APPENDIX D-1: Baseline Environmental Geochemistry Evaluation of Near Surface Materials

DRAFT

BLACK BUTTE COPPER PROJECT

BASELINE ENVIRONMENTAL GEOCHEMISTRY EVALUATION OF NEAR-SURFACE MATERIALS

REVISED MINE OPERATING PERMIT

Prepared for

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Executive Summary

This baseline environmental geochemistry evaluation summarizes geochemical test results for near-surface materials in the vicinity of proposed BBC Project facilities. Shallow, weathered, highly-fractured and oxidized near-surface bedrock (*Ynl Ex*) zones of the Lower Newland Formation and sill-form granodiorite intrusive rocks (*Tgd*) will be excavated and used to construct mine facilities.

The near-surface materials (*Ynl Ex, Tgd,*) have been characterized using static multi-element analysis, acid-base accounting, net acid generation potential, and kinetic methods. Initial results, which include all available weeks of the kinetic tests, are reviewed in this report. Although HCTs for these materials remain online, a significant amount of kinetic data is available and current data indicate that they are likely not significantly acid or metal generating. Enviromin recommends the termination of the *Tgd* test and anticipates recommending termination of the *Ynl Ex* test in the near future. Mineralogical analyses of potential asbestiform mineral content within the near-surface bedrock units were also completed as part of this evaluation and no asbestiform minerals were identified in any of the near-surface construction materials.

1 Introduction

Shallow, weathered, highly-fractured and oxidized near-surface bedrock (*Ynl Ex*) zones of the Lower Newland Formation and sill-form granodiorite intrusive rocks (*Tgd*) will be excavated during construction and used to build embankments, drains, and foundations for Tintina's proposed Black Butte Copper project (Project), located 15 miles north of White Sulphur Springs, MT. **Figure 1-1** shows the location of the proposed mine facilities and geotechnical drill holes, and test pits.

Two near-surface materials, which comprise the majority of near-surface rock types, were included in this geochemical evaluation: *Ynl Ex*, and *Tgd*. Specifically, the *Ynl Ex* is comprised of sediments from the Proterozoic Lower Newland Formation that has been thrust to the surface along the Black Butte Fault (BBF). The *Tgd* is younger granodiorite that intruded the *Ynl Ex* rocks as sill-like tabular bodies. **Figure 1-2** shows that these two rock units have been folded and faulted so that they occur together. This baseline environmental geochemistry evaluation presents data collected for near-surface materials, based on static and kinetic geochemical testing results.

The acid generation and metal release potential of near-surface rock has been characterized using static multi-element analysis, acid-base accounting, net acid generation potential, and kinetic methods. Analyses of potential asbestiform mineral content were also completed. The testing described in this report was conducted in conjunction with environmental geochemical testing of the waste rock and tailings for the Project. Data from those tests are reported separately (Enviromin, 2016).

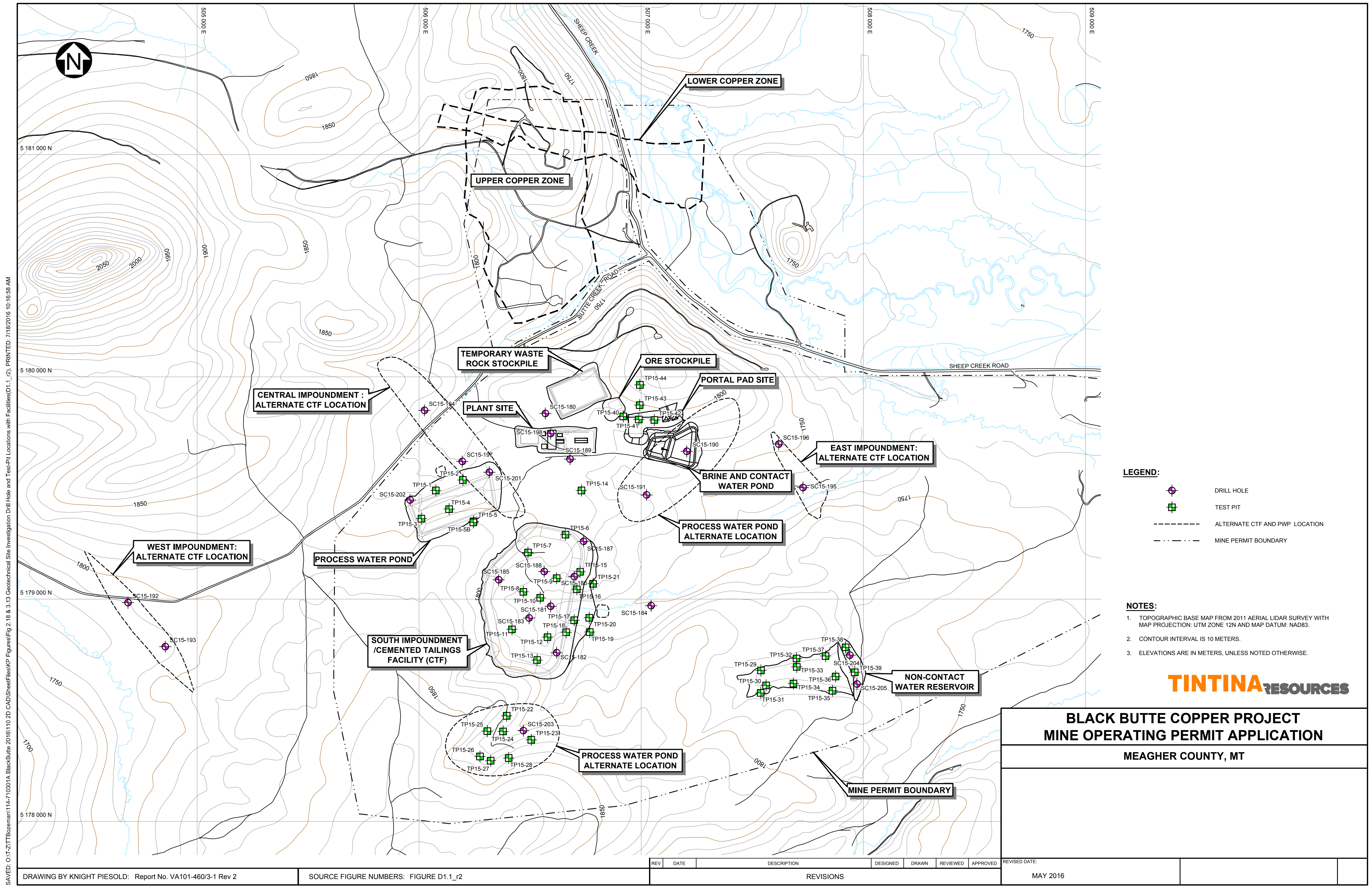

Figure 1-1. Facility Map with Geotechnical Drill Holes and Test Pits

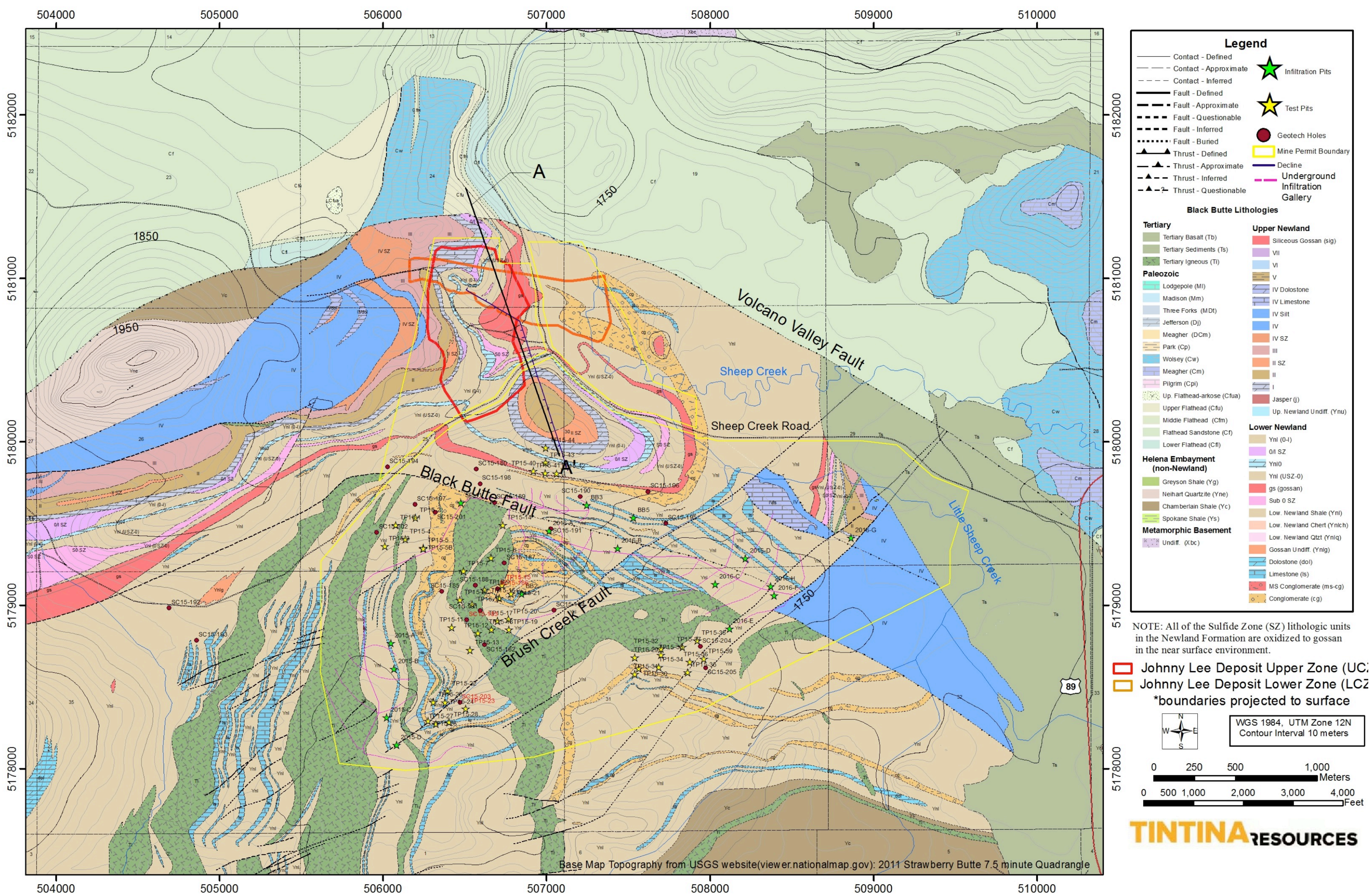

Figure 1-2. Site Geologic Map with Geotechnical Drill Holes and Test Pits

2 Sampling of Near-Surface Materials

A statistical review of select multi-element data as a function of depth was used to determine whether near-surface materials were comparable to deeper material that had already been evaluated as waste rock (Enviromin, 2016). Specifically, statistical summaries of whole rock chemistry for near-surface (less than 20 meters deep) samples of Proterozoic Lower Newland Formation (*Ynl Ex)* and Tertiary granodiorite (*Tgd)*, were compared to samples collected at depth within the *Ynl* below the upper sulfide zone (*Ynl B*) and the igneous dikes (*IG*). These deeper materials were originally tested as part of the baseline environmental geochemistry testing of waste rock and tailings (Enviromin, 2016). The following specific rock units were compared:

Table 2-1. Shallow and Deep Rock Materials Compared

Shallow Material (<20 meters below ground surface)		**Deep Material** (>20 meters below ground surface)	
Ynl Ex	Near surface Lower Newland Formation	*Ynl B*	Lower Newland Formation basal conglomerate
Tgd	Near-surface granodiorite intrusions	*IG*	Igneous dike intrusions

Results of these comparisons are presented in **Table A1** of **Appendix A**. Additionally, **Figure 2-1** displays the % Sulfur of the *Ynl B, Ynl Ex*, *IG*, and *Tgd*.

