). This value is an anomalous result, was reported erroneously, and does not reflect actual site conditions. The field pH measurement recorded on August 10, 2017 was 7.66. Recently measured values of field and laboratory pH are presented in **Table 1** for a longer term perspective.

Table 1. Field and Laboratory pH Measurements for well 5-02 KD available between 12/1/2014 and 3/28/2018.

Station Name	Sample Date	pH (field)	pH (Laboratory)	Units
5-02 KD	21-Feb-18	7.12	8.3	s.u.
5-02 KD	10-Aug-17	7.66	3.4	s.u.
5-02 KD	16-Feb-16	7.75	8.3	s.u.
5-02 KD	26-Aug-15	7.4	8.3	s.u.
5-02 KD	18-Feb-15	7.84	8.2	s.u.
5-02 KD	10-Dec-14	7.28	8.2	s.u.

Comment 4: *Clarification on the conceptualization for contamination of the Dakota at 36-06KD would be helpful. Most of Ponds 7 & 8 are underlain by subcrop of TRA and shale. If the Dakota is contaminated (well 36-06KD), then the TRA is also likely contaminated. The proposed well near 36-06KD, but screened in the TRA, should clarify the status.*

- *Alternative hypotheses for contamination:*
    - *Direct recharge from ponds to TRA, and subsequent leakage to Dakota.*
    - *For example, the mapped fault appears to extend under Ponds 7 & 8, and if conductive, may be the conduit for pond liquids reaching Dakota from the TRA.*
    - *Mounding of the groundwater beneath the Ponds 7 & 8 may have led to the transmission of pond leakage to the southwest where the Dakota subcrop (recharge zone) occurs.*
    - *Mounding from the tailings impoundments could hypothetically laterally spread to recharge zone of the Dakota, TRA, and TRB. However, there is contradicting information for this hypothesis: Recharge area of TRB would be in the area of the mound, but no indication of a pH plume found in wells such as 36-02TRB.*

Response to Comment 4:

The mechanism for contamination from Ponds 7 and 8 entering the KD is not fully understood. The amount of KD subcrop that directly underlies Ponds 7 and 8 is uncertain. Mechanisms for seepage into the KD could include liquids from Ponds 7 and 8 entering the KD either through direct contact, faults and/or fractures, mounding, or some combination of these mechanisms. There is not enough evidence to rule out any of the "Alternative hypotheses for contamination" regarding Ponds 7 and 8, listed above. **Figures 3** through **5** show the individual upper bedrock unit subcrop locations and monitoring networks on a USGS topographic map base.

Tailings impoundments are a likely source of contamination to the TRB, as the TRB subcrops directly beneath the tailings impoundments. Any seepage from the tailings impoundments would be expected to flow downgradient to the northeast in the TRB or to the southeast in the alluvium, away from the TRA and KD subcrops. Topography and groundwater chemistry data from wells in the vicinity do not support the hypothesis that seepage from Tailings Impoundments 1 and 2 spread laterally through mounding to recharge zones for KD and TRA.

INTERA agrees that impacts to the TRA related to Ponds 7 and 8 are possible considering (1) the observed impacts to the KD, and (2) subcrop of the TRA underlies Ponds 7 and 8. Well 36-08 has been proposed to identify potential impacts to the TRA associated with Ponds 7 and 8.

Comment 5: *Proposed POE wells for all three units are co-located at north-northeast LSTM boundary. This implies the (i) groundwater gradients in all three units are in the same direction (see also item 2 above); and (ii) the faults and paleotopography do not influence transport pathways.*

- *Transport pathway from 36-06KD to POE crosses at least one fault*
- *Faults under the site are mostly north-trending, but there are also a set of NE-trending faults on the northern side*
- *Subcrop pattern reflects fault displacement of sandstone units, and likely also reflects paleotopography. The effect of these on potentiometric surfaces and gradients in each unit may complicate things;*

Response to Comment 5:
See Response to Comment 3 above regarding what subcrop patterns may represent.

From water level measurements for wells screened in the TRB and the KD, the directional component of the hydraulic gradient aligns well with the dip direction of the sandstone units and the regional flow direction. There is no indication that faults or paleotopography cause groundwater to flow in a different direction than to the northeast or north-northeast.

Comment 6: *Gross Alpha Issue:*

- *Has RAML considered providing documentation justifying why an ACL for gross alpha is not meaningful nor justified. A discussion of the lack of meaning of the gross alpha measurements should be provided, which would include an analysis site measurements and scientific rationale. Justification would include that all significant alpha emitters are being measured; and conversely, that none are missed.*
- *Gross alpha measurements are highly uncertain, mostly due to high TDS, even using second analysis method. First method, EPA Method 900 (evaporation based), is obviously problematic; second method, EPA Method 600/00-02 (precipitation of barium-radium sulfate and iron hydroxides) still had high uncertainty.*
    - *Data: U-corrected gross alpha +-100 pCi/L, with results in range -200 to +300 pCi/L and many negative values*

- *Regulations require measurements of gross alpha (10 CFR 40, Appendix A). In addition, NRC (2006) evaluated gross alpha as a constituent of concern, and stated that ACLs would be appropriate and protective of human health and the environment.*
- *The bedrock ACL submittal (QMC, 2000) had requested that gross alpha be removed from the license as a hazardous constituent, which was carried through in a response to a Request for Additional Information.*
- *Groundwater protection standards for gross alpha may be >20 times more stringent than sum of ACLs for individual alpha emitters.*
- *Can a meaningful ACL for gross alpha be calculated?*
    - *A complete comparison of measured and corrected gross alpha and summed isotope gross alpha for all wells, semi-annual, quarterly, and monthly would be helpful; there is an incomplete comparison in RAML's Groundwater Stability Monitoring Report Second Half 2016 (RAML, 2017b).*

Response to Comment 6:

INTERA/RAML agrees with all points raised in Comment 6. The gross alpha activity GWPSs may be significantly more stringent than the sum of ACLs for the individual alpha emitter ACLs. Meaningful measurement of gross alpha cannot be obtained at the Site, due to very elevated Total Dissolved Solids (TDS) and calcium concentrations, which interfere with EPA approved gross alpha activity analytical methods and yields a high level of uncertainty in the results. This raises the issue that even if a meaningful ACL for gross alpha can be calculated, the comparison to an uncertain result may not be useful in a compliance setting.

The gross alpha issue has been discussed in meetings with the NRC and in some submittals of the semiannual groundwater monitoring reports as INTERA/RAML has continued to evaluate the difficulties associated with gross alpha monitoring at the Site.

Several EPA-approved methods have been published for analysis of gross alpha activity (listed in 40 CFR §141.25), but they fall into two basic methods: an evaporation method and a coprecipitation method. The evaporation method, EPA 900.0 or SM 7110 B, requires the evaporation of a liquid sample into a powder, followed by analysis with a gas proportional counter or Geiger counter. The maximum volume that can be evaporated is limited by the TDS content of the sample. Precipitated solids will act to self-attenuate radiation within the planchet by absorbing emitted alpha particles during scintillation counting. This self-attenuation interference will bias results to lower values. To minimize self-attenuation, the evaporation methods require no more than 100 milligrams (mg) of precipitated powder in the sample planchett, which requires smaller sample volumes for water with higher TDS. The smaller evaporated sample volumes will contain fewer radionuclides, leading to fewer scintillations during counting, fewer counts, and low signal-to-noise ratios. Combined, this situation results in relatively poor counting statistics and detection limits. Due to this limitation, the method states that it is only appropriate for samples with 500 milligrams per liter (mg/L) TDS or less. Groundwaters at the site often contain greater than 1,000 mg/L TDS.

The coprecipitation methods (EPA 600/00-02 or SM 7110 C) are based on coprecipitation of barium sulfate and iron oxyhydroxides. Radium precipitates with the $BaSO_4$ as a $(Ba,Ra)SO_4$ phase, whereas other alpha emitters sorb to the precipitated iron oxyhydroxides. The precipitates are filtered from the sample and counted for alpha activity. Relatively high concentrations of calcium and barium in solution, however, can cause increased precipitation of non-radioactive sulfate phases and result in the same self-attenuation issue described for evaporation methods (EPA 900.0/SM 7110 B).

RAML presented results from both methods applied to groundwater from 31-02 TRB-R and 36-06 KD (**Table 2**; RAML, 2017b). The coprecipitation method precision is similar to that of the evaporation method. Note that the two different methods do not agree within uncertainty for 36-06 KD.

Table 2. Comparison of EPA-Approved Methods for Gross Alpha Activity

Location	Uncorrected Gross Alpha (pCi/L)	Uncertainty (2 σ)	Uncorrected Gross Alpha & Beta (pCi/L)	Uncertainty (2 σ)
EPA Method	900.0 (Evaporation)	900.0 (Evaporation)	600/00-02 (co-precipitation)	600/00-02 (co-precipitation)
31-02 TRB-R	41	33	50	40
36-06 KD	**670**	100	390	90

A complete comparison of measured and corrected gross alpha and summed isotope gross alpha for all wells is included in **Table 3** (attached). This comparison includes data that (1) was collected from 2009 onward; and (2) has measured gross alpha, Th-230 and Ra-226 activities, gross alpha uncertainty, and uranium concentration data. Data from monthly monitoring at 36-06 KD and 31-02 TRB-R are not presented, as monthly monitoring does not include Ra-226 and Th-230 activity analyses.

Table 3 (attached) presents measured gross alpha activities, reported uncertainties, uranium-corrected gross alpha activities, and summed Th-230 and Ra-226 activities for comparison. Generally, it is apparent that there is a significant discrepancy between the summed activities of the alpha emitters and the corrected gross alpha activities. In addition, corrected gross alpha activities are often negative. We interpret these data to reflect significant and often underestimated uncertainties in the measured gross alpha activities.

Calculating an ACL for gross alpha and identification of exceedances are complicated by the substantial uncertainties in activities measured by application of the 900.0 and 600/00-02 analytical methods to site waters. It would be difficult to determine compliance with a hypothetical gross alpha ACL without a more precise method for measurement of gross alpha activities. Measurement of gross alpha (in accordance with 10CFR40) but not relying on gross alpha Method 900.0 for compliance purposes may be a reasonable solution.

Consistent with discussions with NRC staff, RAML may seek an NRC "staff exemption" for gross alpha to remove the gross alpha sampling requirement. We understand that justification for an alternative gross alpha calculation method is necessary. We are working towards providing evidence that summation of the most significant alpha emitters is an appropriate method for calculating the gross alpha activity of high TDS groundwaters.

Comment 7: *Is there information on the seasonality of water levels, which may also influence contaminant concentrations, in the alluvial sediments along the Arroyo del Puerto?*

- *There are strong inter-annual and intra-annual variations in recharge in semi-arid climates in the southwest, such as at the Ambrosia Lake Site.*
- *With close proximity to the ponds and tailings of the recharge zones for the sandstone layers, there may also be seasonal and inter-annual fluctuations in the water levels of the wells.*

Response to Comment 7:
Changes in water levels in each of the HSUs appear to be controlled primarily by surface discharge and drainage of mine water. An overall decrease in water levels has been observed since cessation of mine dewatering and the Corrective Action Program (CAP). Seasonal variability in water levels has not been observed at the Site.

An alluvial monitoring well point was installed in the Arroyo del Puerto in 2014, just south of the proposed LTSM boundary. This well point was installed at the alluvium-bedrock contact and has been monitored quarterly since installation. No water has been observed in this well point since installation. A transducer was installed in December of 2017, at the request of NMED to record potential intermittent saturation in the alluvium beneath the Arroyo del Puerto (**Figure 6** [attached]).

Groundwater elevations in alluvial well 5-73 ALL (and its replacement, 5-73 ALL-R) (**Figure 7** [below]) and TRB well 31-02 TRB (and its replacement 31-02 TRB-R) (**Figure 8** [below]) are plotted over time below.

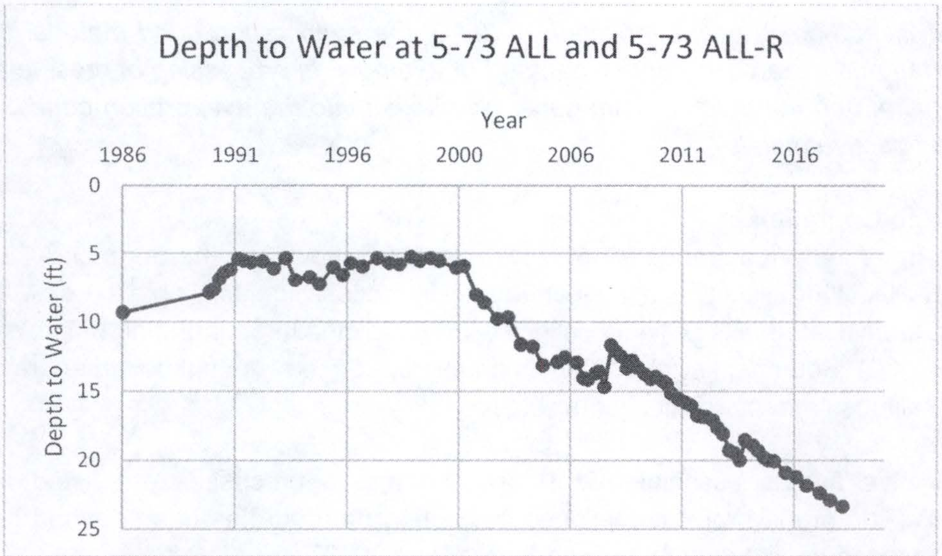

Figure 7: Depth to water at 5-73 ALL and 5-73 ALL-R, which replaced the original well in 2013.

The bedrock unit POC wells, which are generally nearest to the subcrop of their respective HSUs, show a similar trend. The groundwater elevation in 31-02 TRB-R, for example, was stable then decreased when the CAP was ceased in 2006.

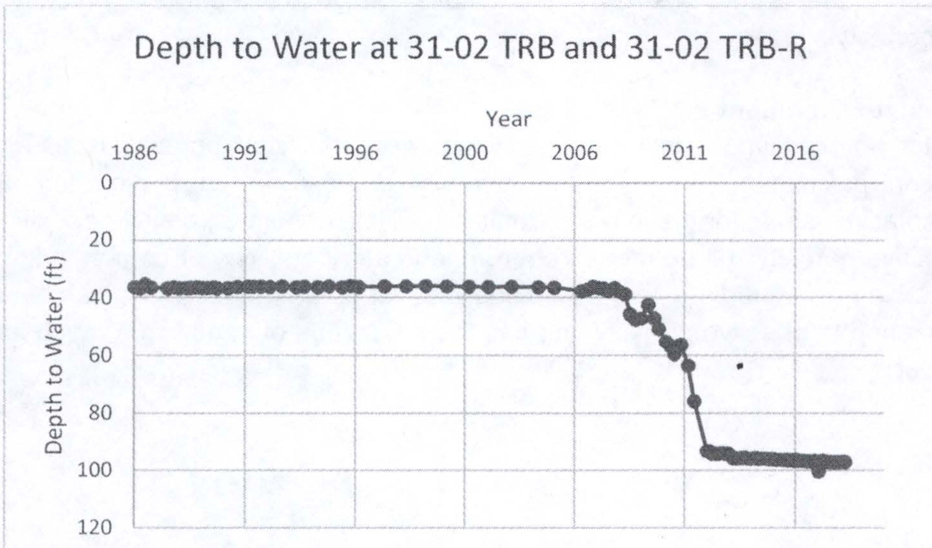

Figure 8: Depth to water at 31-02 TRB and 31-02-R TRB, which replaced the original well in 2013.

Comment 8: *Is there a characterization of the of the evaporation pond material that includes radionuclides and hazardous contaminants? For example, in processing of ores, lots of thorium, some uranium, and not much radium generally make it into the evaporation ponds. What about the non-radioactive metals?*

Response to Comment 8:

The make-up of individual ponds is not fully understood; however, the Bedrock ACL Application (AVM and AHA, 2000) lists typical concentrations in process liquids (Table 2-1 of AVM and AHA, 2000) and analytical results of liquid collected from Tailings Impoundment 1 (Table 2-2 of AVM and AHA, 2000). Source characterization is ongoing through historical document review and the upcoming tailings characterization work.

Non-radioactive metals associated with uranium milling processes are listed in 10CFR40 Appendix A. The groundwater compliance monitoring program has been defined based on the presence of these constituents at the site.

