

## Information Request 7

Information Request 7

7-1

## Responses to Information Request 7

Response to Information Request 7a	7-4
Response to Information Request 7b	7-5
Response to Information Request 7c	7-6
Response to Information Request 7d	7-7
Response to Information Request 7e	7-16
Response to Information Request 7f	7-17
Response to Information Request 7g	7-18
Response to Information Request 7h	7-19
Response to Information Request 7i	7-20
Response to Information Request 7j	7-58

## **IR 7 – Geochemistry – Metal Leaching / Acid Rock Drainage Characterization: Water Quality Source Term Development**

### **References:**

EIS Guidelines, Section 2.7.2.1

EIS, Section 2.7.2.1

EIS, Table 2.7.2.1-21 (Component Inputs, Outputs, and Source Terms)

EIS Appendix 2.7.2.1-E (Mine Rock Source Term Inputs to Water Quality Predictions)

EIS Appendix 2.7.2.1-H (Tailings Source Term Inputs to Water Quality Predictions)

EIS Appendix 2.7.2.1-I (Water Quality Prediction Results)

### **Related comments:**

CEAR # 283 (BC Ministry of Mines, Energy and Natural Gas)

CEAR # 290 (Tsilhqot'in National Government)

### **Rationale:**

The BC Ministry of Mines, Energy and Natural Gas (BC MEMNG) and Tsilhqot'in National Government (TNG) have requested additional information on the description of source terms. Specifically:

- a. The EIS states that maximum concentrations from saturated tailings and waste rock columns were used as source terms for saturated PAG waste rock. Thus it is unclear why predicted source term concentrations for a number of variables (including Cl, Cd and Ni) have decreased since the last assessment for the proposed Prosperity Mine. Further explanation on the derivation of these source terms is requested to be able to fully evaluate the water quality predictions.
- b. Source terms for the Non-PAG Tertiary and Quaternary overburden are stated to have used shake flask data; however the methodology of how these data were used to generate source terms has not been included.
- c. Pit wall loadings/water quality source terms are not provided.
- d. Arrhenius corrections (i.e. temperature corrections for chemical reaction rates) using average annual baseline temperatures have been applied to all variables for non-PAG waste rock, unsaturated PAG waste, ore stockpile, plant site, crusher pad and road construction source terms. However, loading rates for most variables in a large pH-neutral dump are unlikely to be controlled by temperature-dependent primary oxidation rates. To fully evaluate the water quality predictions for the project, further explanation and justification of the Arrhenius corrections is needed.
- e. The tailings beach run-off source term was assessed using maximum concentrations in the columns. Further explanation on the development and conservatism of this source term is needed, as the tailings humidity cells were producing higher concentrations.

- f. The tailings beach infiltration source term was set to the maximum concentration of the porphyry analog data base for waste rock seepage or tailings column data. An explanation of how the waste rock seepage data compares to tailings infiltration data is required so as to provide justification for the term used in the water quality modeling.
- g. A source term for residual blasting agents was not previously assessed for the project and has now been included in the EIS using the methods of Ferguson and Leask (1988). The approach appears to be potentially non-conservative as the proposed powder factor of 0.28 seems low compared to other mines and for the rock characteristics anticipated at the New Prosperity site. The assumption of 100% ANFO use also appears to be optimistic. Additional information is required to demonstrate that the source terms developed for nitrogen species from blasting are appropriate and conservative. Information to support assumed leaching and attenuation rates is requested to fully assess whether nitrogen loadings from explosives can be effectively managed and kept below the levels predicted for the downstream receiving environment. Also, the full reference for Matts et al. (2007) is needed.
- h. A mine dust source term was not previously assessed for the project and has now been included in the EIS. It is noted that the soluble load from dust has been normalized to dust particle surface area. Given that this calculation is very sensitive to the fine fraction present, further explanation is needed as to how the surface area of the humidity cell samples was measured and how the proportion of dust in the particulate matter size fractions PM10 and PM2.5 has been determined.
- i. There is no available field scale data for source term derivation and confirmation for this project. Thus comparisons of the drainage predictions for the non-PAG dump and ore stockpile to data from other relevant analog porphyry copper sites in British Columbia are required to confirm the validity and reasonableness of these inputs to the water quality modeling.
- j. Further information is required on whether the loadings from the main tailings embankment dam have been appropriately incorporated into the modeling. Detailed methodology of how the TSF embankment source term was derived is required, including an explanation of how baseline concentrations for non-PAG overburden have been incorporated with non-PAG waste rock loads. Information on the predicted drainage concentrations from the embankment is also needed along with the runoff coefficient applied, to enable a determination of the appropriateness of the predicted loads from the embankment.

**Information Requested:**

The Panel requests that Taseko provide the following information:

- a. Further explain the derivation of source terms for chlorine, cadmium nickel, Non-PAG Tertiary, and Quaternary overburden source terms.
- b. Describe the methodology used to generate source terms for the Non-PAG Tertiary and Quaternary overburden.

- c. Further explain and justify the use of Arrhenius corrections, using average annual baseline temperatures.
- d. Provide pit wall loadings/source terms entered into the model, the rationale for their development, and the estimated concentration of the runoff.
- e. Further explain the development and conservatism of the tailings beach runoff source term.
- f. Explain how the waste rock seepage data compares to tailings infiltration data.
- g. Clearly demonstrate that the source terms developed for nitrogen species from blasting are appropriate and conservative and provide additional information to support assumed leaching and attenuation rates. In addition, provide the full reference for Matts et al. (2007).
- h. Further explain how the surface area of the humidity cell samples was measured and how the proportion of dust in the particulate matter size fractions  $PM_{10}$  and  $PM_{2.5}$  has been determined.
- i. Validate ARD/ML predictions for the proposed non-PAG dump and ore stockpile by comparing drainage predictions for the proposed non-PAG dump and ore stockpile with data from other relevant analog porphyry copper mines sites in British Columbia.
- j. Clearly describe the methodology concerning how the TSF embankment source term was derived; explain how baseline concentrations for non-PAG overburden have been incorporated with non-PAG waste rock loads; and provide information on the predicted drainage concentrations from the embankment, along with the runoff coefficient applied.

**Information Request #7a**

Further explain the derivation of source terms for chlorine, cadmium nickel, Non-PAG Tertiary, and Quaternary overburden source terms.

**Response Summary**

The 95th percentile concentrations from the respective saturated tailings and saturated PAG waste rock columns were adopted for use as initial source terms for chlorine, nickel, and cadmium. The derivation of Non-PAG Tertiary, and Quaternary overburden source terms is discussed in IR 7b.

**Discussion**

With respect to chlorine, cadmium and nickel, there are no discreet source terms for these parameters. In further reviewing the rationale for IR 7a in the Panel's December 10, 2012 letter, it appears that IR 7a is intended to refer specifically to saturated tailings and saturated PAG waste rock. The rationale for IR 7a further references that maximum concentrations were adopted as source term values, and it may be that this understanding is the basis for raising this question.

Upon further review, it is confirmed that 95th percentile concentrations from the respective saturated tailings and saturated PAG waste rock columns were adopted for use as initial source terms, with certain parameters then increased in concentration to correspond with mineral equilibria. For saturated tailings, this is stated on EIS p. 520; however, a contradictory and incorrect statement in the EIS occurs on p. 493, where the text indicates that maximum concentrations for the saturated tailings and PAG waste rock column tests were adopted. The correct statement is that 95th percentile values were used, and this likely explains the discrepancy in chlorine, cadmium and nickel concentrations that were noted by the reviewer.

**Information Request #7b**

Describe the methodology used to generate source terms for the Non-PAG Tertiary and Quaternary overburden.

**Response Summary**

The source term for the Non-PAG Tertiary waste rock was derived from humidity cell test results on a typical Tertiary basalt sample (HC12) and is incorporated into the Non-PAG Stockpile and Main Embankment source terms as described on p. 492 of the application.

The source term applied to Quaternary overburden stockpiles was background runoff chemistry (i.e. the same chemistry applied to undisturbed catchment areas).

**Information Request #7c**

Further explain and justify the use of Arrhenius corrections, using average annual baseline temperatures.

**Response Summary**

Adjusting reaction rates measured in the laboratory to rates expected under site temperature conditions using the well-known Arrhenius equation is a standard practice in ARD/ML predictive work. In the EIS application, the approach of capping sulphate and calcium at concentrations representative of gypsum solubility was described, however no further reductions in loadings were invoked in the estimates of future drainage chemistry.

The panel's rationale that accompanied IR 7c pointed out that loading rates of many parameters are likely controlled by processes other than primary oxidation rates. Taseko agrees with this point, and believes that relying largely on primary oxidation rates to inform the estimation of future loading rates is a conservative approach. The comparisons of equivalent non-PAG seepage chemistry and measured concentrations at other BC porphyry mines that are presented in response to IR 7i provide indication of the conservative nature of the assessment presented in the application.

## Information Request #7d

Provide pit wall loadings/source terms entered into the model, the rationale for their development, and the estimated concentration of the runoff.

### Response Summary

Estimated average concentrations of pit wall runoff were derived by dividing the combined loadings released due to pit wall runoff by the pit wall runoff flows calculated in the water balance under average hydrological conditions. For purposes of this response, equivalent runoff concentrations were calculated for two project years that were representative of key periods in the project's life:

- Project Year 16 (Calendar Year 2028): this year is the modeled end of open pit mining, and represents the maximum extent of pit wall exposure.
- Project Year 58 (Calendar Year 2060): this year occurs shortly after the pit lake reaches the final spill elevation, and represents the post-closure period.

Monthly average concentrations were calculated to illustrate how the water quality model results vary seasonally for the representative years selected. These concentrations are provided in Attachment IR 7d-1.

### Discussion

The source terms for the pit walls were developed as follows:

- Laboratory release rates were developed for each alteration type and modeled parameter under neutral and acidic conditions based on humidity cell results, as shown in Table 7D-1 and Table 7D-2, respectively. Acidic rates were not applied to basalt and overburden materials, which are not expected to generate acid.
- Field release rates were estimated by scaling the laboratory rates using a temperature correction factor of **0.23** and a particle size correction factor of **0.2**.
- The field release rates were distributed monthly using the average monthly distribution of precipitation released derived from the water balance for loadings resulting from runoff on the pit walls. Average annual field release rates were applied for loadings resulting from pit wall flooding.



**Table 7D-1. Neutral Laboratory Release Rates in mg/kg-week**

Parameter	Alteration Type					
	Potassic	Ser-FeCarb	Propylitic	Phyllic	Basalt	Overburden
Chloride	2.38E-01	0.00E+00	2.37E-01	0.00E+00	2.76E-01	2.76E-01
Fluoride	9.44E-03	0.00E+00	2.38E-02	0.00E+00	1.76E-02	1.76E-02
Nitrate_as_N	0	0	0	0	0	0
Nitrogen_NH3_as_N	0	0	0	0	0	0
Sulfate	5.55E+01	4.08E+00	1.39E+01	6.96E+00	8.35E-01	8.35E-01
Aluminum	1.67E-02	2.47E-02	1.99E-02	3.28E-02	1.84E-02	1.84E-02
Antimony	4.13E-04	3.26E-03	2.36E-03	8.14E-03	4.29E-05	4.29E-05
Arsenic	1.73E-04	1.07E-03	3.20E-04	7.32E-04	4.57E-04	4.57E-04
Barium	6.06E-03	3.45E-03	3.41E-03	4.57E-03	2.73E-04	2.73E-04
Beryllium	7.59E-06	2.43E-04	1.68E-04	4.77E-04	4.83E-06	4.83E-06
Boron	1.82E-02	2.18E-03	4.87E-03	2.54E-03	2.17E-02	2.17E-02
Cadmium	4.51E-06	2.43E-05	2.43E-05	4.77E-05	3.50E-06	3.50E-06
Calcium	2.55E+01	2.92E+00	6.00E+00	3.88E+00	3.23E-01	3.23E-01
Chromium	6.38E-05	2.43E-04	1.90E-04	4.77E-04	5.96E-05	5.96E-05
Cobalt	9.84E-06	4.85E-05	1.05E-03	9.53E-05	8.58E-06	8.58E-06
Copper	9.28E-04	2.43E-04	7.52E-04	4.45E-04	3.68E-04	3.68E-04
Iron	2.15E-03	1.46E-02	1.05E-02	1.41E-02	8.16E-03	8.16E-03
Lead	2.49E-05	5.75E-04	3.04E-04	1.71E-04	6.81E-05	6.81E-05
Lithium	2.73E-04	4.85E-04	5.07E-04	9.53E-04	2.39E-04	2.39E-04
Magnesium	9.74E-01	3.20E+00	1.74E+00	2.07E+00	1.94E-01	1.94E-01
Manganese	3.34E-03	2.83E-03	1.13E-01	1.70E-03	2.03E-04	2.03E-04
Mercury	4.75E-06	0	1.10E-05	0	4.89E-06	4.89E-06