Comparisons of the elemental chemistry as a function of depth demonstrate that weathered surface materials are relatively depleted in metals and sulfur and are thus geochemically distinct from the deeper materials. This is consistent with observations made in hand specimens (highly fractured with iron-oxide stained fractures) collected while drilling (Knight Piésold, 2016). Therefore, the near-surface deposits of *Ynl Ex* and *Tgd* have been independently tested to evaluate acid generation and metal release potential using static and kinetic methods.

Representative subsets of the *Tgd* and *Ynl Ex* samples were selected for environmental geochemical testing through analysis of static multi-element geochemical data. We identified subsamples needed to represent the mean concentrations of ten select elements exhibited by the larger pool of available data for each lithotype using a method based on Runnells *et al.* (1997). **Table A2** of **Appendix A** presents a complete list of samples selected for analysis, along with multi-element data and averages by rock unit. Sampling locations are shown in **Figures 1-1 and 1-2**.

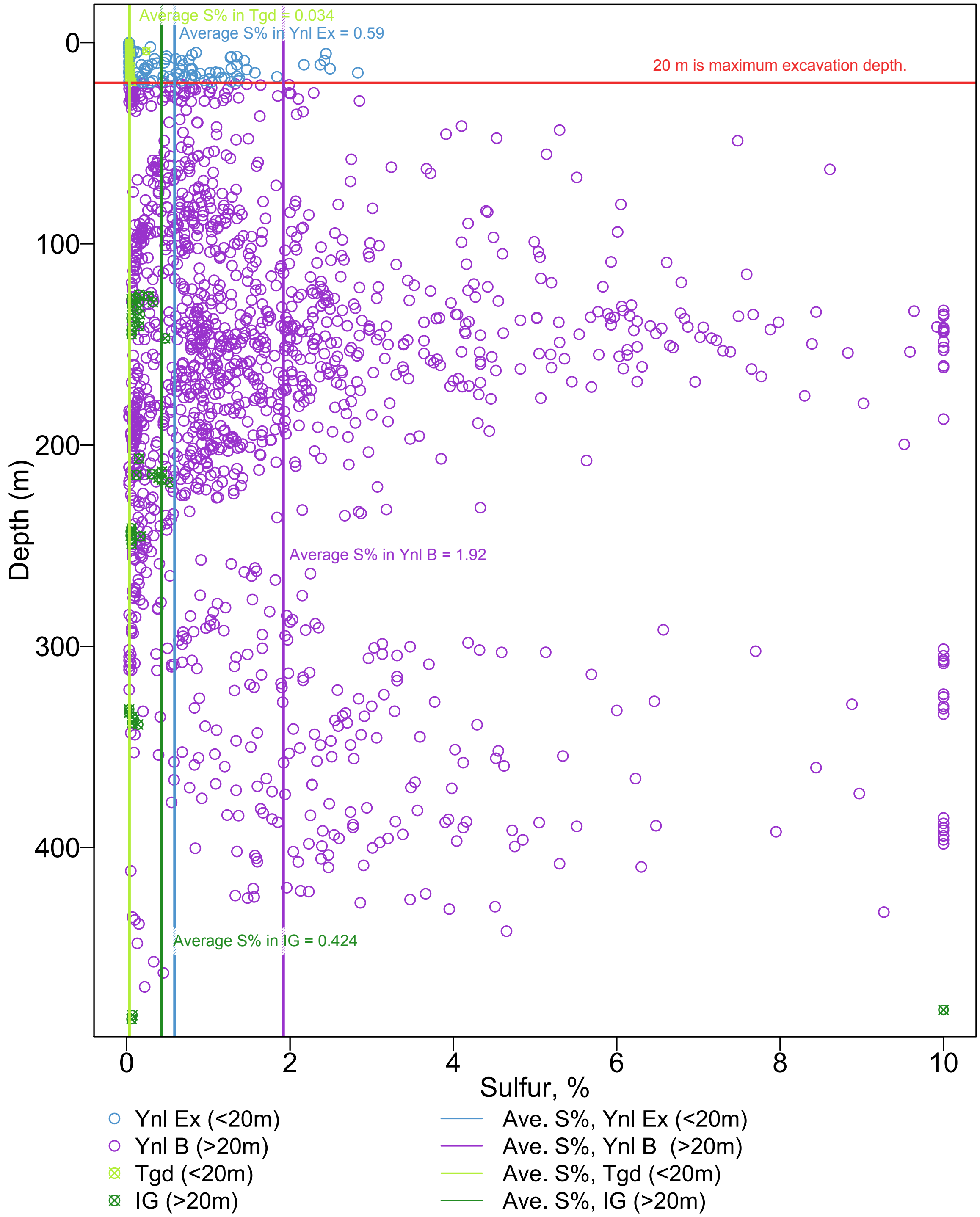

Figure 2-1. Comparison of Sulfur (%) in surface-exposed rocks

3 Geochemical Testing and Results

3.1 Static Acid Base Accounting and Net Acid Generation

The ABA test measures the relative acid production and neutralization potential of material based on the conservative assumption that all sulfides present will oxidize, releasing acidity. The ABA test quantifies the acid production potential (AP) and neutralization potential (NP) of a sample in units of tons $CaCO_3$ / kiloton of rock (Sobek et al. 1978), allowing calculation of the net neutralization potential (NNP) as NP minus AP, as well as the ratio of NP to AP (INAP, 2012). The ABA test uses a relatively complete digestion of finely ground rock, and therefore conservatively estimates the reactivity of available sulfur (S) minerals. These analyses used the modified Sobek method of ABA analysis (Lawrence and Wang, 1996).

As part of the ABA analysis, S was fractionated to identify the sulfide (S^{2-}), acid-soluble and -insoluble sulfate (SO_4), and residual S fractions. Total S was determined by LECO S, and SO_4 sulfur was measured in the carbonate-soluble and HCl-soluble fractions. Sulfide was then calculated by subtracting total SO_4 from total S. In this study, AP was calculated based on S^{2-}, which was the dominant form of S measured in the majority of samples.

To determine NP, a sample is treated with excess standardized hydrochloric acid (HCl) at ambient temperatures for 24 hours. The remaining acid is titrated with a standardized base to pH of 8.3 to allow the calculation of calcium carbonate equivalent for acid consumed.

The acid generation potential of rock samples is assessed based on calculated values of NNP and NP:AP using the ABA criteria shown in **Table 3-1**. These criteria are also used to identify materials that require kinetic testing in humidity cells, to evaluate acid generation and metal release potential under prolonged weathering stress.

Table 3-1. Criteria for Classifying Acid Generation Potential from ABA Data

Classification	ABA Criteria
Potentially Acid Generating (PAG)	NP:AP < 1 and NNP < -20 tons/kton as $CaCO_3$
Uncertain Acid Generation Potential	NP:AP between 1 and 3 and/or NNP between -20 and +20 tons/kton as $CaCO_3$
Unlikely to Generate Acid (NAG)	NP:AP > 3 and NNP > +20 tons/kton as $CaCO_3$

From BLM (1996) and USEPA (1994).

The net acid generation pH (NAG pH) test is another method of evaluating acid generation potential, which relies on the oxidation of a ground sample using hydrogen peroxide (H_2O_2, Miller et al, 1997). Most sulfides are oxidized, and available minerals neutralize any acid produced. The NAG pH method avoids the potential bias of assumptions implicit in the ABA method, including the assumed stoichiometry of sulfide mineralogy and the relative efficiency of speciation methods.

A 2.5 gram sample is pulverized and 250 mL of 15% H_2O_2 is added. The sample reacts overnight, and is then heated for up to 2 hours to remove excess H_2O_2 and encourage the release of inherent neutralizing capacity. The sample is allowed to cool, ending pH (NAG pH) is measured, and the solution is then titrated with sodium hydroxide, to endpoints of pH 4.5 and 7.0. Samples with a NAG pH of less than 4.5 at completion of the NAG test indicate potential to generate acid; titration results further indicate the material's acid-production ability (**Table 3-2**).

Table 3-2. Criteria for Classifying Net Acid Generation Potential

NAG Prediction	Detailed Prediction	Final NAG pH	NAG Value (t H_2SO_4/ 1000 t)
Potentially net acid generating (PAG)	High capacity	<4.5	>5 (up to 10, depending on site-specific factors)
	Low capacity	<4.5	0-5
Potentially non-net acid generating (NAG)		>4.5	0

Adapted from: Miller et al. 1997, and INAP 2012

Figures 3-1 and **3-2**, as well as **Table 3-3** present a summary of ABA and NAG results, for the construction materials. These results show that all but one of the near surface samples are non-acid generating, although some uncertainty exists when the NNP criteria are used as a basis for evaluation.

