APPENDIX E.8.2

QIA INSPECTION REPORTS AND BAFFINLAND RESPONSES

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Qikiqtani Inuit Association

Tuesday, July 24, 2018

Christopher Murray
Environmental and Regulatory Compliance Manager
Baffinland Iron Mines Corporation
2275 Upper Middle Road East, Suite 300
Oakville, ON L6H 0C3

Re: BAFFINLAND IRON MINES CORPORATION'S, MARY RIVER MINE – QIKIQTANI INUIT ASSOCIATION JUNE 2018 SITE INSPECTION, FINDINGS, AND RECOMMENDATIONS

Dear Mr. Murray:

Consistent with requirements under Schedule E, Item 12 of the Commercial Lease No.: Q13C301 (CPL)[1], issued to Baffinland Iron Mines Corporation (Baffinland) by the Qikiqtani Inuit Association (QIA), the QIA conducted a Site Inspection (Inspection) of the Mary River Mine (Project) during the period June 25 – 28, 2018. Mr. Fai Ndofor, P.Geo., Regulatory Manager, conducted the Inspection for QIA. An overview of the inspection's findings and recommendations is provided in the documents attached to this correspondence.

In summary, the Inspection included the following activities:

- An inspection of the Waste Rock Facility (WRF) that included rock sampling and testing to verify the success of Potential Acid Generating (PAG) rock segregation; and
- A general site inspection to assess Baffinland's compliance with select environmental terms and conditions to permits, licences, leases or other regulatory instruments associated with the Project.

Table 1, attached to this correspondence, summarizes the findings, recommendations, and action items generated from the Inspection. Timeframes when QIA expects to have a response to each of the inspection items addressed by Baffinland are indicated in Table 1. Details of the sampling and testing of waste rock from the WRF are presented in Appendix A. Select photos from the Inspection are attached in Appendix B.

If you require any further information, contact the undersigned at your convenience.

Sincerely

Fai Ndofor, P.Geo.
Regulatory Manager

Attachments:
Table 1 – Summary Findings, Recommendations, and Action Items
Appendix A – Details of Waste Rock Facility Sampling and Testing Program
Appendix B – Select Photos from Site Inspection

[1] QIA and BIMC (2013) Commercial Lease No. Q13C301. September 6, 2013.

Table 1. Summary of findings, recommendations, and action items from the June 2018 Site Inspection

#	Project Location	Description of Concern or Finding	Recommended Action	Timeline
1	Mine site	Windblown waste and plastic bags mostly around snow dumps following melting and the landfill from uncovered waste. (Photo 1)	Requires immediate attention. Baffinland to complete site wide housekeeping and tidying.	18/07/31
2	Exploration Drill MR3-18-P04	Overloaded and not properly installed silt fence unable to stop drill cuttings washed out of the hole and flowing in the drilling fluid (water) down the slope. Accumulation of drill cuttings on the tundra, which may affect the health of vegetation and/or eventually washed down the valley into Mary River. (Photo 2)	Baffinland to use silt or sand bags as first barrier to stop cuttings. Silt fences can be installed behind the sand bags to intercept any cuttings that are not stopped by the sand bags and act as a secondary mitigation measure. All cuttings are to be removed/cleaned from the tundra post drilling. Baffinland asked to continue environmental inspections and the filling of logs for all drilling activities including geotechnical drilling. All drill logs to be included in the annual NWB/QIA report.	18/07/31
3	Waste Rock Facility Sedimentation Pond	Visual settlement, slumping of top berm, geotextile visible and water ponding between Stations 0+040 and 0+060 of the containment berm and road. (Photo 3)	Baffinland to place, compact, and slope-fill material to provide a slope for water to flow away from the berm and road.	18/07/31
4	Waste Rock Facility Samples	Sample WRF_018_20180626 obtained from a Non-PAG (base layer of Non-PAG placed on existing ground) location tested and classified as PAG. Sample WRF_004_20180626 obtained from a slope that appears to be located outside the identified PAG boundaries.	Baffinland to explain why PAG material was placed in these locations, provide a plan and a schedule to address the situation.	18/08/30
5	Waste Rock Facility	No instrumentation – At the time of the inspection, no ground temperature cables were installed to verify freeze back of material placed to date.	It is recommended that Baffinland finalize design work and install instrumentation for the WRF immediately. Baffinland indicated they are currently working with their consultants to design and install thermistor cables later this year.	18/10/30
6	Waste Rock Facility Water Treatment Plant	At time of inspection, the water treatment plant had been installed and commissioned. Baffinland indicated they were waiting for water sample test results in a few days to start using the plant. No Standard Operating Procedure (SOP) and measures to avoid and mitigate against eventual spills had been put in place.	Baffinland to produce a SOP with measures to avoid and mitigate against eventual spills well documented and all workers trained prior to using the plant.	18/06/30

#	Project Location	Description of Concern or Finding	Recommended Action	Timeline
7	Ore Crusher	Transfer/transition points along conveyor belts not engineered to avoid or minimise spread of dust to the air as is the case with other sections of the belts. (Photo 4)	It is recommended that Baffinland explore and implement measures to enclose these points to prevent the spreading of dust as was observed during the site inspection.	18/09/30
8	Ore Crushing Pad Water Management	Construction of containment ditches surrounding ore stockpile pad appeared to be complete at the time of the inspection. However, a section of the ditch along the east side of the sedimentation pond was blocked by debris and a snow fence resulting in water ponding in the ditch rather than flowing into the sedimentation pond. Ponding water may infiltrate into and affect berm and liner integrity. (Photo 5)	Baffinland to remove snow fence, clear debris from the ditch, grade and slope the ditch to promote free flow of water towards discharge point into the sedimentation pond.	18/07/31
9	Ore Crushing and Ore Stockpile Pad	Not certain if present as-built pad is within the current for-construction drawings footprint.	Baffinland to provide current as-built drawings of the crusher and ore stockpile pad that includes the recently completed ditch construction prior to the QIA September 2018 Environmental Audit	18/08/31
10	Landfill	Windblown litter and waste flying out of landfill due to lack of fencing and material not covered. Existing fence is inadequate and in a very poor condition. (Photo 6) Observed a washer and a drier (with electronic components not removed) amongst some recently dumped material. (Photo 7)	It is recommended that Baffinland erect a new fence capable of stopping windblown debris from entering the receiving environment. This was identified 2 to 3 years ago. Baffinland should immediately remove all unauthorised waste that includes electronics and hazardous waste from the landfill. Baffinland should review their hazardous waste management policy with all employees responsible for hauling and dumping waste at the landfill, to mitigate against the dumping of unauthorised waste.	18/07/31
11	Hazardous Waste Berm #7	Two totes containing unlabeled hazardous material outside of containment. (Photo 8)	Baffinland to label waste containers and relocate drums into containment area or use temporary containment beneath drums.	18/06/30
12	Mine Site Waste Management Facility	Observed a steel container holding kitchen waste with a hole at its bottom that allowed waste to spill on ground. A fox was seen eating the food waste. (Photo 9)	Baffinland to immediately repair hole or replace container and clean all food waste from the ground as it is attracting wildlife.	18/06/30

#	Project Location	Description of Concern or Finding	Recommended Action	Timeline
13	Tote Road	Baffinland made use of sedimentation and erosion controls along entire road in most areas were this was required. Silt fences and check dams are the common erosion controls put in place. However, some silt fences like those at the km 80 and km 97 bridges were over loaded and in some cases broken with clear evidence that sediment flowed over the fences into the receiving environment. (Photo 10)	Baffinland to replace or repair broken silt fences or use other measures to prevent sedimentation and erosion as warranted.	18/07/31
14	Tote Road	Damaged culvert around Km 74 resulted in possible sediment loaded water flowing on road surface to the receiving environment. Baffinland installed two pipes as a temporary measure at the time of the site inspection. (Photo 11)	A permanent solution that may require approval as per Section 2.8 of the Commercial Lease is required immediately. Baffinland to install a designed and approved culvert at this location.	18/08/30
15	Tote Road	Permafrost degradation along roadside cuts and some old borrow sources still an ongoing issue. Baffinland currently working on stabilizing some of the slopes with the use of geosynthetic material and riprap, as is the case around Km 32. (Photo 12)	Baffinland to continue working on stabilizing and protecting the areas identified in the Tetra Tech EBA 2015[2] report.	Ongoing
16	Tote Road Dust	When the B-Trains hauling ore drive along stretches of the road where dust suppressants (water and/or CaCl) is applied and visible (damp and compact road surface), no visible dust was raised. In areas where no dust suppressants were recently applied (dry and less compact road surface) dust is produced when the B-Trains drive along. (Photos 13 and 14)	Recommended that Baffinland increase their efforts to apply dust suppressants and explore the use of products that can keep the road surface damp, stable and compact for longer periods.	Ongoing
17	Milne Landfarm	Does not currently look like a land farm. Unauthorized waste that includes, HDPE liner, totes and bags observed within the containment area. (Photo 15). This issue was raised in inspections more than two years ago.	It is recommended that Baffinland sort, segregate, and remove all unauthorized material, finalize the construction of berms as designed and re-instate the landfarm to its original intent and use.	18/09/30

[2] Tetra Tech EBA (2015) Inspection of the Milne Inlet Tote Road and Associated Borrow Sources. March 2015

#	Project Location	Description of Concern or Finding	Recommended Action	Timeline
18	Calcium Chloride Storage Area	Torn and damaged bags with calcium chloride spilling on the ground and not within contained facility. During the inspection, it was observed that some of the torn bags are being placed in new and more robust bags. (Photo 16)	It is recommended that a drainage ditch or berm be installed to route any runoff away from the storage area until all the salt is moved to an approved location and the area properly cleaned.	18/07/31
19	Milne Port Used Tires	Pile of used tires that Baffinland has been asked to ship south following previous inspections still at the port.	Baffinland indicated they are working on shipping the tires south this summer	18/09/30

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Appendix A

Mary River Mine Waste Rock Facility Sampling and Testing Program

OVERVIEW

An inspection of the Waste Rock Facility (WRF) that included sampling of waste rock was carried out by Mr. Fai Ndofor, P.Geo, Regulatory Manager of QIA on June 26, 2018. Following the non-compliant discharges[3], on Inuit Owned Land that occurred at the WRF less than a year ago, QIA designed and implemented this waste rock-sampling program to confirm PAG material has not been or being placed in areas where it could have adverse impacts to the environment. QIA further aimed to verify the success of Potential Acid Generating (PAG) rock segregation and placement at the WRF to ensure the accuracy of the recorded and reported volume and type of waste rock delivered to the waste rock storage area as required by the NWB Type "A" Water Licence, 2AM-MRY1325[4] and the Commercial Lease No. Q13C301[5] (Lease).