Parameter	Alteration Type					
	Potassic	Ser-FeCarb	Propylitic	Phyllic	Basalt	Overburden
Molybdenum	3.14E-04	1.16E-04	1.44E-04	2.17E-04	6.95E-05	6.95E-05
Nickel	8.57E-05	4.85E-05	7.63E-04	9.53E-05	1.16E-04	1.16E-04
Phosphorous	8.01E-03	0	2.92E-02	0	1.58E-02	1.58E-02
Potassium	3.61E-01	4.39E-01	2.66E-01	3.66E-01	1.99E-01	1.99E-01
Selenium	1.40E-04	4.85E-04	4.18E-04	9.53E-04	1.97E-05	1.97E-05
Silver	2.73E-06	4.85E-06	4.51E-06	9.53E-06	2.69E-06	2.69E-06
Sodium	1.78E-01	9.70E-01	7.01E-01	9.41E-01	2.80E-01	2.80E-01
Thallium	5.06E-06	6.55E-05	2.11E-05	4.77E-05	1.11E-06	1.11E-06
Tin	1.60E-05	4.85E-05	4.00E-05	9.53E-05	9.66E-06	9.66E-06
Titanium	2.69E-04	4.85E-03	3.20E-03	4.70E-03	9.33E-04	9.33E-04
Uranium	4.16E-05	0	2.09E-05	0	2.35E-06	2.35E-06
Vanadium	1.35E-04	4.85E-04	4.92E-04	9.53E-04	2.25E-03	2.25E-03
Zinc	3.71E-04	4.85E-04	6.76E-03	1.27E-03	3.71E-04	3.71E-04
Alkalinity	1.08E+01	1.43E+01	8.46E+00	1.07E+01	3.19E+00	3.19E+00

Sources:

1. BSLT\_SourceTerm\_20120328.xlsx
2. Phyllic\_SourceTerm\_20120410.xlsx
3. Potassic\_SourceTerm\_20120410.xlsx
4. Propylitic\_SourceTerm\_20120410.xlsx
5. Ser-FeCarb\_SourceTerm\_20120410.xlsx

**Table 7D-2. Acidic Laboratory Release Rates**

<b>Parameter</b>	<b>Alteration Type</b>			
	<b>Potassic</b>	<b>Ser- FeCarb</b>	<b>Propylitic</b>	<b>Phyllic</b>
<b>Chloride</b>	2.54E-01	0.00E+00	2.52E-01	0.00E+00
<b>Fluoride</b>	2.44E-01	0.00E+00	6.14E-01	0.00E+00
<b>Nitrate_as_N</b>	0	0	0	0
<b>Nitrogen_NH3_as_N</b>	0	0	0	0
<b>Sulfate</b>	6.12E+02	4.50E+01	1.54E+02	7.68E+01
<b>Aluminum</b>	5.29E+01	7.84E+01	6.30E+01	1.04E+02
<b>Antimony</b>	7.36E-04	5.81E-03	4.21E-03	1.45E-02
<b>Arsenic</b>	6.45E-02	3.97E-01	1.19E-01	2.73E-01
<b>Barium</b>	4.97E-02	2.83E-02	2.80E-02	3.75E-02
<b>Beryllium</b>	5.10E-04	1.63E-02	1.13E-02	3.20E-02
<b>Boron</b>	2.15E+00	2.58E-01	5.77E-01	3.01E-01
<b>Cadmium</b>	2.61E-03	1.41E-02	5.81E-02	2.76E-02
<b>Calcium</b>	2.90E+01	3.33E+00	6.83E+00	4.42E+00
<b>Chromium</b>	5.07E-03	1.93E-02	1.51E-02	3.79E-02
<b>Cobalt</b>	8.99E-04	4.43E-03	9.63E-02	8.71E-03
<b>Copper</b>	1.36E-01	3.56E-02	1.10E-01	6.53E-02
<b>Iron</b>	9.39E+01	6.36E+02	4.58E+02	6.16E+02
<b>Lead</b>	7.44E-03	1.72E-01	9.08E-02	5.11E-02
<b>Lithium</b>	8.57E-03	1.52E-02	1.59E-02	2.99E-02
<b>Magnesium</b>	2.02E+00	6.65E+00	3.61E+00	4.30E+00
<b>Manganese</b>	4.14E-02	3.51E-02	1.40E+00	2.10E-02

Parameter	Alteration Type			
	Potassic	Ser-FeCarb	Propylitic	Phyllic
Mercury	2.96E-05	0	6.87E-05	0
Molybdenum	3.74E-03	1.38E-03	1.72E-03	2.57E-03
Nickel	8.63E-03	4.89E-03	7.69E-02	9.61E-03
Phosphorous	1.10E+00	0	4.00E+00	0
Potassium	3.00E-01	3.65E-01	2.21E-01	3.04E-01
Selenium	1.37E-03	4.77E-03	4.11E-03	9.37E-03
Silver	3.08E-05	5.46E-05	5.08E-05	1.07E-04
Sodium	2.06E-01	1.12E+00	8.13E-01	1.09E+00
Thallium	1.06E-05	1.37E-04	4.41E-05	9.96E-05
Tin	1.03E-04	3.11E-04	2.56E-04	6.12E-04
Titanium	4.01E-03	7.23E-02	4.78E-02	7.01E-02
Uranium	1.23E-02	0	6.14E-03	0
Vanadium	2.78E-02	1.00E-01	1.02E-01	1.97E-01
Zinc	1.76E-01	2.31E-01	3.22E+00	6.03E-01
Alkalinity	0.00E+00	0.00E+00	0.00E+00	0.00E+00

- Sources:
1. Phyllic\_SourceTerm\_20120410.xlsx
  2. Potassic\_SourceTerm\_20120410.xlsx
  3. Propylitic\_SourceTerm\_20120410.xlsx
  4. Ser-FeCarb\_SourceTerm\_20120410.xlsx

The loadings released from the pit walls were calculated by multiplying the field release rates by the mass of each alteration type. The mass of rock was determined for each pit bench elevation based on the mine plans. The applicable mass was either the mass above the base of the pit during pit development, the mass flooded plus the mass above the water elevation during pit filling or the mass above the water elevation after the pit filling phase was completed.

The pit wall loadings were divided into the following four components:

1. **Loadings from exposed pit walls during pit development.** The potential loadings that could be released from the exposed pit walls were calculated by multiplying the field release rates under neutral conditions by the mass of rock above the base of the pit (based on the bench elevation at that time). 50% of the potential loading was assumed to be released, while the other 50% was assumed to be stored and released during the pit filling phase.
2. **Loadings from exposed pit walls during pit filling under neutral conditions.** The loadings from the exposed pit walls above the water elevation were calculated in the same manner as noted above for the pit development phase, however, the mass of exposed rock was estimated based on the water elevation in the pit (from the water balance) rather than the bench elevation.
3. **Loadings from exposed pit walls during pit filling under acidic conditions.** The loadings from the exposed pit walls above the water elevation were calculated as noted above for pit filling under neutral conditions, with the exception that acidic rates were applied to the portion of rock that was estimated to be acid-generation PAG (see Table 7D-3). It was conservatively assumed that acidic conditions were applicable at **47 years** from the start of the model in 2010 (i.e. in 2057).
4. **Loadings released from walls during pit flooding.** The loadings released from the flooded pit walls were assumed to be 50% of the field release rates multiplied by the incremental mass of rock flooded (where the increment was based on the model time step) and length of time the wall was exposed. The length of time a wall was exposed was based on the difference between the elapsed model time and the first time the bench was exposed.
  - For walls exposed less than 47 years, neutral field rates were applied to all rock masses.
  - For walls exposed longer than 47 years, neutral field rates were applied for the timeframe before the onset of acidic conditions. For the period between the onset of acidic conditions and the time the wall was flooded, acidic release rates were applied to the portion of PAG rock assumed to be acid-generating, while neutral rates were applied to the remainder of the rock.

The percentage of PAG rock for each alteration type is shown in Table 7D-3. It was assumed that acidic field release rates were applicable to **3%** of the PAG rock and that PAG rock in the exposed pit walls above the final flood elevation is present in the same proportions as the overall proportions shown in Table 7D-3.

**Table 7D-3. Percentage PAG for Each Alteration Type**

<b>Alteration Type</b>	<b>Percent PAG</b>
Potassic	59%
SerFeCarb	44%
Propyllic	84%
Phyllic	87%
Basalt	0%
Overburden	0%

Source: NewProsperity\_Pit Model\_20120501\_Rev00.xlsx

Estimated average concentrations of pit wall runoff were derived specifically to respond to request IR 7d by dividing the combined loadings released due to pit wall runoff by the pit wall runoff flows calculated in the water balance under average hydrological conditions. Due to the structure of the water quality model, the model outputs did not include direct estimates of pit wall runoff concentrations. For purposes of this response, equivalent runoff concentrations were calculated for two project years that were representative of key periods in the project's life:

- Project Year 16 (Calendar Year 2028): this year is the modelled end of open pit mining, and represents the maximum extent of pit wall exposure.
- Project Year 58 (Calendar Year 2060): this year occurs shortly after the pit lake reaches the final spill elevation, and represents the post-closure period.

Monthly average concentrations were calculated to illustrate how the water quality model results vary seasonal for the representative years selected. These concentrations are provided in Attachment IR 7d-1.

**Average Monthly Conc**

Year	Month	[Manganese] [mg/L]	[Mercury] [mg/L]	[Molybdenum] [mg/L]	[Nickel] [mg/L]	[Phosphorus] [mg/L]	[Potassium] [mg/L]	[Selenium] [mg/L]	[Silver] [mg/L]	[Sodium] [mg/L]	[Thallium] [mg/L]	[Tin] [mg/L]	[Titanium] [mg/L]	[Uranium] [mg/L]	[Vanadium] [mg/L]	[Zinc] [mg/L]	[Alkalinity] [mg/L]	
2028	Jan	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	
	Feb	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	
	Mar	0.90	0.00014	0.0046	0.0071	0.34	7.1	0.0072	0.000092	11	0.00040	0.00074	0.046	0.00052	0.014	0.059	208	
	Apr	0.89	0.00014	0.0045	0.0070	0.33	7.0	0.0071	0.000091	11	0.00040	0.00073	0.046	0.00051	0.014	0.058	205	
	May	0.88	0.00014	0.0045	0.0070	0.33	6.9	0.0070	0.000091	11	0.00040	0.00073	0.046	0.00051	0.014	0.058	204	
	Jun	0.88	0.00014	0.0045	0.0070	0.33	6.9	0.0070	0.000091	11	0.00039	0.00073	0.045	0.00051	0.014	0.058	204	
	Jul	0.87	0.00013	0.0045	0.0070	0.33	6.9	0.0070	0.000090	11	0.00039	0.00072	0.045	0.00050	0.014	0.058	202	
	Aug	0.87	0.00013	0.0045	0.0069	0.32	6.8	0.0069	0.000090	11	0.00039	0.00072	0.045	0.00050	0.014	0.057	201	
	Sep	0.87	0.00013	0.0044	0.0069	0.32	6.8	0.0069	0.000090	11	0.00039	0.00072	0.045	0.00050	0.014	0.057	201	
	Oct	0.86	0.00013	0.0044	0.0068	0.32	6.7	0.0069	0.000089	11	0.00038	0.00071	0.044	0.00050	0.013	0.057	199	
	Nov	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff
	Dec	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff
2060	Jan	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	
	Feb	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	
	Mar	0.39	0.000080	0.0020	0.0088	0.51	3.3	0.0034	0.000059	5.7	0.00014	0.00038	0.029	0.00083	0.036	0.26	77	
	Apr	0.39	0.000079	0.0020	0.0087	0.50	3.3	0.0034	0.000058	5.7	0.00014	0.00037	0.028	0.00083	0.036	0.26	77	
	May	0.39	0.000079	0.0020	0.0087	0.50	3.3	0.0034	0.000058	5.7	0.00014	0.00038	0.028	0.00083	0.036	0.26	77	
	Jun	0.39	0.000079	0.0020	0.0087	0.50	3.3	0.0034	0.000058	5.7	0.00014	0.00038	0.028	0.00083	0.036	0.26	77	
	Jul	0.39	0.000079	0.0020	0.0087	0.50	3.3	0.0034	0.000058	5.7	0.00014	0.00038	0.028	0.00083	0.036	0.26	77	
	Aug	0.39	0.000079	0.0020	0.0087	0.50	3.3	0.0034	0.000058	5.7	0.00014	0.00038	0.028	0.00083	0.036	0.26	77	
	Sep	0.39	0.000079	0.0020	0.0087	0.50	3.3	0.0034	0.000058	5.7	0.00014	0.00038	0.029	0.00083	0.036	0.26	77	
	Oct	0.39	0.000079	0.0019	0.0087	0.50	3.3	0.0034	0.000058	5.7	0.00014	0.00037	0.028	0.00083	0.036	0.26	77	
	Nov	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff
	Dec	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff