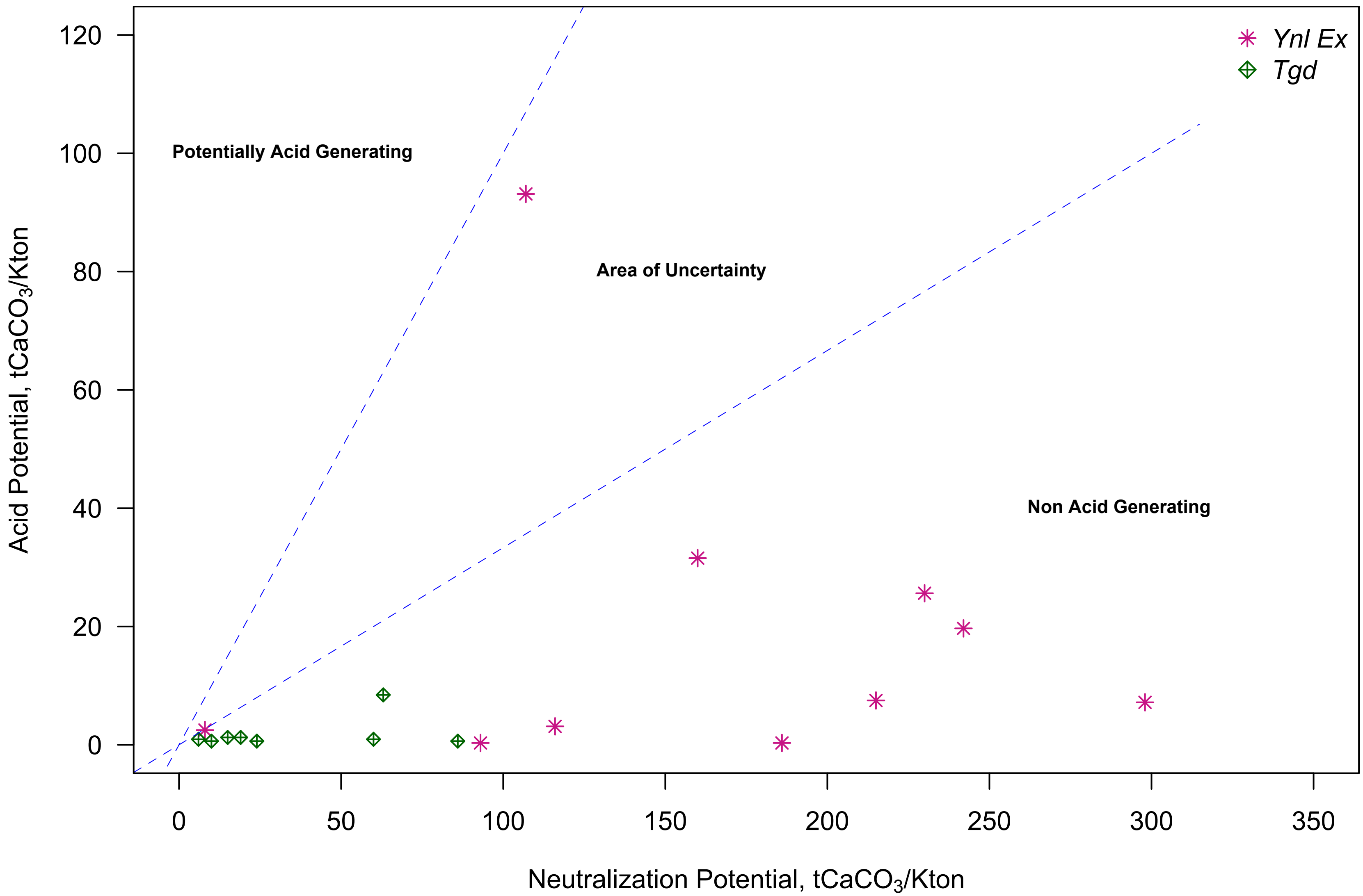

Figure 3-1. Acid Generation Potential for Surface Materials

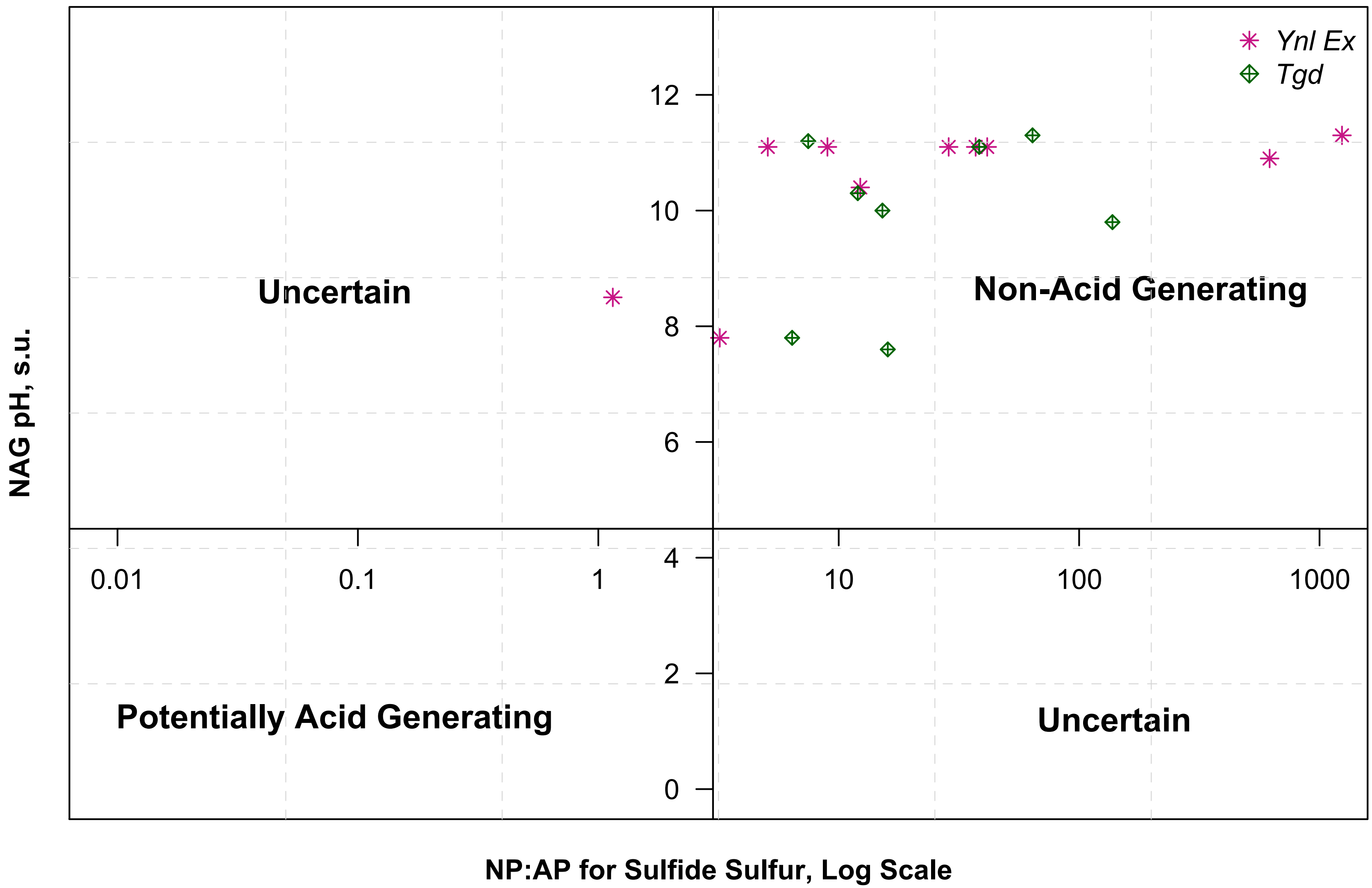

Figure 3-2. Comparison of NAG pH with NP:AP for Surface Materials

Table 3-3. Acid-Base Accounting and Net Acid Generation Data, by lithotype.

HOLE_ID	Interval (m)		Paste pH	AP*	NNP	FIZZ	NP	NP:AP*	Total S	S $NaCO_3$ SO_4	S HCl SO_4	S as Sulfide	NAG 4.5	NAG 7.0	NAG pH	Rating
	from	to	s.u.	$tCaCO_3$/Kton	$tCaCO_3$/Kton	s.u.	$tCaCO_3$/Kton	s.u.	%	%	%	%	Kg H_2SO_4/t	Kg H_2SO_4/t	s.u.	
Tgd																
TP6	NA	NA	7.6	0.63	9	1	10	16	0.02	0.01	0.01	0.02	0.01	0.01	7.6	UN
TP14	NA	NA	7.8	0.94	5	1	6	6.4	0.03	0.01	0.01	0.03	0.01	0.01	7.8	UN
SC15-202	9	11	11.1	0.63	23	2	24	38.4	0.02	0.01	0.01	0.02	0.01	0.01	11.1	NAG
SC15-181	6.71	8.7	10	1.25	18	1	19	15.2	0.04	0.01	0.01	0.04	0.01	0.01	10	UN
SC15-183	8	10	9.8	0.63	85	2	86	137.6	0.02	0.01	0.01	0.02	0.01	0.01	9.8	NAG
SC15-185	4.33	6	11.2	8.44	55	2	63	7.47	0.27	0.01	0.01	0.27	0.01	0.01	11.2	NAG
SC15-187	4	4.96	10.3	1.25	14	1	15	12	0.04	0.01	0.01	0.04	0.01	0.01	10.3	UN
SC15-188	10	12	11.3	0.94	59	2	60	64	0.03	0.01	0.01	0.03	0.01	0.01	11.3	NAG
Ynl Ex																
SC15_181	15.4	17.4	8.5	25.63	204	4	230	8.98	0.84	0.02	0.01	0.82	0.01	0.01	11.1	NAG
SC15_181	19.4	21.4	8.6	31.56	128	3	160	5.07	1.03	0.02	0.01	1.01	0.01	0.01	11.1	NAG
SC15_184	10.63	12.25	8.8	0.31	186	3	186	595	0.01	0.01	0.01	0.01	0.01	0.01	11.3	NAG
SC15_184	19.89	21.36	8.6	7.50	207	4	215	28. 7	0.25	0.01	0.01	0.24	0.01	0.01	11.1	NAG
SC15_184	4.57	5.5	8.3	3.13	112	3	116	37.12	0.12	0.02	0.01	0.1	0.01	0.01	11.1	NAG
SC15_191	8.04	10	8.8	7.19	291	4	298	41.5	0.24	0.01	0.03	0.23	0.01	0.01	11.1	NAG
SC15_204	3.18	5	8.4	0.31	93	3	93	298	0.01	0.01	0.01	0.01	0.01	0.01	10.9	NAG
SC15_197	15.7	17.7	8.8	19.69	222	4	242	12.3	0.63	0.01	0.01	0.63	0.01	0.01	10.4	NAG
SC15_199	19	21	8.7	2.50	5	1	8	3.2	0.09	0.01	0.01	0.08	0.01	0.01	7.8	UN
SC15_205	15	16.65	8	93.13	13	3	107	1.15	3.02	0.04	0.01	2.98	0.01	0.01	8.5	UN

**Calculated from Sulfide S*

*Shading refers to the rating systems for respective parameters presented in **Tables 3-1** and **3-2**. Red=Potentially acid generating, Yellow=Uncertain, and Green=Not acid generating.*

3.2 Asbestiform Minerals

Asbestiform serpentine and amphibole minerals are generally associated with metamorphic processes and do not typically occur in carbonaceous or carbonate sedimentary deposits. Chrysotile fibers are most commonly found in serpentinized ultramafic and dolomitic marbles. Although amphibole minerals are widely found throughout the earth's crust, few varieties exhibit the rare asbestiform habit resulting from mechanical shearing and/or high temperature metamorphism that pose health risks. Asbestiform mineralization is therefore highly unlikely to occur in the Black Butte copper deposit. Nevertheless, composites of lithotypes were screened for the presence of asbestiform minerals at the request of the Montana Department of Environmental Quality.

The presence/absence of chrysotile, amosite, crocidolite, anthophyllite, tremolite, and actinolite was evaluated by the R.J. Lee Group using Polarized Light Microscopy (PLM) methods at a 400 point count, followed by evaluation of any identified asbestiform fibers following U.S. EPA regulations. Any samples found to contain uncertain or demonstrated asbestiform mineral content were to be analyzed using Transmission Electron Microscopic (TEM) analysis to clearly distinguish between mineral cleavage and fibers, along with elemental analysis of the samples. For this project, detection between 0.001 and 0.1 weight percent was required.

No asbestiform minerals were detected in either the *Tgd* or *Ynl Ex* samples. A copy of the lab report from RJ Lee Group is included in **Appendix A**.

3.3 Kinetic Testing of Waste Rock

Humidity cell tests (HCTs) are designed to study the rate of sulfide mineral oxidation and are often used to simulate long-term metals leaching in aerobic (accelerated weathering) environments. Typically, HCTs are run using the established American Society for Testing and Materials (ASTM) testing protocol D5744. Crushed rock is placed in a column and aerated with alternating cycles of humid and dry air, followed by weekly flushing with a relatively large volume of water (approximately 2 pore volumes). The column is allowed to drain and the cycle is repeated weekly for what has conventionally been a 20–week period. However, there are no fixed timelines for HCT duration, which are determined by evidence of steady state in key reaction rates, such as sulfide oxidation, depletion of alkalinity and release of metals.

Based on results of the static multi-element analyses and ABA/NAG tests, one kinetic HCT each for the *Tgd* and *Ynl Ex* was conducted (at McClelland Laboratories, Sparks, NV). These kinetic HCTs are currently in week 24 of testing and data, with the exception of week 24 metals, are available through week 24. As tests are ongoing, McClelland has not yet produced a final report of kinetic testing. That report, including all laboratory reports from kinetic HCTs, will be appended as a modification to this report once testing is completed. Current results of HCTs are presented in **Figures 3-3** and **3-4a and b**, and in **Tables B1 and B2** of **Appendix B**.