Comment 9: *Total porosity is used for transport, rather than effective porosity. Is there a basis for the assumption that effective porosity equals total porosity?*

- *How clean are the sandstones; even clean sandstones have effective porosity up to 25% smaller than total porosity*
- *Hydraulic conductivity and dispersivity may be more variable than effective porosity. But effective porosity can have a significant effect on transport when sorption (e.g., Kd coefficient) is zero or small. It is also conservative to use effective porosity instead of total porosity.*

Response to Comment 9:

Both total porosity and effective porosity are needed. Total porosity is used in the COPC attenuation calculation, and effective porosity is used in calculating seepage velocities. Representative values for these two parameters will be obtained from site-specific data. Porosity and effective porosity will be measured from laboratory analysis of core samples. Aquifer tests conducted in unconfined aquifers will be analyzed for specific yield, which can be used as a good approximation to effective porosity and has the advantage of sampling a much larger volume of the aquifer.

3.0 References

AVM Environmental Services. Inc. and Applied Hydrology Associates, Inc. (AVM and AHA). 2000. Corrective Action Program and Alternate Concentration Limits Petition for Upper Most Bedrock Units Ambrosia Lake Uranium Mill Facility Near Grants, New Mexico. Prepared for Quivira Mining Company USNRC License No. SUA-1473, Docket No. 40-8905.

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FIGURES

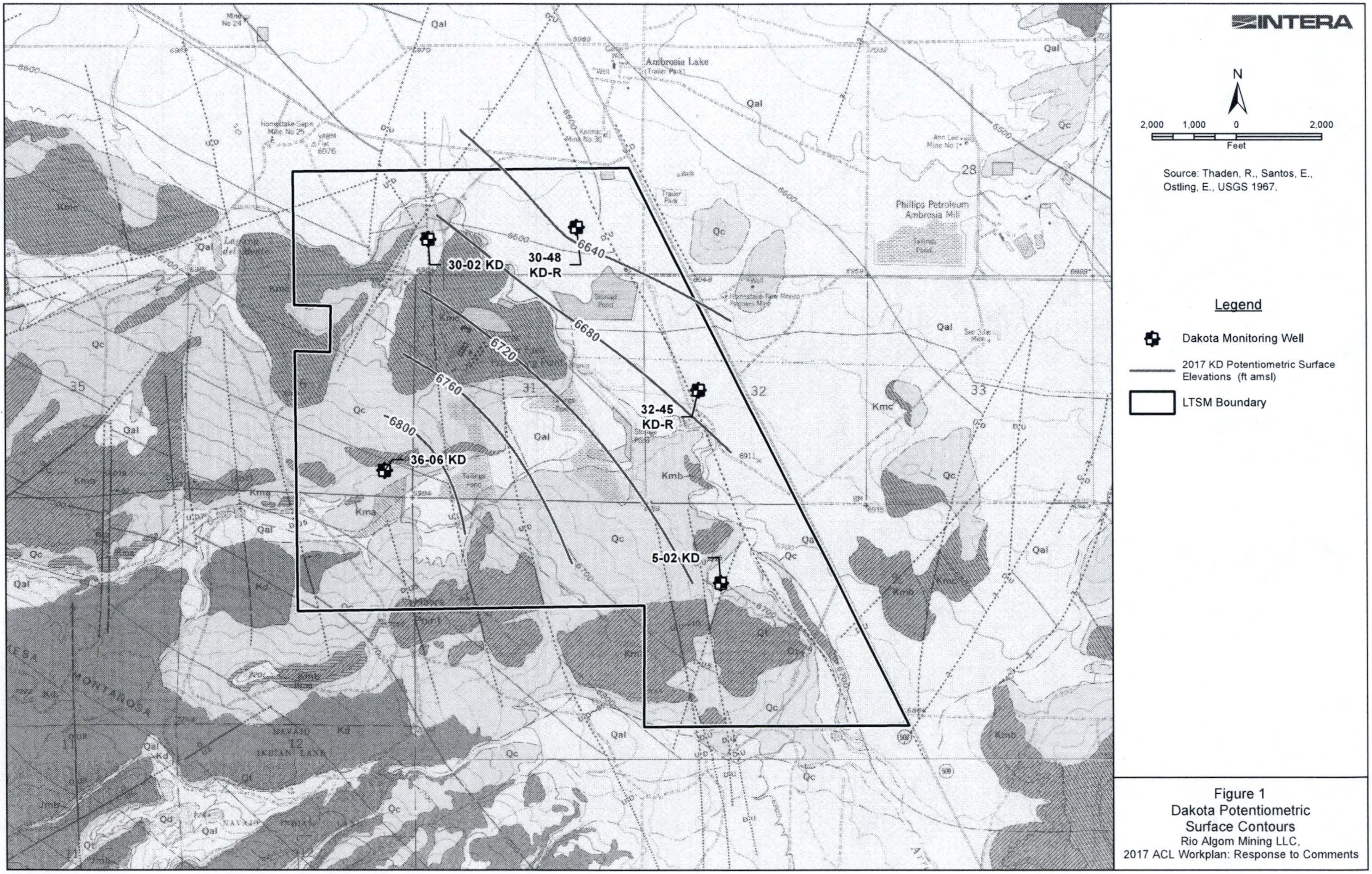

Figure 1
Dakota Potentiometric
Surface Contours
Rio Algom Mining LLC,
2017 ACL Workplan: Response to Comments

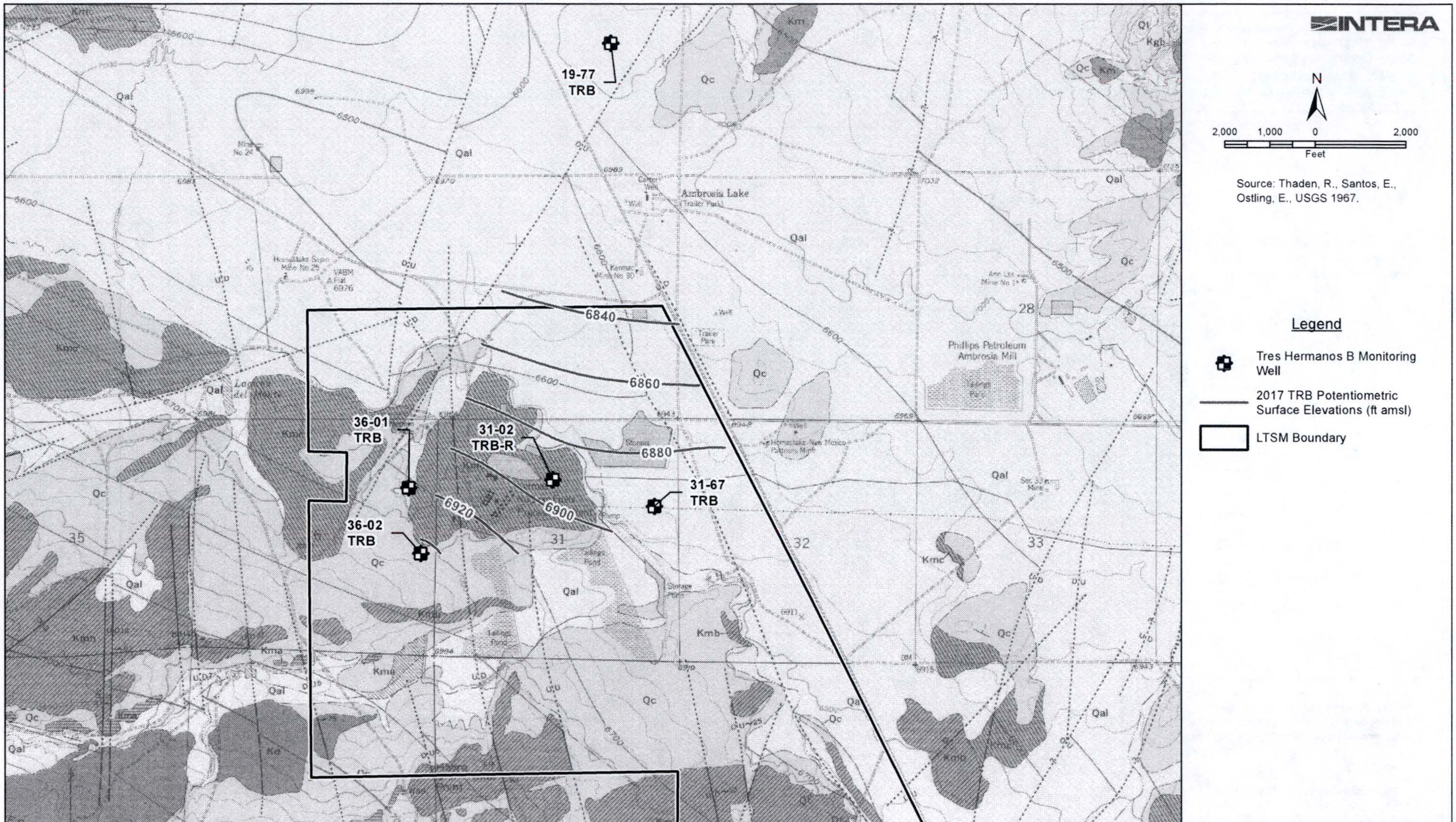

Figure 2
Tres Hermanos B
Potentiometric Surface Contours
Rio Algom Mining LLC,
2017 ACL Workplan: Response to Comments

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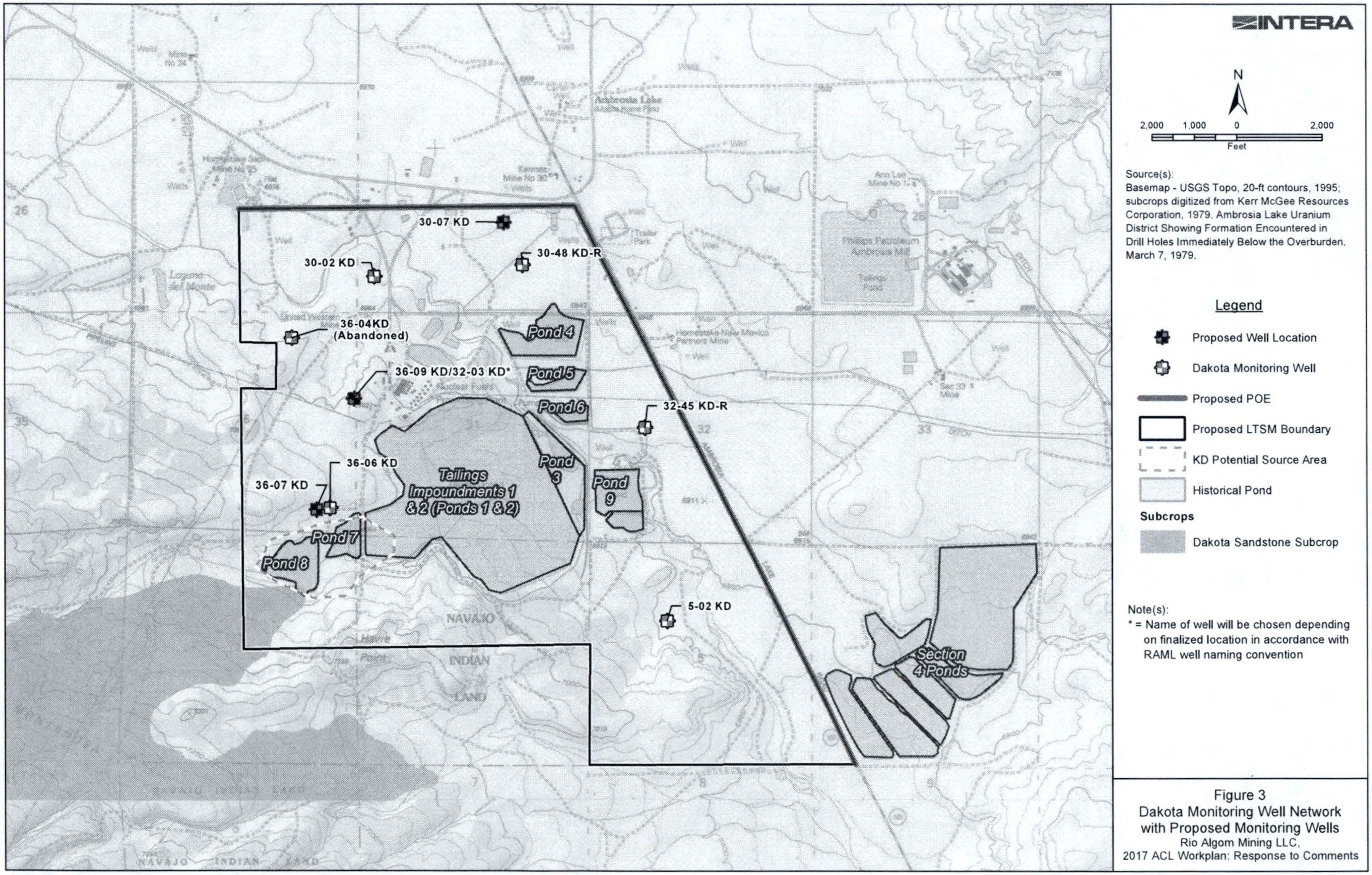

Figure 3
Dakota Monitoring Well Network
with Proposed Monitoring Wells
Rio Algom Mining LLC,
2017 ACL Workplan: Response to Comments

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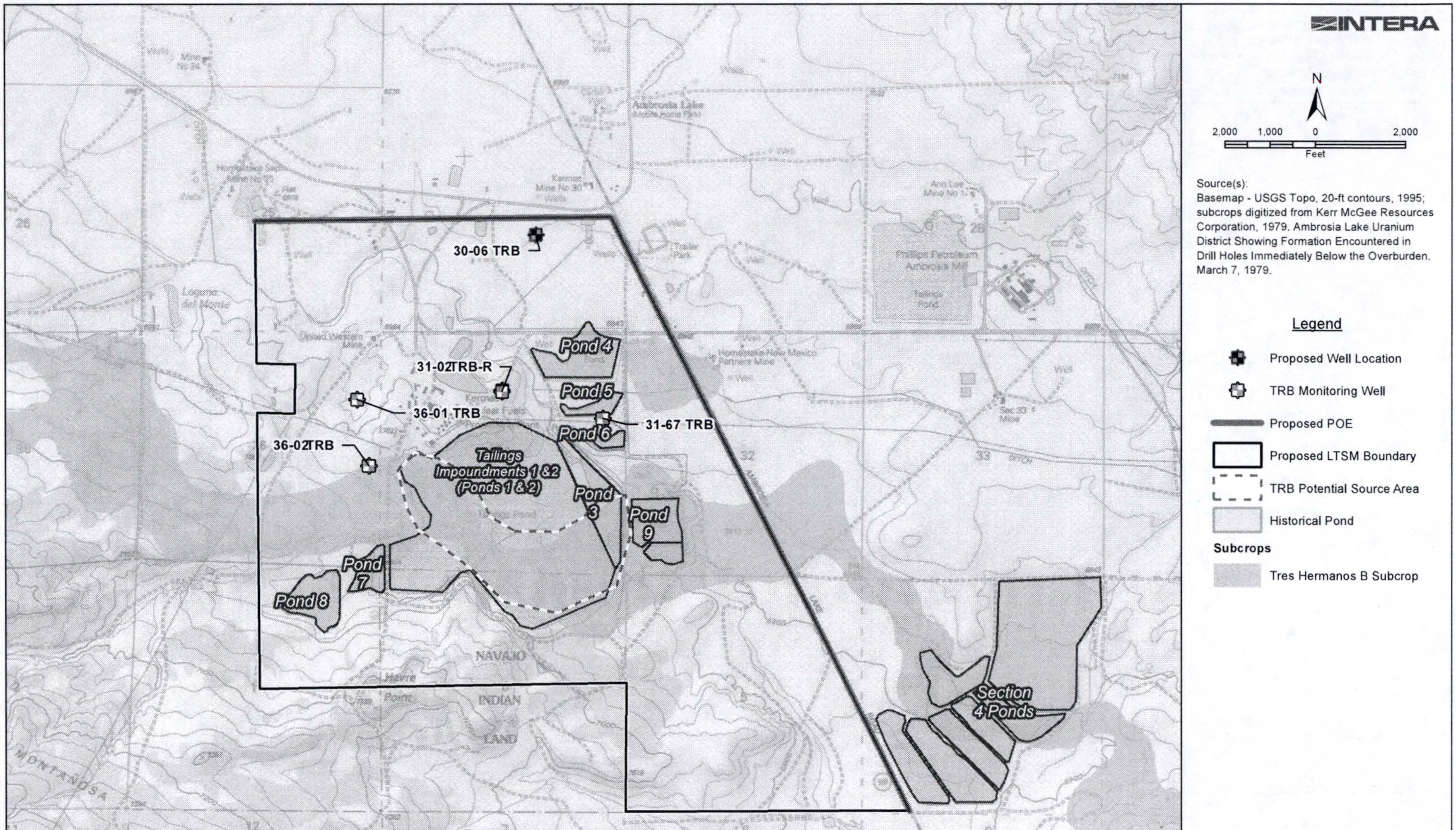

Figure 4
Tres Hermanos B Monitoring Well Network with Proposed Monitoring Wells
Rio Algom Mining LLC,
2017 ACL Workplan: Response to Comments