Source: Q:\1CT013.L

**Average Monthly Concentrations (Average Pit Wall Load/Average Pit Wall Runoff)**

Year	Month	[Chloride] [mg/L]	[Fluoride] [mg/L]	[Sulfate] [mg/L]	[Aluminum] [mg/L]	[Antimony] [mg/L]	[Arsenic] [mg/L]	[Barium] [mg/L]	[Beryllium] [mg/L]	[Boron] [mg/L]	[Cadmium] [mg/L]	[Calcium] [mg/L]	[Chromium] [mg/L]	[Cobalt] [mg/L]	[Copper] [mg/L]	[Iron] [mg/L]	[Lead] [mg/L]	[Lithium] [mg/L]	[Magnesium] [mg/L]	
2028	Jan	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	
	Feb	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	
	Mar	4.6	0.31	599	0.45	0.044	0.0083	0.093	0.0027	0.26	0.00037	275	0.0035	0.0084	0.016	0.17	0.0039	0.0096	31	
	Apr	4.5	0.31	591	0.44	0.043	0.0082	0.092	0.0027	0.26	0.00037	271	0.0035	0.0083	0.016	0.17	0.0038	0.0095	31	
	May	4.5	0.31	589	0.44	0.043	0.0081	0.091	0.0027	0.26	0.00036	270	0.0035	0.0083	0.016	0.17	0.0038	0.0094	30	
	Jun	4.5	0.30	587	0.44	0.043	0.0081	0.091	0.0027	0.26	0.00036	269	0.0035	0.0083	0.016	0.17	0.0038	0.0094	30	
	Jul	4.5	0.30	584	0.44	0.043	0.0081	0.090	0.0027	0.25	0.00036	268	0.0034	0.0082	0.016	0.17	0.0038	0.0093	30	
	Aug	4.5	0.30	581	0.44	0.042	0.0080	0.090	0.0026	0.25	0.00036	266	0.0034	0.0082	0.015	0.17	0.0038	0.0093	30	
	Sep	4.5	0.30	580	0.44	0.042	0.0080	0.090	0.0026	0.25	0.00036	266	0.0034	0.0081	0.015	0.17	0.0038	0.0093	30	
	Oct	4.4	0.30	573	0.43	0.042	0.0079	0.089	0.0026	0.25	0.00035	263	0.0034	0.0081	0.015	0.16	0.0037	0.0092	30	
	Nov	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff
	Dec	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff
2060	Jan	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	
	Feb	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	
	Mar	3.2	0.26	156	9.6	0.019	0.025	0.030	0.0031	0.32	0.0051	59	0.0043	0.0096	0.020	56	0.0097	0.0073	11	
	Apr	3.2	0.26	154	9.5	0.019	0.025	0.030	0.0031	0.32	0.0050	59	0.0042	0.0095	0.020	55	0.0096	0.0073	11	
	May	3.2	0.26	154	9.5	0.019	0.025	0.030	0.0031	0.32	0.0050	59	0.0042	0.0095	0.020	55	0.0096	0.0073	11	
	Jun	3.2	0.26	155	9.5	0.019	0.025	0.030	0.0031	0.32	0.0050	59	0.0042	0.0095	0.020	55	0.0096	0.0073	11	
	Jul	3.2	0.26	155	9.5	0.019	0.025	0.030	0.0031	0.32	0.0050	59	0.0042	0.0095	0.020	55	0.0096	0.0073	11	
	Aug	3.2	0.26	155	9.5	0.019	0.025	0.030	0.0031	0.32	0.0050	59	0.0042	0.0095	0.020	55	0.0096	0.0073	11	
	Sep	3.2	0.26	155	9.6	0.019	0.025	0.030	0.0031	0.32	0.0051	59	0.0042	0.0095	0.020	55	0.0097	0.0073	11	
	Oct	3.2	0.26	154	9.5	0.019	0.025	0.030	0.0031	0.32	0.0050	59	0.0042	0.0095	0.020	55	0.0096	0.0072	11	
	Nov	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff
	Dec	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff	no runoff

Source: Q:\1CT013.001\_Revise\_MLARD\_Characterization\20121210\_CEEA\_AdequacyReview\Adequacy\_IR-response\7d\_PitWallConcs\IR7d\_WallRunoffConcentrations\_1CT013-001\_dbm\_rev00.xlsx



**Information Request #7e**

The tailings beach run-off source term was assessed using maximum concentrations in the columns. Further explanation on the development and conservatism of this source term is needed, as the tailings humidity cells were producing higher concentrations. Further explain the development and conservatism of the tailings beach runoff source term.

**Response Summary**

In weighing the options for inputs to the tailings beach runoff source term, the results of the tailings humidity cell tests were considered along with the unsaturated column tests. The unsaturated columns were selected in the end to serve as the inputs to the source term as the results were judged to be the best available information. Primarily, tailings humidity cells are operated to maximize oxidation rates, including a procedural step whereby the tailings being tested are stirred on a weekly basis to minimize the development of regions of low oxygen content within the sample. As the tailings beaches are expected to be short lived (i.e. covered regularly with fresh tailings), utilizing the unsaturated column results to develop the beach runoff source term was judged to be the most appropriate approach.

It should be noted that the tailings beach is expected to be exposed to runoff only during the operational period (a time during which the TSF pond chemistry will be dominated by milling activities regardless of how other sources are managed). During the closure and post-closure periods, a soil cover placed on the beaches will eliminate direct beach runoff as a source of load to the TSF pond.

**Information Request #7f**

The tailings beach infiltration source term was set to the maximum concentration of the porphyry analog data base for waste rock seepage or tailings column data. An explanation of how the waste rock seepage data compares to tailings infiltration data is required so as to provide justification for the term used in the water quality modeling. Explain how the waste rock seepage data compares to tailings infiltration data.

**Response Summary**

The tailings and PAG waste rock will be disposed in the same facility, and drainage from these two products is expected to follow the same transport pathways. Because of the uncertainty in distinctly defining the fate of PAG porewater separately from tailings porewater, the selected approach identified the most conservative (i.e. highest) inputs to developing a combined tailings + saturated PAG porewater source term. It was Taseko's intention that this be a conservative measure to ensure project effects are adequately considered. It was not intended to explicitly draw an analogy between the geochemical behaviour of New Prosperity tailings and the geochemical behaviour of waste rock at other BC mines.

**Information Request #7g**

Clearly demonstrate that the source terms developed for nitrogen species from blasting are appropriate and conservative and provide additional information to support assumed leaching and attenuation rates. In addition, provide the full reference for Matts et al. (2007).

**Response Summary**

The powder factor, leaching rate and attenuation rate used in the development of source terms for nitrogen species from blasting are all considered conservative for the reasons detailed below.

**Discussion**

The relationships between explosives use and nutrient leaching rates presented in Ferguson and Leask (1988) were empirical relationships developed from operational monitoring of coal mines and comparison with records of explosives use. While the Ferguson and Leask (1988) relationships remain a common approach to estimating blast losses for mines in Canada, it is nevertheless the case that the New Prosperity project and its crystalline host rocks are not directly comparable and would be less susceptible to leaching than the sedimentary rocks at the coal mines that informed the Ferguson and Leask (1988) work. The use of this relationship is therefore considered conservative.

The powder factor of 0.28 kg/tonne used as an input to the water quality prediction is higher than the predicted powder factor 0.23 kg/tonne to be used at the mine. See powder factor calculation in response to IR 25f. The use of this powder factor is therefore considered conservative.

The assumption of 100% ANFO use was adopted in consideration of the high level of dewatering effort that is planned; this assumption was considered reasonable for modeling purposes given the stage of the project. Ferguson and Leask (1988) provided a recommendation for mines that use a combination of ANFO and up to 20% slurry for blasting that suggested estimating 0.1% loss of ANFO-N and 8.5% loss of slurry-N. If Taseko were to use up to 20% slurry, and the Ferguson and Leask (1988) estimation method was validated by operational performance, the nitrogen losses would be lower than the losses allowed for in the application. Therefore the use of ANFO alone in the calculation of nitrogen source terms is considered conservative.

Attenuation rates are assumed to be zero. This is considered conservative.

Full reference for Matts et al. (2007):

Matts, T., Brown, A. and Koren, D. 2007. Diavik Diamond Mine Ammonia Management Plan Review Panel Report. Prepared for the Wek'èezhìi Land and Water Board by the WLWB Ammonia Management Plan Expert Panel, February 9 2007.

**Information Request #7h**

Further explain how the surface area of the humidity cell samples was measured and how the proportion of dust in the particulate matter size fractions PM10 and PM2.5 has been determined.

**Response Summary**

Surface area for the ore humidity cell sample (tested in HC10 and HC11) was estimated from results of sieve analysis on the feed sample. The method for estimating surface area is summarized in the following bullets.

- Sieve apertures of 9.5, 6.35, 2, 0.425, 0.15, and 0.053 mm were employed, and all material retained on a given sieve was assumed to have particle diameters equal to the aperture. For material passing the 0.053 mm aperture sieve, a representative diameter of one-half the aperture (i.e. 0.0265 mm) was assumed.
- The surface area, volume and mass of the representative particle for each size fraction was calculated assuming spherical particle shape and adopting a value of 2.7 t/ m<sup>3</sup> for particle density.
- Using the mass retained on each sieve from the sieve analysis, along with the representative particle mass, the number of particles in each sieve class was estimated.
- Surface area in each fraction was estimated by multiplying the number of particles in each sieve class by the surface area of the representative particle for each sieve class.
- The total surface area for the sieve analysis sample was divided by the mass of the same sample to yield an estimate of specific surface area for the feed sample.

The specific surface area estimated for the ore sample described above was adopted for the ore component of the dust, and was adopted for application to Tertiary basalt material as well.

The proportion of dust in the PM10 and PM2.5 fractions that was used in the mine dust source term was determined as part of the dust modeling exercise which followed a procedure outlined in a widely-used guidance document distributed by the U.S. EPA known as the AP42.

<http://www.epa.gov/ttn/chief/ap42/ch11/index.html>

The AP42 supplies emission factors for various mining processes such as blasting, truck loading, crushing, etc. Relevant sections include 11.19.2 Crushed Stone Processing and Pulverized Mineral Processing and 13.2.2 Unpaved Roads. The size proportions (TSP, PM10, PM2.5) vary among the processes and corresponding emission factors. The total proportion of each size category is the weighted average of the proportions from all the different emission sources.

**Information Request #7i**

Validate ARD/ML predictions for the proposed non-PAG dump and ore stockpile by comparing drainage predictions for the proposed non-PAG dump and ore stockpile with data from other relevant analog porphyry copper mines sites in British Columbia.

**Response Summary**

Due to the stochastic nature of the drainage predictions and the variation over the different phases of mine life, it is challenging to summarize concentrations in a useful way. In response to this information request, the accompanying data summary (Attachment IR 7i-1) was prepared which tabulates the maximum and minimum concentration for each of the mean, 5th percentile and 95th percentile statistical categories for each of the 6 project phases. These values were then compared to previously-compiled near-neutral (>pH 6) seepage chemistry data for calc-alkalic and alkalic porphyry deposits in British Columbia, Canada. Comparisons are reflected in Attachment IR 7i-1 through the use of shading within the tables.

**References**

Day, S. and Reese, B. 2006. Geochemical Controls On Waste-Rock Dump Seepage Chemistry At Several Porphyry Mines In The Canadian Cordillera. Paper presented at the 7th International Conference on Acid Rock Drainage (ICARD), March 26-30, 2006, St. Louis MO. R.I. Barnhisel (ed.) Published by the American Society of Mining and Reclamation (ASMR), 3134 Montavesta Road, Lexington, KY 40502

Facility	Period	5th Percentile		Mean		95th Percentile	
		[Chloride]:5%		[Chloride]:Mean		[Chloride]:95%	
		Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Non-PAG Stockpile	Construction	1.6	5.4	3.1	12	3.7	44
Non-PAG Stockpile	Operations 1	2.3	34	4.8	1086	6.0	7364
Non-PAG Stockpile	Operations 2	15	50	53	2333	76	4461
Non-PAG Stockpile	Closure 1	19	50	68	2013	98	4363
Non-PAG Stockpile	Closure 2	17	51	71	3312	98	11170
Non-PAG Stockpile	Post-Closure	16	53	69	2932	98	9889
Ore Stockpile	Construction	1.3	5.3	1.6	8.9	1.6	26
Ore Stockpile	Operations 1	2.5	125	3.1	3871	3.7	29573
Ore Stockpile	Operations 2	0.8	121	0.8	3067	0.8	6769
Ore Stockpile	Closure 1	0.8	4.7	0.8	4.7	0.8	4.7
Ore Stockpile	Closure 2	0.8	4.7	0.8	4.7	0.8	4.7
Ore Stockpile	Post-Closure	0.8	4.7	0.8	4.7	0.8	4.7

Source: Q:\1CT013.001\_Revise\_MLARD\_Characterization\20121210\_CEEA\_AdequacyReview\Adequacy\_IR-response\IR\_7i\_table\_1CT013-001\_dbm\_rev00.xlsx

**Notes:**

1. 95th Percentile Porphyry Database\* Dissolved Concentration 6.52 mg/L
2. 50th Percentile Porphyry Database\* Dissolved Concentration 3 mg/L
3. Green shading indicates concentration exceeds 95th percentile porphyry database value
4. Grey shading indicates concentration exceeds 50th percentile porphyry database value

\*Day and Reese (2006)

Facility	Period	5th Percentile		Mean		95th Percentile	
		[Fluoride]:5%		[Fluoride]:Mean		[Fluoride]:95%	
		Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Non-PAG Stockpile	Construction	0.12	0.23	0.18	0.8	0.23	3.1
Non-PAG Stockpile	Operations 1	0.16	2.4	0.31	76	0.39	513
Non-PAG Stockpile	Operations 2	1.1	3.5	3.7	163	5.3	311
Non-PAG Stockpile	Closure 1	1.4	3.5	4.8	140	6.8	304
Non-PAG Stockpile	Closure 2	1.2	3.6	4.9	231	6.8	779
Non-PAG Stockpile	Post-Closure	1.1	3.7	4.8	204	6.8	690
Ore Stockpile	Construction	0.080	0.14	0.080	0.36	0.080	1.2
Ore Stockpile	Operations 1	0.12	5.7	0.15	178	0.17	1358
Ore Stockpile	Operations 2	0.050	5.6	0.050	141	0.050	311
Ore Stockpile	Closure 1	0.050	0.10	0.050	0.10	0.050	0.10
Ore Stockpile	Closure 2	0.050	0.10	0.050	0.10	0.050	0.10
Ore Stockpile	Post-Closure	0.050	0.10	0.050	0.10	0.050	0.10

Source: Q:\1CT013.001\_Revise\_MLARD\_Characterization\20121210\_CAAA\_AdequacyReview\Adequacy\_IR-response\IR\_7i\_table\_1CT013-001\_dbm\_rev00.xlsx

**Notes:**

1. 95th Percentile Porphyry Database\* Dissolved Concentration 0.904 mg/L
2. 50th Percentile Porphyry Database\* Dissolved Concentration 0.28 mg/L
3. Green shading indicates concentration exceeds 95th percentile porphyry database value
4. Grey shading indicates concentration exceeds 50th percentile porphyry database value