3.3.1 Granodiorite- *Tgd*

Results of the kinetic HCT of *Tgd*, thus far, are consistent with the static geochemistry results, indicating that this material has low potential for acid production and metal release.

- In all weeks of testing, thus far, the pH has remained strongly neutral, ranging from 7.82 (week 7) to 8.26 (week 2) and is currently steady at 8.0.
- Redox potential had initially held steady at approximately 300 mV and in recent weeks has decreased to a recent value of 213 mV.
- After slightly elevated conductivity readings in week 0 and 1, the conductivity appears to have stabilized between 80 and 95 µS/cm.
- Iron has not been detected in any weekly extract
- Sulfate concentrations have been consistently low, ranging from 2.1 mg/L in week 17 to 7.0 mg/L in week 1.
- Acidity has only been detected in week 5, at a concentration of 5 mg $CaCO_3$/L.
- Alkalinity has been consistently in the 35-45 mg $CaCO_3$/L range, with a maximum observed concentration in week 0 of 55 mg $CaCO_3$/L, followed by the minimum observed concentration of 33 mg $CaCO_3$/L in week 16.

Metal release in the *Tgd* HCT has been extremely low. Most metal concentrations have been consistently below respective method detection limits and meet all applicable water quality standards apart from a single exceedance of the surface water standard for selenium in week 0 (DEQ, 2012). Results are presented in **Figures 3-3** and **3-4a and b**, and in **Table B1** and **B2** in **Appendix B**. Enviromin recommends the termination of this test and is preparing a recommendation for DEQ approval.

3.3.2 Near-surface Lower Newland- *Ynl Ex*

The kinetic HCT of *Ynl Ex* has, thus far, remained consistent with the static geochemistry results. This representative composite is comprised primarily of samples with very low sulfur percentages, but also included a few samples with higher sulfur percentages (as confirmed by ABA). This suggests that the majority of this material has low potential for acid production and metal release, while local pockets of non-oxidized primary sulfide have greater acid and metal release potential.

- The pH has remained strongly neutral and very stable for all weeks of testing, thus far, ranging from 7.77 (week 7) to 8.03 (week 23).
- Redox potential has remained oxidizing and relatively stable (most weeks reporting between 220- 270 mV) with a slightly decreasing trend, recently in the 130-140 mV range.
- Conductivity values have been relatively high, and have yet to stabilize. A maximum conductivity of 863 µS/cm was observed in week 9 and a minimum value of 194 µS/cm was observed in week 5.
- Iron has not been detected in any weekly extract
- Sulfate concentrations have followed a release trend similar to other *Ynl* materials (Enviromin, 2016). After an initial flush in weeks 0 and 1 of 120 mg/L, concentrations dropped well below 100 mg/L. However, a maximum concentration of 510 mg/L was observed in week 10 followed by slowly decreasing concentrations, which were 114 and 90 mg/L in weeks 23 and 24, respectively.
- Acidity not been detected in any weekly extract.
- Alkalinity has been high, but initially inconsistent, with a maximum observed concentration in week 0 of 109 mg $CaCO_3$/L, and a minimum observed concentration of 39 mg $CaCO_3$/L in week 9. Recently, the data indicate some stability at approximately 50 mg $CaCO_3$/L.

In terms of metal release, the *Ynl Ex* HCT has been reliably low. Many metals have exhibited consistently low concentrations, frequently below respective method detection limits. The only instances of exceedances occurred for selenium: in weeks 1, 2, and 4 the respective surface water standard was exceeded (DEQ, 2012). This exceedance was not observed in subsequent extracts. Results are presented in **Figures 3-3** and **3-4a and b**, and in **Tables B1 and B2** in **Appendix B**. This test is approaching low and stable sulfate concentrations, at which time Enviromin will recommend its termination.

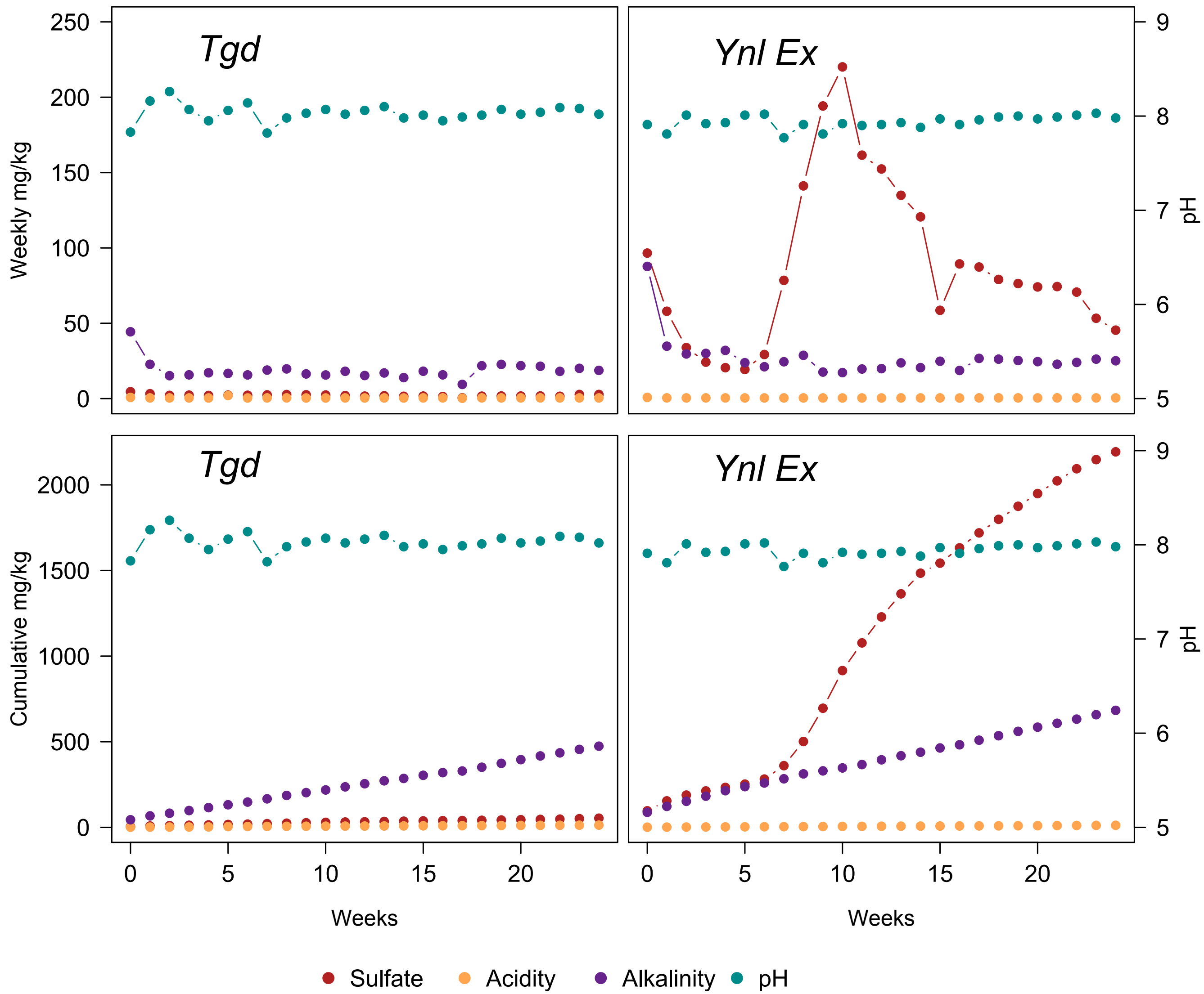

Figure 3-3. Weekly and Cumulative Parameters for *Tgd* and *Ynl Ex* HCTs

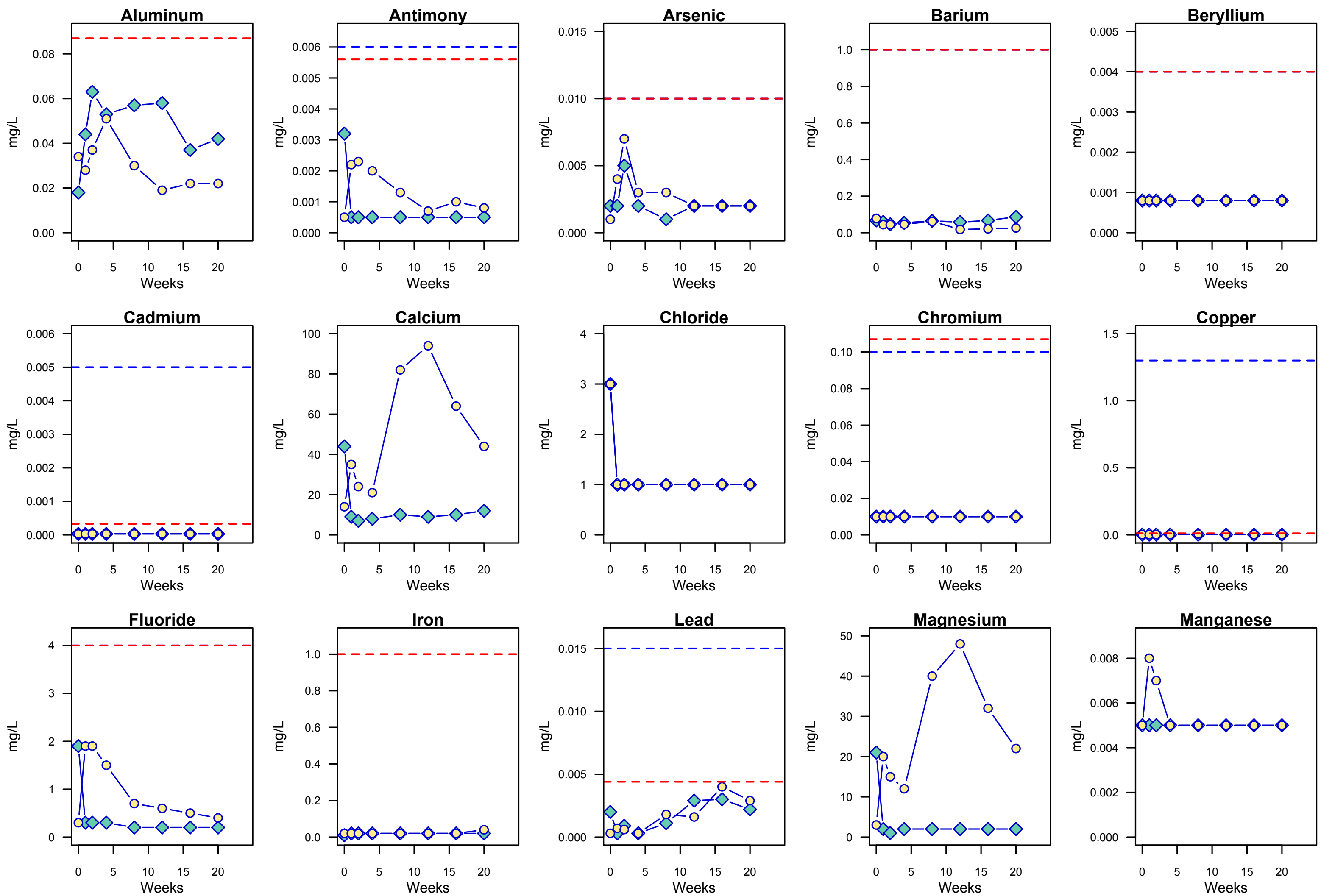

Figure 3-4a. Periodic Metals for *Tgd* (Diamonds) and *Ynl Ex* (Circles) HCTs

Blue lines are groundwater standards. Red lines are surface water standards.