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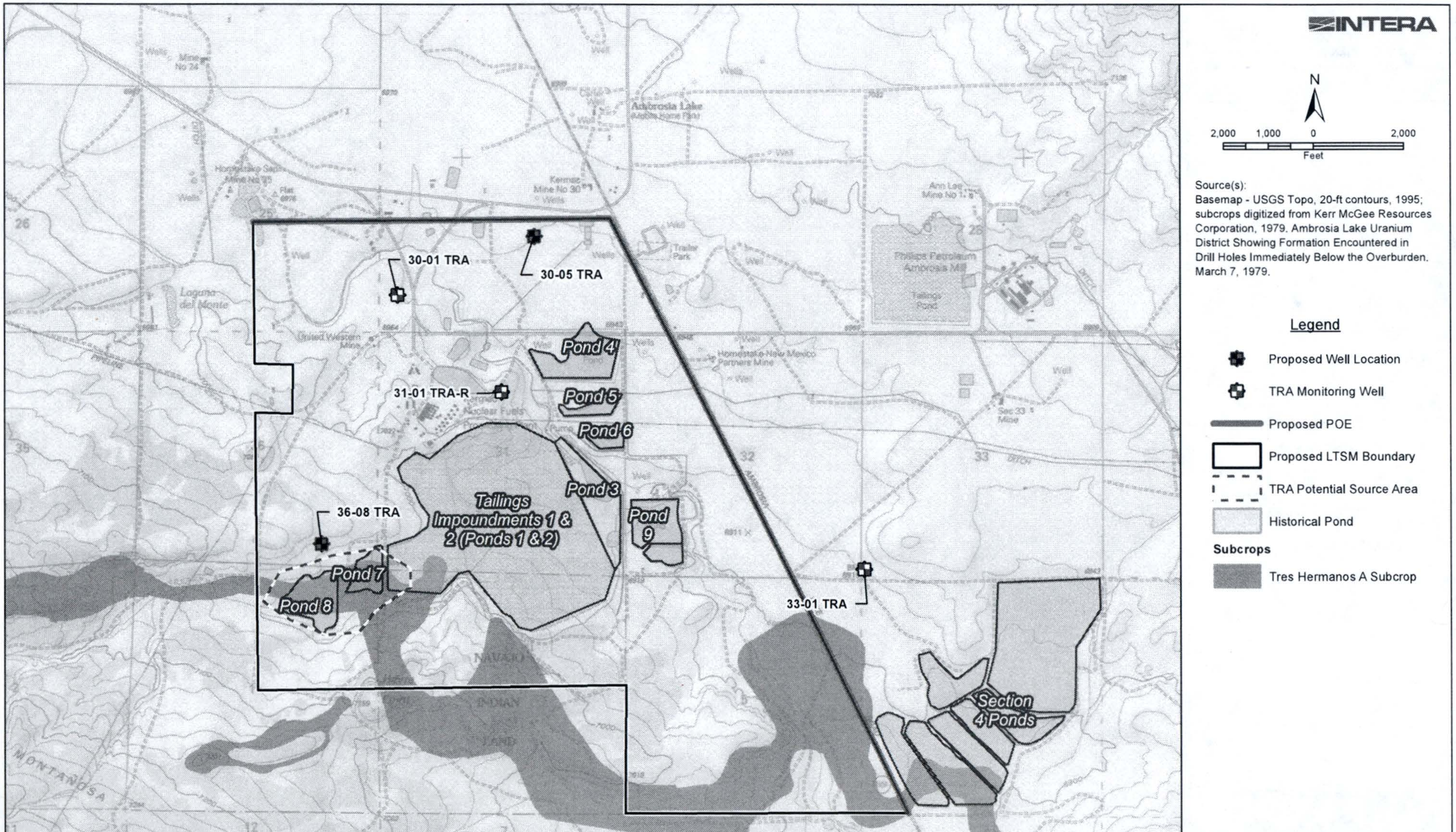

Figure 5
Tres Hermanos A Monitoring Well
Network with Proposed Monitoring Wells
Rio Algom Mining LLC
2017 ACL Workplan: Response to Comments

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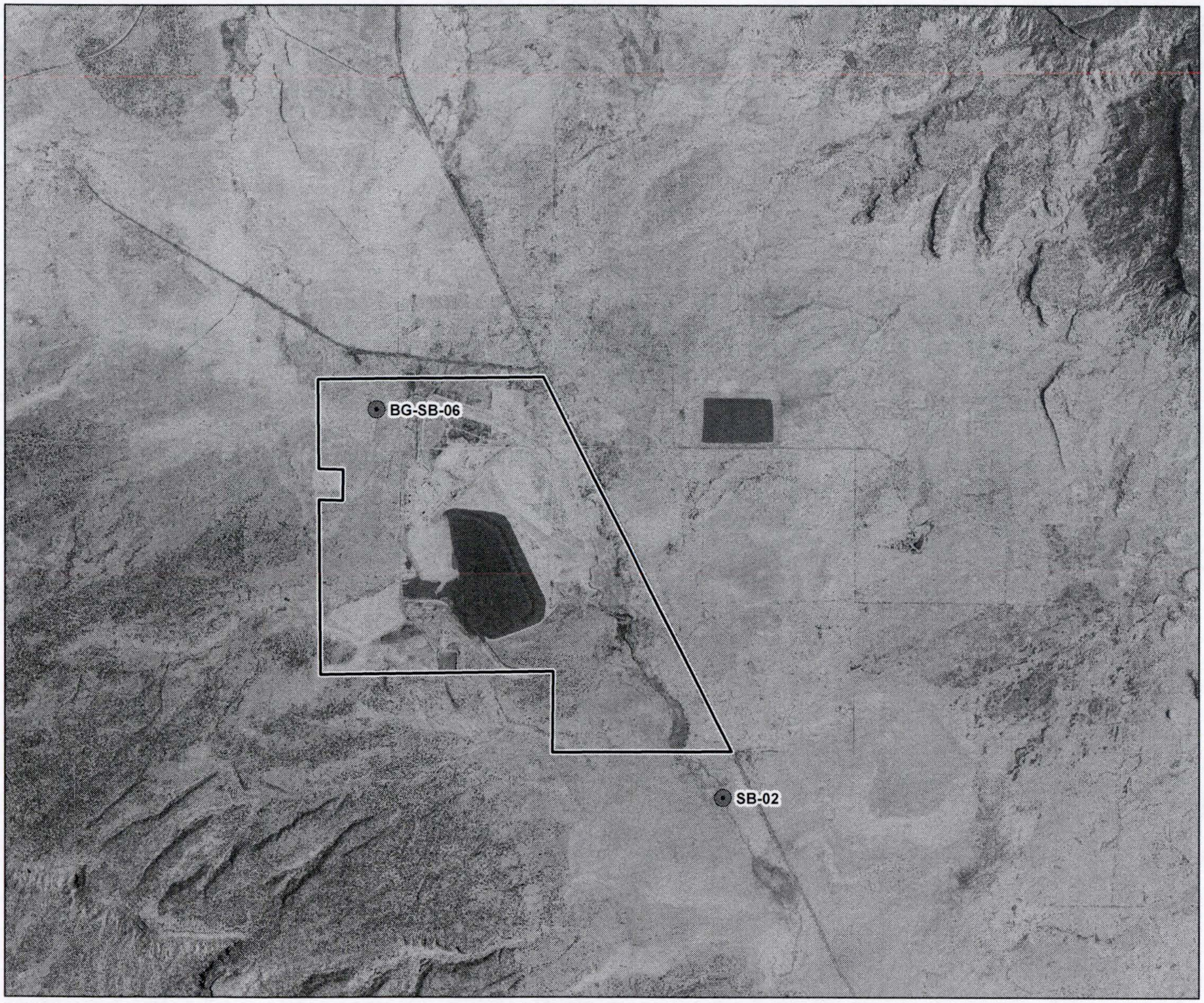

INTERA

N

3,500 0 3,500

Feet

Aerial – NAIP imagery, dated 2014

Legend

Alluvial Well Point

Proposed LTSM Boundary

Figure 6
Alluvial Well Point Monitoring Locations
Rio Algom Mining LLC
2017 ACL Workplan: Response to Comments

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TABLE

Table 3
Comparison of Gross Alpha Measurements and Combined Alpha Emitter Activities
INTERA/RAML Responses to Comments, Ambrosia Lake Work Plans 2017 and 2018

Station	Date Sampled	Uranium (mg/L)	Gross Alpha (pCi/L)	Gross Alpha Uncertainty (2 sigma)	Gross Alpha - Corrected (pCi/L)	Ra-226 Activity (pCi/L)	Th-230 Activity (pCi/L)	Combined Ra/Th Activity (pCi/L)	Combined v. Adjusted RPD	Total Dissolved Solids (mg/L)
17-01 KD	9/28/2009	0.0001	1.7	2.9	1.7	0.23	0.15	0.38	-127	1160
17-01 KD	11/10/2009	0.0003	1.3	2.8	1.1	0.05	0.21	0.26	-124	1130
17-01 KD	3/16/2010	0.0011	0.83	2.4	0.09	0.13	-0.04	0.09	0	1120
17-01 KD	9/28/2010	0.0007	0.01	2.7	-0.5	0.69	-0.3	0.39	-1618	1100
17-01 KD	11/8/2010	0.0001	6.6	10	6.5	0.46	0.03	0.49	-172	1080
17-01 KD	3/1/2011	0.0003	0.61	3.5	0.41	0.49	-0.45	0.04	-164	1100
17-01 KD	6/20/2011	0.003	0.01	3.1	0.01	0.76	-0.24	0.52	192	1090
17-01 KD	9/27/2011	0.0003	0.01	3.2	-0.2	0.61	0.05	0.66	374	1080
17-01 KD	11/7/2011	0.003	2	3.3	2	1	-0.05	0.95	-71	1070
17-01 KD	2/27/2012	0.0002	3.9	3.9	3.8	0.4	0.06	0.46	-157	1060
17-01 KD	5/7/2012	0.0003	5.5	3.4	5.3	0.56	0.3	0.86	-144	1100
17-01 KD	8/13/2012	0.003	9.4	4.2	9.4	0.48	0.28	0.76	-170	1090
17-01 KD	11/6/2012	0.003	9.7	4.3	9.7	0.93	0.07	1	-163	1050
17-01 KD	8/6/2013	0.003	0.01	3.4	0.01	0.53	-2.1	-1.57	203	1100
17-01 KD	11/12/2013	0.001	2.8	3.5	2.1	0.94	0.03	0.97	-74	1040
17-01 KD	3/18/2014	0.0018	0.64	4.3	-0.57	1.6	0.11	1.71	400	1070
17-01 KD	6/10/2014	0.0012	1.7	4	0.9	1	0.13	1.13	23	1070
17-01 KD	9/23/2014	0.0001	-2	2.5	-2	0.22	0.04	0.26	-260	820
17-01 KD	12/16/2014	0.0001	0.01	3.1	0.01	0.43	0.12	0.55	193	1040
17-01 KD	2/17/2015	0.0001	0.2	4	0.2	1.4	0.16	1.56	155	1110
17-01 KD	8/12/2015	0.0001	4.3	3.8	4.3	0.57	0.08	0.65	-147	900
17-01 KD	2/16/2016	0.0001	9.6	4.9	9.6	0.8	0.07	0.87	-167	1010
17-01 KD	7/26/2016	0.0001	0.01	3	0.01	0.59	-0.09	0.5	192	1080
17-01 KD	2/23/2017	0.0001	3.8	3.7	3.8	0.8	-0.08	0.72	-136	1130
19-77 TRB	8/4/2009	0.0164	2.6	8.5	-8.4	0.46	0.14	0.6	-231	3480
19-77 TRB	11/3/2009	0.0208	2.7	9.1	-11.2	0.47	0.13	0.6	-223	3510
19-77 TRB	3/8/2010	0.0163	9.3	10	-1.6	0.4	-0.11	0.29	-289	3430
19-77 TRB	5/11/2010	0.017	16	12	5	0.43	0.18	0.61	-157	3460
19-77 TRB	7/19/2010	0.0099	10	11	3	0.56	-0.13	0.43	-150	3460
19-77 TRB	11/9/2010	0.0113	-0.34	2.6	-7.91	1.1	-0.23	0.87	-249	3460
19-77 TRB	3/8/2011	0.0114	0.8	8.5	-6.8	1.3	0.08	1.38	-302	3440
19-77 TRB	6/14/2011	0.0284	27	14	8	0.49	0.01	0.5	-176	3500
19-77 TRB	9/19/2011	0.0264	6.9	14	-10.8	0.33	-0.02	0.31	-212	3410
19-77 TRB	11/14/2011	0.0175	15	13	3	1.2	0.2	1.4	-73	3440
19-77 TRB	2/21/2012	0.0167	9.5	9.8	-1.7	0.37	-0.04	0.33	-296	3460
19-77 TRB	5/7/2012	0.0194	36	17	23	0.91	0.48	1.39	-177	3530
19-77 TRB	8/13/2012	0.0216	14	10	0.01	0.3	-0.18	0.12	169	3510
19-77 TRB	8/19/2013	0.0107	16	12	9	2.8	2.1	4.9	-59	3650
19-77 TRB	11/11/2013	0.014	17	14	8	0.65	-0.33	0.32	-185	3540
19-77 TRB	3/18/2014	0.0099	6.2	18	-0.4	0.3	-0.06	0.24	-800	3410
19-77 TRB	6/16/2014	0.012	20	20	12	0.47	0.75	1.22	-163	3370
19-77 TRB	9/23/2014	0.0116	15	14	7	0.53	0.53	1.06	-147	3390
19-77 TRB	11/6/2014	0.0091	8.6	9.8	2.5	0.49	0.03	0.52	-131	3330
19-77 TRB	1/12/2015	0.0065	6.7	14	2.3	0.37	0.17	0.54	-124	3350
19-77 TRB	2/13/2015	0.0056	-16	8.4	-20	0.76	-0.49	0.27	-205	3290
19-77 TRB	8/25/2015	0.0091	-0.07	13	-6.17	0.41	0.2	0.61	-244	3330