Baffinland's Phase 1 Waste Rock Management Plan (BAF-PH1-830-P16-0029), Section 6.3, sets a site-specific criterion for the assessment of acid-rock drainage for the Project. The criterion stipulates that a sample with a total Sulphur content greater than 0.20% will be considered PAG rock or subjected to standard Acid Base Accounting (ABA) testing for confirmation as either PAG or non-PAG rock. From ABA tests, rock with a Neutralization Potential Ratio (NPR) less than 2 is considered PAG. Non-Acid Generating (NAG) pH testing may also be used as a screening tool for this purpose.

Following Baffinland's Phase 1 Waste Rock Management Plan (BAF-PH1-830-P16-0029)[6] and talking to the projects and environmental staff on site, QIA understands that PAG waste rock is currently being identified by processing on-site analytical data from blast hole drill cuttings samples. It is further understood that all material within a specified 3D radius from a sample determined to be PAG is assigned as PAG, hauled and deposited at a specific section of the waste rock stockpile where it is or will be encapsulated within non-PAG waste rock.

FIELD SAMPLING

Alex Ozaruk (Baffinland), Bill Bowden (Baffinland) and Fai Ndofor (QIA) collected Twenty (20) rock samples from the WRF. Sample locations shown in the attached Figure 1, were provided by QIA and staked by Baffinland surveyors. Figure 1 was produced by QIA from the aerial survey data of the WRF layout provided by Baffinland to QIA on June 8, 2018. One rock sample was collected from each location and taken to Baffinland's exploration shack, where they were washed, characterised and split into three pieces by Baffinland's exploration geologists. One of the three pieces was retained by QIA and brought back to Iqaluit and the other two pieces retained by Baffinland. Baffinland indicated they will be testing one of each piece and the other piece stored on site for future testing and verification if required. The attached report (QIA Waste Rock Facility Inspection, Sample Collection Summary) provides a summary description of the samples and photographs taken by Baffinland's exploration department.

[3] INAC (2017) 170509 Inspector's Direction 2AM-MRY1325. September 5, 2017.
[4] NWB (2015). Type 'A' Water Licence No.: 2AM-MRY1325, Amendment No. 1. July 31, 2015.
[5] QIA and Baffinland (2013). Commercial Lease No. Q13C301. September 6, 2013.
[6] Baffinland (2014). Phase 1 Waste Rock Management Plan. April 30, 2014.

LABORATORY TEST RESULTS

The twenty (20) samples retained by QIA were shipped to ALS Laboratory Ltd.'s North Vancouver laboratory for testing. All samples were analysed for modified Sobek Acid Base Accounting (ABA) using the siderite corrected method, NAG pH and total sulphur. The attached detailed laboratory test results indicate that five (5) of the samples (WRF_004_20180626, WRF_005_20180626, WRF_007_20180626, WRF_012_20180626 and WRF_018_20180626) have a total sulphur content >0.2% and Neutralization Potential Ratio (NPR) <2 and are classified as PAG based on the site-specific criteria.

CONCLUSION AND RECOMMENDATIONS

Sample WRF_018_20180626, classified as PAG, was sampled from a location where only NAG waste rock is expected to have been placed as indicated in Figure 1. The rock is supposed to be the base layer of NAG placed on the ground on which PAG material will eventually be placed. Sample WRF_004_20180626 obtained from a slope that appears to be located outside the identified PAG boundaries as sent by Baffinland on June 8, 2018. Baffinland is requested to explain why PAG material was placed in these locations, provide a plan and a schedule to address the situation on or before August 30, 2018.

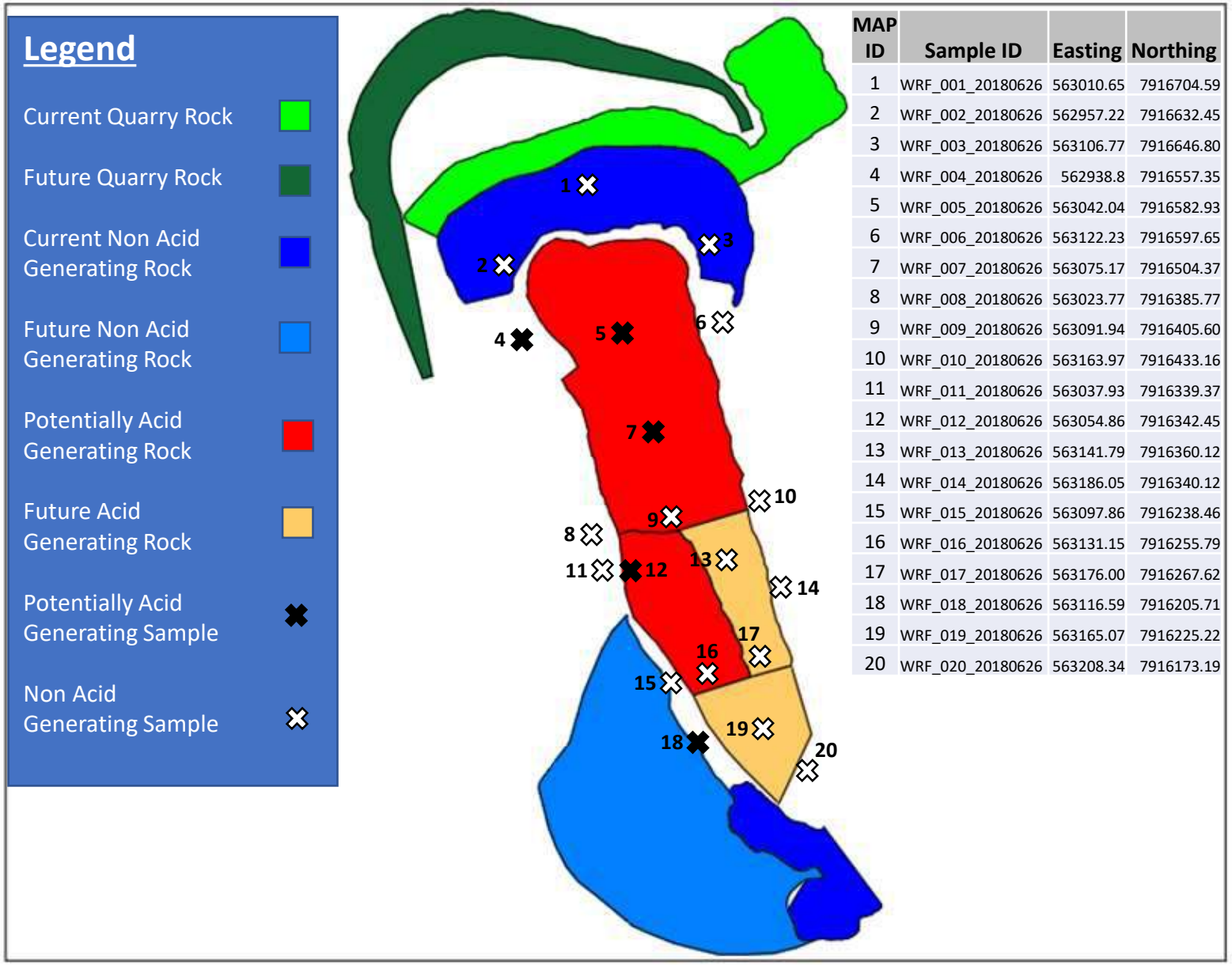
QIA understands that Baffinland has never performed any sampling and testing at the WRF to verify the success of PAG rock segregation and placement. Baffinland should note that the verification of PAG rock placement to design intent will be a long term closure issue if it cannot be demonstrated through testing that proper PAG rock placement occurred.

Given the non-compliance observed from the Sample WRF_018_20180626 location, it is required that the sampling and verification program be performed on an annual basis at the minimum to verify the success of PAG rock segregation and placement. This program should be developed by Baffinland and submitted to QIA for approval.

It is recommended that these results including any subsequent verification test results be included in the NWB/QIA Annual report.