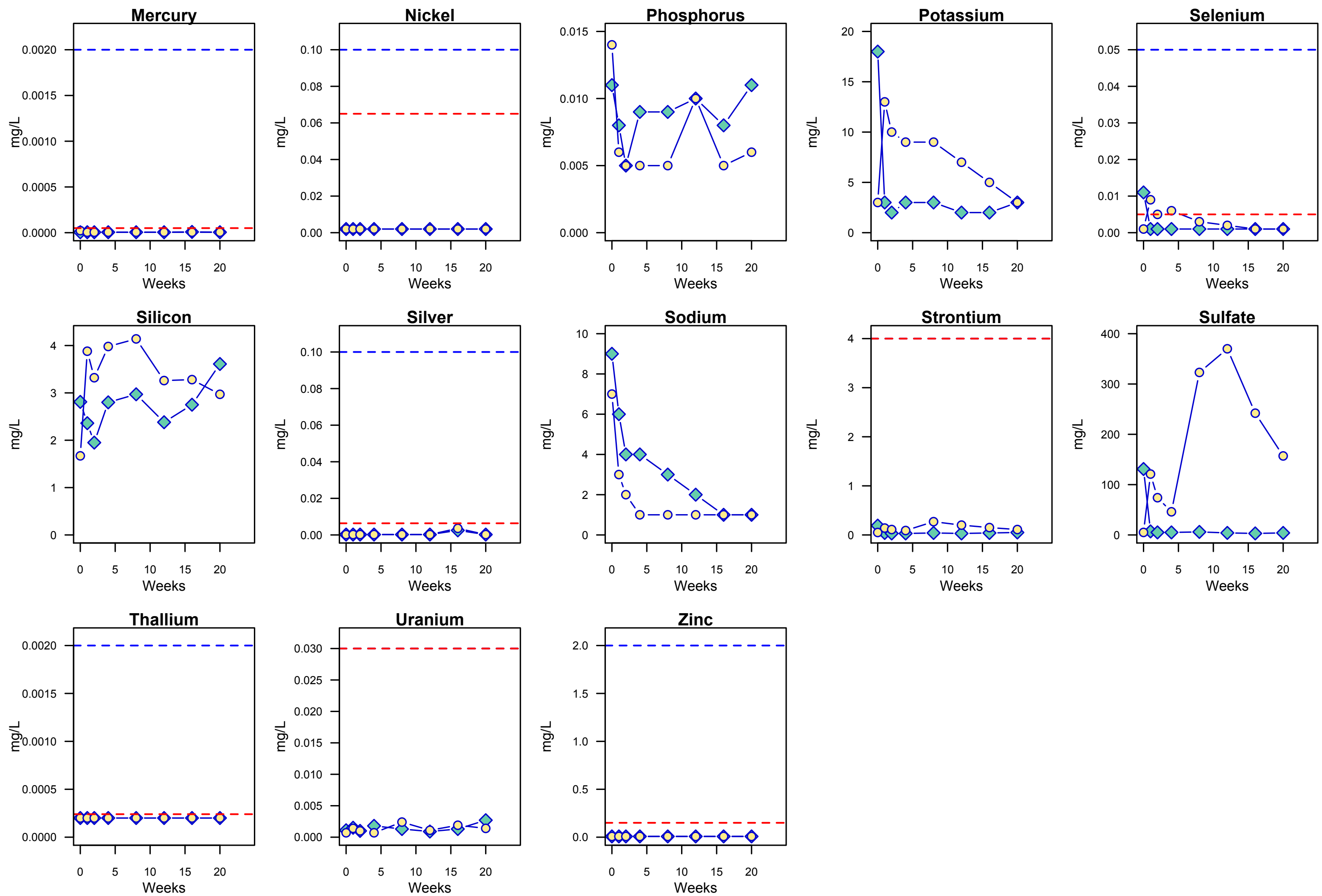

Figure 3-4b. Periodic Metals for *Tgd* (Diamonds) and *Ynl Ex* (Circles) HCTs, cont.

Blue lines are groundwater standards. Red lines are surface water standards.

4 Conclusions

The near-surface materials present at the Project site have been characterized to predict acid generation and metal release potential. These include the Lower Newland Formation conglomerate rocks that lie below the Upper Copper Zone (*Ynl Ex*) and granodiorite (*Tgd*) sills that intrude the *Ynl Ex* unit. These two rock units are exposed together throughout the most of Project area (**Figure 1-2**).

Information provided by static test results and kinetic testing, suggests that it is unlikely that the *Tgd* material will produce acid or release metals. Both static and kinetic tests indicate *Tgd* is net neutralizing and metal release potential is very low. Enviromin is preparing a request to DEQ to terminate this test.

Based on static ABA, NAG pH and kinetic data, the *Ynl Ex* also appears unlikely to produce acid or elevated metal concentrations. A mid-test increase in sulfate has been followed by a decline to near background levels. Kinetic testing of the *Ynl Ex* material will continue until sulfate production is consistently low and stable.

No asbestiform minerals were identified in any of the near-surface construction materials. Although testing is nearly complete, kinetic tests remain underway and will continue until stable solute release is observed and DEQ has approved their termination.

5 References

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Appendix A

Static Data

Table A1 Summary Statistics for ICP Metals, Shallow and Deep Comparisons

Table A2 Sample Subset and multi-element data, by lithotype

ABA/NAG Laboratory Reports (ALS)

Asbestiform Mineral Laboratory Reports (R.J. Lee Gp.)

Table A1: Summary Statistics for ICP Metals
Shallow and Deep Comparisons

Group	Element	Minimum	1st Quartile	Median	Mean	3rd Quartile	Maximum	Standard Deviation
Ynl B from excavations <20 meters (Ynl EX) N=108	Aluminum (%)	2.0	4.7	5.1	5.3	5.8	9.1	1.2
	Arsenic (ppm)	25	25	25	25	25	50	2.4
	Copper (ppm)	5	20	30	27.2	30	90	12.7
	Iron (%)	1.4	2.6	3.3	3.3	4.0	5.1	0.9
	Manganese (ppm)	80	250	360	355	430	1290	167
	Nickel (ppm)	10	20	20	22	30	50	9
	Lead (ppm)	10	20	35	40	50	140	25
	Sulfur (%)	0.03	0.03	0.32	0.58	0.91	2.83	0.66
	Thallium(ppm)	25	25	25	25	25	50	2
	Zinc (ppm)	10	60	90	132	163	670	114
All Ynl B Deeper than 20 meters (YnlB) N=1406	Aluminum (%)	0.16	3.91	4.40	4.63	5.25	9.40	1.50
	Arsenic (ppm)	25	25	25	37	25	1040	49
	Copper (ppm)	5	20	30	143	80	24900	769
	Iron (%)	1.0	3.0	3.7	4.3	4.6	31.1	2.7
	Manganese (ppm)	10	290	510	563	750	4010	395
	Nickel (ppm)	5	10	20	28	30	670	33
	Lead (ppm)	10	10	20	44	30	2350	131
	Sulfur (%)	0.03	0.55	1.2	1.9	2.4	10	2.1
	Thallium(ppm)	25	25	25	25	25	110	5
	Zinc (ppm)	10	20	30	53.07	40	2510	140
Tgd <20 meters , N=76	Aluminum (%)	2.3	3.4	4.1	4.2	5.0	6.4	1.0
	Arsenic (ppm)	25	25	25	25.33	25	50	2.9
	Copper (ppm)	5	5	10	14	20	60	11
	Iron (%)	1.8	2.3	2.5	2.5	2.6	4.9	0.3
	Manganese (ppm)	280	370	415	407	440	580	54
	Nickel (ppm)	30	50	50	53	60	80	11
	Lead (ppm)	10	20	20	24	30	80	14
	Sulfur (%)	0.03	0.03	0.03	0.03	0.03	0.24	0.02
	Thallium(ppm)	25	25	25	25	25	25	0
	Zinc (ppm)	30	40	50	52	60	120	15
IG General Population, N=37	Aluminum (%)	0.9	5.8	6.0	5.8	6.3	7.3	1.2
	Arsenic (ppm)	25	25	25	35	25	410	63
	Copper (ppm)	10	30	40	55	50	470	76
	Iron (%)	2.8	4.4	5.1	5.3	5.4	24.6	3.3
	Manganese (ppm)	110	700	760	753	810	1220	150
	Nickel (ppm)	10	130	210	199	280	340	86
	Lead (ppm)	10	10	20	38	30	690	110
	Sulfur (%)	0.03	0.06	0.11	0.42	0.17	10	1.62
	Thallium(ppm)	25	25	25	27.03	25	100	12
	Zinc (ppm)	20	70	80	80	90	150	23

Table A2: Sample Subset and whole element data, by lithotype

	Hole ID	From (m)	To (m)	Silver (ppm)	Aluminum (%)	Arsenic (ppm)	Gold (ppm)	Barium (ppm)	Beryllium (ppm)	Calcium (%)	Cadmium (ppm)	Cobalt (ppm)	Chromium (ppm)	Copper (ppm)	Iron (%)	Potassium (%)	Magnesium (%)
***Tgd* Sample Subset (n=8)**	TP6	--	--	1	3.44	25	0.0025	1390	5	1.75	5	10	80	10	2.36	2.2	1.26
	TP14	--	--	0.5	3.95	25	0.0025	1320	5	1.37	5	10	80	5	2.37	2.4	1.25
	SC15-188	10	12	0.5	4.14	25	0.0025	1430	5	3.13	5	10	80	10	2.64	2.2	1.34
	SC15-183	8	10	0.5	4.91	25	0.0025	1230	5	4.41	5	20	80	10	2.38	2	0.78
	SC15-181	6.71	8.7	0.5	4.29	25	0.0025	1160	5	1.27	5	10	100	10	2.6	2.5	1.07
	SC15-202	9	11	0.5	4.44	25	0.0025	1424	5	1.96	5	20	130	5	2.4	2.7	1.53
	SC15-185	4.33	6	0.5	3.1	25	0.0025	1470	5	2.72	5	10	100	40	2.57	2.3	1.34
	SC15-187	4	4.96	0.5	4.79	25	0.0025	1560	5	1.68	5	10	90	30	2.7	2.4	1.46
	***Tgd* Subset Averages**			0.6	4.13	25	0.0025	1373	5	2.29	5	13	93	15	2.50	2.3	1.25
***Ynl Ex* Sample Subset (n=10)**	SC15_181	15.4	17.4	0.5	5.24	25	0.0025	410	5	6	5	20	30	20	3.85	1.2	5.98
	SC15_181	19.4	21.4	0.5	5.55	25	0.0025	200	5	4.34	5	20	30	30	4	1.3	5.84
	SC15_184	10.63	12.25	0.5	3.68	25	0.0025	150	5	5	5	5	30	10	1.86	1	3.46
	SC15_184	19.89	21.36	0.5	5.01	25	0.0025	220	5	4.76	5	5	40	20	2.61	1.3	5.2
	SC15_184	4.57	5.5	0.5	6.11	25	0.0025	480	5	2.41	5	10	40	40	4.53	1.5	4.15
	SC15_197	15.7	17.7	0.5	4.23	25	0.0025	130	5	5.4	5	10	30	10	2.46	1.1	6.89
	SC15_191	8.04	10	0.5	4.27	25	0.0025	260	5	7.52	5	10	30	20	2.27	1.3	5.66
	SC15_199	19	21	0.5	6.59	25	0.0025	310	5	0.16	5	10	60	90	3.25	2.5	3
	SC15_204	3.18	5	0.5	5.59	25	0.0025	250	5	2.44	5	10	20	30	3.63	1.8	4.44
	SC15_205	15	16.65	0.5	6.14	25	0.0025	220	5	2.69	5	10	30	50	4.93	1.5	4.25
	***Ynl Ex* Subset Averages**			0.5	5.24	25	0.0025	263	5	4.07	5	11	34	32	3.34	1.5	4.89