Table 3

Comparison of Gross Alpha Measurements and Combined Alpha Emitter Activities

INTERA/RAML Responses to Comments, Ambrosia Lake Work Plans 2017 and 2018

Station	Date Sampled	Uranium (mg/L)	Gross Alpha (pCi/L)	Gross Alpha Uncertainty (2 sigma)	Gross Alpha - Corrected (pCi/L)	Ra-226 Activity (pCi/L)	Th-230 Activity (pCi/L)	Combined Ra/Th Activity (pCi/L)	Combined v. Adjusted RPD	Total Dissolved Solids (mg/L)
19-77 TRB	2/10/2016	0.0088	9	13	3	0.33	0.63	0.96	-103	3340
19-77 TRB	7/25/2016	0.0083	-3	9.8	-9	0.29	-0.44	-0.15	-193	3330
19-77 TRB	2/16/2017	0.0102	7.9	11	1.1	0.39	-0.55	-0.16	-268	3340
30-01 TRA	12/10/2014	0.0005	0.01	2.6	-0.3	0.33	0.01	0.34	3200	716
30-02 KD	8/18/2009	0.0019	0.01	18	-1.3	1.2	0.11	1.31	52200	6030
30-02 KD	11/3/2009	0.004	0.01	21	-3	1.3	-0.29	1.01	-403	6050
30-02 KD	3/8/2010	0.0029	3.1	20	1.2	1	0.2	1.2	0	5580
30-02 KD	7/20/2010	0.0005	-12	21	-12	0.86	-0.11	0.75	-227	5640
30-02 KD	11/16/2010	0.0005	19	23	19	1.3	0.03	1.33	-174	6160
30-02 KD	3/8/2011	0.0018	-0.98	19	-2.19	0.94	-0.41	0.53	-328	6220
30-02 KD	6/20/2011	0.0015	25	28	24	1.6	2.1	3.7	-147	5920
30-02 KD	9/26/2011	0.0013	0.01	26	-0.9	1.1	0.02	1.12	1836	6070
30-02 KD	2/21/2012	0.0007	28	25	28	0.94	0.18	1.12	-185	6060
30-02 KD	5/29/2012	0.0109	30	27	23	2.1	-0.34	1.76	-172	6210
30-02 KD	12/11/2014	0.0017	0.01	17	-1.1	0.69	-0.14	0.55	-600	3980
30-48 KD-R	3/5/2013	0.0048	5.1	14	1.9	3.2	0.45	3.65	63	4420
30-48 KD-R	5/20/2013	0.0013	8.2	13	7.3	3.4	-0.22	3.18	-79	4370
30-48 KD-R	8/20/2013	0.0009	6.8	16	6.2	2.8	0.42	3.22	-63	4110
30-48 KD-R	11/12/2013	0.0018	0.01	13	-1	2.8	19	21.8	219	4510
30-48 KD-R	3/18/2014	0.0042	-4.8	17	-7.6	2.3	-0.43	1.87	-331	4320
30-48 KD-R	6/17/2014	0.0011	-16	18	-17	2.4	-0.05	2.35	-264	4420
30-48 KD-R	9/25/2014	0.0005	7.4	18	7.4	2.7	0.24	2.94	-86	4250
30-48 KD-R	11/5/2014	0.0005	29	23	29	3.3	0.03	3.33	-159	4250
30-48 KD-R	2/17/2015	0.0005	3	19	3	3.1	0.12	3.22	7	4350
30-48 KD-R	8/24/2015	0.0005	-0.85	21	-0.85	1.9	1.2	3.1	351	4330
30-48 KD-R	2/18/2016	0.0005	24	19	24	2.5	-0.25	2.25	-166	4170
30-48 KD-R	7/26/2016	0.0005	6.8	16	6.8	2.3	-0.04	2.26	-100	4350
30-48 KD-R	2/22/2017	0.0005	2.3	12	2.3	2.7	0.22	2.92	24	4260
31-01 TRA	8/4/2009	0.0014	2.8	4.6	1.9	1	0.01	1.01	-61	1570
31-01 TRA	11/10/2009	0.0041	2.2	3.4	-0.5	0.63	-0.32	0.31	-853	1530
31-01 TRA	3/2/2010	0.0064	5.9	4.8	1.6	0.74	0.1	0.84	-62	1540
31-01 TRA	8/17/2010	0.0028	6.8	6.1	4.9	0.86	0.21	1.07	-128	1570
31-01 TRA	11/9/2010	0.0008	-1	4	-2	0.68	-0.1	0.58	-363	1520
31-01 TRA	3/8/2011	0.003	1.6	3.6	1.6	0.51	-0.2	0.31	-135	1470
31-01 TRA	6/14/2011	0.005	9.7	5.2	6.3	1	0.02	1.02	-144	1450
31-01 TRA	9/20/2011	0.044	9.5	7.4	-20	1.2	0.23	1.43	-231	1350
31-01 TRA	11/8/2011	0.013	3.7	5.7	-5	1.1	0.35	1.45	-363	1400
31-01 TRA	2/27/2012	0.0014	0.01	4.9	-1	1.1	0.06	1.16	2700	1410
31-01 TRA	5/22/2012	0.0086	7.9	6	2.1	1.4	-0.04	1.36	-43	1460
31-01 TRA	8/14/2012	0.006	5.9	5	1.9	1.9	1.7	3.6	62	1480
31-01 TRA-R	2/25/2013	0.0113	21	12	13	0.18	0.37	0.55	-184	2850
31-01 TRA-R	5/13/2013	0.0105	10	9.6	3	0.38	2.1	2.48	-19	2620
31-01 TRA-R	8/13/2013	0.006	4.2	6.6	0.2	0.23	0.36	0.59	99	2410
31-01 TRA-R	11/11/2013	0.0055	0.01	6.5	-4	0.13	0.69	0.82	-303	2170
31-01 TRA-R	3/17/2014	0.0033	6.7	8.7	4.5	0.21	-0.04	0.17	-185	2060
31-01 TRA-R	9/24/2014	0.0028	6.8	6.9	4.9	0.25	0.15	0.4	-170	1770

Table 3
Comparison of Gross Alpha Measurements and Combined Alpha Emitter Activities
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Station	Date Sampled	Uranium (mg/L)	Gross Alpha (pCi/L)	Gross Alpha Uncertainty (2 sigma)	Gross Alpha - Corrected (pCi/L)	Ra-226 Activity (pCi/L)	Th-230 Activity (pCi/L)	Combined Ra/Th Activity (pCi/L)	Combined v. Adjusted RPD	Total Dissolved Solids (mg/L)
31-01 TRA-R	12/10/2014	0.0031	12	6.8	10	0.22	0.01	0.23	-191	1810
31-01 TRA-R	2/18/2015	0.0019	3	8	2	0.22	-0.21	0.01	-198	1790
31-01 TRA-R	8/26/2015	0.0016	-1.5	5.2	-2.6	0.14	0.46	0.6	-320	1800
31-01 TRA-R	2/12/2016	0.0012	2.3	5.2	1.5	0.28	-0.05	0.23	-147	1760
31-01 TRA-R	7/26/2016	0.0013	3.5	6.4	2.6	0.22	-0.4	-0.18	-230	1710
31-01 TRA-R	2/16/2017	0.0019	3.5	4.8	2.2	0.48	0.1	0.58	-117	1790
31-02 TRB	8/18/2009	0.984	570	66	-89	1.7	-0.04	1.66	-208	4680
31-02 TRB	11/3/2009	1.3	500	64	-371	0.96	0.53	1.49	-202	4790
31-02 TRB	3/2/2010	0.368	180	39	-67	0.85	-0.52	0.33	-202	4730
31-02 TRB	5/10/2010	0.613	430	59	19	1.3	0.64	1.94	-163	4760
31-02 TRB	7/19/2010	0.6855	380	55	-79	1.5	0.01	1.51	-208	4810
31-02 TRB	11/8/2010	0.3133	280	47	70	1.3	-0.08	1.22	-193	4850
31-02 TRB	3/9/2011	0.4885	230	45	-97	1.1	0.58	1.68	-207	4800
31-02 TRB	6/13/2011	4.54	2000	130	-1042	1	-0.08	0.92	-200	4990
31-02 TRB	9/20/2011	4.27	2200	140	-661	1.4	-0.11	1.29	-201	4920
31-02 TRB	11/8/2011	2.23	1200	100	-294	1.2	0.09	1.29	-202	5100
31-02 TRB	2/27/2012	0.768	420	64	-95	0.85	-0.06	0.79	-203	5030
31-02 TRB	5/22/2012	0.2125	99	31	-43	1	0.66	1.66	-216	5060
31-02 TRB	8/14/2012	0.1181	15	9.6	-64	0.81	-0.25	0.56	-204	4970
31-02 TRB-R	2/25/2013	0.0034	3.6	26	1.3	2.4	0.18	2.58	66	6170
31-02 TRB-R	5/13/2013	0.0044	8.3	31	5.4	1.8	-0.29	1.51	-113	6700
31-02 TRB-R	8/13/2013	0.0038	0.01	23	-2.5	1.6	0.25	1.85	-1338	8380
31-02 TRB-R	11/11/2013	0.0052	16	27	13	1.6	0.24	1.84	-150	7390
31-02 TRB-R	3/17/2014	0.0036	16	36	14	1.7	-0.48	1.22	-168	7350
31-02 TRB-R	6/16/2014	0.0039	-2.4	23	-5	2.3	0.3	2.6	-633	7060
31-02 TRB-R	9/8/2014	0.0035	-1.2	30	-3.5	3.3	0.16	3.46	-34800	7760
31-02 TRB-R	11/7/2014	0.0036	3.1	24	0.7	3.8	-0.02	3.78	138	7500
31-02 TRB-R	2/11/2015	0.0039	24	41	21	4.1	0.21	4.31	-132	7740
31-02 TRB-R	8/25/2015	0.0041	-2.3	29	-5	2.2	0.61	2.81	-713	8050
31-02 TRB-R	2/10/2016	0.0039	-8.5	21	-11.1	2.7	0.07	2.77	-333	8160
31-02 TRB-R	7/18/2016	0.0045	7.7	24	4.7	3.5	0.24	3.74	-23	7770
31-02 TRB-R	2/16/2017	0.0062	22	30	18	3.5	-0.08	3.42	-136	8250
31-61 ALL	8/31/2009	0.439	130	45	-164	0.76	-0.06	0.7	-202	11300
31-61 ALL	11/2/2009	0.523	210	68	-140	1.2	-0.1	1.1	-203	13000
31-61 ALL	3/9/2010	0.464	180	64	-131	0.46	0.08	0.54	-202	13000
31-61 ALL	5/4/2010	0.459	150	59	-158	0.34	0.01	0.35	-201	13400
31-61 ALL	7/12/2010	0.511	160	64	-182	0.66	0.04	0.7	-202	13800
31-61 ALL	11/15/2010	0.507	220	70	-120	0.3	-0.06	0.24	-201	13800
31-61 ALL	3/1/2011	0.515	190	77	-155	0.7	0.18	0.88	-202	13700
31-61 ALL	9/3/2014	0.586	160	98	-233	0.15	0.05	0.2	-200	11900
31-61 ALL	11/7/2014	0.606	190	92	-216	0.42	0.01	0.43	-201	13300
31-61 ALL	2/13/2015	0.588	240	100	-154	0.19	0.05	0.24	-201	14100
31-61 ALL	8/7/2015	0.694	110	44	-355	18	1.3	19.3	-223	13100
31-61 ALL	2/9/2016	0.703	260	88	-211	0.32	0.16	0.48	-201	13500
31-61 ALL	7/28/2016	0.642	210	93	-220	0.38	0.28	0.66	-201	13800
31-61 ALL	2/17/2017	0.692	320	100	-144	0.2	-0.17	0.03	-200	13600

Table 3
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INTERA/RAML Responses to Comments, Ambrosia Lake Work Plans 2017 and 2018

Station	Date Sampled	Uranium (mg/L)	Gross Alpha (pCi/L)	Gross Alpha Uncertainty (2 sigma)	Gross Alpha - Corrected (pCi/L)	Ra-226 Activity (pCi/L)	Th-230 Activity (pCi/L)	Combined Ra/Th Activity (pCi/L)	Combined v. Adjusted RPD	Total Dissolved Solids (mg/L)
31-65 ALL	8/31/2009	0.112	53	36	-22	0.43	-0.02	0.41	-208	10100
31-65 ALL	11/2/2009	0.126	-14	30	-98	0.52	0.12	0.64	-203	10400
31-65 ALL	3/9/2010	0.114	56	35	-20	0.33	-0.01	0.32	-207	10800
31-65 ALL	5/4/2010	0.111	67	42	-7	0.44	-0.29	0.15	-209	11400
31-65 ALL	7/12/2010	0.129	44	36	-42	0.77	0.31	1.08	-211	11900
31-65 ALL	11/15/2010	0.119	69	45	-11	0.46	0.06	0.52	-220	12100
31-65 ALL	3/1/2011	0.102	35	49	-33	0.56	0.9	1.46	-219	12600
31-65 ALL	9/3/2014	0.101	39	73	-29	0.27	-15	-14.73	-65	13300
31-65 ALL	11/7/2014	0.102	100	73	32	1.4	0.13	1.53	-182	14100
31-65 ALL	2/11/2015	0.094	17	79	-46	0.33	0.24	0.57	-205	14000
31-65 ALL	8/24/2015	0.101	-28	64	-96	0.67	2.2	2.87	-212	14200
31-65 ALL	2/10/2016	0.098	23	55	-43	0.34	-0.06	0.28	-203	14600
31-65 ALL	7/28/2016	0.086	5.5	59	-52.1	0.11	0.14	0.25	-202	15700
31-65 ALL	3/2/2017		47	59		1.5	1.3	2.8	100	
31-67 TRB	8/18/2009	0.013	0.01	21	-8.7	2.3	0.03	2.33	-346	6850
31-67 TRB	11/3/2009	0.0199	4.2	25	-9.1	2.2	0.06	2.26	-332	6710
31-67 TRB	3/1/2010	0.0147	29	28	19	1.9	-0.08	1.82	-165	6580
31-67 TRB	5/10/2010	0.0179	47	32	35	2.8	-0.32	2.48	-174	6630
31-67 TRB	7/13/2010	0.0162	26	23	15	2.5	0.69	3.19	-130	7060
31-67 TRB	11/9/2010	0.016	4.5	22	-6.2	2.2	0.13	2.33	-441	6610
31-67 TRB	3/7/2011	0.0144	14	21	4	3	0.22	3.22	-22	6600
31-67 TRB	6/13/2011	0.0177	190	50	178	3.1	0.5	3.6	-192	6680
31-67 TRB	9/19/2011	0.0207	9.4	31	-4.5	3.7	-0.03	3.67	-1969	6390
31-67 TRB	11/14/2011	0.0174	24	33	12	2.9	0.3	3.2	-116	6480
31-67 TRB	2/20/2012	0.0223	20	24	5	2.2	0.06	2.26	-75	6460
31-67 TRB	5/22/2012	0.0242	27	26	11	4.6	0.14	4.74	-80	6550
31-67 TRB	8/7/2012	0.0198	36	25	23	3.3	0.15	3.45	-148	6750
31-67 TRB	8/12/2013	0.0131	0.01	22	-8.8	2.3	0.46	2.76	-383	6700
31-67 TRB	11/5/2013	0.0183	4	22	-8	2.8	1	3.8	-562	6420
31-67 TRB	3/11/2014	0.013	23	34	14	2.8	-0.54	2.26	-144	7000
31-67 TRB	6/3/2014	0.0109	21	29	14	2.7	0.28	2.98	-130	6340
31-67 TRB	9/4/2014	0.0121	-9.4	27	-17.5	3.1	-0.28	2.82	-277	6350
31-67 TRB	11/7/2014	0.0129	-13	20	-22	2.6	0.31	2.91	-261	7000
31-67 TRB	2/17/2015	0.0124	-11	32	-19	3.4	0.29	3.69	-296	7120
31-67 TRB	8/24/2015	0.0117	-4.9	31	-12.7	2.4	0.65	3.05	-326	7260
31-67 TRB	2/10/2016	0.014	-4.5	20	-13.9	3.4	0.37	3.77	-349	7120
31-67 TRB	7/28/2016	0.0129	-3.4	25	-12	2.4	-0.21	2.19	-289	7380
31-67 TRB	2/20/2017	0.0141	6.3	21	-3.1	2.6	0.22	2.82	-4229	7160
32-45 KD	8/17/2009	0.0072	13	6.5	8	0.79	0.07	0.86	-161	1550
32-45 KD	11/9/2009	0.0109	7.1	5.8	-0.2	0.98	0.17	1.15	284	1550
32-45 KD	3/2/2010	0.0112	7.5	7.2	0.01	0.96	-0.13	0.83	195	1580
32-45 KD	5/11/2010	0.0128	14	7.3	5	0.78	-0.01	0.77	-147	1590
32-45 KD	7/20/2010	0.0098	7.8	5.2	1.2	0.58	-0.02	0.56	-73	1580
32-45 KD	11/16/2010	0.0097	10	5.7	4	1.5	-0.14	1.36	-99	1590
32-45 KD	3/8/2011	0.0094	7	5.4	1	1.2	-0.01	1.19	17	1560
32-45 KD	6/14/2011	0.0117	26	8.6	18	1.1	-1.8	-0.7	-216	1590