Figure 1: Waste Rock Facility Sample Location Plan

Figure 1: Waste Rock Facility Sample Location Plan



MAP ID	Sample ID	Easting	Northing
1	WRF_001_20180626	563010.65	7916704.59
2	WRF_002_20180626	562957.22	7916632.45
3	WRF_003_20180626	563106.77	7916646.80
4	WRF_004_20180626	562938.8	7916557.35
5	WRF_005_20180626	563042.04	7916582.93
6	WRF_006_20180626	563122.23	7916597.65
7	WRF_007_20180626	563075.17	7916504.37
8	WRF_008_20180626	563023.77	7916385.77
9	WRF_009_20180626	563091.94	7916405.60
10	WRF_010_20180626	563163.97	7916433.16
11	WRF_011_20180626	563037.93	7916339.37
12	WRF_012_20180626	563054.86	7916342.45
13	WRF_013_20180626	563141.79	7916360.12
14	WRF_014_20180626	563186.05	7916340.12
15	WRF_015_20180626	563097.86	7916238.46
16	WRF_016_20180626	563131.15	7916255.79
17	WRF_017_20180626	563176.00	7916267.62
18	WRF_018_20180626	563116.59	7916205.71
19	WRF_019_20180626	563165.07	7916225.22
20	WRF_020_20180626	563208.34	7916173.19

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QIA Waste Rock Facility Inspection, Sample Collection Summary

QIA Waste Rock Facility Inspection

Sample Collection Summary

2018-Jun-26

Summary

- Participants: Alex Ozaruk (BIM), Bill Bowden (BIM), Fai Ndofor (QIA)
- Weather: mix of sun and cloud, approx. 5˚C, very windy
- Start time: 10:45AM End time: 1:10PM

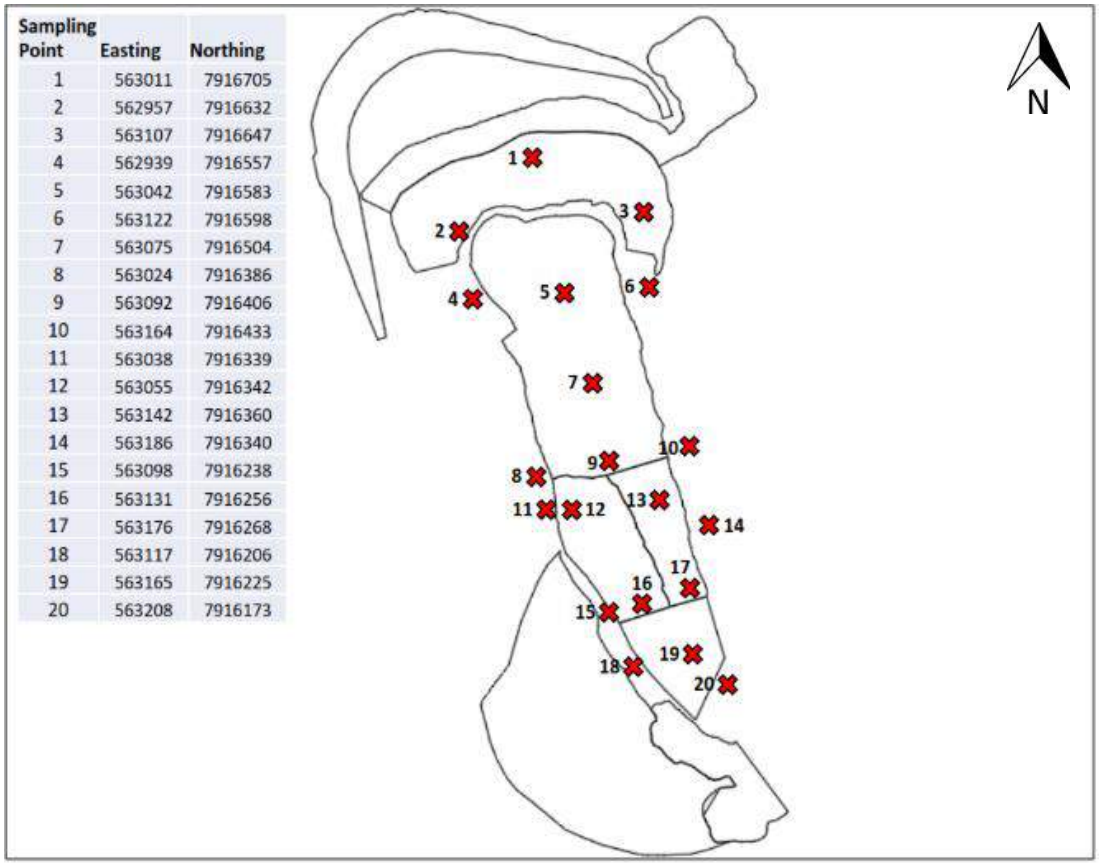
QIA provided BIM with coordinates for 20 sample locations on the current waste rock stockpile. One large sample was collected from each location, characterized, and split into three equal parts for analysis.

- 1/3 for QIA analysis
- 1/3 for BIM analysis
- 1/3 to be kept by BIM for reference

Sample Locations - QIA

- Points have been provided to collect representative samples from different locations on the waste rock stockpile.
- These points are located in both the PAG and NAG sections of the stockpile.

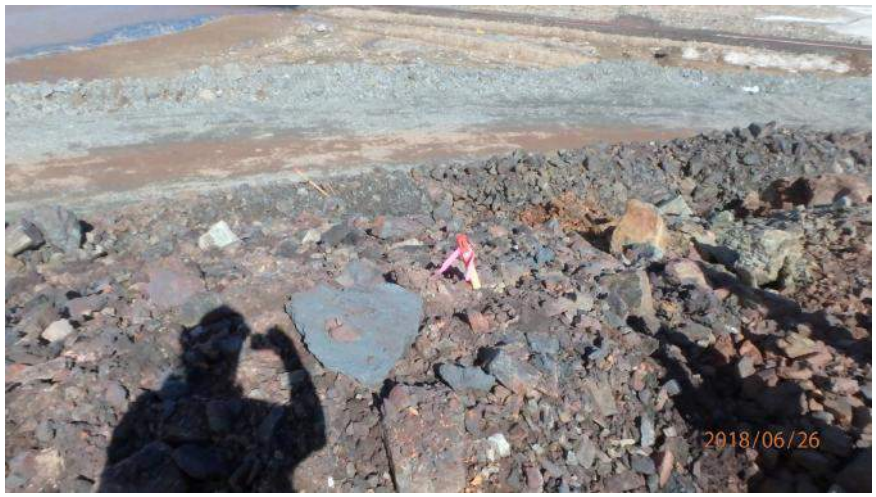
Sampling Point	Easting	Northing
1	563011	7916705
2	562957	7916632
3	563107	7916647
4	562939	7916557
5	563042	7916583
6	563122	7916598
7	563075	7916504
8	563024	7916386
9	563092	7916406
10	563164	7916433
11	563038	7916339
12	563055	7916342
13	563142	7916360
14	563186	7916340
15	563098	7916238
16	563131	7916256
17	563176	7916268
18	563117	7916206
19	563165	7916225
20	563208	7916173



WRF_001_20180626

- Sample collected from northern facing slope of stockpile
- Area is predominantly iron ore

- Sample is high grade iron formation
- Weakly magnetic massive hematite with minor magnetite. Moderate porosity and no visible sulphides



WRF_001_20180626

WRF_002_20180626

- Sample collected from north-western terrace of stockpile
- Area is a mix of iron ore and biotite chlorite schist

- Sample is biotite chlorite schist
- Dominantly biotite and mm scale garnets moderately chlorite and hematite altered. No visible sulphides.

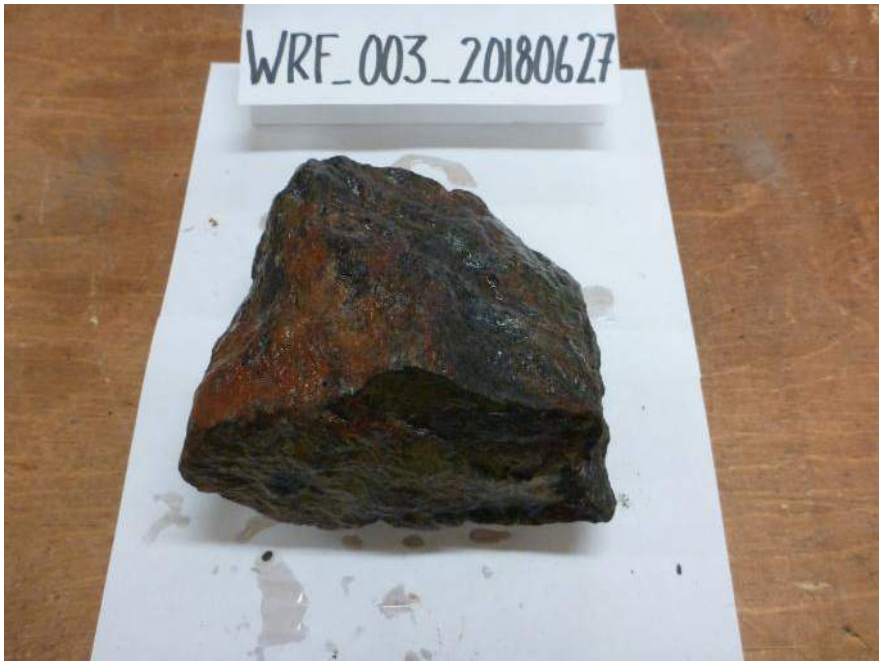
WRF_002_20180626

WRF_003_20180626

- Sample collected from north-eastern terrace of stockpile
- Area is mainly biotite chlorite schist

- Sample is biotite chlorite schist
- Matrix is dominantly diorite and chlorite with moderate hematite staining. Local quartz right veinlets cross cutting. No visible sulphides.