\*Day and Reese (2006)



Facility	Period	5th Percentile		Mean		95th Percentile	
		[Nitrate_as_N]:5%		[Nitrate_as_N]:Mean		[Nitrate_as_N]:95%	
		Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Non-PAG Stockpile	Construction	0.6	1.5	2.1	8	2.8	33
Non-PAG Stockpile	Operations 1	0.4	2	2.1	75	2.8	506
Non-PAG Stockpile	Operations 2	1	3	3	136	5	259
Non-PAG Stockpile	Closure 1	1	3	4	104	5	225
Non-PAG Stockpile	Closure 2	0	3	0	76	0	195
Non-PAG Stockpile	Post-Closure	0	0	0	0	0	0
Ore Stockpile	Construction	0.0	3.2	0.0	19.7	0.0	78
Ore Stockpile	Operations 1	1.1	6	4.9	190	6.7	1455
Ore Stockpile	Operations 2	0.0	6	0.0	9	0.0	13
Ore Stockpile	Closure 1	0.0	0.0	0.0	0.0	0.0	0.0
Ore Stockpile	Closure 2	0.0	0.0	0.0	0.0	0.0	0.0
Ore Stockpile	Post-Closure	0.0	0.0	0.0	0.0	0.0	0.0

Source: Q:\1CT013.001\_Revise\_MLARD\_Characterization\20121210\_CEEA\_AdequacyReview\Adequacy\_IR-response\IR\_7i\_table\_1CT013-001\_dbm\_rev00.xlsx]

**Notes:**

1. 95th Percentile Porphyry Database\* Dissolved Concentration not available mg/L
2. 50th Percentile Porphyry Database\* Dissolved Concentration not available mg/L
3. Green shading indicates concentration exceeds 95th percentile porphyry database value
4. Grey shading indicates concentration exceeds 50th percentile porphyry database value

\*Day and Reese (2006)

Facility	Period	5th Percentile		Mean		95th Percentile	
		[Nitrogen_NH3_as_N]:5%		[Nitrogen_NH3_as_N]:Mean		[Nitrogen_NH3_as_N]:95%	
		Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Non-PAG Stockpile	Construction	0.7	1.5	2.1	8	2.8	33
Non-PAG Stockpile	Operations 1	0.5	2	2.1	75	2.8	506
Non-PAG Stockpile	Operations 2	1	3	3	136	5	259
Non-PAG Stockpile	Closure 1	1	3	4	104	5	225
Non-PAG Stockpile	Closure 2	0	3	0	76	0	195
Non-PAG Stockpile	Post-Closure	0	0	0	0	0	0
Ore Stockpile	Construction	0.0	3.3	0.0	19.7	0.0	78
Ore Stockpile	Operations 1	1.1	6	5.0	190	6.7	1455
Ore Stockpile	Operations 2	0.0	6	0.0	9	0.0	13
Ore Stockpile	Closure 1	0.0	0.1	0.0	0.1	0.0	0.1
Ore Stockpile	Closure 2	0.0	0.1	0.0	0.1	0.0	0.1
Ore Stockpile	Post-Closure	0.0	0.1	0.0	0.1	0.0	0.1

Source: Q:\1CT013.001\_Revise\_MLARD\_Characterization\20121210\_CEEA\_AdequacyReview\Adequacy\_IR-response\IR\_7i\_table\_1CT013-001\_dbm\_rev00.xlsx

**Notes:**

1. 95th Percentile Porphyry Database\* Dissolved Concentration not available mg/L
2. 50th Percentile Porphyry Database\* Dissolved Concentration not available mg/L
3. Green shading indicates concentration exceeds 95th percentile porphyry database value
4. Grey shading indicates concentration exceeds 50th percentile porphyry database value

\*Day and Reese (2006)

Facility	Period	5th Percentile		Mean		95th Percentile	
		[Sulfate]:5%		[Sulfate]:Mean		[Sulfate]:95%	
		Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Non-PAG Stockpile	Construction	38.4	83.5	38.4	83	38.4	83
Non-PAG Stockpile	Operations 1	83.5	1263	83.5	1263	83.5	1263
Non-PAG Stockpile	Operations 2	1263	1775	1263	1775	1263	1775
Non-PAG Stockpile	Closure 1	1775	1800	1775	1800	1775	1800
Non-PAG Stockpile	Closure 2	1800	1800	1800	1800	1800	1800
Non-PAG Stockpile	Post-Closure	1800	1800	1800	1800	1800	1800
Ore Stockpile	Construction	1.2	59.9	1.2	59.9	1.2	60
Ore Stockpile	Operations 1	59.9	1800	59.9	1800	59.9	1800
Ore Stockpile	Operations 2	1.0	1800	1.0	1800	1.0	1800
Ore Stockpile	Closure 1	1.0	2.0	1.0	2.0	1.0	2.0
Ore Stockpile	Closure 2	1.0	2.0	1.0	2.0	1.0	2.0
Ore Stockpile	Post-Closure	1.0	2.0	1.0	2.0	1.0	2.0

Source: Q:\1CT013.001\_Revise\_MLARD\_Characterization\20121210\_CEEA\_AdequacyReview\Adequacy\_IR-response\IR\_7i\_table\_1CT013-001\_dbm\_rev00.xlsx

**Notes:**

1. 95th Percentile Porphyry Database\* Dissolved Concentration 1530.6 mg/L
2. 50th Percentile Porphyry Database\* Dissolved Concentration 464 mg/L
3. Green shading indicates concentration exceeds 95th percentile porphyry database value
4. Grey shading indicates concentration exceeds 50th percentile porphyry database value

\*Day and Reese (2006)

Facility	Period	5th Percentile		Mean		95th Percentile	
		[Aluminum]:5%		[Aluminum]:Mean		[Aluminum]:95%	
		Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Non-PAG Stockpile	Construction	0.095	0.27	0.19	0.90	0.23	3.4
Non-PAG Stockpile	Operations 1	0.17	2.7	0.32	85	0.42	574
Non-PAG Stockpile	Operations 2	1.2	3.9	4.1	182	5.9	348
Non-PAG Stockpile	Closure 1	1.5	3.9	5.3	157	7.6	340
Non-PAG Stockpile	Closure 2	1.4	4.0	5.5	258	7.6	871
Non-PAG Stockpile	Post-Closure	1.2	4.1	5.4	229	7.6	771
Ore Stockpile	Construction	0.064	0.22	0.068	0.46	0.068	1.7
Ore Stockpile	Operations 1	0.13	8.1	0.166	251	0.20	1919
Ore Stockpile	Operations 2	0.022	7.9	0.0	199	0.022	439
Ore Stockpile	Closure 1	0.022	0.18	0.022	0.18	0.022	0.18
Ore Stockpile	Closure 2	0.022	0.18	0.022	0.18	0.022	0.18
Ore Stockpile	Post-Closure	0.022	0.18	0.022	0.18	0.022	0.18

Source: Q:\1CT013.001\_Revise\_MLARD\_Characterization\20121210\_CEEA\_AdequacyReview\Adequacy\_IR-response\IR\_7i\_table\_1CT013-001\_dbm\_rev00.xlsx

**Notes:**

1. 95th Percentile Porphyry Database\* Dissolved Concentration 0.169 mg/L
2. 50th Percentile Porphyry Database\* Dissolved Concentration 0.0225 mg/L
3. Green shading indicates concentration exceeds 95th percentile porphyry database value
4. Grey shading indicates concentration exceeds 50th percentile porphyry database value

\*Day and Reese (2006)

Facility	Period	5th Percentile		Mean		95th Percentile	
		[Antimony]:5%		[Antimony]:Mean		[Antimony]:95%	
		Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Non-PAG Stockpile	Construction	0.0045	0.012	0.0087	0.061	0.012	0.24
Non-PAG Stockpile	Operations 1	0.0086	0.19	0.019	6.1	0.026	41
Non-PAG Stockpile	Operations 2	0.085	0.28	0.30	13	0.43	25
Non-PAG Stockpile	Closure 1	0.11	0.28	0.38	11	0.55	25
Non-PAG Stockpile	Closure 2	0.098	0.29	0.40	19	0.55	63
Non-PAG Stockpile	Post-Closure	0.089	0.30	0.39	16	0.55	56
Ore Stockpile	Construction	0.000073	0.0045	0.000073	0.027	0.000073	0.11
Ore Stockpile	Operations 1	0.0045	0.53	0.0068	16	0.009169	125
Ore Stockpile	Operations 2	0.000050	0.51	0.000050	13	0.000050	29
Ore Stockpile	Closure 1	0.000050	0.000075	0.000050	0.000075	0.000050	0.000075
Ore Stockpile	Closure 2	0.000050	0.000075	0.000050	0.000075	0.000050	0.000075
Ore Stockpile	Post-Closure	0.000050	0.000075	0.000050	0.000075	0.000050	0.000075

Source: Q:\1CT013.001\_Revise\_MLARD\_Characterization\20121210\_CEAA\_AdequacyReview\Adequacy\_IR-response\IR\_7i\_table\_1CT013-001\_dbm\_rev00.xlsx

**Notes:**

1. 95th Percentile Porphyry Database\* Dissolved Concentration 0.07515 mg/L
2. 50th Percentile Porphyry Database\* Dissolved Concentration 0.01 mg/L
3. Green shading indicates concentration exceeds 95th percentile porphyry database value
4. Grey shading indicates concentration exceeds 50th percentile porphyry database value

\*Day and Reese (2006)

Facility	Period	5th Percentile		Mean		95th Percentile	
		[Arsenic]:5%		[Arsenic]:Mean		[Arsenic]:95%	
		Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Non-PAG Stockpile	Construction	0.0012	0.0034	0.0024	0.017	0.0033	0.068
Non-PAG Stockpile	Operations 1	0.0024	0.053	0.0052	1.7	0.0071	12
Non-PAG Stockpile	Operations 2	0.024	0.079	0.082	3.7	0.12	7.0
Non-PAG Stockpile	Closure 1	0.030	0.079	0.11	3.2	0.15	6.8
Non-PAG Stockpile	Closure 2	0.027	0.081	0.11	5.2	0.15	17
Non-PAG Stockpile	Post-Closure	0.025	0.083	0.11	4.6	0.15	15
Ore Stockpile	Construction	0.00000	0.0025	0.00000	0.0052	0.00000	0.019
Ore Stockpile	Operations 1	0.00078	0.094	0.0012	2.9	0.0016	22
Ore Stockpile	Operations 2	0.00000	0.092	0.00000	2.3	0.00000	5.1
Ore Stockpile	Closure 1	0.00000	0.00200	0.00000	0.0020	0.00000	0.0020
Ore Stockpile	Closure 2	0.00000	0.00200	0.00000	0.0020	0.00000	0.0020
Ore Stockpile	Post-Closure	0.00000	0.00200	0.00000	0.0020	0.00000	0.0020

Source: Q:\1CT013.001\_Revise\_MLARD\_Characterization\20121210\_CEEA\_AdequacyReview\Adequacy\_IR-response\IR\_7i\_table\_1CT013-001\_dbm\_rev00.xlsx

**Notes:**

1. 95th Percentile Porphyry Database\* Dissolved Concentration 0.0297 mg/L
2. 50th Percentile Porphyry Database\* Dissolved Concentration 0.0062 mg/L
3. Green shading indicates concentration exceeds 95th percentile porphyry database value
4. Grey shading indicates concentration exceeds 50th percentile porphyry database value

\*Day and Reese (2006)

Facility	Period	5th Percentile		Mean		95th Percentile	
		[Barium]:5%		[Barium]:Mean		[Barium]:95%	
		Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Non-PAG Stockpile	Construction	0.014	0.033	0.024	0.15	0.032	0.58
Non-PAG Stockpile	Operations 1	0.024	0.45	0.048	14	0.064	98
Non-PAG Stockpile	Operations 2	0.20	0.67	0.70	31	1.0	59
Non-PAG Stockpile	Closure 1	0.26	0.67	0.91	27	1.3	58
Non-PAG Stockpile	Closure 2	0.23	0.69	0.94	44	1.3	149
Non-PAG Stockpile	Post-Closure	0.21	0.71	0.93	39	1.3	132
Ore Stockpile	Construction	0.0040	0.018	0.0040	0.083	0.0040	0.32
Ore Stockpile	Operations 1	0.017	1.6	0.024	48	0.031	370
Ore Stockpile	Operations 2	0.0040	1.5	0.0040	38	0.0040	85
Ore Stockpile	Closure 1	0.0040	0.010	0.0040	0.010	0.0040	0.010
Ore Stockpile	Closure 2	0.0040	0.010	0.0040	0.010	0.0040	0.0100
Ore Stockpile	Post-Closure	0.0040	0.010	0.0040	0.010	0.0040	0.0100

Source: Q:\1CT013.001\_Revise\_MLARD\_Characterization\20121210\_CAAA\_AdequacyReview\Adequacy\_IR-response\IR\_7i\_table\_1CT013-001\_dbm\_rev00.xlsx

**Notes:**

1. 95th Percentile Porphyry Database\* Dissolved Concentration 0.07564 mg/L
2. 50th Percentile Porphyry Database\* Dissolved Concentration 0.023 mg/L
3. Green shading indicates concentration exceeds 95th percentile porphyry database value
4. Grey shading indicates concentration exceeds 50th percentile porphyry database value

\*Day and Reese (2006)