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Station	Date Sampled	Uranium (mg/L)	Gross Alpha (pCi/L)	Gross Alpha Uncertainty (2 sigma)	Gross Alpha - Corrected (pCi/L)	Ra-226 Activity (pCi/L)	Th-230 Activity (pCi/L)	Combined Ra/Th Activity (pCi/L)	Combined v. Adjusted RPD	Total Dissolved Solids (mg/L)
32-45 KD	9/26/2011	0.0091	15	6.7	9	0.48	-0.17	0.31	-187	1540
32-45 KD	11/7/2011	0.0151	14	7.3	4	2.9	-0.21	2.69	-39	1530
32-45 KD	2/21/2012	0.0099	24	9	17	0.86	-0.34	0.52	-188	1570
32-45 KD	5/29/2012	0.012	11	6.4	3	1.7	0.08	1.78	-51	1590
32-45 KD	8/14/2012	0.0158	6.7	5.2	-3.9	0.63	-0.08	0.55	-266	1580
32-45 KD-R	2/26/2013	0.0395	55	16	29	2.7	1.2	3.9	-153	2450
32-45 KD-R	5/14/2013	0.0439	48	24	19	3.1	6.8	9.9	-63	2920
32-45 KD-R	8/19/2013	0.0494	61	19	28	110	-0.08	109.92	119	3100
32-45 KD-R	11/12/2013	0.0498	49	16	16	1.9	0.35	2.25	-151	2890
32-45 KD-R	3/18/2014	0.0452	68	22	38	1.4	0.12	1.52	-185	2630
32-45 KD-R	6/17/2014	0.0836	100	27	44	1.2	0.19	1.39	-188	2350
32-45 KD-R	9/5/2014	0.0699	75	21	28	2.3	0.35	2.65	-165	2440
32-45 KD-R	11/24/2014	0.0622	120	23	78	2.5	-0.29	2.21	-189	2350
32-45 KD-R	2/17/2015	0.0687	94	22	48	2.4	-0.06	2.34	-181	2260
32-45 KD-R	8/24/2015	0.0805	56	18	2	1.6	0.16	1.76	-13	2080
32-45 KD-R	2/11/2016	0.0783	94	18	42	1	0.16	1.16	-189	1900
32-45 KD-R	7/18/2016	0.0813	110	19	56	1.1	2.4	3.5	-176	1810
32-45 KD-R	2/15/2017	0.0751	96	16	45.7	1.2	0.04	1.24	-194	1700
32-59 ALL	8/18/2009	0.147	63	20	-35	0.09	-0.15	-0.06	-199	4140
32-59 ALL	11/2/2009	0.16	59	20	-48	0.19	-0.01	0.18	-202	4220
32-59 ALL	3/9/2010	0.148	53	20	-46	0.08	-0.36	-0.28	-198	4080
32-59 ALL	5/4/2010	0.15	75	23	-26	0.13	-0.05	0.08	-201	4200
32-59 ALL	7/12/2010	0.172	84	25	-31	0.2	-0.12	0.08	-201	4290
32-59 ALL	11/15/2010	0.174	110	31	-7	0.09	-0.36	-0.27	-185	4830
32-59 ALL	3/1/2011	0.157	94	33	-11	0.24	0.07	0.31	-212	4610
32-59 ALL	6/6/2011	0.1435	110	31	14	-0.02	-0.45	-0.47	-214	4670
32-59 ALL	9/3/2014	0.1959	89	34	-42	0.17	0.19	0.36	-203	4240
32-59 ALL	12/10/2014	0.1502	93	31	-8	0.09	2.1	2.19	-351	4650
32-59 ALL	2/10/2015	0.1437	61	30	-35	0.22	0.1	0.32	-204	4660
32-59 ALL	9/1/2015	0.175	79	37	-38	0.23	-0.19	0.04	-200	4440
32-59 ALL	2/9/2016	0.1998	85	33	-49	0.14	-0.11	0.03	-200	4800
32-59 ALL	7/28/2016	0.1706	84	29	-30	0.1	-0.24	-0.14	-198	4910
32-59 ALL	2/21/2017	0.152	54	23	-48	0.39	-0.43	-0.04	-200	4690
33-01 TRA	8/4/2009	0.0035	0.01	6.2	-2.3	0.52	-0.21	0.31	-262	2780
33-01 TRA	11/9/2009	0.0031	30	15	28	0.51	0.1	0.61	-191	2740
33-01 TRA	3/1/2010	0.0034	4.7	7.6	2.4	0.42	-0.28	0.14	-178	2760
33-01 TRA	5/10/2010	0.0029	4.1	7.8	2.2	1.5	0.35	1.85	-17	2760
33-01 TRA	7/13/2010	0.0026	7.2	7.6	5.5	0.7	-0.13	0.57	-162	2790
33-01 TRA	11/9/2010	0.0024	-5.1	6.6	-6.7	0.59	0.26	0.85	-258	2760
33-01 TRA	3/7/2011	0.0017	-3.8	4.1	-4.9	0.78	0.23	1.01	-304	2720
33-01 TRA	6/14/2011	0.0041	41	13	38	0.8	0.05	0.85	-191	2760
33-01 TRA	9/19/2011	0.0046	1.9	9.6	-1.2	0.46	0.03	0.49	-476	2690
33-01 TRA	11/9/2011	0.0063	6.2	9.3	2	0.84	0.37	1.21	-49	2700
33-01 TRA	2/21/2012	0.0027	11	9	9	0.15	-0.12	0.03	-199	2720
33-01 TRA	5/8/2012	0.0054	4.4	3.8	0.8	0.63	0.27	0.9	12	2760
33-01 TRA	8/13/2012	0.004	3.2	6.2	0.5	0.44	-0.13	0.31	-47	2740

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Station	Date Sampled	Uranium (mg/L)	Gross Alpha (pCi/L)	Gross Alpha Uncertainty (2 sigma)	Gross Alpha - Corrected (pCi/L)	Ra-226 Activity (pCi/L)	Th-230 Activity (pCi/L)	Combined Ra/Th Activity (pCi/L)	Combined v. Adjusted RPD	Total Dissolved Solids (mg/L)
33-01 TRA	8/12/2013	0.0021	0.01	5.8	-1.4	0.59	0.64	1.23	-3094	2770
33-01 TRA	11/12/2013	0.002	2.1	7.2	0.8	0.82	-0.09	0.73	-9	2740
33-01 TRA	3/17/2014	0.0017	11	13	10	0.45	-0.18	0.27	-189	2730
33-01 TRA	6/10/2014	0.0016	0.01	9.3	-1.1	0.46	0.15	0.61	-698	2720
33-01 TRA	9/18/2014	0.0012	-13	11	-14	0.62	-0.03	0.59	-218	2660
33-01 TRA	11/6/2014	0.0011	3.9	8.1	3.2	0.45	0.21	0.66	-132	2690
33-01 TRA	2/10/2015	0.0009	2.1	9.4	1.5	0.47	0.28	0.75	-67	2710
33-01 TRA	8/25/2015	0.0009	-5.1	7.6	-5.7	0.39	-0.18	0.21	-215	2700
33-01 TRA	2/9/2016	0.0009	-2.4	5.5	-3	0.52	-0.29	0.23	-233	2700
33-01 TRA	7/25/2016	0.0008	4.4	8.5	3.9	0.51	0.05	0.56	-150	2710
33-01 TRA	2/24/2017	0.0006	2.8	6.3	2.4	0.59	0.02	0.61	-119	2710
36-02 TRB	8/4/2009	0.0071	0.93	18	-3.83	0.86	-0.01	0.85	-314	8220
36-02 TRB	11/3/2009	0.0132	0.01	25	-9	1.2	0.21	1.41	-274	9050
36-02 TRB	3/2/2010	0.0131	-15	17	-24	0.65	-0.07	0.58	-210	9740
36-02 TRB	5/10/2010	0.011	18	34	11	1.1	0.04	1.14	-162	10600
36-02 TRB	7/19/2010	0.0143	7.2	29	-2.4	1.2	-0.04	1.16	-574	9360
36-02 TRB	11/9/2010	0.0521	-23	30	-58	0.85	-0.16	0.69	-205	9790
36-02 TRB	3/7/2011	0.009	8.3	26	2.3	0.93	0.14	1.07	-73	10700
36-02 TRB	6/13/2011	0.006	54	37	50	1.5	-0.18	1.32	-190	10300
36-02 TRB	9/19/2011	0.0176	32	40	20	1.1	0.19	1.29	-176	8560
36-02 TRB	11/8/2011	0.0106	0.01	31	-7.1	1.5	0.52	2.02	-359	8490
36-02 TRB	2/20/2012	0.0163	42	33	31	0.66	-0.15	0.51	-194	8980
36-02 TRB	5/8/2012	0.0113	1.6	23	-6	0.65	0.02	0.67	-250	8660
36-02 TRB	8/7/2012	0.0126	72	44	64	0.86	0.21	1.07	-193	8910
36-02 TRB	11/6/2012	0.0143	-2.6	29	-12.2	0.76	-0.09	0.67	-223	8200
36-02 TRB	2/19/2013	0.0095	12	30	6	0.67	0.27	0.94	-146	8240
36-02 TRB	5/7/2013	0.0078	21	29	16	0.61	4.3	4.91	-106	8870
36-02 TRB	8/12/2013	0.0092	0.01	22	-6.2	0.79	0.29	1.08	-284	9410
36-02 TRB	11/5/2013	0.0364	15	31	-9	0.8	-0.03	0.77	-237	8880
36-02 TRB	3/11/2014	0.0076	3.8	34	-1.3	0.84	0.01	0.85	-956	8100
36-02 TRB	6/3/2014	0.0056	0.01	43	-3.8	0.62	0.3	0.92	-328	8420
36-02 TRB	9/5/2014	0.0045	-33	30	-36	0.83	0.2	1.03	-212	8280
36-02 TRB	11/25/2014	0.0059	2.5	27	-1.5	-0.4	0.41	0.01	-203	8040
36-02 TRB	2/11/2016	0.004	13	22	10	0.62	0.05	0.67	-175	7700
36-02 TRB	7/26/2016	0.0031	-28	26	-30	0.47	0.28	0.75	-210	8510
36-02 TRB	3/2/2017		0.15	25		0.49	0.18	0.67	100	
36-06 KD	8/4/2009	0.971	520	75	-131	12	37	49	-439	8750
36-06 KD	11/9/2009	0.976	610	81	-44	9.8	34	43.8	-87800	8870
36-06 KD	3/1/2010	0.918	640	87	25	12	37	49	65	8390
36-06 KD	5/11/2010	0.808	450	75	-91	13	28	41	-528	7770
36-06 KD	7/19/2010	0.671	430	60	-20	18	63	81	331	7580
36-06 KD	11/8/2010	0.608	480	75	73	10	39	49	-39	7600
36-06 KD	3/7/2011	0.6745	480	78	28	10	28	38	30	7440
36-06 KD	6/13/2011	0.6955	430	71	-36	14	29	43	2257	7900
36-06 KD	9/26/2011	0.7635	420	75	-92	13	45	58	-882	7400
36-06 KD	11/8/2011	0.8135	510	86	-35	18	170	188	292	7850

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Station	Date Sampled	Uranium (mg/L)	Gross Alpha (pCi/L)	Gross Alpha Uncertainty (2 sigma)	Gross Alpha - Corrected (pCi/L)	Ra-226 Activity (pCi/L)	Th-230 Activity (pCi/L)	Combined Ra/Th Activity (pCi/L)	Combined v. Adjusted RPD	Total Dissolved Solids (mg/L)
36-06 KD	2/20/2012	0.6135	590	87	179	10	23	33	-138	7700
36-06 KD	5/8/2012	0.735	700	98	208	12	48	60	-110	8070
36-06 KD	8/7/2012	0.6085	540	84	132	8.3	23	31.3	-123	7640
36-06 KD	8/12/2013	0.3746	240	48	-11	8.4	9.3	17.7	857	6170
36-06 KD	11/11/2013	0.691	470	76	7	10	15	25	113	7800
36-06 KD	3/17/2014	0.687	400	93	-60	9.3	25	34.3	-734	8210
36-06 KD	6/10/2014	0.738	550	87	56	9.2	29	38.2	-38	7270
36-06 KD	9/24/2014	0.7945	410	91	-122	10	25	35	-361	8540
36-06 KD	11/6/2014	0.6584	510	96	69	15	13	28	-85	8480
36-06 KD	2/11/2015	0.7454	460	100	-39	12	30	42	5400	8770
36-06 KD	8/26/2015	0.7405	430	90	-66	11	13	24	-429	8240
36-06 KD	2/11/2016	0.773	500	88	-18	16	11	27	1000	8340
36-06 KD	7/18/2016	0.9195	650	95	34	19	84	103	101	7710
36-06 KD	2/15/2017	0.62	600	76	185	17	21	38	-132	6560
5-02 KD	8/17/2009	0.0009	14	4.3	13	2	0.07	2.07	-145	390
5-02 KD	11/9/2009	0.0012	9	3.9	8	2.2	0.04	2.24	-113	440
5-02 KD	3/8/2010	0.0007	0.83	2	0.36	1	-0.18	0.82	78	430
5-02 KD	7/20/2010	0.0002	1.3	2.1	1.2	1.3	0.09	1.39	15	480
5-02 KD	8/14/2012	0.0018	6.4	3.3	5.2	0.01	-0.31	-0.3	-224	660
5-02 KD	12/10/2014	0.003	3.1	3.7	1.1	0.74	0.02	0.76	-37	618
5-02 KD	2/18/2015	0.0019	0.26	5	-1.01	0.86	0.15	1.01	#DIV/0!	716
5-02 KD	8/26/2015	0.001	-4.3	4.1	-5	0.46	0.58	1.04	-305	756
5-02 KD	2/15/2016	0.0022	2.2	3.9	0.7	1.1	0.24	1.34	63	792
5-03 ALL	8/18/2009	0.0015	5.9	8.1	4.9	1.4	-0.26	1.14	-125	3530
5-03 ALL	11/2/2009	0.0015	3.2	6.7	2.2	2.1	0.13	2.23	1	3560
5-03 ALL	3/9/2010	0.0007	-1.7	7	-2.2	1.3	-0.13	1.17	-654	3490
5-03 ALL	5/4/2010	0.0003	0.01	8.9	0.01	1.8	0.23	2.03	198	3500
5-03 ALL	7/12/2010	0.0032	11	9.1	9	1.2	-0.03	1.17	-154	3630
5-03 ALL	11/15/2010	0.0019	6.5	7.7	5.2	2.8	-0.37	2.43	-73	3550
5-03 ALL	2/28/2011	0.0052	0.01	11	-3	0.82	0.24	1.06	-419	3680
5-03 ALL	6/6/2011	0.0036	7.5	10	5.1	1.7	-0.06	1.64	-103	3610
5-03 ALL-R	9/3/2014	0.0911	40	26	-21	0.18	0.42	0.6	-212	4110
5-03 ALL-R	11/6/2014	0.0935	64	27	1	0.43	0.07	0.5	-67	4390
5-03 ALL-R	2/10/2015	0.0874	51	24	-8	0.33	-0.35	-0.02	-199	4200
5-03 ALL-R	8/21/2015	0.0949	37	21	-27	0.22	0.31	0.53	-208	4270
5-03 ALL-R	2/8/2016	0.101	66	33	-2	0.35	-0.13	0.22	-249	4340
5-03 ALL-R	7/28/2016	0.1019	47	22	-21	0.31	-0.14	0.17	-203	4490
5-03 ALL-R	2/21/2017	0.103	43	21	-26	0.23	-0.23	0	-200	4340
5-04 ALL	8/17/2009	0.0011	39	21	38	0.33	0.28	0.61	-194	4590
5-04 ALL	11/2/2009	0.0012	3.2	13	2.4	0.55	0.06	0.61	-119	4530
5-04 ALL	3/9/2010	0.0012	-2.1	11	-2.9	0.44	-0.07	0.37	-258	4550
5-04 ALL	5/4/2010	0.11	11	16	-63	0.58	0.01	0.59	-204	4530
5-04 ALL	7/12/2010	0.0083	-1.4	11	-7	0.52	-0.17	0.35	-221	5520
5-04 ALL	11/15/2010	0.003	19	15	17	0.5	0.05	0.55	-187	5140
5-04 ALL	2/28/2011	0.0142	46	30	36	5.6	-0.26	5.34	-148	5110
5-04 ALL	6/6/2011	0.0059	28	19	24	1	0.34	1.34	-179	5130

Table 3

Comparison of Gross Alpha Measurements and Combined Alpha Emitter Activities

INTERA/RAML Responses to Comments, Ambrosia Lake Work Plans 2017 and 2018

Station	Date Sampled	Uranium (mg/L)	Gross Alpha (pCi/L)	Gross Alpha Uncertainty (2 sigma)	Gross Alpha - Corrected (pCi/L)	Ra-226 Activity (pCi/L)	Th-230 Activity (pCi/L)	Combined Ra/Th Activity (pCi/L)	Combined v. Adjusted RPD	Total Dissolved Solids (mg/L)
5-04 ALL	9/2/2014	0.0005	-8.2	19	-8.2	0.52	0.14	0.66	-235	5100
5-04 ALL	11/25/2014	0.0005	83	35	83	0.48	0.14	0.62	-197	5240
5-04 ALL	2/10/2015	0.0009	-5	22	-6	0.71	0.17	0.88	-269	5180
5-04 ALL	8/21/2015	0.0005	-19	12	-19	0.37	-1.8	-1.43	-172	4990
5-04 ALL	2/8/2016	0.0005	-9.2	11	-9.2	0.52	0.01	0.53	-224	5420
5-04 ALL	7/27/2016	0.0005	-16	14	-16	0.35	-0.02	0.33	-208	5120
5-04 ALL	2/23/2017	0.0005	-10	11	-10	0.71	-0.12	0.59	-225	4960
5-08 ALL	8/17/2009	0.001	44	15	43	11	-0.13	10.87	-119	3520
5-08 ALL	11/2/2009	0.0015	8.7	10	7.7	14	-0.12	13.88	57	3510
5-08 ALL	3/9/2010	0.0058	12	10	8	10	-0.56	9.44	17	3420
5-08 ALL	5/4/2010	0.0045	31	15	28	19	-0.3	18.7	-40	3460
5-08 ALL	7/12/2010	0.0147	27	12	17	17	0.11	17.11	1	3540
5-08 ALL	11/16/2010	0.0023	31	14	29	14	-0.34	13.66	-72	3440
5-08 ALL	2/28/2011	0.007	20	14	15	14	0.82	14.82	-1	3410
5-08 ALL	6/6/2011	0.0033	34	14	32	16	0.41	16.41	-64	3380
5-08 ALL-R	9/2/2014	0.0233	10	15	-6	0.1	0.01	0.11	-207	3760
5-08 ALL-R	11/5/2014	0.0226	17	14	2	0.45	-0.07	0.38	-136	3830
5-08 ALL-R	2/10/2015	0.0203	7.6	17	-6	0.24	0.22	0.46	-233	3770
5-08 ALL-R	8/21/2015	0.0233	4.9	14	-10.7	0.33	-0.4	-0.07	-197	3880
5-08 ALL-R	2/8/2016	0.0244	32	20	16	0.14	-0.06	0.08	-198	3920
5-08 ALL-R	7/27/2016	0.0249	5.9	13	-10.8	0.15	0.32	0.47	-218	3880
5-08 ALL-R	2/22/2017	0.0216	5.5	12	-9	0.35	-0.2	0.15	-207	3800
5-73 ALL	8/17/2009	0.041	16	9.9	-11	0.17	-0.27	-0.1	-196	2640
5-73 ALL	11/2/2009	0.0846	19	13	-38	0.35	0.16	0.51	-205	4190
5-73 ALL	3/8/2010	0.101	52	24	-16	0.13	-0.14	-0.01	-200	4340
5-73 ALL	5/4/2010	0.0022	50	25	49	0.2	0.01	0.21	-198	5090
5-73 ALL	7/12/2010	0.165	100	31	-11	0.86	-0.32	0.54	-221	5080
5-73 ALL	11/15/2010	0.0749	55	23	5	0.59	-0.14	0.45	-167	4580
5-73 ALL	2/28/2011	0.1554	120	41	16	0.13	-0.01	0.12	-197	4760
5-73 ALL	6/6/2011	0.1951	100	38	-31	0.2	-0.15	0.05	-201	5090
5-73 ALL-R	9/4/2014	1.04	330	76	-367	0.16	-0.92	-0.76	-199	5340
5-73 ALL-R	11/5/2014	1.12	420	82	-330	1.4	0.2	1.6	-202	5800
5-73 ALL-R	2/10/2015	1.28	210	62	-648	1	-0.24	0.76	-200	6100
5-73 ALL-R	8/21/2015	1.25	160	54	-678	0.1	-0.26	-0.16	-200	5780
5-73 ALL-R	2/8/2016	1.3	770	120	-101	0.07	0.12	0.19	-201	5710
5-73 ALL-R	7/28/2016	1.23	510	77	-314	0.16	0.29	0.45	-201	5720
5-73 ALL-R	2/22/2017	1.17	360	60	-424	0.34	-0.04	0.3	-200	5570