WRF_003_20180626



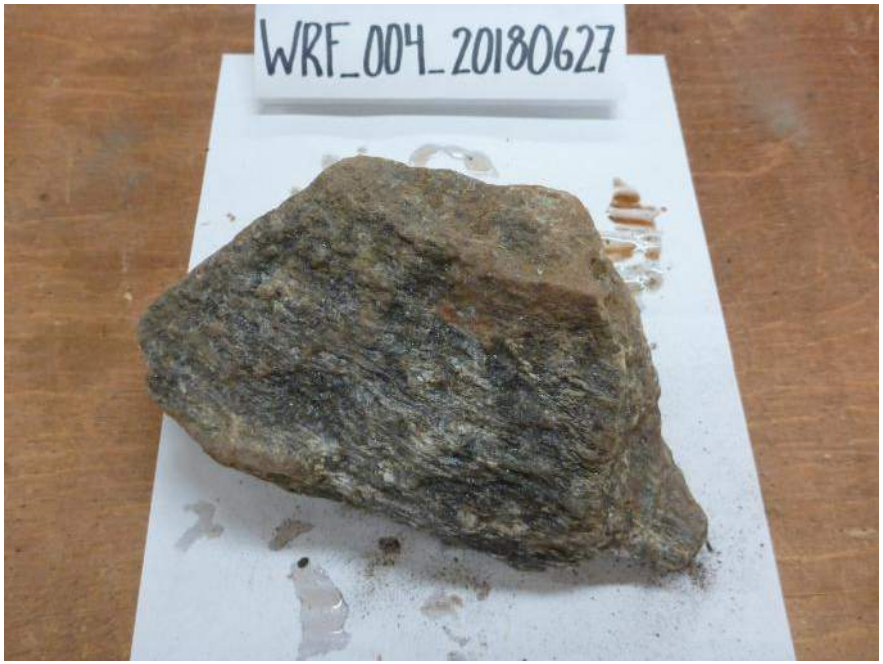
WRF_004_20180626

- Sample collected from western terrace of stockpile
- Area is a mix of different schist units

- Sample is Quartz-Feldspar-Biotite-Amphibole Gneiss

- Dominant mafic layers with strained quartz approaching augen texture. 1% disseminated pyrite in matrix.

WRF_004_20180626

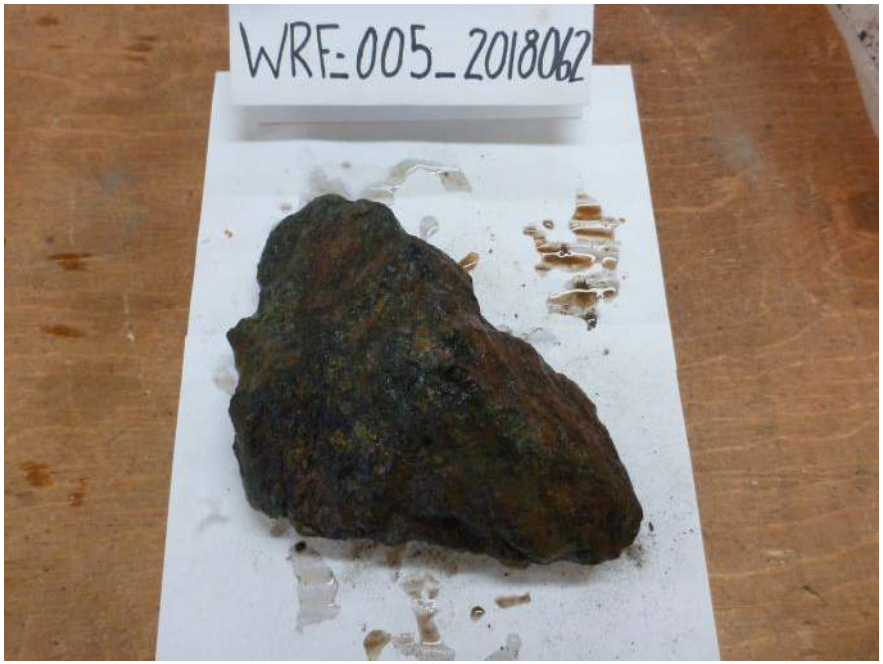


WRF_005_20180626

- Sample collected from top lift of stockpile
- Area is hard-packed. Mix of chlorite schist and some ore.

- Sample is Chlorite Schist
- Chlorite matrix with weak hematite alteration. 2% fine trained to medium trained blebby pyrite.

WRF_005_20180626

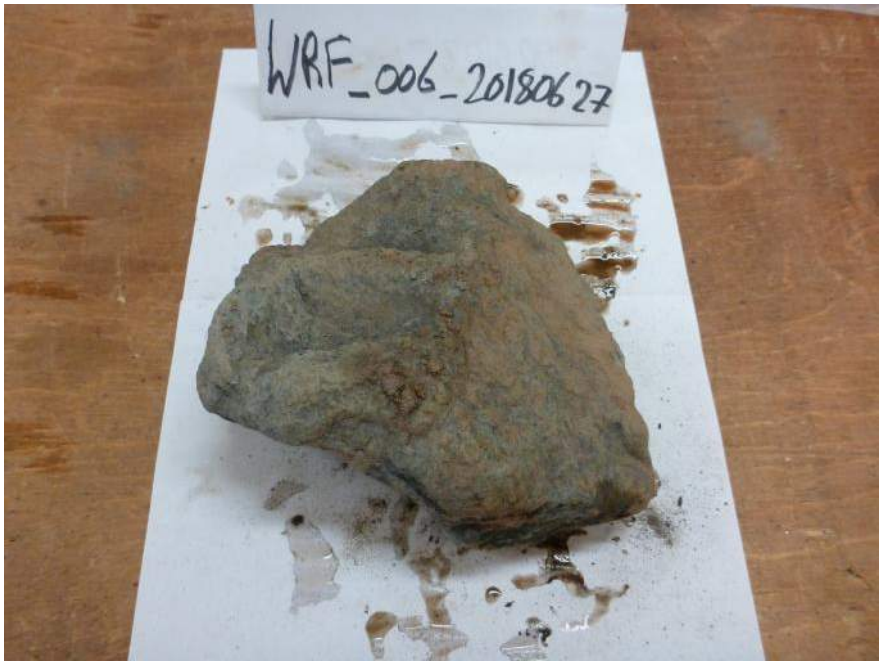


WRF_006_20180626

- Sample collected from eastern terrace of stockpile
- Area is a mix of chlorite schist and some ore.

- Sample is Chlorite Schist
- Chlorite dominant schist with 1% fine grained disseminated pyrite.

WRF_006_20180626



WRF_007_20180626

- Sample collected from top lift of stockpile
- Area is hard-packed. Mix of chlorite schist with minor ore.

- Sample is Chlorite-Biotite Schist
- Chlorite and biotite dominant matrix with 20% fine grained to coarse grained net textured and stringer pyrite.

WRF_007_20180626

WRF_008_20180626

- Sample collected from western slope of stockpile.
- Area is a mix of high-grade iron ore and biotite-chlorite schist.

- Sample is High Grade Iron Formation.
- Massive magnetite with clay filled voids. No sulphides visible.

WRF_008_20180626

WRF_009_20180626

- Sample collected from top lift of stockpile
- Area is hard-packed. Mix of chlorite schist with minor ore.

- Sample is High Grade Iron Formation.
- Massive magnetite with clay filled vesicles. No sulphides visible.

WRF_009_20180626

WRF_010_20180626

- Sample collected from base of eastern facing slope of stockpile
- Area is predominantly chlorite schist.

- Sample is Chlorite-Biotite-Garnet Schist.
- Chlorite and biotite dominant matrix with minor quartz and mm to cm scale garnet porphyroblasts. No visible sulphides.

WRF_010_20180626

WRF_011_20180626

- Sample collected from western slope of stockpile.
- Area is a mix of high-grade iron ore and biotite-chlorite schist.

- Sample is High Grade Iron Formation.
- Massive magnetite with weak porosity. No visible sulphides.

WRF_011_20180626

WRF_012_20180626

- Sample collected from top lift of stockpile. Area is not hard-packed.
- Mix of chlorite schist with minor ore.

- Sample is Chlorite-Muscovite-Biotite Schist
- Dominant chlorite matrix with lessor muscovite and biotite matrix. Limonite and hematite altered fractures cross cutting. No visible sulphides.

WRF_012_20180626

WRF_013_20180626

- Sample collected from eastern facing slope of stockpile
- Area is predominantly metasediments and amphibolites.

- Sample is a Metasediment.
- Massive quartz and feldspar dominant matrix with lesser biotite. No visible sulphides

WRF_013_20180626

WRF_014_20180626

- Sample collected from eastern terrace of stockpile.
- Area is predominantly metasediments and amphibolites.

- Sample is a Metasediment.
- Quartz and feldspar dominant with lesser medium to coarse grained biotite. No visible sulphides.

WRF_014_20180626

WRF_015_20180626

- Sample collected from western facing slope of stockpile.
- Area is predominantly chlorite schist with minor ore.

- Sample is Chlorite-Garnet Schist.
- Chlorite matrix with mm scale garnet porphyroblasts.

WRF_015_20180626

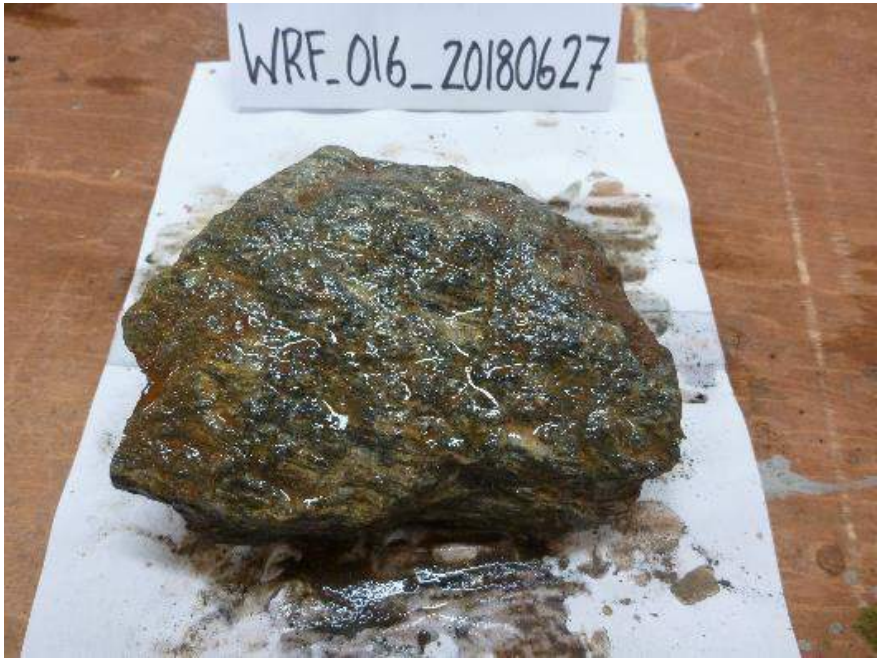
WRF_016_20180626

- Sample collected from top lift of stockpile
- Area is hard-packed. Mix of different schist units, minor ore.