Facility	Period	5th Percentile		Mean		95th Percentile	
		[Beryllium]:5%		[Beryllium]:Mean		[Beryllium]:95%	
		Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Non-PAG Stockpile	Construction	0.0022	0.0032	0.0025	0.0057	0.0027	0.017
Non-PAG Stockpile	Operations 1	0.0024	0.013	0.0030	0.39	0.0034	2.6
Non-PAG Stockpile	Operations 2	0.0055	0.018	0.019	0.83	0.028	1.6
Non-PAG Stockpile	Closure 1	0.0069	0.018	0.024	0.72	0.035	1.6
Non-PAG Stockpile	Closure 2	0.0062	0.018	0.025	1.2	0.035	4.0
Non-PAG Stockpile	Post-Closure	0.0056	0.019	0.025	1.0	0.035	3.5
Ore Stockpile	Construction	0.0019	0.0029	0.0019	0.0030	0.0019	0.0032
Ore Stockpile	Operations 1	0.0015	0.0038	0.0019	0.12	0.0019	0.91
Ore Stockpile	Operations 2	0.00037	0.0037	0.0011	0.095	0.0016	0.21
Ore Stockpile	Closure 1	0.0020	0.0030	0.0020	0.0030	0.0020	0.0030
Ore Stockpile	Closure 2	0.0020	0.0030	0.0020	0.0030	0.0020	0.0030
Ore Stockpile	Post-Closure	0.0020	0.0030	0.0020	0.0030	0.0020	0.0030

Source: Q:\1CT013.001\_Revise\_MLARD\_Characterization\20121210\_CEEA\_AdequacyReview\Adequacy\_IR-response\IR\_7i\_table\_1CT013-001\_dbm\_rev00.xlsx

**Notes:**

1. 95th Percentile Porphyry Database\* Dissolved Concentration 0.003 mg/L
2. 50th Percentile Porphyry Database\* Dissolved Concentration 0.00005 mg/L
3. Green shading indicates concentration exceeds 95th percentile porphyry database value
4. Grey shading indicates concentration exceeds 50th percentile porphyry database value

\*Day and Reese (2006)



Facility	Period	5th Percentile		Mean		95th Percentile	
		[Boron]:5%		[Boron]:Mean		[Boron]:95%	
		Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Non-PAG Stockpile	Construction	0.077	3.4	0.23	3.7	0.40	4
Non-PAG Stockpile	Operations 1	0.12	3.5	0.39	61	0.78	411
Non-PAG Stockpile	Operations 2	0.8	2.9	3.8	130	5.1	249
Non-PAG Stockpile	Closure 1	1.1	2.9	3.8	112	5.5	244
Non-PAG Stockpile	Closure 2	1.0	2.9	3.9	185	5.5	624
Non-PAG Stockpile	Post-Closure	0.9	3.0	3.9	164	5.5	552
Ore Stockpile	Construction	0.073	3.5	0.18	3.7	0.31	4
Ore Stockpile	Operations 1	0.21	10	0.701	310	1.4	2367
Ore Stockpile	Operations 2	0.029	10	0.029	246	0.029	542
Ore Stockpile	Closure 1	0.029	3.6	0.029	3.6	0.029	3.6
Ore Stockpile	Closure 2	0.029	3.6	0.029	3.6	0.029	3.6
Ore Stockpile	Post-Closure	0.029	3.6	0.029	3.6	0.029	3.6

Source: Q:\1CT013.001\_Revise\_MLARD\_Characterization\20121210\_CEEA\_AdequacyReview\Adequacy\_IR-response\IR\_7i\_table\_1CT013-001\_dbm\_rev00.xlsx

**Notes:**

1. 95th Percentile Porphyry Database\* Dissolved Concentration 0.413 mg/L
2. 50th Percentile Porphyry Database\* Dissolved Concentration 0.07 mg/L
3. Green shading indicates concentration exceeds 95th percentile porphyry database value
4. Grey shading indicates concentration exceeds 50th percentile porphyry database value

\*Day and Reese (2006)

Facility	Period	5th Percentile		Mean		95th Percentile	
		[Cadmium]:5%		[Cadmium]:Mean		[Cadmium]:95%	
		Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Non-PAG Stockpile	Construction	0.00019	0.00036	0.00028	0.0015	0.00035	0.0057
Non-PAG Stockpile	Operations 1	0.00028	0.0044	0.00050	0.14	0.00066	0.95
Non-PAG Stockpile	Operations 2	0.0020	0.0065	0.0068	0.30	0.0098	0.58
Non-PAG Stockpile	Closure 1	0.0025	0.0065	0.0089	0.26	0.013	0.57
Non-PAG Stockpile	Closure 2	0.0023	0.0067	0.0092	0.43	0.013	1.4
Non-PAG Stockpile	Post-Closure	0.0020	0.0069	0.0090	0.38	0.013	1.3
Ore Stockpile	Construction	0.000079	0.00013	0.000079	0.00031	0.000079	0.0010
Ore Stockpile	Operations 1	0.00011	0.0043	0.00013	0.13	0.00015	1.0
Ore Stockpile	Operations 2	0.000067	0.0042	0.000067	0.11	0.000067	0.23
Ore Stockpile	Closure 1	0.000067	0.00011	0.000067	0.00011	0.000067	0.00011
Ore Stockpile	Closure 2	0.000067	0.00011	0.000067	0.00011	0.000067	0.00011
Ore Stockpile	Post-Closure	0.000067	0.00011	0.000067	0.00011	0.000067	0.00011

Source: Q:\1CT013.001\_Revise\_MLARD\_Characterization\20121210\_CEEA\_AdequacyReview\Adequacy\_IR-response\IR\_7i\_table\_1CT013-001\_dbm\_rev00.xlsx

**Notes:**

1. 95th Percentile Porphyry Database\* Dissolved Concentration 0.0065 mg/L
2. 50th Percentile Porphyry Database\* Dissolved Concentration 0.00014 mg/L
3. Green shading indicates concentration exceeds 95th percentile porphyry database value
4. Grey shading indicates concentration exceeds 50th percentile porphyry database value

\*Day and Reese (2006)

Facility	Period	5th Percentile		Mean		95th Percentile	
		[Calcium]:5%		[Calcium]:Mean		[Calcium]:95%	
		Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Non-PAG Stockpile	Construction	33	59	33	59	33	59
Non-PAG Stockpile	Operations 1	50	497	50	497	50	497
Non-PAG Stockpile	Operations 2	497	691	497	691	497	691
Non-PAG Stockpile	Closure 1	691	700	691	700	691	700
Non-PAG Stockpile	Closure 2	700	700	700	700	700	700
Non-PAG Stockpile	Post-Closure	700	700	700	700	700	700
Ore Stockpile	Construction	19	45	19	45	19	45
Ore Stockpile	Operations 1	41	700	41	700	41	700
Ore Stockpile	Operations 2	13	700	13	700	13	700
Ore Stockpile	Closure 1	13	39	13	39	13	39
Ore Stockpile	Closure 2	13	39	13	39	13	39
Ore Stockpile	Post-Closure	13	39	13	39	13	39

Source: Q:\1CT013.001\_Revise\_MLARD\_Characterization\20121210\_CAAA\_AdequacyReview\Adequacy\_IR-response\IR\_7i\_table\_1CT013-001\_dbm\_rev00.xlsx

**Notes:**

1. 95th Percentile Porphyry Database\* Dissolved Concentration 727 mg/L
2. 50th Percentile Porphyry Database\* Dissolved Concentration 247 mg/L
3. Green shading indicates concentration exceeds 95th percentile porphyry database value
4. Grey shading indicates concentration exceeds 50th percentile porphyry database value

\*Day and Reese (2006)

Facility	Period	5th Percentile		Mean		95th Percentile	
		[Chromium]:5%		[Chromium]:Mean		[Chromium]:95%	
		Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Non-PAG Stockpile	Construction	0.00095	0.0018	0.0013	0.0062	0.0016	0.023
Non-PAG Stockpile	Operations 1	0.0013	0.018	0.0022	0.56	0.0028	3.8
Non-PAG Stockpile	Operations 2	0.0079	0.026	0.027	1.2	0.039	2.3
Non-PAG Stockpile	Closure 1	0.010	0.026	0.035	1.0	0.051	2.3
Non-PAG Stockpile	Closure 2	0.0090	0.027	0.037	1.7	0.051	5.8
Non-PAG Stockpile	Post-Closure	0.0081	0.027	0.036	1.5	0.051	5.1
Ore Stockpile	Construction	0.00051	0.0016	0.00051	0.0025	0.00051	0.0069
Ore Stockpile	Operations 1	0.00074	0.032	0.00088	0.98	0.0010	7.5
Ore Stockpile	Operations 2	0.00051	0.031	0.00051	0.78	0.00051	1.7
Ore Stockpile	Closure 1	0.00051	0.0014	0.00051	0.0014	0.00051	0.0014
Ore Stockpile	Closure 2	0.00051	0.0014	0.00051	0.0014	0.00051	0.0014
Ore Stockpile	Post-Closure	0.00051	0.0014	0.00051	0.0014	0.00051	0.0014

Source: Q:\1CT013.001\_Revise\_MLARD\_Characterization\20121210\_CEEA\_AdequacyReview\Adequacy\_IR-response\IR\_7i\_table\_1CT013-001\_dbm\_rev00.xlsx

**Notes:**

1. 95th Percentile Porphyry Database\* Dissolved Concentration 0.00233 mg/L
2. 50th Percentile Porphyry Database\* Dissolved Concentration 0.0002 mg/L
3. Green shading indicates concentration exceeds 95th percentile porphyry database value
4. Grey shading indicates concentration exceeds 50th percentile porphyry database value

\*Day and Reese (2006)

Facility	Period	5th Percentile		Mean		95th Percentile	
		[Cobalt]:5%		[Cobalt]:Mean		[Cobalt]:95%	
		Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Non-PAG Stockpile	Construction	0.0013	0.0039	0.0022	0.013	0.0029	0.050
Non-PAG Stockpile	Operations 1	0.0022	0.039	0.0043	1.2	0.0056	8.4
Non-PAG Stockpile	Operations 2	0.017	0.057	0.060	2.7	0.086	5.1
Non-PAG Stockpile	Closure 1	0.022	0.057	0.078	2.3	0.11	5.0
Non-PAG Stockpile	Closure 2	0.020	0.059	0.080	3.8	0.11	13
Non-PAG Stockpile	Post-Closure	0.018	0.060	0.079	3.3	0.11	11
Ore Stockpile	Construction	0.00040	0.0029	0.00049	0.0031	0.00051	0.0036
Ore Stockpile	Operations 1	0.00048	0.0057	0.00055	0.18	0.00058	1.3
Ore Stockpile	Operations 2	0.00038	0.0055	0.00038	0.14	0.00038	0.31
Ore Stockpile	Closure 1	0.00038	0.0029	0.00038	0.0029	0.00038	0.0029
Ore Stockpile	Closure 2	0.00038	0.0029	0.00038	0.0029	0.00038	0.0029
Ore Stockpile	Post-Closure	0.00038	0.0029	0.00038	0.0029	0.00038	0.0029

Source: Q:\1CT013.001\_Revise\_MLARD\_Characterization\20121210\_CEEA\_AdequacyReview\Adequacy\_IR-response\IR\_7i\_table\_1CT013-001\_dbm\_rev00.xlsx

**Notes:**

1. 95th Percentile Porphyry Database\* Dissolved Concentration 0.3336 mg/L
2. 50th Percentile Porphyry Database\* Dissolved Concentration 0.0078 mg/L
3. Green shading indicates concentration exceeds 95th percentile porphyry database value
4. Grey shading indicates concentration exceeds 50th percentile porphyry database value

\*Day and Reese (2006)

Facility	Period	5th Percentile		Mean		95th Percentile	
		[Copper]:5%		[Copper]:Mean		[Copper]:95%	
		Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Non-PAG Stockpile	Construction	0.0029	0.0067	0.0051	0.029	0.0066	0.11
Non-PAG Stockpile	Operations 1	0.0048	0.087	0.0096	2.8	0.013	19
Non-PAG Stockpile	Operations 2	0.039	0.13	0.13	5.9	0.19	11
Non-PAG Stockpile	Closure 1	0.049	0.13	0.17	5.1	0.25	11
Non-PAG Stockpile	Closure 2	0.044	0.13	0.18	8.4	0.25	28
Non-PAG Stockpile	Post-Closure	0.040	0.13	0.18	7.5	0.25	25
Ore Stockpile	Construction	0.0012	0.0073	0.0012	0.035	0.00120	0.13
Ore Stockpile	Operations 1	0.0066	0.66	0.0095	21	0.01255	157
Ore Stockpile	Operations 2	0.00076	0.64	0.00076	16	0.00076	36
Ore Stockpile	Closure 1	0.00076	0.0037	0.00076	0.0037	0.00076	0.0037
Ore Stockpile	Closure 2	0.00076	0.0037	0.00076	0.0037	0.00076	0.0037
Ore Stockpile	Post-Closure	0.00076	0.0037	0.00076	0.0037	0.00076	0.0037

Source: Q:\1CT013.001\_Revise\_MLARD\_Characterization\20121210\_CAAA\_AdequacyReview\Adequacy\_IR-response\IR\_7i\_table\_1CT013-001\_dbm\_rev00.xlsx

**Notes:**

1. 95th Percentile Porphyry Database\* Dissolved Concentration 0.1434 mg/L
2. 50th Percentile Porphyry Database\* Dissolved Concentration 0.02 mg/L
3. Green shading indicates concentration exceeds 95th percentile porphyry database value
4. Grey shading indicates concentration exceeds 50th percentile porphyry database value

\*Day and Reese (2006)