Notes:

RPD: Relative percent difference. (Combined Activity - Corrected Gross Alpha) / ((Combined Activity + Corrected Gross Alpha)/2) * 100

All gross alpha activities are measured using EPA method 900.0

Combined Ra/Th Activity: Calculated by summing the individual Ra-226 and Th-230 activities

Only samples for which uranium concentrations, gross alpha activities and uncertainties, Ra-226 activities, and Th-230 activities are all available are presented in this table.

Note that the corrected gross alpha value is based on the measure gross alpha - 670 * [U] to remove the alpha activity contribution from uranium. Due to the significant uncertainties in measured gross alpha activities due to the high TDS of these sample, this often produces a negative corrected gross alpha. These are interpreted to be the result of inaccuracies in the gross alpha measurements.

All gross alpha activities are measured using EPA method 900.0

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Technical Meeting
Cells 1 & 2 and ACL Work Plans
Ambrosia Lake Mill Site

Rio Algom Mining LLC

April 5, 2018

Workplan for the Rio Algom Mining Ambrosia Lake Mill Site: Disposal Cells 1 and 2 Dams and Tailings Characterization (RAML 2018)

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Cells 1 and 2 Dams and Tailings Characterization Work Plan

1. *Will laboratory measurements for the particle size analysis of samples include hygrometer analysis for fines?*
   - **Selected samples of cover material or tailing may have hydrometer analyses**
   - **Majority of samples will be dry-sieved**
   - **Atterberg limits will be determined to assign USCS designation**
2. *Will the model inputs based laboratory samples for hydraulic properties reflect scale effects and cover evolution? Engineered covers tend to perform less than as designed due to scale effects and imposition of surficial processes over time (e.g., Benson et al., 2010).*
   - **Cover and tailings samples will be collected from both Disposal Cells 1 and 2 representative of present-day conditions**
     - **Disposal Cell 1 – reclamation completed in 1998**
     - **Disposal Cell 2 – reclamation completed in 2016**
   - **Limited loss of radon barrier performance because of stringent design, construction, and maintenance requirements for uranium disposal facilities (long mandated closure design life)**
     - **Minimal root penetration**
     - **Frost protection layer**
     - **Radon layer protected beneath erosion protection and frost protection layers**

Cells 1 and 2 Dams and Tailings Characterization Work Plan

3. *Describe how the use of average precipitation and climatic conditions as input for the water balance model will reflect the episodic nature of the relevant processes. Recharge in the desert southwest is highly episodic, both inter-annually and seasonally. With the lack of data to support specification of the lower boundary condition, hence use of the assumption of a unit gradient, constraints for inferring recharge rates are left to properties of average climatic conditions. It is noted that the UNSAT-H model, which is suggested as an alternative approach that may be considered, could address this uncertainty.*
   - **Data from the field and laboratory testing will facilitate performance modeling of the full cover and tailing profiles at both Disposal Cells 1 and 2 to estimated pore fluid flux for groundwater transport modeling**
   - **HELP, UNSAT-H, and laboratory analyses of profile samples all provide useful information to estimate flux**
   - **HELP and UNSAT-H use period of record climatologic data from nearby weather stations in Milan/Grants or Thoreau**
4. *Is the source fluid exiting from the tailings pile to be used as input for reactive transport to the Point of Compliance (POC) and Point of Exposure (POE) wells? If so, then explain the possible disconnect between the use of acidity measurements on the tailings pore fluids in RAML (2018), and the use of pH measurements for the reactive transport pH neutralization analysis between the POC and POE wells, such as RAML (2017). Will there be a sufficiently complete analysis of species contributing to the acidity data in the tailings fluids such that a pH can be inferred?*
   - **Field parameters temperature, pH, SC, DO, and ORP will be measured during sampling**
   - **Tailings pore fluid chemistry used as source-term input to reactive transport modeling, or as comparison to inverse-modeled values from POC wells**

Rio Algom Mining LLC's Ambrosia Lake Mill Site: Data Collection Work Plan in Support of Additional Alternate Concentration Limits (RAML 2017)

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Comment 1: Transport Modeling

A description of the reactive transport model would help shed light on the information needs of the model in relation to the 2017 supplemental Alternate Concentration Limit (ACL) characterization and monitoring work plan.

- 2001 Alluvium ACL application utilized PHREEQC in batch-reactor mode to answer questions about sorption, mineral precipitation, and pH neutralization extent (mass-wise, not spatial-wise). While validated, the model relies on a couple significant assumptions, most notably surface area and percent of a mineral available for sorption, which would be expected to substantially control the results. A description of the validation concept (or plan) for the reactive transport model mentioned in the 2017 work plan would help understand how the assumptions will be addressed.
- Based on the "transport" part of reactive transport model, the supplemental 2017 ACL work plan may be pointing to the 1D transport component of PHREEQC, or linking PHREEQC to some transport code (e.g., HST3D, the linked code available as PHAST on the PHREEQC website).
- Is there supporting information that iron hydroxides are the primary or only contributor for the pH neutralization mechanism? Other sites have seen several fronts delineated by neutralization mechanisms related not only to iron hydroxides, but also calcite dissolution (and the interplay with gypsum precipitation), and aluminum hydroxides.

Response to Comment 1: Transport Modeling

- The Data Quality Objective (DQO) table lists the data needs and methods of data collection for reactive transport modeling and ACL characterization.
  - Uncertainties in conceptual models and model parameters will be reduced to the extent possible by site-characterization investigations. Sensitivity/uncertainty analyses will be used to confirm that selected ACLs will be protective of human health and the environment.

- The ACL modeling approach will be to apply pH-based partition coefficients (Kd) to a flow and transport model.

- The pH is expected to be a strong control on sorption, and pH is most likely controlled by acidic fluids interacting with carbonates in each aquifer. Sorption to ferrihydrite is not expected to be a major control on pH.

Response to Comment 1: Transport Modeling

Table 3. Data Quality Objectives for the ACL Program

1.0 State the Problem	Concentrations of contaminants of potential concern (COPCs) at RAML's closed mill and tailings facility exceed water quality standards at the POC. Due to the infeasibility of cleaning up the site to acceptable background levels, the site will be evaluated for alternative concentration limits (ACLs) that result in COPCs at the downgradient point of exposure (POE) that are protective of human health and the environment for 1000 years. Site specific data are required to inform the flow and transport model.
2.0 Identify the Goals of the Study	Develop and apply a reactive-transport model based on the groundwater flow model. The model will be simplified (i.e., only a sorption version), or, if necessary, more comprehensive (reactive-transport). It will be used to carry out sensitivity/uncertainty analyses and to calculate ACLs.
3.0 Identify Information Inputs	Hybrid approach will be based on pH-dependent retardation factors, which can be estimated using a surface-complexation model (SCM). Information inputs include SC parameters [initial water chemistry at the POC, sorbant (e.g., ferrihydrite) characteristics and concentrations, temperature] and constraints on changes in pH along the flow path. Information inputs for Reactive-transport models, if necessary, will be similar to, but more mineralogically comprehensive than, those for pH-buffering models. Information inputs for flow behavior in reactive-transport models are as described above for the groundwater flow models.
4.0 Define Boundaries of the Study	Boundaries coincide with the LTSM. As a reference case, COPC transport will be assumed to occur within the Dakota Formation along a flow path from the POC (near Ponds 7/8) to the POE (near the northern boundary of the LTSM). The extent to which COPC transport is attenuated in the TRA and TRB may be assessed qualitatively based on differences in sorbant characteristics and concentrations between the KD and TRA/TRB.

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Response to Comment 1: Transport Modeling

Table 3. Data Quality Objectives for the ACL Program (continued)

5.0 Develop the Analytic Approach	Dakota groundwaters will be sampled at the POC. Analytes include physico-chemical parameters (temperature, conductivity, pH, ORP, dissolved oxygen), major cations and anions (Na, K, Ca, Mg, Cl, SO4, alkalinity), minor elements (e.g., Si, Al, Mn, Fe, NO3/NO2, organic carbon), and COPCs. Redox pairs will also be measured. Dakota groundwaters will also be sampled at POE wells, and at other wells that exist or may be installed between the POE and POC. The mineralogy and paragenesis of the KD will be characterized based on a review of relevant documentation, and by petrographic analysis of core samples. The petrographic analyses will include whole-rock chemistry, optical microscopy, XRD, and SEM/ EDS. Sorbant (e.g., ferrihydrite) concentrations will be determined by selective-extraction. The neutralization potential of core samples will also be measured.
6.0 Specify Performance or Acceptance Criteria	Groundwater quality data will be collected by appropriately certified labs working under their own QA/QC program. Duplicate and split samples will be submitted for analysis at a minimum of 1/20th of the number of submitted samples to allow for evaluation of laboratory accuracy. EPA-approved analytical methods may be changed as necessary to achieve project objectives. Use of professional judgment will be required to evaluate historical data sources. Selected historical data will (a) be site-specific, (b) come from a referenceable source, and (c) have explicitly documented reporting units. Mineralogical parameters will be collected by appropriately certified labs working under their own QA/QC program. Duplicate and split samples will be submitted for analysis at a minimum of 1/20th of the number of submitted samples to allow for evaluation of laboratory accuracy.
7.0 Develop Plan for Obtaining Data	POE corings/wells will be installed near the LTSM boundary. Water quality and COPC concentrations in the POC and POE wells will be determined. Petrography, sorbant concentrations, and NP values will be determined for core samples. Model predictions of the propagation velocity of reaction fronts (e.g., pH) will be tested by locating and installing a monitoring well downgradient of the maximum predicted extent of front migration.

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Comment 2: Hydraulic Gradient in TRA

Why does the groundwater gradient in the TRA differ from that of the TRB and Dakota? The direction of groundwater gradients may influence site-wide groundwater conceptualization, and in particular the placement of wells.

- Dakota and TRB groundwater gradients are to the NNE, while TRA gradient is currently drawn to the WNW.
- In earlier years, the groundwater gradient of the TRA was more northerly, and was based on 5 or 6 wells. In the past several years, the WNW direction of the TRA gradient was based on three wells that fall along a line – a situation that leads to high uncertainty in determining groundwater flow direction and magnitude. The proposed TRA wells in the work plan should help alleviate this problem.
  - Also, the most easterly well, 33-01TRA, may not be hydraulically connected to the TRA wells to the west. It is located on the eastern side of the fault that traces the Arroyo del Puerto. The offset on this fault large enough such that the TRA unit would not appear to have hydraulic connection across the fault (cross-section of Figure 1.3 in Maxim, 2001); the TRA on the west connected with KD on the east.
- If the WNW gradient in the TRA is real, then the Point of Exposure well for the TRA should not be to the NNE

Response to Comment 2: Hydraulic Gradient in TRA

- One or more additional wells are needed to provide a more reliable estimate of the hydraulic gradient for the TRA aquifer.

- The influence of the fault underlying Arroyo del Puerto on groundwater flow is uncertain since the offset is not indicated on the USGS geologic map (Santos and Thaden, 1966).

Comment 3: Influence of Faults on Groundwater Flow (pt. 1)

What are the roles of faults and paleotopography in transport pathways? Would leakage through faults change the monitoring strategy? Would transport pathways along faults or paleochannels change the monitoring strategy?

- The subcrop patterns of the sandstone units appear to strongly exhibit the influence of faults and paleotopographic features (e.g., paleo-channels).
- Transport pathways from POC to POE wells are crossing faults and ignoring paleosurfaces. For the latter, however, it is acknowledged that the topology of bottom surface of each sandstone unit is more relevant to the transport pathway than the top (subcrop). The bottom surface topology is not known, but would unlikely be flat.

Comment 3: Influence of Faults on Groundwater Flow (pt. 2)

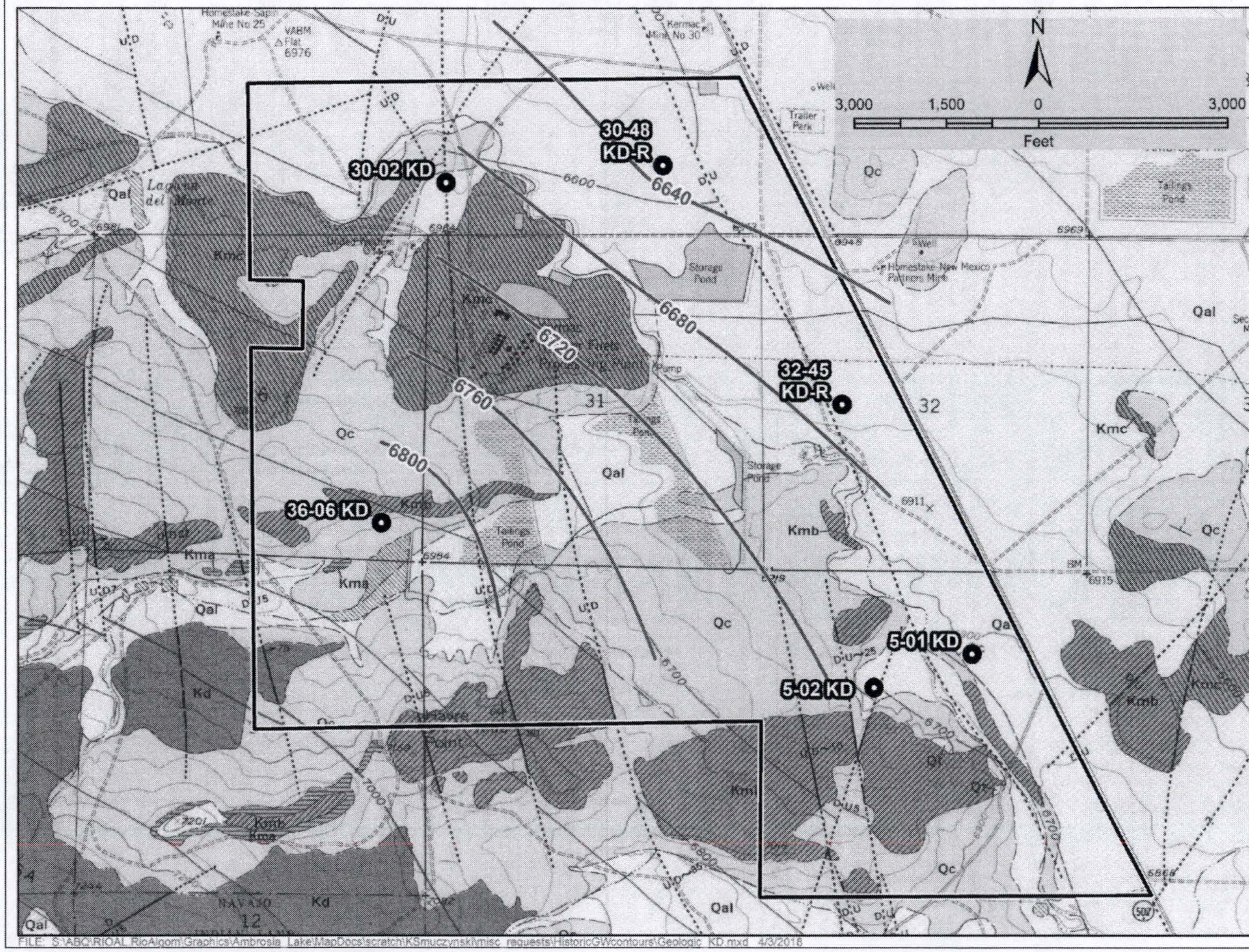
- Only limited information was found in site documents on the hydraulic connection, or lack thereof, between the sandstone units that may be related to across-fault or along-fault transmissivity (or relative impermeability).
  - "The ability for faults to transmit water either along the fault due to fault-related fracturing, or for faults to limit cross-fault flow has not been documented with site-specific data for faults in the Ambrosia Lake area." [RioAlgom, 2017, p.]
  - Generally ~40 ft displacement (p.2-8, Bedrock ACL, Maxim, 2001)
  - "While the general direction of groundwater flow is well characterized by regional groundwater information, chloride concentrations, and groundwater levels, the groundwater levels and constituent concentrations at individual TRB wells downgradient of the Facility varies depending upon the structural features within the bedrock units, including fault displacements and fracture patterns." [Bedrock ACL application, 2000].
  - Low pH data in well 5-02KD during 2017 could only be fault related (south of the tailings, beneath the southerly flowing alluvial sediments in the main arroyo).