- Sample is Amphibole-Chlorite Quartz Schist.

- Amphibole and chlorite-sericite dominant matrix with mm to cm scale quartz crystals and associated mm scale garnets. No visible sulphides

WRF_016_20180626



WRF_017_20180626

- Sample collected from top lift of stockpile.
- Area is hard-packed. Mix of different schist units, minor ore.

- Sample is Amphibole-Chlorite Schist.
- Amphibole and chlorite dominant matrix with lenses of hematite and limonite alteration. No visible sulphides

WRF_017_20180626

WRF_018_20180626

- Sample collected from western facing slope of stockpile
- Area is predominantly schist with minor ore.

- Sample is Chlorite-Garnet Schist.
- Dominant chlorite matrix with mm scale garnet porphyroblasts. Moderately magnetic with local lenses of magnetite. No visible sulphides.

WRF_018_20180626

WRF_019_20180626

- Sample collected from top lift of stockpile.
- Area is hard-packed. No dominant lithology observed.

- Sample is High Grade Iron Formation.
- Massive magnetite with local clay filled voids. No visible sulphides.

WRF_019_20180626

WRF_020_20180626

- Sample collected from top lift of stockpile on ramp.
- Area is hard-packed. No dominant lithology observed.

- Sample is Quartz-Feldspar-Amphibole Gneiss

- Quartz and feldspar rich leucosomes with mm scale amphibole rich melanosomes. No visible sulphides.

WRF_020_20180626

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WRF Rock Samples Laboratory Test Results

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www.alsglobal.com/geochemistry

To: **QIKIQTANI INUIT ASSOCIATION**
PO BOX 1340
IQALUIT NU X0A 0H0

Finalized Date: 16-JUL-2018
This copy reported on
17-JUL-2018
Account: QIANIC

CERTIFICATE VA18163896

Project: Mary River Mine- WRF

P.O. No.: 2008-2278

This report is for 20 Rock samples submitted to our lab in Vancouver, BC, Canada on 9-JUL-2018.

The following have access to data associated with this certificate:

FAI NDOFOR

SAMPLE PREPARATION

ALS CODE	DESCRIPTION
WEI-21	Received Sample Weight
CRU-QC	Crushing QC Test
PUL-QC	Pulverizing QC Test
LOG-22	Sample login - Rcd w/o BarCode
CRU-31	Fine crushing - 70% <2mm
SPL-21	Split sample - riffle splitter
PUL-31	Pulverize split to 85% <75 um

ANALYTICAL PROCEDURES

ALS CODE	DESCRIPTION	
OA-VOL08s	Siderite NP	
S-IR08	Total Sulphur (Leco)	LECO
OA-ELE07	Paste pH	

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

To: **QIKIQTANI INUIT ASSOCIATION**
PO BOX 1340
IQALUIT NU X0A 0H0

Finalized Date: 16- JUL- 2018
Account: QIANIC

Project: Mary River Mine- WRF

CERTIFICATE OF ANALYSIS VA18163896

Sample Description	Method Analyte Units LOD	WEI- 21 Recvd Wt. kg 0.02	OA- VOL08s FIZZ RAT Unity 1	OA- VOL08s NP tCaCO3/1Kt 1	OA- VOL08s MPA tCaCO3/1Kt 0.3	OA- VOL08s NNP tCaCO3/1Kt 1	OA- VOL08s Ratio (N Unity 0.01	S- IR08 S % 0.01	OA- ELE07 pH Unity 0.1
WRF_001_20180626		1.76	1	2	<0.3	2	12.80	<0.01	7.3
WRF_002_20180626		1.64	1	20	<0.3	20	128.00	<0.01	8.1
WRF_003_20180626		1.00	1	16	3.1	13	5.12	0.10	7.8
WRF_004_20180626		1.68	1	13	19.1	-6	0.68	0.61	7.0
WRF_005_20180626		0.90	1	14	66.6	-53	0.21	2.13	6.9
WRF_006_20180626		1.16	1	26	0.9	25	27.73	0.03	8.2
WRF_007_20180626		1.08	1	11	366	-355	0.03	11.70	5.3
WRF_008_20180626		1.86	1	6	4.1	2	1.48	0.13	6.6
WRF_009_20180626		1.36	1	9	0.9	8	9.60	0.03	8.0
WRF_010_20180626		1.82	1	17	1.3	16	13.60	0.04	8.0
WRF_011_20180626		1.38	1	6	1.9	4	3.20	0.06	7.4
WRF_012_20180626		1.90	1	15	14.4	1	1.04	0.46	5.6
WRF_013_20180626		1.04	1	15	0.3	15	48.00	0.01	9.9
WRF_014_20180626		2.18	1	13	<0.3	13	83.20	<0.01	9.7
WRF_015_20180626		1.84	1	11	0.3	11	35.20	0.01	8.1
WRF_016_20180626		0.94	1	12	0.9	11	12.80	0.03	8.6
WRF_017_20180626		1.50	1	17	0.3	17	54.40	0.01	8.3
WRF_018_20180626		1.60	1	14	10.0	4	1.40	0.32	7.6
WRF_019_20180626		3.10	1	3	0.3	3	9.60	0.01	8.0
WRF_020_20180626		3.02	1	10	0.3	10	32.00	0.01	9.4

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

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www.alsglobal.com/geochemistry

To: **QIKIQTANI INUIT ASSOCIATION**
PO BOX 1340
IQALUIT NU X0A 0H0

Project: Mary River Mine- WRF

CERTIFICATE OF ANALYSIS VA18163896

CERTIFICATE COMMENTS

LABORATORY ADDRESSES

Applies to Method:

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

CRU-31	CRU-QC	LOG-22	OA-ELE07
OA-VOL08s	PUL-31	PUL-QC	S-IR08
SPL-21	WEI-21		

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Qikiqtani Inuit Association

Appendix B

PHOTOS FROM THE JUNE 2018 SITE INSPECTION

Photo 1: Windblown waste west of landfill

Photo 2: Exploration Drill Location MR3-18-240 – Overloaded and broken silt fence

Photo 3: WRF Pond - Berm settlement, geotextile exposed & water ponding btw. 0+040 & 0+060

Photo 4: Ore Crusher – Transition points not enclosed to prevent dust dispersion

Photo 5: Crusher Pad Sedimentation Pond- Debris, water ponding and snow fence in ditch east of pond

Photo 6: Landfill – Inadequate damaged fence needs to be replaced

Photo 7: Landfill – Washer and drier amongst recently dumped waste

Photo 8: Hazardous Waste Berm #7 – Two totes of unlabeled hazardous material out of containment area

Photo 9: Mine Site Waste Management Facility – Fox eating kitchen waste from seacan outside facility

Phot0 10: Southside Downstream of km 80 Bridge – Broken silt fence, sediments went over

Photo 11: Tote Road Km 74 – Pipes installed in place of damaged culvert

Photo 12: Tote Road – Slope stabilization work ongoing on road cut around km 32

Photo 13: Tote Road – Damp and compact road surface following application of dust suppressant

Photo 14: Tote Road – Dust raised by truck along stretch where dust suppressant wasn't recently applied

Photo 15: Milne Landfarm – view from SW corner showing variety of non-biodegradable waste

Phot0 16: Milne Port - CaCl storage area

2 August 2018

Fai Ndofor, Regulatory Manager
Qikiqtani Inuit Association
P.O. Box 1340
Iqaluit, NU X0A 0H0

RE: Response to QIA June 2018 Site Inspection, Findings and Recommendations

Baffinland Iron Mines Corporation (Baffinland) provides the Qikiqtani Inuit Association (QIA) with the following response to the inspection completed[1] June 25-28, 2018, consistent with the Commercial Lease No. Q13C301.

In the time elapsed since the inspection and the close out meeting held on 28 June 2018, Baffinland has endeavored to address issues raised and implement corrective actions. The attached Table 1 provides Baffinland's responses to the concerns/findings of the QIA inspection, including details where applicable on progress made to date.

Should you have any additional concerns or questions regarding the attached responses, please to not hesitate to contact the undersigned at your convenience.

Regards,

Christopher Murray
Environmental & Regulatory Compliance Manager

Cc: Megan Lord-Hoyle, Tim Sewell, William Bowden, Connor Devereaux (Baffinland)

Attachments:
Attachment 1 – Baffinland Responses to QIA Concerns/Findings

[1] QIA (2018) Re: Baffinland Iron Mines Corporation's, Mary River Mine – Qikiqtani Inuit Association June 2018 Site Inspection, Findings, and Recommendations. Letter dated Tuesday 24 July 2018.