Facility	Period	5th Percentile		Mean		95th Percentile	
		[Iron]:5%		[Iron]:Mean		[Iron]:95%	
		Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Non-PAG Stockpile	Construction	0.32	5.32	0.39	5.5	0.41	5.9
Non-PAG Stockpile	Operations 1	0.33	5.33	0.43	33	0.47	226
Non-PAG Stockpile	Operations 2	0.48	2.34	1.7	72	2.4	137
Non-PAG Stockpile	Closure 1	0.60	1.55	2.1	62	3.0	134
Non-PAG Stockpile	Closure 2	0.53	1.58	2.2	101	3.0	342
Non-PAG Stockpile	Post-Closure	0.48	1.62	2.1	90	3.0	303
Ore Stockpile	Construction	0.30	5.5	0.31	5.5	0.34	5.6
Ore Stockpile	Operations 1	0.30	5.3	0.35	29	0.35	223
Ore Stockpile	Operations 2	0.09	5.6	0.27	23	0.30	51
Ore Stockpile	Closure 1	0.30	5.6	0.30	5.6	0.30	5.6
Ore Stockpile	Closure 2	0.30	5.6	0.30	5.6	0.30	5.6
Ore Stockpile	Post-Closure	0.30	5.6	0.30	5.6	0.30	5.6

Source: Q:\1CT013.001\_Revise\_MLARD\_Characterization\20121210\_CEEA\_AdequacyReview\Adequacy\_IR-response\IR\_7i\_table\_1CT013-001\_dbm\_rev00.xlsx

**Notes:**

1. 95th Percentile Porphyry Database\* Dissolved Concentration 0.20 mg/L
2. 50th Percentile Porphyry Database\* Dissolved Concentration 0.04 mg/L
3. Green shading indicates concentration exceeds 95th percentile porphyry database value
4. Grey shading indicates concentration exceeds 50th percentile porphyry database value

\*Day and Reese (2006)

Facility	Period	5th Percentile		Mean		95th Percentile	
		[Lead]:5%		[Lead]:Mean		[Lead]:95%	
		Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Non-PAG Stockpile	Construction	0.00088	0.0017	0.0013	0.0072	0.0017	0.027
Non-PAG Stockpile	Operations 1	0.0013	0.021	0.0024	0.68	0.0031	4.6
Non-PAG Stockpile	Operations 2	0.0095	0.031	0.033	1.5	0.047	2.8
Non-PAG Stockpile	Closure 1	0.012	0.031	0.043	1.3	0.061	2.7
Non-PAG Stockpile	Closure 2	0.011	0.032	0.044	2.1	0.061	7.0
Non-PAG Stockpile	Post-Closure	0.0098	0.033	0.043	1.8	0.061	6.2
Ore Stockpile	Construction	0.00035	0.00070	0.00035	0.0011	0.00035	0.0030
Ore Stockpile	Operations 1	0.00044	0.013	0.00049	0.40	0.00055	3.0
Ore Stockpile	Operations 2	0.00031	0.012	0.00031	0.31	0.00031	0.69
Ore Stockpile	Closure 1	0.00031	0.00065	0.00031	0.00065	0.00031	0.00065
Ore Stockpile	Closure 2	0.00031	0.00065	0.00031	0.00065	0.00031	0.00065
Ore Stockpile	Post-Closure	0.00031	0.00065	0.00031	0.00065	0.00031	0.00065

Source: Q:\1CT013.001\_Revise\_MLARD\_Characterization\20121210\_CEEA\_AdequacyReview\Adequacy\_IR-response\IR\_7i\_table\_1CT013-001\_dbm\_rev00.xlsx

**Notes:**

1. 95th Percentile Porphyry Database\* Dissolved Concentration 0.00361 mg/L
2. 50th Percentile Porphyry Database\* Dissolved Concentration 0.00007 mg/L
3. Green shading indicates concentration exceeds 95th percentile porphyry database value
4. Grey shading indicates concentration exceeds 50th percentile porphyry database value

\*Day and Reese (2006)



Facility	Period	5th Percentile		Mean		95th Percentile	
		[Lithium]:5%		[Lithium]:Mean		[Lithium]:95%	
		Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Non-PAG Stockpile	Construction	0.0023	0.081	0.0032	0.087	0.0041	0.108
Non-PAG Stockpile	Operations 1	0.0036	0.082	0.0058	1.6	0.0076	11
Non-PAG Stockpile	Operations 2	0.023	0.075	0.079	3.5	0.11	6.7
Non-PAG Stockpile	Closure 1	0.029	0.075	0.10	3.0	0.15	6.5
Non-PAG Stockpile	Closure 2	0.026	0.077	0.11	5.0	0.15	17
Non-PAG Stockpile	Post-Closure	0.024	0.079	0.10	4.4	0.15	15
Ore Stockpile	Construction	0.0009	0.082	0.0009	0.085	0.0009	0.093
Ore Stockpile	Operations 1	0.0019	0.13	0.0025	4.1	0.0031	31
Ore Stockpile	Operations 2	0.00090	0.13	0.00090	3.2	0.00090	7.2
Ore Stockpile	Closure 1	0.00090	0.085	0.00090	0.085	0.00090	0.085
Ore Stockpile	Closure 2	0.00090	0.085	0.00090	0.085	0.00090	0.085
Ore Stockpile	Post-Closure	0.00090	0.085	0.00090	0.085	0.00090	0.085

Source: Q:\1CT013.001\_Revise\_MLARD\_Characterization\20121210\_CAAA\_AdequacyReview\Adequacy\_IR-response\IR\_7i\_table\_1CT013-001\_dbm\_rev00.xlsx

**Notes:**

1. 95th Percentile Porphyry Database\* Dissolved Concentration 0.076 mg/L
2. 50th Percentile Porphyry Database\* Dissolved Concentration 0.0021 mg/L
3. Green shading indicates concentration exceeds 95th percentile porphyry database value
4. Grey shading indicates concentration exceeds 50th percentile porphyry database value

\*Day and Reese (2006)

Facility	Period	5th Percentile		Mean		95th Percentile	
		[Magnesium]:5%		[Magnesium]:Mean		[Magnesium]:95%	
		Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Non-PAG Stockpile	Construction	15	33	22	62	24	210
Non-PAG Stockpile	Operations 1	17	159	29	4964	35	33632
Non-PAG Stockpile	Operations 2	70	230	245	10654	350	20371
Non-PAG Stockpile	Closure 1	89	230	312	9194	448	19922
Non-PAG Stockpile	Closure 2	80	235	323	15123	447	51009
Non-PAG Stockpile	Post-Closure	72	242	317	13390	447	45159
Ore Stockpile	Construction	15	34	15	59	15	188
Ore Stockpile	Operations 1	21	867	25	26950	29	205903
Ore Stockpile	Operations 2	10	843	10	21356	10	47131
Ore Stockpile	Closure 1	10	30	10	30	10	30
Ore Stockpile	Closure 2	10	30	10	30	10	30
Ore Stockpile	Post-Closure	10	30	10	30	10	30

Source: Q:\1CT013.001\_Revise\_MLARD\_Characterization\20121210\_CEEA\_AdequacyReview\Adequacy\_IR-response\IR\_7i\_table\_1CT013-001\_dbm\_rev00.xlsx

**Notes:**

1. 95th Percentile Porphyry Database\* Dissolved Concentration 100.58 mg/L
2. 50th Percentile Porphyry Database\* Dissolved Concentration 24.1 mg/L
3. Green shading indicates concentration exceeds 95th percentile porphyry database value
4. Grey shading indicates concentration exceeds 50th percentile porphyry database value

\*Day and Reese (2006)

Facility	Period	5th Percentile		Mean		95th Percentile	
		[Manganese]:5%		[Manganese]:Mean		[Manganese]:95%	
		Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Non-PAG Stockpile	Construction	0.17	3.3	0.25	4.0	0.33	5.7
Non-PAG Stockpile	Operations 1	0.24	4.1	0.47	132	0.61	895
Non-PAG Stockpile	Operations 2	1.8	6.1	6.4	283	9.2	542
Non-PAG Stockpile	Closure 1	2.4	6.1	8.3	245	12	530
Non-PAG Stockpile	Closure 2	2.1	6.3	8.6	402	12	1357
Non-PAG Stockpile	Post-Closure	1.9	6.4	8.4	356	12	1202
Ore Stockpile	Construction	0.051	3.4	0.068	3.4	0.068	3.6
Ore Stockpile	Operations 1	0.074	3.3	0.086	53	0.093	405
Ore Stockpile	Operations 2	0.042	3.4	0.042	42	0.042	93
Ore Stockpile	Closure 1	0.042	3.4	0.042	3.4	0.042	3.4
Ore Stockpile	Closure 2	0.042	3.4	0.042	3.4	0.042	3.4
Ore Stockpile	Post-Closure	0.042	3.4	0.042	3.4	0.042	3.4

Source: Q:\1CT013.001\_Revise\_MLARD\_Characterization\20121210\_CEEA\_AdequacyReview\Adequacy\_IR-response\IR\_7i\_table\_1CT013-001\_dbm\_rev00.xlsx

**Notes:**

1. 95th Percentile Porphyry Database\* Dissolved Concentration 4.496 mg/L
2. 50th Percentile Porphyry Database\* Dissolved Concentration 0.71 mg/L
3. Green shading indicates concentration exceeds 95th percentile porphyry database value
4. Grey shading indicates concentration exceeds 50th percentile porphyry database value

\*Day and Reese (2006)

Facility	Period	5th Percentile		Mean		95th Percentile	
		[Mercury]:5%		[Mercury]:Mean		[Mercury]:95%	
		Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Non-PAG Stockpile	Construction	0.000023	0.000063	0.000044	0.00031	0.000061	0.0012
Non-PAG Stockpile	Operations 1	0.000043	0.00097	0.000096	0.031	0.00013	0.21
Non-PAG Stockpile	Operations 2	0.00043	0.0014	0.0015	0.067	0.0022	0.13
Non-PAG Stockpile	Closure 1	0.00056	0.0014	0.0020	0.058	0.0028	0.13
Non-PAG Stockpile	Closure 2	0.00050	0.0015	0.0020	0.095	0.0028	0.32
Non-PAG Stockpile	Post-Closure	0.00045	0.0015	0.0020	0.084	0.0028	0.28
Ore Stockpile	Construction	0.000000	0.000022	0.000000	0.00013	0.000000	0.00053
Ore Stockpile	Operations 1	0.000022	0.0026	0.000033	0.081	0.000045	0.62
Ore Stockpile	Operations 2	0.000000	0.0025	0.000000	0.064	0.000000	0.14
Ore Stockpile	Closure 1	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Ore Stockpile	Closure 2	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Ore Stockpile	Post-Closure	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

Source: Q:\1CT013.001\_Revise\_MLARD\_Characterization\20121210\_CEAA\_AdequacyReview\Adequacy\_IR-response\IR\_7i\_table\_1CT013-001\_dbm\_rev00.xlsx

**Notes:**

1. 95th Percentile Porphyry Database\* Dissolved Concentration 0.0004325 mg/L
2. 50th Percentile Porphyry Database\* Dissolved Concentration 0.00005 mg/L
3. Green shading indicates concentration exceeds 95th percentile porphyry database value
4. Grey shading indicates concentration exceeds 50th percentile porphyry database value

\*Day and Reese (2006)

Facility	Period	5th Percentile		Mean		95th Percentile	
		[Molybdenum]:5%		[Molybdenum]:Mean		[Molybdenum]:95%	
		Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Non-PAG Stockpile	Construction	0.001	0.002	0.0020	0.0080	0.0024	0.031
Non-PAG Stockpile	Operations 1	0.001	0.024	0.0032	0.76	0.0041	5.2
Non-PAG Stockpile	Operations 2	0.011	0.035	0.037	1.6	0.054	3.1
Non-PAG Stockpile	Closure 1	0.014	0.035	0.048	1.4	0.069	3.1
Non-PAG Stockpile	Closure 2	0.012	0.036	0.050	2.3	0.069	7.9
Non-PAG Stockpile	Post-Closure	0.011	0.037	0.049	2.1	0.069	7.0
Ore Stockpile	Construction	0.001	0.031	0.001	0.19	0.0010	0.736
Ore Stockpile	Operations 1	0.031	3.6	0.047	113	0.064	866
Ore Stockpile	Operations 2	0.00042	3.5	0.000	90	0.00042	198
Ore Stockpile	Closure 1	0.00042	0.0013	0.00042	0.0013	0.00042	0.0013
Ore Stockpile	Closure 2	0.00042	0.0013	0.00042	0.0013	0.00042	0.0013
Ore Stockpile	Post-Closure	0.00042	0.0013	0.00042	0.0013	0.00042	0.0013

Source: Q:\1CT013.001\_Revise\_MLARD\_Characterization\20121210\_CEEA\_AdequacyReview\Adequacy\_IR-response\IR\_7i\_table\_1CT013-001\_dbm\_rev00.xlsx

**Notes:**

1. 95th Percentile Porphyry Database\* Dissolved Concentration 0.33 mg/L
2. 50th Percentile Porphyry Database\* Dissolved Concentration 0.03155 mg/L
3. Green shading indicates concentration exceeds 95th percentile porphyry database value
4. Grey shading indicates concentration exceeds 50th percentile porphyry database value

\*Day and Reese (2006)