Response to Comment 3: Influence of Faults on Groundwater Flow

- Water levels in wells screened in the TRA, TRB, and KD reflect influences that faulting has on groundwater flow and are therefore representative of flow at the scale of the LTSM area.

- As noted in response to comment 2, TRA needs at least one additional well to be able to more accurately establish the hydraulic gradient within the LTSM area.

KD Groundwater Levels, 2nd Half 2017



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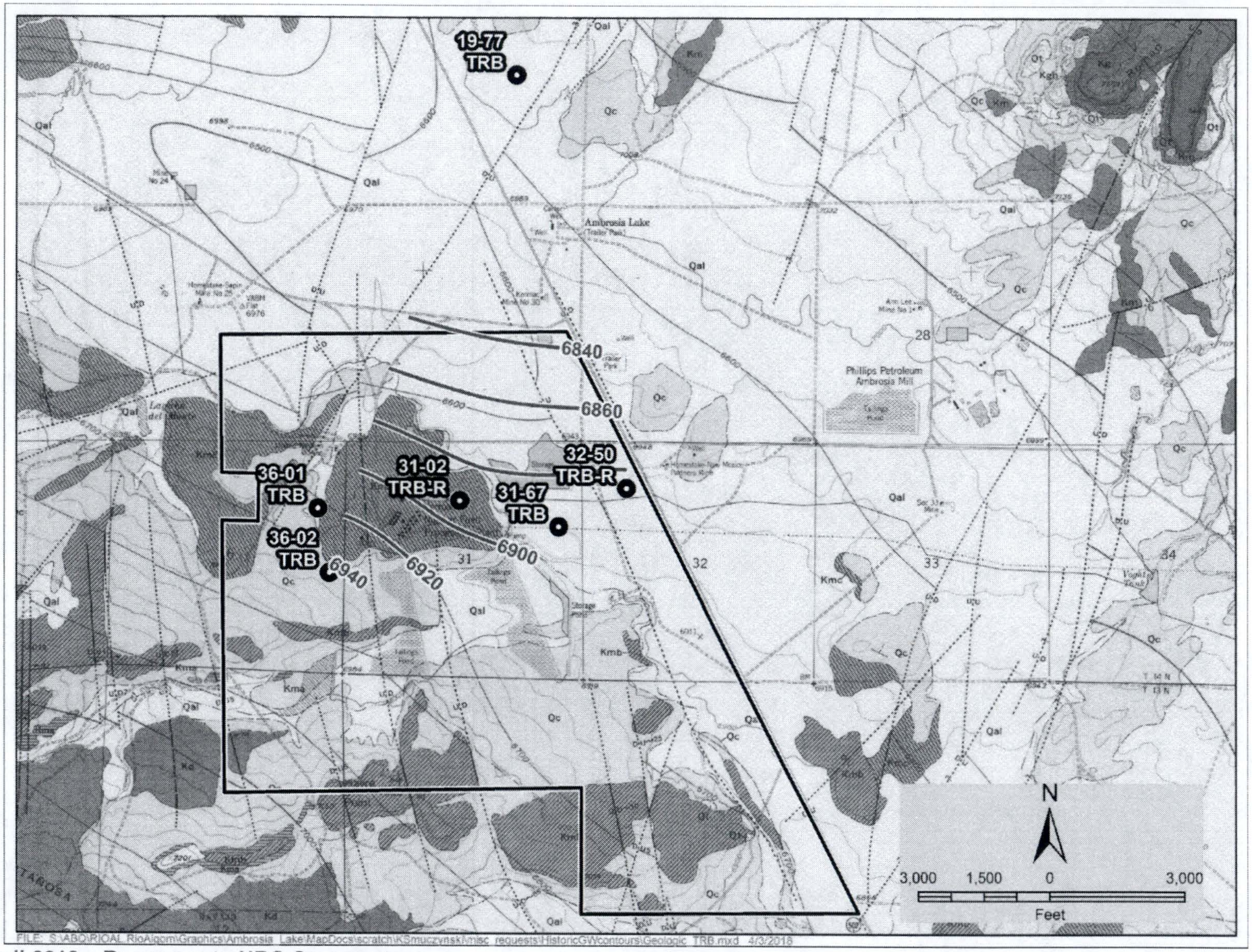
TRB Groundwater Levels, 2nd Half 2017



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Response to Comment 3: Influence of Faults on Groundwater Flow – pH at 5-02 KD

- The low pH measured in 5-02 KD is a laboratory pH and is not representative of site conditions.

Field and Laboratory pH Measurements for well 5-02 KD. available between 12/1/2014 and 3/28/2018

Station Name	Samp.Date	pH (field)	pH (Laboratory)	Units
5-02 KD	21-Feb-18	7.12	8.3	s.u.
5-02 KD	10-Aug-17	7.66	3.4	s.u.
5-02 KD	16-Feb-16	7.75	8.3	s.u.
5-02 KD	26-Aug-15	7.4	8.3	s.u.
5-02 KD	18-Feb-15	7.84	8.2	s.u.
5-02 KD	10-Dec-14	7.28	8.2	s.u.

Comment 4: Subcrops near Ponds 7 and 8

Clarification on the conceptualization for contamination of the Dakota at 36-06KD would be helpful. Most of Ponds 7 & 8 are underlain by subcrop of TRA and shale. If the Dakota is contaminated (well 36-06KD), then the TRA is also likely contaminated. The proposed well near 36-06KD, but screened in the TRA, should clarify the status.

Alternative hypotheses for contamination:

- Direct recharge from ponds to TRA, and subsequent leakage to Dakota. For example, the mapped fault appears to extend under Ponds 7 & 8, and if conductive, may be the conduit for pond liquids reaching Dakota from the TRA.
- Mounding of the groundwater beneath the Ponds 7 & 8 may have led to the transmission of pond leakage to the southwest where the Dakota subcrop (recharge zone) occurs.
- Mounding from the tailings impoundments could hypothetically laterally spread to recharge zone of the Dakota, TRA, and TRB. However, there is contradicting information for this hypothesis: Recharge area of TRB would be in the area of the mound, but no indication of a pH plume found in wells such as 36-02TRB.

Response to Comment 4: Subcrops near Ponds 7 and 8

- The mechanism for contamination is not fully understood. Tailings seepage could have entered the Dakota directly through subcrop, or indirectly through faults and fractures.

- The tailings impoundments are expected to contribute seepage to the TRB, but, currently, there is no direct evidence for contribution to deeper aquifers directly or contribution to subcrops to the southwest due to mounding. The upcoming field program will provide additional information to address this issue.

Comment 5: POE Well Locations

Proposed POE wells for all three units are co-located at north-northeast LSTM boundary. This implies the (i) groundwater gradients in all three units are in the same direction (see also item 2 above); and (ii) the faults and paleotopography do not influence transport pathways.

- Transport pathway from 36-06KD to POE crosses at least one fault.
- Faults under the site are mostly north-trending, but there are also a set of NE-trending faults on the northern side.
- Subcrop pattern reflects fault displacement of sandstone units, and likely also reflects paleotopography. The effect of these on potentiometric surfaces and gradients in each unit may complicate things.

Response to Comment 5: POE Well Locations

- For KD and TRB, the directional component of the hydraulic gradient is oriented to the northeast and generally aligns with the dip direction of those units and the regional flow direction.

- There is no indication that faults or paleotopography cause groundwater to flow in a different direction than to the northeast.

- It is assumed the flow direction in TRA is also oriented to the northeast, this will be confirmed with data collected from additional well(s).

- Final proposed POE well locations will be determined based on further analyses of the hydraulic gradient in the TRA, TRB, and KD.

Comment 6: Gross Alpha Issues

Gross Alpha Issue:

- Has RAML considered providing documentation justifying why an ACL for gross alpha is not meaningful nor justified. A discussion of the lack of meaning of the gross alpha measurements should be provided, which would include an analysis site measurements and scientific rationale. Justification would include that all significant alpha emitters are being measured; and conversely, that none are missed.
- Gross alpha measurements are highly uncertain, mostly due to high TDS, even using second analysis method. First method, EPA Method 900 (evaporation based), is obviously problematic; second method, EPA Method 600/00-02 (precipitation of barium-radium sulfate and iron hydroxides) still had high uncertainty.
  - Data: U-corrected gross alpha +-100 pCi/L, with results in range -200 to +300 pCi/L and many negative values
- Regulations require measurements of gross alpha (10 CFR 40, Appendix A). In addition, NRC (2006) evaluated gross alpha as a constituent of concern, and stated that ACLs would be appropriate and protective of human health and the environment.

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Comment 6: Gross Alpha Issues (continued)

Gross Alpha Issue:

The bedrock ACL submittal (QMC, 2000) had requested that gross alpha be removed from the license as a hazardous constituent, which was carried through in a response to a Request for Additional Information.

Groundwater protection standards for gross alpha may be >20 times more stringent than sum of ACLs for individual alpha emitters.

Can a meaningful ACL for gross alpha be calculated?

- A complete comparison of measured and corrected gross alpha and summed isotope gross alpha for all wells, semi-annual, quarterly, and monthly would be helpful; there is an incomplete comparison in RAML's Groundwater Stability Monitoring Report Second Half 2016.

Response to Comment 6: Gross Alpha Issues

- Gross alpha compliance is complicated by the significant uncertainties in gross alpha measurements for high TDS waters.

- Steps towards addressing the gross alpha issue may include:
  - Evaluation of alternative analytical methods.
  - Addressing existing groundwater protection standards (GWPS) through revision of the GWPS or some other regulatory variance.

Comparison of EPA Approved Methods for Gross Alpha Activity

Location	Uncorrected Gross Alpha	Uncertainty	Uncorrected Gross Alpha & Beta	Uncertainty
EPA Method	900.0 (Evaporation)	900.0 (Evaporation)	600/00-02 (co-precipitation)	600/00-02 (co-precipitation)
31-02 TRB-R	41	33	50	40
36-06 KD	670	100	390	90

Response to Comment 6: Gross Alpha Issues (continued)

Comparison of Gross Alpha Measurements and Combined Alpha Emitter Activities

Station	Date Sampled	Uranium (mg/L)	Gross Alpha (pCi/L)	GA Uncertainty (2 sigma)	Gross Alpha - Corrected (pCi/L)	Ra-226 Activity (pCi/L)	Th-230 Activity (pCi/L)	Combined Ra/Th Activity (pCi/L)	Combined v. Adjusted RPD (Percent)	Total Dissolved Solids (mg/L)
17-01 KD	2/23/2017	0.0001	3.8	3.7	3.8	0.8	-0.08	0.72	-136	1130
19-77 TRB	2/16/2017	0.0102	7.9	11	1.1	0.39	-0.55	-0.16	-268	3340
30-48 KD-R	2/22/2017	0.0005	2.3	12	2.3	2.7	0.22	2.92	24	4260
31-01 TRA-R	2/16/2017	0.0019	3.5	4.8	2.2	0.48	0.1	0.58	-117	1790
31-02 TRB-R	2/16/2017	0.0062	22	30	18	3.5	-0.08	3.42	-136	8250
31-61 ALL	2/17/2017	0.692	320	100	-144	0.2	-0.17	0.03	-200	13600
31-67 TRB	2/20/2017	0.0141	6.3	21	-3.1	2.6	0.22	2.82	-4229	7160
32-45 KD-R	2/15/2017	0.0751	96	16	45.7	1.2	0.04	1.24	-194	1700
32-59 ALL	2/21/2017	0.152	54	23	-48	0.39	-0.43	-0.04	-200	4690
33-01 TRA	2/24/2017	0.0006	2.8	6.3	2.4	0.59	0.02	0.61	-119	2710
36-06 KD	2/15/2017	0.62	600	76	185	17	21	38	-132	6560
5-03 ALL-R	2/21/2017	0.103	43	21	-26	0.23	-0.23	0	-200	4340
5-04 ALL	2/23/2017	0.0005	-10	11	-10	0.71	-0.12	0.59	-225	4960
5-08 ALL-R	2/22/2017	0.0216	5.5	12	-9	0.35	-0.2	0.15	-207	3800
5-73 ALL-R	2/22/2017	1.17	360	60	-424	0.34	-0.04	0.3	-200	5570

RPD: Relative percent difference. (Combined Activity - Corrected Gross Alpha) / ((Combined Activity + Corrected Gross Alpha)/2) * 100

Note that the corrected gross alpha value is based on the measure gross alpha - 670 * [U] to remove the alpha activity contribution from uranium. Due to the significant uncertainties in gross alpha activities due to the high TDS of these sample, this often produces a negative corrected gross alpha. These are interpreted to be the result of inaccuracies in the gross alpha measurements.

Comment 7: Seasonality of Water Levels

Is there information on the seasonality of water levels, which may also influence contaminant concentrations, in the alluvial sediments along the Arroyo del Puerto?

- There are strong inter-annual and intra-annual variations in recharge in semi-arid climates in the southwest, such as at the Ambrosia Lake Site.
- With close proximity to the ponds and tailings of the recharge zones for the sandstone layers, there may also be seasonal and inter-annual fluctuations in the water levels of the wells.

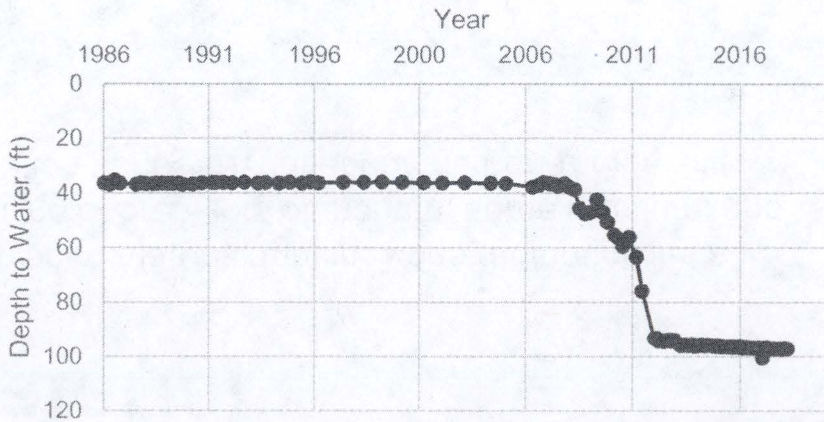
Response to Comment 7: Seasonality of Water Levels

- No significant seasonal variation in water levels is observed, regardless of hydrostratigraphic unit.

- Hydrographs for a well ~30-ft from the Arroyo del Puerto (5-73 ALL) and another well in the TRB nearest the subcrop (31-02 TRB) are presented below.

Depth to Water at 5-73 ALL and 5-73 ALL-R

Depth to Water at 31-02 TRB and 31-02 TRB-R



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Comment 8: Characterization of Evaporation Pond Material

Is there a characterization of the of the evaporation pond material that includes radionuclides and hazardous contaminants? For example, in processing of ores, lots of thorium, some uranium, and not much radium generally make it into the evaporation ponds. What about the non-radioactive metals?