Attachment 1

Baffinland Responses to QIA Concerns/Findings

Baffinland

Table 1. Summary of findings, recommendations, and action items from the June QIA 2018 Site Inspection

#	Project Location	Description of Concern or Finding	Recommended Action	Timeline	Baffinland Response
1	Mine site	Windblown waste and plastic bags mostly around snow dumps following melting and the landfill from uncovered waste. (Photo 1)	Requires immediate attention. Baffinland to complete site wide housekeeping and tidying.	2018-Jul-31	Baffinland Operations and Project group co-ordinated to develop a clean-up and housekeeping initiative at the Milne Port Snow Dump and the Mary River MSC Snow Dump, Emulsion Plant Snow Dump, Weather Haven Snow Dump and Landfill. Significant resources including heavy equipment and labour were allocated to this process. The debris and plastics is challenging to wholly remove and Baffinland recognizes this will be an ongoing process as the snow dumps continue to melt. Significant progress has been made to date.
2	Exploration Drill MR3-18-P04	Overloaded and not properly installed silt fence unable to stop drill cuttings washed out of the hole and flowing in the drilling fluid (water) down the slope. Accumulation of drill cuttings on the tundra, which may affect the health of vegetation and/or eventually washed down the valley into Mary River. (Photo 2)	Baffinland to use silt or sand bags as first barrier to stop cuttings. Silt fences can be installed behind the sand bags to intercept any cuttings that are not stopped by the sand bags and act as a secondary mitigation measure. All cuttings are to be removed/cleaned from the tundra post drilling. Baffinland asked to continue environmental inspections and the filling of logs for all drilling activities including geotechnical drilling. All drill logs to be included in the annual NWB/QIA report.	2018-Jul-31	Exploration continues to utilize measures to reduce the impact of drill surface water runoff and cuttings. Silt fences in conjunction with sand bags are deployed at each exploration drill site. Exploration continues to fill out drilling monitoring logs. Drill cuttings are mitigated from migration into water bodies utilizing sedimentation mitigation measures promoting settling and filtration on the tundra. In Baffinland's Type B Water Licence it states that cuttings should be prevented from entering primary receiving water bodies however it is understood that cuttings will settle out and deposit on the tundra. Cuttings are deposited in such thin layers, in remote locations, that it is operational infeasible to recover drill cuttings.
3	Waste Rock Facility Sedimentation Pond	Visual settlement, slumping of top berm, geotextile visible and water ponding between Stations 0+040 and 0+060 of the containment berm and road. (Photo 3)	Baffinland to place, compact, and slope-fill material to provide a slope for water to flow away from the berm and road.	2018-Jul-31	Material has been placed to further level the top of the WRF toe berm in the indicated settlement area referenced in photo 3 of QIA's inspection report
4	Waste Rock Facility Samples	Sample WRF_018_20180626 obtained from a Non-PAG (base layer of Non- PAG placed on existing ground) location tested and classified as PAG. Sample WRF_004_20180626 obtained from a slope that appears to be located outside the identified PAG boundaries.	Baffinland to explain why PAG material was placed in these locations, provide a plan and a schedule to address the situation.	2018-Aug-30	Baffinland is currently expediting the sample results for the respective QIA sample locations. Upon receiving results, Baffinland will compare results to provided QIA data and communicate these results to QIA. Field evaluations of the identified non-conformance zones will be actioned to evaluate the extent of the non-conformance and a plan developed prior to August 30th.
5	Waste Rock Facility	No instrumentation – At the time of the inspection, no ground temperature cables were installed to verify freeze back of material placed to date.	It is recommended that Baffinland finalize design work and install instrumentation for the WRF immediately. Baffinland indicated they are currently working with their consultants to design and install thermistor cables later this year.	2018-Oct-30	Mine operations is currently working with Golder to develop and action the installation of thermistors in the Waste Rock Stockpile to evaluate thermal in situ thermal conditions. The thermistors are currently being purchased and installation will be complete by end of October.
6	Waste Rock Facility Water Treatment Plant	At time of inspection, the water treatment plant had been installed and commissioned. Baffinland indicated they were waiting for water sample test results in a few days to start using the plant. No Standard Operating Procedure (SOP) and measures to avoid and mitigate against eventual spills had been put in place.	Baffinland to produce a SOP with measures to avoid and mitigate against eventual spills well documented and all workers trained prior to using the plant.	2018-Jun-30	McCue Engineering is currently working on an Operation Manual, from which Standard Operating Procedure (SOP) for the operation of the treatment system will be developed, to be finalized in early August 2018. In the interim, expert McCue operators and a limited number of highly skilled Baffinland scientists trained by McCue have been operating the treatment system to ensure designed operating conditions are achieved.
7	Ore Crusher	Transfer/transition points along conveyor belts not engineered to avoid or minimise spread of dust to the air as is the case with other sections of the belts. (Photo 4)	It is recommended that Baffinland explore and implement measures to enclose these points to prevent the spreading of dust as was observed during the site inspection.	2018-Sep-30	Baffinland continues to research and develop novel methods of dust migration mitigation from the Mary River Crusher Pad. Baffinland has engineered dust reduction measures installed on all three crusher spreads at the identified locations that produce significant dust. In addition, since the June 2018 QIA inspection, Baffinland has installed three conveyors hood chutes that mitigate dust from conveyor transfer points, and is continuing to install conveyor covers.
8	Ore Crushing Pad Water Management	Construction of containment ditches surrounding ore stockpile pad appeared to be complete at the time of the inspection. However, a section of the ditch along the east side of the sedimentation pond was blocked by debris and a snow fence resulting in water ponding in the ditch rather than flowing into the sedimentation pond. Ponding water may infiltrate into and affect berm and liner integrity. (Photo 5)	Baffinland to remove snow fence, clear debris from the ditch, grade and slope the ditch to promote free flow of water towards discharge point into the sedimentation pond.	2018-Jul-31	The section of the ditching identified during the inspection has been worked and graded and the snow fences have been removed
9	Ore Crushing and Ore Stockpile Pad	Not certain if present as-built pad is within the current for-construction drawings footprint.	Baffinland to provide current as-built drawings of the crusher and ore stockpile pad that includes the recently completed ditch construction prior to the QIA September 2018 Environmental Audit	2018-Aug-31	The As built for the Crusher pad is currently in the final stages of drafting and will be stamped and submitted to QIA.
10	Landfill	Windblown litter and waste flying out of landfill due to lack of fencing and material not covered. Existing fence is inadequate and in a very poor condition. (Photo 6) Observed a washer and a drier (with electronic components not removed) amongst some recently dumped material. (Photo 7)	It is recommended that Baffinland erect a new fence capable of stopping windblown debris from entering the receiving environment. This was identified 2 to 3 years ago. Baffinland should immediately remove all unauthorised waste that includes electronics and hazardous waste from the landfill. Baffinland should review their hazardous waste management policy with all employees responsible for hauling and dumping waste at the landfill, to mitigate against the dumping of unauthorised waste.	2018-Jul-31	The landfill is regularly covered with comprehensive fill eliminating wind blown debris. The current fence is damaged and Baffinland is preparing to construct a new, more robust landfill fence this fall when supplies purchased arrive on the sealift. Waste Sorting memos are regularly sent out for review by all departments documenting the importance of waste sorting. The identified washer and dryer were removed from the landfill and the department responsible addressed.
11	Hazardous Waste Berm #7	Two totes containing unlabeled hazardous material outside of containment. (Photo 8)	Baffinland to label waste containers and relocate drums into containment area or use temporary containment beneath drums.	2018-Jun-30	The two totes containing hazardous material outside containment at HWB #7 have been properly relocated inside containment
12	Mine Site Waste Management Facility	Observed a steel container holding kitchen waste with a hole at its bottom that allowed waste to spill on ground. A fox was seen eating the food waste. (Photo 9)	Baffinland to immediately repair hole or replace container and clean all food waste from the ground as it is attracting wildlife.	2018-Jun-30	The hole in the c-can identified has been repaired and repurposed. A new more competent c-can has replaced the older c-can.
13	Tote Road	Baffinland made use of sedimentation and erosion controls along entire road in most areas were this was required. Silt fences and check dams are the common erosion controls put in place. However, some silt fences like those at the km 80 and km 97 bridges were over loaded and in some cases broken with clear evidence that sediment flowed over the fences into the receiving environment. (Photo 10)	Baffinland to replace or repair broken silt fences or use other measures to prevent sedimentation and erosion as warranted.	2018-Jul-31	Clean up and removal of Silt fences following freshet and is an ongoing process. It should be recognized that removal of spent of silt fences is not always a recommended industry standard as this will allow sediment captured to be re-mobilised. Baffinland will continue to repair and replace silt fencing in 2018 in preparation for freshet 2019.
14	Tote Road	Damaged culvert around Km 74 resulted in possible sediment loaded water flowing on road surface to the receiving environment. Baffinland installed two pipes as a temporary measure at the time of the site inspection. (Photo 11)	A permanent solution that may require approval as per Section 2.8 of the Commercial Lease is required immediately. Baffinland to install a designed and approved culvert at this location.	2018-Aug-30	The km 74 culvert issue was a culvert exhibiting a damaged inflow end a couple meters away. The culvert was repaired/ buffed out and the steel pipes were removed as they were no longer necessary or holding water.
15	Tote Road	Permafrost degradation along roadside cuts and some old borrow sources still an ongoing issue. Baffinland currently working on stabilizing some of the slopes with the use of geosynthetic material and riprap, as is the case around Km 32. (Photo 12)	Baffinland to continue working on stabilizing and protecting the areas identified in the Tetra Tech EBA 2015[2] report.	Ongoing	The km 32 area is part of ongoing erosion mitigation efforts on the tote road and part of the projects that will be executed in 2018 following QIA approval of a TRAN submission.