Table A2: Sample Subset and whole element data, by lithotype

	Hole ID	From (m)	To (m)	Manganese (ppm)	Sodium (%)	Nickel (ppm)	Phosphorus (ppm)	Lead (ppm)	Sulfur (%)	Antimony (ppm)	Strontium (ppm)	Titanium (%)	Thallium (ppm)	Uranium (ppm)	Vandium (ppm)	Zinc (ppm)
***Tgd* Sample Subset (n=8)**	TP6	--	--	370	2.77	40	660	50	0.025	25	670	0.26	25	25	60	60
	TP14	--	--	430	2.73	50	750	20	0.025	25	510	0.26	25	25	60	60
	SC15-188	10	12	440	2.59	50	800	10	0.025	25	640	0.27	25	25	70	50
	SC15-183	8	10	400	2.01	50	740	30	0.025	25	510	0.27	25	25	60	50
	SC15-181	6.71	8.7	540	2.61	60	800	40	0.025	25	420	0.29	25	25	70	70
	SC15-202	9	11	400	2.79	70	660	30	0.025	25	620	0.29	25	25	60	60
	SC15-185	4.33	6	400	2.61	50	740	10	0.24	25	590	0.26	25	25	70	30
	SC15-187	4	4.96	440	3.31	50	770	10	0.025	25	720	0.29	25	25	70	60
	***Tgd* Subset Averages**			428	2.68	53	740	25	0.05	25	585	0.27	25	25	65	55
***Ynl Ex* Sample Subset (n=10)**	SC15_181	15.4	17.4	460	0.2	20	850	30	0.9	25	90	0.38	25	25	60	80
	SC15_181	19.4	21.4	410	0.27	20	690	20	1.28	25	70	0.32	25	25	60	80
	SC15_184	10.63	12.25	370	0.12	10	110	10	0.025	25	50	0.13	25	25	30	10
	SC15_184	19.89	21.36	320	0.13	20	340	40	0.29	25	40	0.2	25	25	60	70
	SC15_184	4.57	5.5	320	0.24	30	1370	70	0.13	25	50	0.43	25	25	80	340
	SC15_197	15.7	17.7	530	0.08	10	180	40	0.64	25	60	0.13	25	25	40	40
	SC15_191	8.04	10	460	0.2	20	240	70	0.34	25	90	0.16	25	25	50	180
	SC15_199	19	21	80	0.63	30	240	40	0.11	25	40	0.31	25	25	70	80
	SC15_204	3.18	5	300	0.05	20	710	30	0.025	25	40	0.27	25	25	60	100
	SC15_205	15	16.65	170	0.025	30	1190	70	2.83	25	40	0.42	25	25	80	200
	***Ynl Ex* Subset Averages**			342	0.19	21	592	42	0.66	25	57	0.28	25	25	59	118

RJ LeeGroup, Inc.

RJ Lee Group, Inc.
350 Hochberg Road, Monroeville, PA 15146
Tel: 724-325-1776 I Fax: 724-733-1799

Laboratory Report

Revised

Enviromin Inc.
1807 W Dickerson St.
Suite D
Bozeman , MT 59771
Attention: Lisa Kirk
Telephone: 406-581-8261

Report Date	08/05/2016
Sample Receipt Date	03/14/2016
RJ Lee Group Job No.	AOH1040339-0
Authorization/P.O. No.	
Client Job No./Name	3767-01

Analysis: Asbestos in Bulk Samples by Point Count
Method: EPA/600/R-93/116

RJLG Sample Number	Client Sample Number	Homogeneous	# of Layers	Asbestos Detected(%)	Non-Asbestos Fibers(%)	Non-Fibrous Materials(%)	Matrix Material	Analyst - Analysis Date
10360883.HPL	Ynl Ex	Yes	1	ND		100.00	Q, CA, OP, M	JM-03/28/2016
Description:	Gray Dust 400 points counted. Detection limit of 0.25%. No asbestiform minerals detected.							
Weight Loss: 0.0%								
10360884.HPL	Tgd	Yes	1	ND		100.00	Q, CA, OP, M	JM-03/28/2016
Description:	Tan Dust 400 points counted. Detection limit of 0.25%. No asbestiform minerals detected.							
Weight Loss: 0.0%								

Client Job No./Name: 3767-01 RJ Lee Group Job No: AOH1040339-0

RJLG Sample Number	Client Sample Number	Homogeneous	# of Layers	Asbestos Detected(%)	Non-Asbestos Fibers(%)	Non-Fibrous Materials(%)	Matrix Material	Analyst - Analysis Date

Authorized Signature: Jacquelyn Mershon

Jacquelyn Mershon

ASBESTOS
AM = Amosite
AC = Actinolite
AN = Anthophyllite
CH = Chrysotile
CR = Crocidolite
TR = Tremolite

NON-ASBESTOS
CE = Cellulose
MW = Mineral Wool
FG = Fibrous Glass
SF = Synthetic Fibers
H = Hair
W = Wollastonite
OF = Other Fibers

NON-FIBROUS MATERIALS
AM = Amphibole
B = Binder
CA = Carbonates
CL = Clay
F = Feldspar
G = Gypsum
HY = Hydromagnesite
M = Miscellaneous
MI = Mica
OP = Opaque
OR = Organic
P = Perlite
Q = Quartz
T = Tar
V = Vermiculite

DISCLAIMER NOTES
· "ND" indicates no asbestos was detected; the method detection limit is 0.25%.
· "Trace" or "<" indicates asbestos was identified in the sample, but the concentration is less than the method quantitation limit. PLM coefficients of variance range from approximately 1.8 at the quantitation limit of 0.25% to 0.32 at high fiber concentrations.
· Samples are archived for three months following analysis and are then properly discarded.
· These results are submitted pursuant to RJ Lee Group's current terms and conditions of sale, including the company's standard warranty and limitation of liability provisions. No responsibility or liability is assumed for the manner in which these results are used or interpreted.
· This test report relates to the items tested.
· This report is not valid unless it bears the name of a NVLAP Lab Code 101208-0 approved signatory.
· Any reproduction of this document must be in full in order for the report to be valid.
· This report may not be used to claim product endorsement by NVLAP Lab Code 101208-0, any agency of the U.S. Government or any other laboratory accrediting agency.
· Polarized-light microscopy is not consistently reliable in detecting asbestos in floor coverings and similar nonfriable organically bound materials. Quantitative transmission electron microscopy is currently the only method that can be used to determine if this material can be considered or treated as "non-asbestos-containing."
· Sample(s) for this project were analyzed at our: Monroeville, PA (AIHA #100364) facility.
· If RJ Lee Group, Inc. did not collect the samples analyzed, the verifiability of the laboratorys results are limited to the reported values.

ALS Canada Ltd.

2103 Dollarton Hwy
North Vancouver BC V7H 0A7
Phone: +1 (604) 984 0221 Fax: +1 (604) 984 0218
www.alsglobal.com

To: **TINTINA MONTANA INC.**
17 MAIN ST
WHITE SULPHUR SPRINGS MT 59645
USA

Finalized Date: 3- FEB- 2016
Account: TINALEX

CERTIFICATE RE16004989

P.O. No.: NA

This report is for 10 Reject samples submitted to our lab in Reno, NV, USA on 12- JAN- 2016.

The following have access to data associated with this certificate:

JACK COTE	LISA KIRK	VINCE SCARTOZZI
KATHARINE SEIPEL	DAMON SHEUMAKER	JERRY ZIEG

SAMPLE PREPARATION

ALS CODE	DESCRIPTION
SPL- 21	Split sample - riffle splitter
PUL- 31	Pulverize split to 85% <75 um
SPLIT- Z	Pulp split for send out
FND- 03	Find Reject for Addn Analysis
PUL- QC	Pulverizing QC Test
WEI- 25	Wt. of Crushed Reject

ANALYTICAL PROCEDURES

ALS CODE	DESCRIPTION	INSTRUMENT
S- IR08	Total Sulphur (Leco)	LECO
OA- ELE07	Paste pH	
S- CAL06	Sulfide Sulfur (calculated)	LECO
S- GRA06	Sulfate Sulfur- carbonate leach	WST- SEQ
S- GRA06a	Sulfate Sulfur (HCl leachable)	WST- SEQ
OA- VOL11	Static Net Acid Generation	
OA- VOL08m	Modified NP	

The results of this assay were based solely upon the content of the sample submitted. Any decision to invest should be made only after the potential investment value of the claim 'or deposit has been determined based on the results of assays of multiple samples of geological materials collected by the prospective investor or by a qualified person selected by him/her and based on an evaluation of all engineering data which is available concerning any proposed project. Statement required by Nevada State Law NRS 519

To: **TINTINA MONTANA INC.**
ATTN: KATHARINE SEIPEL
17 MAIN ST
WHITE SULPHUR SPRINGS MT 59645
USA

This is the Final Report and supersedes any preliminary report with this certificate number. Results apply to samples as submitted. All pages of this report have been checked and approved for release.

***** See Appendix Page for comments regarding this certificate *****

Signature:
Colin Ramshaw, Vancouver Laboratory Manager

ALS Canada Ltd.
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To: TINTINA MONTANA INC.
17 MAIN ST
WHITE SULPHUR SPRINGS MT 59645
USA

Finalized Date: 3- FEB- 2016
Account: TINALEX

CERTIFICATE OF ANALYSIS RE16004989

Sample Description	Method / Analyte / Units / LOR	WEI- 25 Reject W kg 0.001	OA- VOL11 NAGpH4.5 kg H2SO4/t 0.01	OA- VOL11 NAGpH7.0 kg H2SO4/t 0.01	OA- VOL11 pH Unity 0.1	OA- VOL08m MPA tCaCO3/1Kt 0.3	OA- VOL08m NNP tCaCO3/1Kt 1	OA- VOL08m FIZZ RAT Unity 1	OA- VOL08m NP tCaCO3/1Kt 1	OA- ELE07 pH Unity 0.1	OA- VOL08m Ratio (N Unity 0.01	S- IR08 S % 0.01	S- GRA06 S % 0.01	S- GRA06a S % 0.01	S- CAL06 S % 0.01
220524		6.68	<0.01	<0.01	11.1	26.3	204	4	230	8.5	8.76	0.84	0.02	<0.01	0.82
220526		2.67	<0.01	<0.01	11.1	32.2	128	3	160	8.6	4.97	1.03	0.02	<0.01	1.01
220578		9.00	<0.01	<0.01	11.3	<0.3	186	3	186	8.8	1190.40	<0.01	<0.01	<0.01	<0.01
220585		9.08	<0.01	<0.01	11.1	7.8	207	4	215	8.6	27.52	0.25	0.01	0.01	0.24
220572		3.41	<0.01	<0.01	11.1	3.8	112	3	116	8.3	30.93	0.12	0.02	0.01	0.10
220694		5.51	<0.01	<0.01	11.1	7.5	291	4	298	8.8	39.73	0.24	0.01	0.03	0.23
221088		3.17	<0.01	<0.01	10.9	<0.3	93	3	93	8.4	595.20	<0.01	0.01	0.01	<0.01
220826		5.90	<0.01	<0.01	10.4	19.7	222	4	242	8.8	12.29	0.63	<0.01	<0.01	0.63
220865		6.39	<0.01	<0.01	7.8	2.8	5	1	8	8.7	2.84	0.09	0.01	<0.01	0.08
221113		5.48	<0.01	<0.01	8.5	94.4	13	3	107	8.0	1.13	3.02	0.04	<0.01	2.98

***** See Appendix Page for comments regarding this certificate *****

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To: TINTINA MONTANA INC.
17 MAIN ST
WHITE SULPHUR SPRINGS MT 59645
USA

Finalized Date: 3- FEB- 2016
Account: TINALEX

CERTIFICATE OF ANALYSIS RE16004989

CERTIFICATE COMMENTS

LABORATORY ADDRESSES

Processed at ALS Reno located at 4977 Energy Way, Reno, NV, USA.