Facility	Period	5th Percentile		Mean		95th Percentile	
		[Nickel]:5%		[Nickel]:Mean		[Nickel]:95%	
		Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Non-PAG Stockpile	Construction	0.0035	0.0066	0.0045	0.015	0.0051	0.049
Non-PAG Stockpile	Operations 1	0.0046	0.037	0.0063	1.2	0.0075	7.9
Non-PAG Stockpile	Operations 2	0.016	0.054	0.057	2.5	0.082	4.8
Non-PAG Stockpile	Closure 1	0.021	0.054	0.073	2.1	0.10	4.7
Non-PAG Stockpile	Closure 2	0.019	0.055	0.075	3.5	0.10	12
Non-PAG Stockpile	Post-Closure	0.017	0.057	0.074	3.1	0.10	11
Ore Stockpile	Construction	0.0029	0.0061	0.0030	0.0078	0.0030	0.015
Ore Stockpile	Operations 1	0.0033	0.057	0.0035	1.8	0.0038	14
Ore Stockpile	Operations 2	0.0026	0.056	0.0026	1.4	0.0026	3.1
Ore Stockpile	Closure 1	0.0026	0.0059	0.0026	0.0059	0.0026	0.0059
Ore Stockpile	Closure 2	0.0026	0.0059	0.0026	0.0059	0.0026	0.0059
Ore Stockpile	Post-Closure	0.0026	0.0059	0.0026	0.0059	0.0026	0.0059

Source: Q:\1CT013.001\_Revise\_MLARD\_Characterization\20121210\_CEEA\_AdequacyReview\Adequacy\_IR-response\IR\_7i\_table\_1CT013-001\_dbm\_rev00.xlsx

**Notes:**

1. 95th Percentile Porphyry Database\* Dissolved Concentration 0.21 mg/L
2. 50th Percentile Porphyry Database\* Dissolved Concentration 0.0055 mg/L
3. Green shading indicates concentration exceeds 95th percentile porphyry database value
4. Grey shading indicates concentration exceeds 50th percentile porphyry database value

\*Day and Reese (2006)

Facility	Period	5th Percentile		Mean		95th Percentile	
		[Phosphorous]:5%		[Phosphorous]:Mean		[Phosphorous]:95%	
		Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Non-PAG Stockpile	Construction	0.079	0.33	0.14	0.84	0.19	3.2
Non-PAG Stockpile	Operations 1	0.15	2.5	0.27	80	0.36	545
Non-PAG Stockpile	Operations 2	1.1	3.7	3.9	173	5.6	330
Non-PAG Stockpile	Closure 1	1.4	3.7	5.1	149	7.3	323
Non-PAG Stockpile	Closure 2	1.3	3.8	5.2	245	7.2	827
Non-PAG Stockpile	Post-Closure	1.2	3.9	5.1	217	7.2	732
Ore Stockpile	Construction	0.012	0.27	0.021	0.2879	0.028	0.34
Ore Stockpile	Operations 1	0.023	0.59	0.034	18	0.036	139
Ore Stockpile	Operations 2	0.0090	0.57	0.0090	14	0.0090	32
Ore Stockpile	Closure 1	0.0090	0.27	0.0090	0.2720	0.0090	0.27
Ore Stockpile	Closure 2	0.0090	0.27	0.0090	0.2720	0.0090	0.27
Ore Stockpile	Post-Closure	0.0090	0.27	0.0090	0.2720	0.0090	0.27

Source: Q:\1CT013.001\_Revise\_MLARD\_Characterization\20121210\_CEEA\_AdequacyReview\Adequacy\_IR-response\IR\_7i\_table\_1CT013-001\_dbm\_rev00.xlsx

**Notes:**

1. 95th Percentile Porphyry Database\* Dissolved Concentration 0.118 mg/L
2. 50th Percentile Porphyry Database\* Dissolved Concentration 0.04 mg/L
3. Green shading indicates concentration exceeds 95th percentile porphyry database value
4. Grey shading indicates concentration exceeds 50th percentile porphyry database value

\*Day and Reese (2006)

Facility	Period	5th Percentile		Mean		95th Percentile	
		[Potassium]:5%		[Potassium]:Mean		[Potassium]:95%	
		Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Non-PAG Stockpile	Construction	1.9	5.8	2.9	14	3.6	52
Non-PAG Stockpile	Operations 1	2.7	40	5.0	1270	6.4	8612
Non-PAG Stockpile	Operations 2	18	59	62	2728	89	5216
Non-PAG Stockpile	Closure 1	23	59	80	2355	115	5102
Non-PAG Stockpile	Closure 2	20	60	83	3873	114	13063
Non-PAG Stockpile	Post-Closure	18	62	81	3429	114	11565
Ore Stockpile	Construction	1.2	4.6	1.2	7.9	1.2	24
Ore Stockpile	Operations 1	2.1	116	2.6	3610	3.1	27582
Ore Stockpile	Operations 2	0.7	113	0.7	2861	0.7	6313
Ore Stockpile	Closure 1	0.7	4.0	0.7	4.0	0.7	4.0
Ore Stockpile	Closure 2	0.7	4.0	0.7	4.0	0.7	4.0
Ore Stockpile	Post-Closure	0.7	4.0	0.7	4.0	0.7	4.0

Source: Q:\1CT013.001\_Revise\_MLARD\_Characterization\20121210\_CEEA\_AdequacyReview\Adequacy\_IR-response\IR\_7i\_table\_1CT013-001\_dbm\_rev00.xlsx

**Notes:**

1. 95th Percentile Porphyry Database\* Dissolved Concentration 38.56 mg/L
2. 50th Percentile Porphyry Database\* Dissolved Concentration 4 mg/L
3. Green shading indicates concentration exceeds 95th percentile porphyry database value
4. Grey shading indicates concentration exceeds 50th percentile porphyry database value

\*Day and Reese (2006)



Facility	Period	5th Percentile		Mean		95th Percentile	
		[Selenium]:5%		[Selenium]:Mean		[Selenium]:95%	
		Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Non-PAG Stockpile	Construction	0.0011	0.0024	0.0018	0.0108	0.0023	0.042
Non-PAG Stockpile	Operations 1	0.0018	0.0328	0.0035	1.0470	0.0046	7.1
Non-PAG Stockpile	Operations 2	0.015	0.0485	0.0508	2.2488	0.0730	4.3
Non-PAG Stockpile	Closure 1	0.019	0.0485	0.0659	1.9411	0.0945	4.2
Non-PAG Stockpile	Closure 2	0.017	0.0496	0.0681	3.1926	0.0944	11
Non-PAG Stockpile	Post-Closure	0.015	0.0511	0.0670	2.8269	0.0943	9.5
Ore Stockpile	Construction	0.00028	0.00081	0.00028	0.0037	0.00028	0.013
Ore Stockpile	Operations 1	0.00081	0.065	0.0011	2.0	0.0014	15
Ore Stockpile	Operations 2	0.00027	0.063	0.00027	1.6	0.00027	3.5
Ore Stockpile	Closure 1	0.00027	0.00038	0.00027	0.00038	0.00027	0.00038
Ore Stockpile	Closure 2	0.00027	0.00038	0.00027	0.00038	0.00027	0.00038
Ore Stockpile	Post-Closure	0.00027	0.00038	0.00027	0.00038	0.00027	0.00038

Source: Q:\1CT013.001\_Revise\_MLARD\_Characterization\20121210\_CAAA\_AdequacyReview\Adequacy\_IR-response\IR\_7i\_table\_1CT013-001\_dbm\_rev00.xlsx

**Notes:**

1. 95th Percentile Porphyry Database\* Dissolved Concentration 0.27205 mg/L
2. 50th Percentile Porphyry Database\* Dissolved Concentration 0.05885 mg/L
3. Green shading indicates concentration exceeds 95th percentile porphyry database value
4. Grey shading indicates concentration exceeds 50th percentile porphyry database value

\*Day and Reese (2006)

Facility	Period	5th Percentile		Mean		95th Percentile	
		[Silver]:5%		[Silver]:Mean		[Silver]:95%	
		Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Non-PAG Stockpile	Construction	0.000042	0.00038	0.000084	0.00044	0.00013	0.00067
Non-PAG Stockpile	Operations 1	0.000056	0.00059	0.00013	0.016	0.00023	0.11
Non-PAG Stockpile	Operations 2	0.00022	0.00075	0.00087	0.034	0.0012	0.066
Non-PAG Stockpile	Closure 1	0.00029	0.00075	0.0010	0.030	0.0014	0.064
Non-PAG Stockpile	Closure 2	0.00026	0.00076	0.0010	0.049	0.0014	0.16
Non-PAG Stockpile	Post-Closure	0.00023	0.00078	0.0010	0.043	0.0014	0.15
Ore Stockpile	Construction	0.000037	0.00038	0.000056	0.00041	0.000075	0.00050
Ore Stockpile	Operations 1	0.000059	0.0014	0.00013	0.045	0.00024	0.3435
Ore Stockpile	Operations 2	0.000030	0.0014	0.000030	0.036	0.000030	0.079
Ore Stockpile	Closure 1	0.000030	0.00039	0.000030	0.00039	0.000030	0.00039
Ore Stockpile	Closure 2	0.000030	0.00039	0.000030	0.00039	0.000030	0.00039
Ore Stockpile	Post-Closure	0.000030	0.00039	0.000030	0.00039	0.000030	0.00039

Source: Q:\1CT013.001\_Revise\_MLARD\_Characterization\20121210\_CEEA\_AdequacyReview\Adequacy\_IR-response\IR\_7i\_table\_1CT013-001\_dbm\_rev00.xlsx

**Notes:**

1. 95th Percentile Porphyry Database\* Dissolved Concentration 0.000010 mg/L
2. 50th Percentile Porphyry Database\* Dissolved Concentration 0.000010 mg/L
3. Green shading indicates concentration exceeds 95th percentile porphyry database value
4. Grey shading indicates concentration exceeds 50th percentile porphyry database value

\*Day and Reese (2006)

Facility	Period	5th Percentile		Mean		95th Percentile	
		[Sodium]:5%		[Sodium]:Mean		[Sodium]:95%	
		Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Non-PAG Stockpile	Construction	7.3	39	12	49	20	82
Non-PAG Stockpile	Operations 1	8.2	65	21	1913	24	12956
Non-PAG Stockpile	Operations 2	27	89	98	4104	138	7847
Non-PAG Stockpile	Closure 1	34	89	120	3542	172	7674
Non-PAG Stockpile	Closure 2	31	91	124	5825	172	19649
Non-PAG Stockpile	Post-Closure	28	93	122	5158	172	17396
Ore Stockpile	Construction	5.8	40	6.6	41	8.2	46
Ore Stockpile	Operations 1	6.5	60	12	1859	17	14200
Ore Stockpile	Operations 2	5.6	58	5.6	1473	5.6	3250
Ore Stockpile	Closure 1	5.6	40	5.6	40	5.6	40
Ore Stockpile	Closure 2	5.6	40	5.6	40	5.6	40
Ore Stockpile	Post-Closure	5.6	40	5.6	40	5.6	40

Source: Q:\1CT013.001\_Revise\_MLARD\_Characterization\20121210\_CAAA\_AdequacyReview\Adequacy\_IR-response\IR\_7i\_table\_1CT013-001\_dbm\_rev00.xlsx

**Notes:**

1. 95th Percentile Porphyry Database\* Dissolved Concentration 54.4 mg/L
2. 50th Percentile Porphyry Database\* Dissolved Concentration 10.7 mg/L
3. Green shading indicates concentration exceeds 95th percentile porphyry database value
4. Grey shading indicates concentration exceeds 50th percentile porphyry database value

\*Day and Reese (2006)

Facility	Period	5th Percentile		Mean		95th Percentile	
		[Thallium]:5%		[Thallium]:Mean		[Thallium]:95%	
		Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Non-PAG Stockpile	Construction	0.000092	0.0075	0.00026	0.0076	0.00055	0.0078
Non-PAG Stockpile	Operations 1	0.00013	0.0076	0.00057	0.063	0.0012	0.42
Non-PAG Stockpile	Operations 2	0.00087	0.0036	0.0033	0.13	0.0047	0.26
Non-PAG Stockpile	Closure 1	0.0011	0.0029	0.0039	0.12	0.0057	0.25
Non-PAG Stockpile	Closure 2	0.0010	0.0030	0.0041	0.19	0.0056	0.64
Non-PAG Stockpile	Post-Closure	0.00091	0.0031	0.0040	0.17	0.0056	0.57
Ore Stockpile	Construction	0.000057	0.0076	0.000091	0.0076	0.00015	0.0077
Ore Stockpile	Operations 1	0.000085	0.0075	0.00028	0.067	0.00083	0.51
Ore Stockpile	Operations 2	0.000050	0.0080	0.000050	0.053	0.000050	0.12
Ore Stockpile	Closure 1	0.000050	0.0080	0.000050	0.0080	0.000050	0.0080
Ore Stockpile	Closure 2	0.000050	0.0080	0.000050	0.0080	0.000050	0.0080
Ore Stockpile	Post-Closure	0.000050	0.0080	0.000050	0.0080	0.000050	0.0080

Source: Q:\1CT013.001\_Revise\_MLARD\_Characterization\20121210\_CEEA\_AdequacyReview\Adequacy\_IR-response\IR\_7i\_table\_1CT013-001\_dbm\_rev00.xlsx

**Notes:**

1. 95th Percentile Porphyry Database\* Dissolved Concentration 0.00005 mg/L
2. 50th Percentile Porphyry Database\* Dissolved Concentration 0.00005 mg/L
3. Green shading indicates concentration exceeds 95th percentile porphyry database value
4. Grey shading indicates concentration exceeds 50th percentile porphyry database value

\*Day and Reese (2006)