Response to Comment 8: Characterization of Evaporation Pond Material

- The composition of individual ponds is not fully understood, however some information on the qualities of process liquids is available.

- Further investigation will include analysis of tailings core samples and the ongoing historical document review.

- Non-radioactive metals associated with uranium milling are listed in 10 CFR 40 App. A. The groundwater compliance monitoring program has been defined based on the presence of these constituents at the Site.

Comment 9: Total vs Effective Porosity

Total porosity is used for transport, rather than effective porosity. Is there a basis for the assumption that effective porosity equals total porosity?

- How clean are the sandstones; even clean sandstones have effective porosity up to 25% smaller than total porosity
- Hydraulic conductivity and dispersivity may be more variable than effective porosity. But effective porosity can have a significant effect on transport when sorption (e.g., Kd coefficient) is zero or small. It is also conservative to use effective porosity instead of total porosity.

Response to Comment 9: Total vs Effective Porosity

- Both total porosity and effective porosity are needed.

- Total porosity is used in the COPC attenuation calculation, effective porosity is used in calculating seepage velocities.

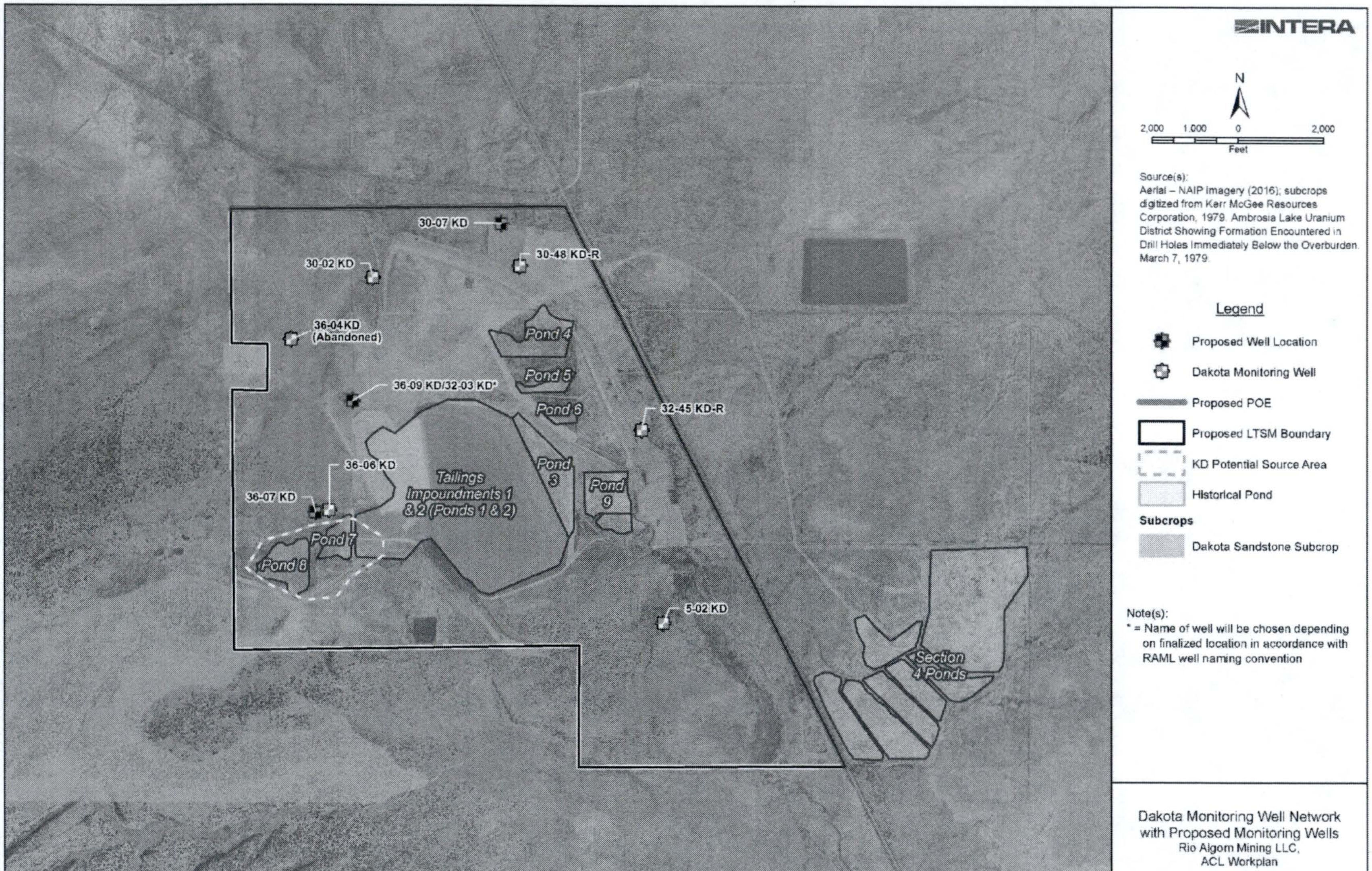
- Representative values for these two parameters will be obtained from site-specific data.

- Total porosity and effective porosity will be measured from laboratory analysis of core samples. Aquifer tests conducted in unconfined aquifers will be analyzed for specific yield, which can be used as a good approximation for effective porosity.

Questions?

BHP

Subcrop Maps - Dakota



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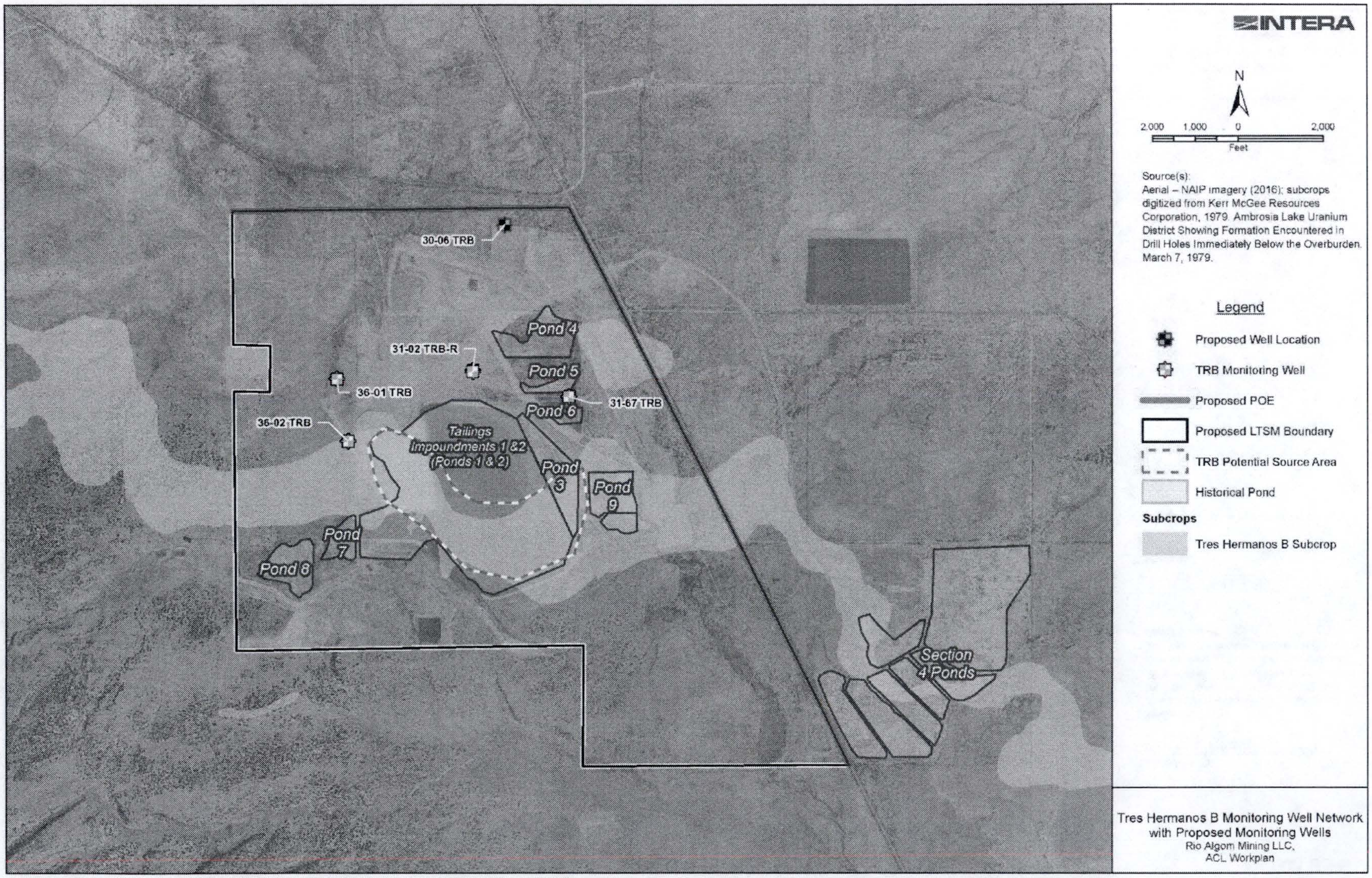
Subcrop Maps – Tres Hermanos A



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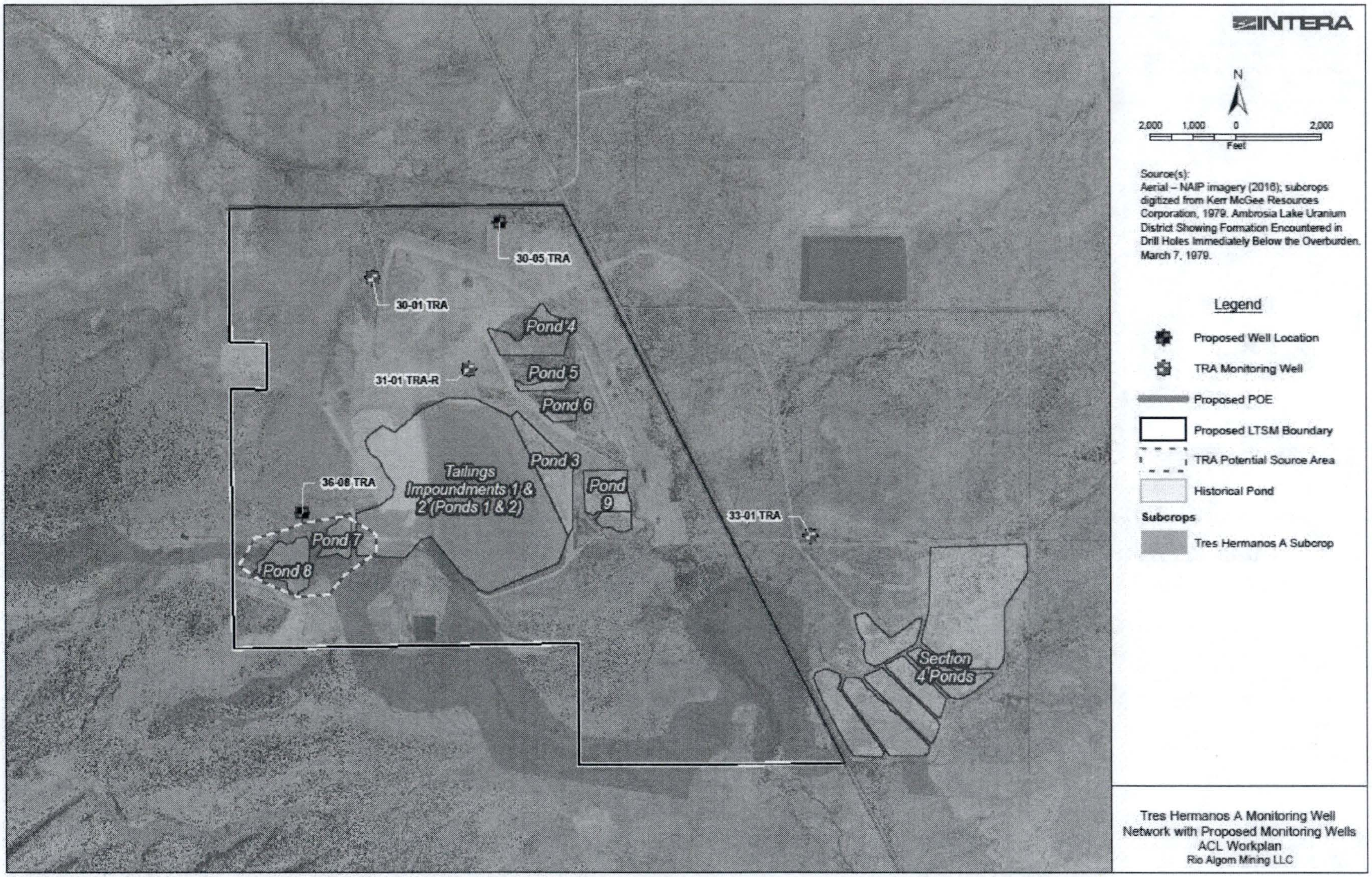
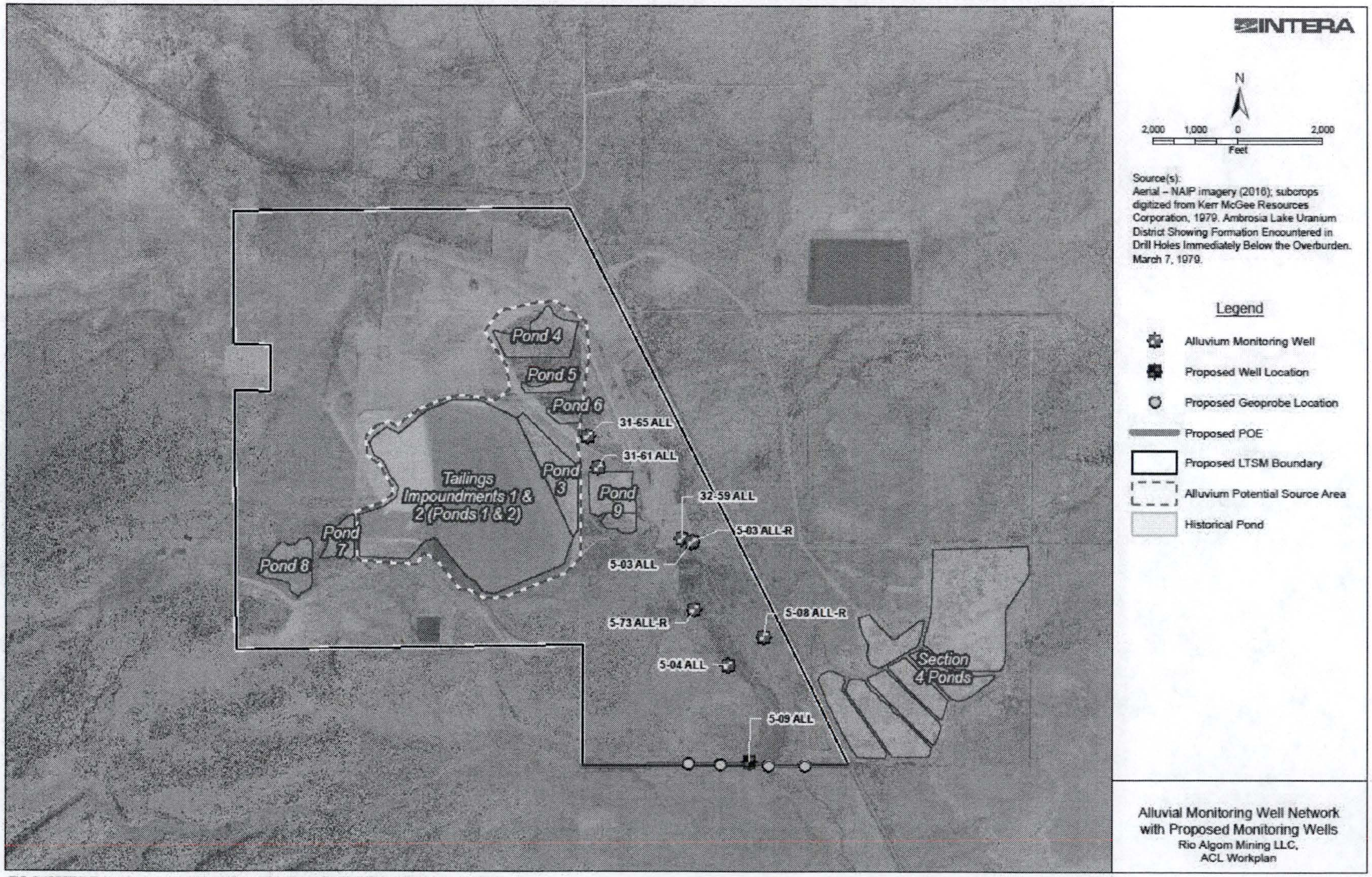
Subcrop Maps – Tres Hermanos B



Subcrop Maps – Alluvium



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