Applies to Method:	FND- 03	PUL- 31	PUL- QC	SPL- 21
	SPLIT- Z	WEI- 25		

Processed at ALS Vancouver located at 2103 Dollarton Hwy, North Vancouver, BC, Canada.

Applies to Method:	OA- ELE07	OA- VOL08m	OA- VOL11	S- CAL06
	S- GRA06	S- GRA06a	S- IR08	

ALS Canada Ltd.

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To: **TINTINA MONTANA INC.**
17 MAIN ST
WHITE SULPHUR SPRINGS MT 59645
USA

Finalized Date: 27- NOV- 2015
Account: TINALEX

CERTIFICATE RE15168566

P.O. No.: NA

This report is for 8 Reject samples submitted to our lab in Reno, NV, USA on 30- OCT- 2015.

The following have access to data associated with this certificate:

JACK COTE KATHARINE SEIPEL	LISA KIRK JERRY ZIEG	VINCE SCARTOZZI

SAMPLE PREPARATION

ALS CODE	DESCRIPTION
FND- 03	Find Reject for Addn Analysis
SPLIT- Z	Pulp split for send out
SPL- 21	Split sample - riffle splitter
PUL- 31	Pulverize split to 85% <75 um
WEI- 25	Wt. of Crushed Reject

ANALYTICAL PROCEDURES

ALS CODE	DESCRIPTION	INSTRUMENT
S- IR08	Total Sulphur (Leco)	LECO
OA- ELE07	Paste pH	
S- CAL06	Sulfide Sulfur (calculated)	LECO
S- GRA06	Sulfate Sulfur- carbonate leach	WST- SEQ
S- GRA06a	Sulfate Sulfur (HCl leachable)	WST- SEQ
OA- VOL11	Static Net Acid Generation	
OA- VOL08m	Modified NP	

The results of this assay were based solely upon the content of the sample submitted. Any decision to invest should be made only after the potential investment value of the claim 'or deposit has been determined based on the results of assays of multiple samples of geological materials collected by the prospective investor or by a qualified person selected by him/her and based on an evaluation of all engineering data which is available concerning any proposed project. Statement required by Nevada State Law NRS 519

To: **TINTINA MONTANA INC.**
ATTN: KATHARINE SEIPEL
17 MAIN ST
WHITE SULPHUR SPRINGS MT 59645
USA

This is the Final Report and supersedes any preliminary report with this certificate number. Results apply to samples as submitted. All pages of this report have been checked and approved for release.

***** See Appendix Page for comments regarding this certificate *****

Signature:
Colin Ramshaw, Vancouver Laboratory Manager

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Finalized Date: 27- NOV- 2015
Account: TINALEX

CERTIFICATE OF ANALYSIS RE15168566

Sample Description	Method / Analyte / Units / LOR	WEI- 25 Reject W kg 0.001	OA- VOL11 NAGpH4.5 kg H2SO4/t 0.01	OA- VOL11 NAGpH7.0 kg H2SO4/t 0.01	OA- VOL11 pH Unity 0.1	OA- VOL08m MPA tCaCO3/1Kt 0.3	OA- VOL08m NNP tCaCO3/1Kt 1	OA- VOL08m FIZZ RAT Unity 1	OA- VOL08m NP tCaCO3/1Kt 1	OA- ELE07 pH Unity 0.1	OA- VOL08m Ratio (N Unity 0.01	S- IR08 S % 0.01	S- GRA06 S % 0.01	S- GRA06a S % 0.01	S- CAL06 S % 0.01
219008		0.540	<0.01	<0.01	7.6	0.6	9	1	10	8.6	16.00	0.02	<0.01	0.01	0.02
219009		0.720	<0.01	<0.01	7.8	0.9	5	1	6	8.1	6.40	0.03	<0.01	<0.01	0.03
221054		7.07	<0.01	<0.01	11.1	0.6	23	2	24	8.7	38.40	0.02	<0.01	<0.01	0.02
220517		5.12	<0.01	<0.01	10.0	1.3	18	1	19	8.4	15.20	0.04	<0.01	<0.01	0.04
220556		5.00	<0.01	<0.01	9.8	0.6	85	2	86	8.2	137.60	0.02	<0.01	<0.01	0.02
220595		10.15	<0.01	<0.01	11.2	8.4	55	2	63	8.8	7.47	0.27	<0.01	<0.01	0.27
220634		2.58	<0.01	<0.01	10.3	1.3	14	1	15	8.9	12.00	0.04	<0.01	<0.01	0.04
220678		6.48	<0.01	<0.01	11.3	0.9	59	2	60	8.8	64.00	0.03	<0.01	<0.01	0.03

***** See Appendix Page for comments regarding this certificate *****

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CERTIFICATE OF ANALYSIS RE15168566

CERTIFICATE COMMENTS

LABORATORY ADDRESSES

Processed at ALS Reno located at 4977 Energy Way, Reno, NV, USA.

Applies to Method:	FND- 03	PUL- 31	SPL- 21	SPLIT- Z
	WEI- 25			

Processed at ALS Vancouver located at 2103 Dollarton Hwy, North Vancouver, BC, Canada.

Applies to Method:	OA- ELE07	OA- VOL08m	OA- VOL11	S- CAL06
	S- GRA06	S- GRA06a	S- IR08	

Appendix B

Kinetic Data

Table B1	Weekly Parameters
Table B2	Periodic Metals

Table B1. Summary of Weekly Data for 2016 HCTs of Near-Surface Materials, *Tgd* and *Ynl Ex.* Tests are ongoing and in week 24 of testing. Data is currently available through week 24. All values displayed are mg/L.

	Volume	Effluent pH	Redox Potential	Conductivity	Total Fe			Fe^{2+}	Fe^{3+}	SO_4^{2-}			Acidity, $CaCO_3$ Equivalents			Alkalinity, $CaCO_3$ Equivalents		
Week	L	s.u.	mV (vs Ag/AgCl)	µS/cm	mg/L	mg/kg	Cum. mg/kg	mg/L	mg/L	mg/L	mg/kg	Cum. mg/kg	mg/L	mg/kg	Cum. mg/kg	mg/L	mg/kg	Cum. mg/kg
Tgd																		
0	1.614	7.83	294	136	<0.10	0.08	0.081	<0.10	<0.10	5.7	4.60	4.60	<1.0	0.81	0.81	55	44	44.4
1	0.929	8.16	267	101	<0.10	0.05	0.127	<0.10	<0.10	7.0	3.25	7.85	<1.0	0.46	1.27	49	23	67.1
2	0.871	8.26	272	77	<0.10	0.04	0.171	<0.10	<0.10	4.9	2.13	9.98	<1.0	0.44	1.71	40	17	84.5
3	0.877	8.07	318	80	<0.10	0.04	0.214	<0.10	<0.10	5.3	2.32	12.3	<1.0	0.44	2.14	41	18	102
4	0.837	7.95	314	77	<0.10	0.04	0.256	<0.10	<0.10	5.0	2.09	14.4	<1.0	0.42	2.56	41	17	115
5	0.817	8.06	343	83	<0.10	0.04	0.297	<0.10	<0.10	5.7	2.33	16.7	5.0	2.04	4.60	41	17	132
6	0.828	8.14	303	78	<0.10	0.04	0.338	<0.10	<0.10	5.4	2.23	19.0	<1.0	0.41	5.02	38	16	148
7	0.924	7.82	332	82	<0.10	0.05	0.385	<0.10	<0.10	5.4	2.49	21.5	<1.0	0.46	5.48	41	19	167
8	0.963	7.98	302	84	<0.10	0.05	0.433	<0.10	<0.10	5.6	2.69	24.1	<1.0	0.48	5.96	41	20	186
9	0.820	8.03	311	83	<0.10	0.04	0.474	<0.10	<0.10	6.2	2.54	26.7	<1.0	0.41	6.37	40	16	203
10	0.826	8.07	338	78	<0.10	0.04	0.515	<0.10	<0.10	5.8	2.39	29.1	<1.0	0.41	6.78	38	16	218
11	0.907	8.02	357	78	<0.10	0.05	0.560	<0.10	<0.10	4.4	1.99	31.1	<1.0	0.45	7.24	40	18	237
12	0.858	8.06	316	66	<0.10	0.043	0.599	<0.10	<0.10	3.9	1.66	32.5	<1.0	0.43	7.62	36	15	255
13	0.927	8.10	274	70	<0.10	0.046	0.645	<0.10	<0.10	4.1	1.89	34.4	<1.0	0.46	8.08	37	17	272
14	0.826	7.98	278	70	<0.10	0.041	0.686	<0.10	<0.10	3.7	1.52	35.9	<1.0	0.41	8.49	34	14	286
15	0.963	8.01	257	73	<0.10	0.048	0.734	<0.10	<0.10	3.5	1.67	37.6	<1.0	0.48	8.97	38	18	304
16	0.963	7.95	271	77	<0.10	0.048	0.782	<0.10	<0.10	2.9	1.39	39.0	<1.0	0.48	9.44	33	16	320
17	0.513	7.99	227	74	<0.10	0.025	0.808	<0.10	<0.10	2.1	0.53	39.5	<1.0	0.25	9.70	37	9	329
18	0.956	8.01	229	86	<0.10	0.047	0.855	<0.10	<0.10	3.4	1.61	41.2	<1.0	0.47	10.2	46	22	351
19	0.952	8.07	258	95	<0.10	0.047	0.902	<0.10	<0.10	3.7	1.75	42.9	<1.0	0.47	10.7	48	23	374
20	0.957	8.02	225	93	<0.10	0.048	0.950	<0.10	<0.10	3.6	1.71	44.6	<1.0	0.48	11.1	46	22	396
21	0.983	8.04	269	95	<0.10	0.049	0.999	<0.10	<0.10	3.6	1.8	46.4	<1.0	0.49	11.6	44	21	417
22	0.934	8.09	158	82	<0.10	0.046	1.045	<0.10	<0.10	3.3	1.5	47.9	<1.0	0.46	12.1	39	18	435
23	0.919	8.08	178	92	<0.10	0.046	1.091	<0.10	<0.10	6.0	2.7	50.6	<1.0	0.46	12.5	44	20	455
24	0.920	8.02	213	86	<0.10	0.046	1.136	<0.10	<0.10	6.0	2.7	53.4	<1.0	0.46	13.0	41	19	474
Ynl Ex																		
0	1.611	7.91	304	473	<0.10	0.08	0.080	<0.10	<0.10	120	97	96.6	<1.0	<0.80	0.80	109	87.7	88
1	0.967	7.81	293	395	<0.10	0.05	0.129	<0.10	<0.10	120	58	155	<1.0	<0.48	1.29	72	34.8	123
2	0.942	8.01	257	302	<0.10	0.05	0.176	<0.10	<0.10	72	34	188	<1.0	<0.47	1.76	72	33.9	156
3	0.969	7.92	331	240	<0.10	0.05	0.224	<0.10	<0.10	50	24	213	<1.0	<0.48	2.24	70	33.9	190
4	0.956	7.93	312	215	<0.10	0.05	0.272	<0.10	<0.10	43	21	233	<1.0	<0.48	2.72	67	32.0	214
5	0.900	8.01	341	194	<0.10	0.04	0.317	<0.10	<0.10	43	19	253	<1.0	<0.45	3.17	53	23.8	238
6	0.901	8.02	313	236	<0.10	0.05	0.362	<0.10	<0.10	65	29	282	<1.0	<0.45	3.62	47	21.2	259
7	0.924	7.77	331	437	<0.10	0.05	0.408	<0.10	<0.10	170	79	360	<1.0	<0.46	4.08	53	24.5	284
8	0.942	7.91	277	674	<0.10	0.05	0.455	<0.10	<0.10	300	141	501	<1.0	<0.47	4.55	61	28.7	312
9	0.904	7.81	275	863	<0.10	0.05	0.500	<0.10	<0.10	430	194	696	<1.0	<0.45	5.00	39	17.6	330
10	0.864	7.92	366	750	<0.10	0.04	0.544	<0.10	<0.10	510	220	916	<1.0	<0.43	5.44	40	17.3	347
11	0.874	7.90	373	707	<0.10	0.04	0.587	<0.10	<0.10	370	162	1077	<1.0	<0.44	5.87	45	19.7	367
12	0.848	7.91	350	638	<0.10	0.04	0.629	<0.10	<0.10	360	152	1229	<1.0	<0.42	6.29	47	19.9	395
13	0.932	7.93	302	568	<0.10	0.05	0.676	<0.10	<0.10	290	135	1364	<1.0	<0.47	6.76	51	23.7	418
14	0.895	7.88	298	505	<0.10	0.04	0.720	<0.10	<0.10	270	121	1484	<1.0	<0.45	7.20	46	20.6	439
15	0.903	7.97	267	505	<0.10	0.05	0.765	<0.10	<0.10	130	59	1543	<1.0	<0.45	7.65	55	24.8	464