Facility	Period	5th Percentile		Mean		95th Percentile	
		[Tin]:5%		[Tin]:Mean		[Tin]:95%	
		Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Non-PAG Stockpile	Construction	0.00016	0.0017	0.00024	0.0022	0.00031	0.0047
Non-PAG Stockpile	Operations 1	0.00024	0.0036	0.00043	0.12	0.00056	0.79
Non-PAG Stockpile	Operations 2	0.0016	0.0054	0.0056	0.25	0.0081	0.48
Non-PAG Stockpile	Closure 1	0.0021	0.0054	0.0073	0.21	0.010	0.47
Non-PAG Stockpile	Closure 2	0.0019	0.0055	0.0075	0.35	0.010	1.2
Non-PAG Stockpile	Post-Closure	0.0017	0.0056	0.0074	0.31	0.010	1.1
Ore Stockpile	Construction	0.000080	0.0017	0.000080	0.0020	0.000080	0.0028
Ore Stockpile	Operations 1	0.00018	0.013	0.00024	0.40	0.00029	3.0
Ore Stockpile	Operations 2	0.000080	0.012	0.000080	0.31	0.000080	0.69
Ore Stockpile	Closure 1	0.000080	0.0017	0.000080	0.0017	0.000080	0.0017
Ore Stockpile	Closure 2	0.000080	0.0017	0.000080	0.0017	0.000080	0.0017
Ore Stockpile	Post-Closure	0.000080	0.0017	0.000080	0.0017	0.000080	0.0017

Source: Q:\1CT013.001\_Revise\_MLARD\_Characterization\20121210\_CEEA\_AdequacyReview\Adequacy\_IR-response\IR\_7i\_table\_1CT013-001\_dbm\_rev00.xlsx

**Notes:**

1. 95th Percentile Porphyry Database\* Dissolved Concentration 0.000111 mg/L
2. 50th Percentile Porphyry Database\* Dissolved Concentration 0.00005 mg/L
3. Green shading indicates concentration exceeds 95th percentile porphyry database value
4. Grey shading indicates concentration exceeds 50th percentile porphyry database value

\*Day and Reese (2006)

Facility	Period	5th Percentile		Mean		95th Percentile	
		[Titanium]:5%		[Titanium]:Mean		[Titanium]:95%	
		Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Non-PAG Stockpile	Construction	0.01	0.02	0.02	0.083	0.021	0.31
Non-PAG Stockpile	Operations 1	0.02	0.24	0.03	8	0.038	53
Non-PAG Stockpile	Operations 2	0.11	0.36	0.38	17	0.54	32
Non-PAG Stockpile	Closure 1	0.14	0.36	0.49	14	0.70	31
Non-PAG Stockpile	Closure 2	0.12	0.37	0.50	24	0.70	80
Non-PAG Stockpile	Post-Closure	0.11	0.38	0.50	21	0.70	71
Ore Stockpile	Construction	0.0055	0.011	0.0062	0.015	0.0062	0.034
Ore Stockpile	Operations 1	0.0070	0.14	0.0076	4.3	0.0082	33
Ore Stockpile	Operations 2	0.0050	0.14	0.0050	3.4	0.0050	7.6
Ore Stockpile	Closure 1	0.0050	0.010	0.0050	0.010	0.0050	0.010
Ore Stockpile	Closure 2	0.0050	0.010	0.0050	0.010	0.0050	0.010
Ore Stockpile	Post-Closure	0.0050	0.010	0.0050	0.010	0.0050	0.010

Source: Q:\1CT013.001\_Revise\_MLARD\_Characterization\20121210\_CEEA\_AdequacyReview\Adequacy\_IR-response\IR\_7i\_table\_1CT013-001\_dbm\_rev00.xlsx

**Notes:**

1. 95th Percentile Porphyry Database\* Dissolved Concentration 0.02411 mg/L
2. 50th Percentile Porphyry Database\* Dissolved Concentration 0.0109 mg/L
3. Green shading indicates concentration exceeds 95th percentile porphyry database value
4. Grey shading indicates concentration exceeds 50th percentile porphyry database value

\*Day and Reese (2006)

Facility	Period	5th Percentile		Mean		95th Percentile	
		[Uranium]:5%		[Uranium]:Mean		[Uranium]:95%	
		Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Non-PAG Stockpile	Construction	0.00015	0.00039	0.00033	0.0011	0.00039	0.0043
Non-PAG Stockpile	Operations 1	0.00021	0.0033	0.00049	0.10	0.00061	0.71
Non-PAG Stockpile	Operations 2	0.0015	0.0049	0.0051	0.23	0.0074	0.43
Non-PAG Stockpile	Closure 1	0.0019	0.0049	0.0066	0.19	0.0095	0.42
Non-PAG Stockpile	Closure 2	0.0017	0.0050	0.0068	0.32	0.0094	1.1
Non-PAG Stockpile	Post-Closure	0.0015	0.0051	0.0067	0.28	0.0094	0.95
Ore Stockpile	Construction	0.00013	0.00036	0.00019	0.00081	0.00019	0.0029
Ore Stockpile	Operations 1	0.00029	0.014	0.00035	0.44	0.00042	3.4
Ore Stockpile	Operations 2	0.000048	0.014	0.000048	0.35	0.000048	0.77
Ore Stockpile	Closure 1	0.000048	0.00028	0.000048	0.00028	0.000048	0.00028
Ore Stockpile	Closure 2	0.000048	0.00028	0.000048	0.00028	0.000048	0.00028
Ore Stockpile	Post-Closure	0.000048	0.00028	0.000048	0.00028	0.000048	0.00028

Source: Q:\1CT013.001\_Revise\_MLARD\_Characterization\20121210\_CEEA\_AdequacyReview\Adequacy\_IR-response\IR\_7i\_table\_1CT013-001\_dbm\_rev00.xlsx

**Notes:**

1. 95th Percentile Porphyry Database\* Dissolved Concentration 0.00136 mg/L
2. 50th Percentile Porphyry Database\* Dissolved Concentration 0.00039 mg/L
3. Green shading indicates concentration exceeds 95th percentile porphyry database value
4. Grey shading indicates concentration exceeds 50th percentile porphyry database value

\*Day and Reese (2006)

Facility	Period	5th Percentile		Mean		95th Percentile	
		[Vanadium]:5%		[Vanadium]:Mean		[Vanadium]:95%	
		Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Non-PAG Stockpile	Construction	0.01	0.02	0.02	0.05	0.02	0.17
Non-PAG Stockpile	Operations 1	0.02	0.13	0.02	4.15	0.03	28.12
Non-PAG Stockpile	Operations 2	0.06	0.19	0.20	8.91	0.29	17.03
Non-PAG Stockpile	Closure 1	0.07	0.19	0.26	7.69	0.37	16.66
Non-PAG Stockpile	Closure 2	0.07	0.20	0.27	12.64	0.37	42.65
Non-PAG Stockpile	Post-Closure	0.06	0.20	0.27	11.20	0.37	37.76
Ore Stockpile	Construction	0.01	0.01	0.01	0.02	0.01	0.02
Ore Stockpile	Operations 1	0.01	0.05	0.01	1.67	0.01	12.79
Ore Stockpile	Operations 2	0.01	0.05	0.01	1.33	0.01	2.93
Ore Stockpile	Closure 1	0.01	0.01	0.01	0.01	0.01	0.01
Ore Stockpile	Closure 2	0.01	0.01	0.01	0.01	0.01	0.01
Ore Stockpile	Post-Closure	0.01	0.01	0.01	0.01	0.01	0.01

Source: Q:\1CT013.001\_Revise\_MLARD\_Characterization\20121210\_CEEA\_AdequacyReview\Adequacy\_IR-response\IR\_7i\_table\_1CT013-001\_dbm\_rev00.xlsx

**Notes:**

1. 95th Percentile Porphyry Database\* Dissolved Concentration 0.0011285 mg/L
2. 50th Percentile Porphyry Database\* Dissolved Concentration 0.000815 mg/L
3. Green shading indicates concentration exceeds 95th percentile porphyry database value
4. Grey shading indicates concentration exceeds 50th percentile porphyry database value

\*Day and Reese (2006)



Facility	Period	5th Percentile		Mean		95th Percentile	
		[Zinc]:5%		[Zinc]:Mean		[Zinc]:95%	
		Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Non-PAG Stockpile	Construction	0.010	0.020	0.015	0.096	0.020	0.36
Non-PAG Stockpile	Operations 1	0.017	0.281	0.029	9.0	0.039	61
Non-PAG Stockpile	Operations 2	0.13	0.42	0.44	19	0.63	37
Non-PAG Stockpile	Closure 1	0.16	0.42	0.56	17	0.81	36
Non-PAG Stockpile	Closure 2	0.14	0.43	0.58	27	0.81	92
Non-PAG Stockpile	Post-Closure	0.13	0.44	0.57	24	0.81	82
Ore Stockpile	Construction	0.0020	0.0073	0.0020	0.017	0.0020	0.049
Ore Stockpile	Operations 1	0.0036	0.21	0.0046	6.6	0.0055	50
Ore Stockpile	Operations 2	0.0020	0.21	0.0020	5.2	0.0020	11
Ore Stockpile	Closure 1	0.0020	0.0066	0.0020	0.0066	0.0020	0.0066
Ore Stockpile	Closure 2	0.0020	0.0066	0.0020	0.0066	0.0020	0.0066
Ore Stockpile	Post-Closure	0.0020	0.0066	0.0020	0.0066	0.0020	0.0066

Source: Q:\1CT013.001\_Revise\_MLARD\_Characterization\20121210\_CAAA\_AdequacyReview\Adequacy\_IR-response\IR\_7i\_table\_1CT013-001\_dbm\_rev00.xlsx

**Notes:**

1. 95th Percentile Porphyry Database\* Dissolved Concentration 0.81 mg/L
2. 50th Percentile Porphyry Database\* Dissolved Concentration 0.031 mg/L
3. Green shading indicates concentration exceeds 95th percentile porphyry database value
4. Grey shading indicates concentration exceeds 50th percentile porphyry database value

\*Day and Reese (2006)

Facility	Period	5th Percentile		Mean		95th Percentile	
		[Alkalinity]:5%		[Alkalinity]:Mean		[Alkalinity]:95%	
		Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result	Minimum Daily Result	Maximum Daily Result
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Non-PAG Stockpile	Construction	113	293	170	459	189	1499
Non-PAG Stockpile	Operations 1	130	1133	222	35088	261	237710
Non-PAG Stockpile	Operations 2	494	1626	1736	75305	2478	143982
Non-PAG Stockpile	Closure 1	627	1626	2205	64984	3164	140804
Non-PAG Stockpile	Closure 2	563	1661	2280	106883	3159	360523
Non-PAG Stockpile	Post-Closure	508	1709	2243	94639	3159	319176
Ore Stockpile	Construction	120	312	125	512	125	1516
Ore Stockpile	Operations 1	176	6997	206	217359	238	1660673
Ore Stockpile	Operations 2	81	6797	81	171971	81	379378
Ore Stockpile	Closure 1	81	277	81	277	81	277
Ore Stockpile	Closure 2	81	277	81	277	81	277
Ore Stockpile	Post-Closure	81	277	81	277	81	277

Source: Q:\1CT013.001\_Revise\_MLARD\_Characterization\20121210\_CEEA\_AdequacyReview\Adequacy\_IR-response\IR\_7i\_table\_1CT013-001\_dbm\_rev00.xlsx

**Notes:**

1. 5th Percentile Porphyry Database\* Dissolved Concentration 7.525 mg/L
2. 50th Percentile Porphyry Database\* Dissolved Concentration 43.6 mg/L
3. Green shading indicates concentration is less than 5th percentile porphyry database value
4. Grey shading indicates concentration is less than 50th percentile porphyry database value

\*Day and Reese (2006)

**Information Request #7j**

Information Request: Clearly describe the methodology concerning how the TSF embankment source term was derived; explain how baseline concentrations for non-PAG overburden have been incorporated with non-PAG waste rock loads; and provide information on the predicted drainage concentrations from the embankment, along with the runoff coefficient applied.

**Response Summary**

Topsoil is the top layer of overburden material that is suitable for reclamation re-vegetation. This topsoil layer will be removed ahead of mining and stockpiled separately. The overburden layer below the topsoil consists of sands, gravels, clays and glacial till. The Non-PAG component of this overburden layer will be used in certain portions of the tailings dam construction. The bedrock layer (waste rock) below the overburden will be blasted and removed during the mining operation. A portion of this Non-PAG waste rock will be used in the construction of the tailings dam. Non-PAG waste rock and non-PAG overburden are treated as separate components in the dam construction and in the water quality modeling.

Loadings for non-PAG waste rock were calculated as described in Section 2.7.2.1 of the EIS, beginning on p. 492. Subsequently, these non-PAG rock loadings were divided between the Non-PAG Stockpile and the Main Embankment according to the proportion of the overall rock volume that is expected to report to each facility (44% of non-PAG rock is slated for storage in the Non-PAG Stockpile, while 56% is expected to be required for Main Embankment construction).

Non-PAG overburden run-off was assigned background water quality chemistry. Approximately 40% of the non-PAG overburden will be required for Main Embankment construction and the remaining 60% will be used to construct the West and South embankments and the Non-PAG stockpile.

Runoff from the non-PAG overburden component of the Main Embankment was combined with loadings from the non-PAG rock component in the embankment using the GoldSim model. The model is capable of handling discrete sources in different ways; non-PAG overburden runoff is handled as flow volumes and concentrations, whereas non-PAG rock runoff is handled as flow volumes and chemical loads per unit time.

The runoff coefficient applied to the non-PAG component of the Main Embankment was 70%.

Concentrations over time were provided for the Main Embankment seepage collection ponds (ME Pond 1 and ME Pond 2) in the application (Appendices 2-7-2-1-I-11 and -I-12). The present structure of the GoldSim model does not facilitate estimation of non-PAG waste rock seepage concentrations from the embankment as a unique output, as the embankment seepage and the embankment infiltration mix together and report to the seepage collection ponds.

However, the embankment volume and geochemical characteristics are similar to those of the non-PAG stockpile and concentrations would be expected to be similar to those projected for the non-PAG Stockpile seepage. Predicted concentrations for the non-PAG stockpile were presented in Appendix 2-7-2-1-I of the application and are further discussed in the response to IR 7i.