Baffinland

Table 1. Summary of findings, recommendations, and action items from the June QIA 2018 Site Inspection

#	Project Location	Description of Concern or Finding	Recommended Action	Timeline	Baffinland Response
16	Tote Road Dust	When the B-Trains hauling ore drive along stretches of the road where dust suppressants (water and/or CaCl) is applied and visible (damp and compact road surface), no visible dust was raised. In areas where no dust suppressants were recently applied (dry and less compact road surface) dust is produced when the B-Trains drive along. (Photos 13 and 14)	Recommended that Baffinland increase their efforts to apply dust suppressants and explore the use of products that can keep the road surface damp, stable and compact for longer periods.	Ongoing	Baffinland dust control efforts on the Tote Road continue. Approximately double the volume of water for the Month of June in 2018 was used compared to 2017 for dust suppressant on the Tote Road. Additional CaCl has been purchased for continued application. Repairs have been made to the 3rd water truck on site and currently in the process of converting another truck into a water trailer for additional watering support.
17	Milne Landfarm	Does not currently look like a land farm. Unauthorized waste that includes, HDPE liner, totes and bags observed within the containment area. (Photo 15). This issue was raised in inspections more than two years ago.	It is recommended that Baffinland sort, segregate, and remove all unauthorized material, finalize the construction of berms as designed and re-instate the landfarm to its original intent and use.	2018-Sep-30	The landfarm is has been cleaned to remove debris, totes, quatrex bags from the facility. Tilling operations and further processing of the deposited contaminated soil is planned upon arrival of tilling equipment on the 2018 sealift.
18	Calcium Chloride Storage Area	Torn and damaged bags with calcium chloride spilling on the ground and not within contained facility. During the inspection, it was observed that some of the torn bags are being placed in new and more robust bags. (Photo 16)	It is recommended that a drainage ditch or berm be installed to route any runoff away from the storage area until all the salt is moved to an approved location and the area properly cleaned.	2018-Jul-31	A significant amount of CaCl bags stored in the Salt Storage laydown in Q1 have been repackaged and utilized. Excess plastics have been consolidated and cleaned up. Baffinland continues to address housekeeping in this area as salt bags are processed for drilling operations. Regular Surface water runoff has not been observed to be contact with the calcium chloride storage area during summer months. Implementation of the Milne Port Surface Water Management in 2018 as part of Modification Request No. 7 will further ensure surface water is diverted around this area.
19	Milne Port Used Tires	Pile of used tires that Baffinland has been asked to ship south following previous inspections still at the port.	Baffinland indicated they are working on shipping the tires south this summer	2018-Sep-30	7,410 historical tires have been assembled and prepared to be shipped on back haul, and will be removed from the Milne Port historical tire storage pile. Some historical tires in Mary River will be utilized for the landfill to assist in the securing of fencing. Tires that are produced from the current tire stream are input into c-cans and backhauled as well.

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Qikiqtani Inuit Association

Friday, August 10, 2018

Christopher Murray
Environmental and Regulatory Compliance Manager
Baffinland Iron Mines Corporation
2275 Upper Middle Road East, Suite 300
Oakville, ON L6H 0C3

Re: BAFFINLAND IRON MINES CORPORATION'S, MARY RIVER MINE – QIKIQTANI INUIT ASSOCIATION AUGUST 2018 SITE INSPECTION, FINDINGS, AND RECOMMENDATIONS

Dear Mr. Murray:

Consistent with requirements under Schedule E, Item 12 of the Commercial Lease No.: Q13C301 (CPL)[1], issued to Baffinland Iron Mines Corporation (Baffinland) by the Qikiqtani Inuit Association (QIA), the QIA conducted a Site Inspection (Inspection) of the Mary River Mine (Project) during the period August 3 – 4, 2018. An overview of the inspection's findings and recommendations is provided in the documents attached to this correspondence.

In summary, the Inspection, conducted by Mr. Fai Ndofor, P.Geo. and Mr. Victor Liu, P.Eng. included a general site inspection to assess Baffinland's compliance with select environmental terms and conditions to permits, licences, leases or other regulatory instruments associated with the Project. QIA's inspectors observed that most of the issues/concerns/findings raised during QIA's June 2018 inspection had been generally addressed with proper corrective measures taken or in the process of being addressed.

Table 1, attached to this correspondence, summarizes the findings, recommendations, and action items generated from the August 2018 Inspection. Select photos from the Inspection are also attached.

If you require any further information, contact the undersigned at your convenience.

Sincerely

Fai Ndofor, P.Geo.
Regulatory Manager

Attachments:
Table 1 – Summary Findings, Recommendations, and Action Items
Select Photos from Site Inspection

[1] QIA and BIMC (2013) Commercial Lease No. Q13C301. September 6, 2013.

Table 1. Summary of findings, recommendations, and action items from the August 3-4, 2018 Site Inspection

#	Project Location	Description of Concern or Finding	Recommended Action	Timeline
1	Waste Rock Facility Sedimentation Pond	No action has been taken to empty the pond and carryout a proper investigation to determine the cause of last year's spill event as indicated by Baffindland in their response to INAC dated March 13, 2018 WRF strategy letter.	It is recommended that Baffinland empty the pond and perform the investigation immediately as weather conditions may not be suitable for this activity in the next few weeks.	18/08/31
2	Waste Rock Facility Water Treatment Plant	At time of inspection, the water treatment plant was fully functional with no Operation Manual or Standard Operating Procedure (SOP) and measures to avoid and mitigate against eventual spills put in place. Poor housekeeping - soda ash and hydrated lime spills observed on floor. Also observed torn and opened bags thrown carelessly. (Photos 1 and 2) Baffinland was reminded that the pad has no liner or containment system to trap these chemicals or their solutions so they do not infiltrate through the permeable pad into the ground and probably end up and affect the receiving environment.	Recommended that the soda ash and hydrated lime spills be cleaned immediately and photos of the clean-up forwarded to QIA. As a temporary measure to avoid the spilled substances infiltrating through the pad, Baffinland should place some waterproof material like tarp on the areas where bags are stored and opened. Baffinland should immediately produce a SOP with measures to avoid and mitigate against eventual spills.	18/08/31
3	Milne Landfarm	Liner and other unauthorised substances observed though it was noted that some of these had been removed after the June 2018 inspection. (Photo 3)	It is recommended that Baffinland continue to sort, segregate, and remove all unauthorized material, finalize the construction of berms as designed and re-instate the landfarm to its original intent and use.	18/09/30
4	Milne Port Snow dump	Waste and plastic bags on and around snow dump following melting. (Photo 4)	Requires immediate attention. Baffinland to complete site wide housekeeping and tidying.	18/08/31

Photo 1: Water treatment plant pad floor – white substance is hydrated lime

Photo 2: Water treatment plant pad floor – soda ash on floor

Photo 3: Milne Landfarm

Photo 4: Milne Landfarm

28 November 2018

Fai Ndofor, Regulatory Manager
Qikiqtani Inuit Association
P.O. Box 1340
Iqaluit, NU X0A 0H0

RE: Response to QIA August 2018 Site Inspection, Findings and Recommendations

Baffinland Iron Mines Corporation (Baffinland) provides the Qikiqtani Inuit Association (QIA) with the following response to the inspection completed[1] August 3-4, 2018, consistent with the Commercial Lease No. Q13C301.

The attached Table 1 provides Baffinland's responses to the concerns/findings of the QIA inspection, including details where applicable on progress made to date.

Should you have any additional concerns or questions regarding the attached responses, please to not hesitate to contact the undersigned at your convenience.

Regards,

Christopher Murray
Environmental & Regulatory Compliance Manager

Cc: Megan Lord-Hoyle, Tim Sewell, William Bowden, Connor Devereaux (Baffinland)

Attachments:
Attachment 1 – Baffinland Responses to QIA Concerns/Findings
Attachment 2 – Water Treatment Plant SOP

[1] QIA (2018) Re: Baffinland Iron Mines Corporation's, Mary River Mine – Qikiqtani Inuit Association August 2018 Site Inspection, Findings, and Recommendations. Letter dated Friday August 10, 2018.

Attachment 1

Baffinland Responses to QIA Concerns/Findings

Baffinland

Table 1 - Baffinland Responses to QIA Concerns/Finidings
August 2018 Site Inspection

#	Project Location	Description of Concern or Finding	Recommended Action	Response
1	Waste Rock Facility Sedimentation Pond	No action has been taken to empty the pond and carryout a proper investigation to determine the cause of last year's spill event as indicated by Baffindland in their response to INAC dated March 13, 2018 WRF strategy letter.	It is recommended that Baffinland empty the pond and perform the investigation immediately as weather conditions may not be suitable for this activity in the next few weeks.	Baffinland provided an update to QIA on the WRF Sedimentation Pond in person during the 2018 QIA Audit, and in writing on 21 September 2018.
2	Waste Rock Facility Water Treatment Plant	At time of inspection, the water treatment plant was fully functional with no Operation Manual or Standard Operating Procedure (SOP) and measures to avoid and mitigate against eventual spills put in place. Poor housekeeping - soda ash and hydrated lime spills observed on floor. Also observed torn and opened bags thrown carelessly. (Photos 1 and 2) Baffinland was reminded that the pad has no liner or containment system to trap these chemicals or their solutions so they do not infiltrate through the permeable pad into the ground and probably end up and affect the receiving environment.	Recommended that the soda ash and hydrated lime spills be cleaned immediately and photos of the clean- up forwarded to QIA. As a temporary measure to avoid the spilled substances infiltrating through the pad, Baffinland should place some waterproof material like tarp on the areas where bags are stored and opened. Baffinland should immediately produce a SOP with measures to avoid and mitigate against eventual spills.	Baffinland cleaned the areas impacted by minor soda ash and lime, and placed tarps down in strategic locations to mitigate the potential for future residue of the chemicals. Baffinland is developing a long term strategy for the 2019 discharge season to ensure more comprehensive secondary containment at the Water Treatement Plant facility. The SOP for the Water Treatement Plant is provided as an addendum to this letter.
3	Milne Landfarm	Liner and other unauthorised substances observed though it was noted that some of these had been removed after the June 2018 inspection. (Photo 3)	It is recommended that Baffinland continue to sort, segregate, and remove all unauthorized material, finalize the construction of berms as designed and re-instate the landfarm to its original intent and use.	Baffinland continues to sort and remove plastics and other materials through the management of the landfarm in 2018 and will continue these efforts in 2019. Baffinland has demonstrated a commitment to manage the landfarm in an appropriate manner through the efforts expended in 2018 and will continue to improve on landfarm management and performance.
4	Milne Port Snow dump	Waste and plastic bags on and around snow dump following melting. (Photo 4)	Requires immediate attention. Baffinland to complete site wide housekeeping and tidying.	Baffinland continues to address debris collected during snow movement and storage, and has expended significant effort to reduce the volume of debris in the area of the snow dump, as well as Site wide. Baffinland will continue through winter 2018/19 to reduce debris present in snow dump locations and will continue to engage in spring and summer season site cleanup days and other efforts.