	Volume	Effluent pH	Redox Potential	Conductivity	Total Fe			Fe^{2+}	Fe^{3+}	SO_4^{2-}			Acidity, $CaCO_3$ Equivalents			Alkalinity, $CaCO_3$ Equivalents		
Week	L	s.u.	mV (vs Ag/AgCl)	µS/cm	mg/L	mg/kg	Cum. mg/kg	mg/L	mg/L	mg/L	mg/kg	Cum. mg/kg	mg/L	mg/kg	Cum. mg/kg	mg/L	mg/kg	Cum. mg/kg
16	0.814	7.91	265	539	<0.10	0.04	0.806	<0.10	<0.10	220	89	1632	<1.0	<0.41	8.06	46	18.7	482
17	0.972	7.96	221	377	<0.10	0.05	0.854	<0.10	<0.10	180	87	1720	<1.0	<0.49	8.54	55	26.7	509
18	0.990	7.99	233	399	<0.10	0.05	0.904	<0.10	<0.10	160	79	1799	<1.0	<0.49	9.04	53	26.2	535
19	0.956	8.00	279	425	<0.10	0.05	0.952	<0.10	<0.10	160	76	1875	<1.0	<0.48	9.52	53	25.3	560
20	0.928	7.97	241	388	<0.10	0.05	0.998	<0.10	<0.10	160	74	1949	<1.0	<0.46	9.98	53	24.6	585
21	0.993	7.99	283	387	<0.10	0.05	1.048	<0.10	<0.10	150	74	2024	<1.0	<0.49	10.5	46	22.8	608
22	0.944	8.01	148	369	<0.10	0.05	1.095	<0.10	<0.10	150	71	2094	<1.0	<0.47	10.9	51	24.0	632
23	0.937	8.03	130	327	<0.10	0.05	1.141	<0.10	<0.10	114	53	2148	<1.0	<0.47	11.4	56	26.2	658
24	0.968	7.98	132	310	<0.10	0.05	1.190	<0.10	<0.10	94	45	2193	<1.0	<0.48	11.9	52	25.1	683

Table B2. Summary of Energy Labs data for 2016 HCTs of Near-Surface Materials, *Tgd* and *Ynl Ex.* Tests are ongoing and results are collected in weeks 0,1,2,4, and every fourth week thereafter. Data is currently available through week 20. All values displayed are mg/L.

MT DEQ Water Quality Standards		Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chloride	Chromium	Copper	Fluoride	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Phosphorus	Potassium	Selenium	Silicon	Silver	Sodium	Strontium	Sulfate	Thallium	Uranium	Zinc
GW		None	0.006	0.01	1	0.004	0.005	None	None	0.1	1.3	4	None	0.015	None	None	0.002	0.1	None	None	0.05	None	0.1	None	4	None	0.002	0.03	2
SW[1]		0.087	0.0056	0.01	1	0.004	0.00033	None	None	0.107	0.0117	4	1	0.0044	None	None	0.00005	0.065	None	None	0.005	None	0.00637	None	4	None	0.00024	0.03	0.15
MDL		0.009	0.0005	0.001	0.003	0.0008	0.00003	None	None	0.01	0.002	0.2	0.02	0.0003	None	0.005	0.000005	0.002	0.0012	None	0.001	None	0.0002	None	0.02	None	0.0002	0.0002	0.T008
2016 *Tgd* (Weeks)	0	0.018	0.0032	0.002	0.067	<0.0008	<0.00003	44	3	<0.01	<0.002	1.9	0.01	0.002	21	<0.005	0.000005	<0.002	0.011	18	0.011	2.81	<0.0002	9	0.19	131	<0.0002	0.0011	<0.008
	1	0.044	<0.0005	0.002	0.059	<0.0008	<0.00003	9	<1	<0.01	<0.002	0.3	<0.02	<0.0003	2	<0.005	0.0000052	<0.002	0.008	3	<0.001	2.36	<0.0002	6	0.04	7	<0.0002	0.0015	<0.008
	2	0.063	<0.0005	0.005	0.046	<0.0008	<0.00003	7	<1	<0.01	<0.002	0.3	0.02	0.0009	1	<0.005	<0.000005	<0.002	<0.005	2	<0.001	1.95	<0.0002	4	0.03	5	<0.0002	0.001	<0.008
	4	0.053	<0.0005	0.002	0.054	<0.0008	<0.00003	8	<1	<0.01	<0.002	0.3	<0.02	<0.0003	2	<0.005	<0.000005	<0.002	0.009	3	<0.001	2.8	<0.0002	4	0.03	5	<0.0002	0.0018	<0.008
	8	0.057	<0.0005	0.001	0.065	<0.0008	<0.00003	10	<1	<0.01	<0.002	<0.2	<0.02	0.0011	2	<0.005	<0.000005	<0.002	0.009	3	<0.001	2.97	<0.0002	3	0.04	6	<0.0002	0.0013	<0.008
	12	0.058	<0.0005	0.002	0.058	<0.0008	<0.00003	9	<1	<0.01	<0.002	<0.2	<0.02	0.0029	2	<0.005	<0.000005	<0.002	0.01	2	<0.001	2.38	<0.0002	2	0.03	4	<0.0002	0.0009	<0.008
	16	0.037	<0.0005	0.002	0.067	<0.0008	<0.00003	10	<1	<0.01	<0.002	<0.2	<0.02	0.003	2	<0.005	0.000008	<0.002	0.008	2	<0.001	2.75	0.0025	1	0.04	3	<0.0002	0.0009	<0.008
	20	0.042	<0.0005	0.002	0.087	<0.0008	<0.00003	12	<1	<0.01	<0.002	<0.2	<0.02	0.0022	2	<0.005	0.000008	<0.002	0.011	3	<0.001	3.61	<0.0002	1	0.05	4	<0.0002	0.0027	<0.008

MT DEQ Water Quality Standards		Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chloride	Chromium	Copper	Fluoride	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Phosphorus	Potassium	Selenium	Silicon	Silver	Sodium	Strontium	Sulfate	Thallium	Uranium	Zinc
GW		None	0.006	0.01	1	0.004	0.005	None	None	0.1	1.3	4	None	0.015	None	None	0.002	0.1	None	None	0.05	None	0.1	None	4	None	0.002	0.03	2
SW[1]		0.087	0.0056	0.01	1	0.004	0.00033	None	None	0.107	0.0117	4	1	0.0044	None	None	0.00005	0.065	None	None	0.005	None	0.00637	None	4	None	0.00024	0.03	0.15
MDL		0.009	0.0005	0.001	0.003	0.0008	0.00003	None	None	0.01	0.002	0.2	0.02	0.0003	None	0.005	0.000005	0.002	0.0012	None	0.001	None	0.0002	None	0.02	None	0.0002	0.0002	0.008
2016 *Ynl EX* (Weeks)	0	0.034	<0.0005	<0.001	0.078	<0.0008	<0.00003	14	3	<0.01	<0.002	0.3	<0.02	<0.0003	3	<0.005	0.0000225	<0.002	0.014	3	<0.001	1.67	<0.0002	7	0.05	5	<0.0002	0.0007	<0.008
	1	0.028	0.0022	0.004	0.044	<0.0008	<0.00003	35	<1	<0.01	<0.002	1.9	<0.02	0.0007	20	0.008	<0.000005	<0.002	0.006	13	0.009	3.88	<0.0002	3	0.14	121	<0.0002	0.0014	<0.008
	2	0.037	0.0023	0.007	0.044	<0.0008	<0.00003	24	<1	<0.01	<0.002	1.9	<0.02	0.0006	15	0.007	<0.000005	<0.002	<0.005	10	0.005	3.32	<0.0002	2	0.11	74	<0.0002	0.001	<0.008
	4	0.051	0.002	0.003	0.046	<0.0008	<0.00003	21	<1	<0.01	<0.002	1.5	<0.02	<0.0003	12	<0.005	<0.000005	<0.002	<0.005	9	0.006	3.98	<0.0002	1	0.09	46	<0.0002	0.0007	<0.008
	8	0.03	0.0013	0.003	0.062	<0.0008	<0.00003	82	<1	<0.01	0.007	0.7	<0.02	0.0018	40	<0.005	<0.000005	<0.002	<0.005	9	0.003	4.14	<0.0002	<1	0.27	323	<0.0002	0.0024	<0.008
	12	0.019	<0.0005	0.002	0.018	<0.0008	<0.00003	94	1	<0.01	<0.002	<0.6	<0.02	0.0016	48	<0.005	<0.000005	<0.002	0.01	7	0.002	3.26	<0.0002	<1	0.2	370	<0.0002	0.0011	<0.008
	16	0.022	0.001	0.002	0.021	<0.0008	<0.00003	64	<1	<0.01	<0.002	0.5	<0.02	0.004	32	<0.005	<0.000005	<0.002	<0.005	5	0.001	3.28	0.0036	<1	0.15	242	<0.0002	0.0019	<0.008
	20	0.022	0.0008	0.002	0.026	<0.0008	<0.00003	44	<1	<0.01	<0.002	0.4	0.04	0.0029	22	<0.005	<0.000005	<0.002	0.006	3	0.001	2.97	<0.0002	<1	0.11	157	<0.0002	0.0014	<0.008

GW= Ground water, SW= Surface water, MDL=Required Reporting Limit,

Pink highlighted cells indicate surface water quality exceedances and blue highlighted cells indicate ground water quality exceedances.

[1] Surface water standards are the lowest available, which in most cases in the “chronic aquatic life” criteria. Hardness-dependent criteria have been adjusted for a site hardness of 130 mg/L.

[2]MDL (Method Detection Limit) for phosphorus is the lowest available by lab and differs from the Required Reporting Limit (RRL): MDL=0.005 mg/L, RRL=0.001 mg/L