Attachment 2

Water Treatment Plant SOP

Baffinland Iron Mines Corporation

Waste Pond Water Treatment Plant Operations

Rev 1.0

Prepared By: Chet Fong
Department: Mine Operations
Title: Senior Mining Engineer
Date: 17/08/2018
Signature:

Approved By: Simon Fleury
Department: Mine Operations
Title: Mine Manager
Date: 17/08/2018
Signature: Simon L. Fleury

DOCUMENT REVISION RECORD

Issue Date MM/DD/YY	Revision	Prepared By	Approved By	Issue Purpose
08/17/18	V1.0	CF		Initial

TABLE OF CONTENTS

1 PURPOSE

This document outlines the basic procedure to safely operate the Water Treatment Plant

2 SCOPE

This document will cover the basic operations of the plant, including start up and shut down, monitoring, treatment, and emergency protocols and procedures for at risk activities at the Water Treatment Plant.

2.1 EXEMPTIONS

This document does not include instructions related to water treatment, which can be found in the plant Operations and Maintenance Manual.

3 RESPONSIBILITES

Any visitor shall request permission to the plant operator prior to entering the work area. In the absence of an operator, permission shall be requested to the mine supervisor.

The Plant operator shall ensure that everyone working in the plant wears the requisite PPE according to the activities being performed (e.g. chemical handling).

4 PROCEDURES

The information in this section is intended as a summary of plant operations. In the case of a discrepancy between this document and the Operations and Maintenance Manual, the latter will take precedence.

For full details on design and plant operation, refer to the operator's manual. In standard operations, the WTP is intended to draw water from the Waste Dump Pond and treat the intake water in 3 steps inside the WTP structure. The water is then discharged to a Geotube Settling Pond, where a fourth treatment step of settlement will occur, before water is either discharged into the environment or, if not compliant, recirculated back to the Waste Dump Pond.

The three steps of treatment involve the injection of chemical into temporary storage tanks.

- Step 1 – Iron Precipitation
- Step 2 – Hydroxide Precipitation and pH Adjustment

- Step 3 – Flocculation
- Step 4 - Filtration

Steps 1-3 occur inside the WTP structure, with the 4th step taking place in the Geotube Settling Pond.

4.1 PLANT OPERATIONS

Plant operations consists primarily of managing flow, dosage and water levels across the pond, sump, and tanks. Flow is managed with a combination of control panel adjustments and manual valve manipulations.

The plant consists of the following components:

1. Intake Pump – pulls water from the Waste Dump Pond into the WTP
2. Onion tanks – water is stored for treatment prior to discharge. There are two trains, which can be run independently or concurrently.
3. Control panel – use to remotely manage pumps – can be set for automatic and manual operations
4. Dosing pumps – use to inject chemical into onion tanks at a fixed rate
5. Dosing tanks – mixing tanks from which chemicals (Lime, Polymer) is depleted at a configurable rate
6. Transfer pumps – used to take treated water from the plant out to the Geotube Pond
7. Geotube Pond – discharge from the plant is deposited here for particulate settlement prior to final discharge.
8. Discharge pump – used to pull treated water from the Geotube Pond to either be discharged into the environment or recirculated back to the Waste Dump Pond.
9. Blower motors – used to agitate water in onion tanks during treatment to ensure more even dispersion of chemicals.

Once the Plant is operational, the operator will commence with monitoring the measured levels of pH and suspended solids with built in instrumentations and gauges. These readings may be corroborated with manual instrumentations such as a YSI meter.

When readings indicate pH readings at the desired values, the operator shall then initiate discharging of water into the Geotube Pond. This water is allowed to percolate through the Geotube, which catches particulates as a filter. Once in the Sump, where any remaining particulates are then captured and settle into the bottom of the pond.

Water is discharged from this Geotube Pond, either directly into the environment or back into the Waste Dump Pond. The maximum flow rate for these discharging is 1200 gal/min, this limit imposed by the flowmeter installed.

At design capacity, the intake pump(s) should be able to pull water into the WTP for treatment at an equal rate to the discharge pump. The plant effectively runs continuously with dosing in-stream.

4.2 Plant Start up

The following steps should be undertaken when starting up the WTP.

1. Ensure blower motors are activated.
2. Ensure all the Valves to the Geotube Sump are open.
3. Ensure the transfer pumps are switched to automatic
4. Check that all the intake valves are open
5. Keep valves open between tanks on each train
6. Start up intake pump and adjust pressure accordingly. To do this, adjust the following:
    a. Rpm of the pump
    b. Valve openings
7. Start Ferric Sulphate Dosing system. Ensure intake is in the Ferric Sulphate barrels, and there are no leaks present. Pumps should be activated.
8. Start Lime Dosing system. Dosing pumps should be activated.
9. Start up Polymer Dosing System. Dosing pumps should be activated

Plant operations can now commence.

4.3 Plant Shut Down

Plant shut down can be undertaken when it is to be unmanned for a longer period of time (eg. More than 2 shifts) within the same system (for winter decommissioning, procedure XXX). To run a plant shut down

1. Shut all intake valves
2. Shut all Ferric Sulphate dosing equipment
3. Shut all Lime dosing equipment
4. shut all Polymer dosing equipment
5. Rinse Lime lines (reference other procedure)

Plant can now be shut down. This procedure can be utilized with the onion tanks full. This should also be done before any interruptions in power due to generator maintenance or other causes.

4.4 Discharging

Discharging be undertaken whenever the plant is running. It is most efficient to run the discharge when there is moderate to high water levels in the Geotube Sump. The intake hose for the Geotube Sump should utilize the ring to ensure that drawn water is from the top of the water surface.

Discharging requires the manual operation of the valves to discharge the water either to the environment or back to the Waste Dump Pond. Readings should also be checked and logged on the flowmeter when discharge begins using the totalizer values.

NOTE: discharge flow rate should be kept below 1200 gal/min, as flow greater than this will not be measureable.

To discharge, the following steps should be undertaken:

1. Ensure enough water to discharge. Water levels should be at least 50 centimetres from the bottom of the sump prior to beginning discharge.
2. Ensure valve on re-circulation line is closed. This will enable the water to discharge into the environment. Where re-circulation is required, close the valve on the discharge line and open the valve on the re-circulation line.
3. If discharging to the environment, check the totalizer reading on the flowmeter prior to discharge. This is not required if re-circulating.
4. On the control panel, Set discharge to "on"
5. While discharging, check discharge pH and Turbidity with sampling tap periodically. Samples can be collected and tested using YSI instrument.
6. When discharging is complete or to be disabled, go to control panel and set discharge to "off"

4.5 CHEMICAL DOSING

Chemical dosing is performed as part of the treatment process. The primary drivers for chemical dosing is:

1. Reduce the pH
2. Reduce the suspended solids

Prior to discharging water back into the environment.

As dosing quantities will vary depending on flow rate and water qualities, refer to user manual for dosing quantities.

Dosing procedures will vary slightly between the stages of treatment. The three stages that require chemical intervention are Ferric Sulphate, Lime, and Polymer.

4.5.1 FERRIC SULPHATE – LIQUID

PPE Required: long chemical resistant gloves, apron, face shield, standard PPE

- Prepare a barrel for dosing by placing the barrel into the duck pond by the ferric sulphate dosing area and removing the top seal.
- Put 2 dosing pumps into 1 barrel (1 per train)
- Switch on dosing pump on the control panel
- On the pump, check frequency and stroke length to ensure dosage is as expected.
- To change barrels, switch off on the dosing pump and change barrel

4.5.2 LIME – BAGS

PPE Required: long chemical resistant gloves, respirator, face shield, respirator, standard PPE

- Fill mixing tank with intake water.
- Check filter on accessory intake water line (dedicated line for filling lime and polymer mixing tanks)
- Open valve on AI water line (fill tank). Fill to required water levels
- Ensure mixer is operating
- Add lime to water

4.5.3 POLYMER – BAGS

PPE Required: standard PPE

- Fill mixing tank with intake water.
- Check filter on accessory intake water line (dedicated line for filling lime and polymer mixing tanks)
- Open valve on AI water line (fill tank). Fill to required water levels
- Ensure mixer is operating
- Add polymer to water

4.6 SYSTEM AUTOMATION

For instruction on System Automation, please refer to the Operations and Maintenance Manual.

4.7 TROUBLE SHOOTING

For issue identification, please refer to the checklists in the Operations and Maintenance Manual.

4.8 ACCIDENT RESPONSE

As the WTP involves the handling of a number of chemicals that may be harmful, precautions must be taken to ensure all personnel who are in the work area are informed of the hazards and the preventative and treatment measures.

4.8.1 RESPONSE EQUIPMENT AVAILABLE

The WTP is equipped with a stationary emergency shower, 2 portable emergency shower stations and eyewash stations (dual purpose), 2 fire extinguishers, and 1 stationary eyewash station.

Additionally, the WTP is equipped with spare PPE, face shields, respirators, chemical resistant gloves, hearing protection, and spill kits.

There are also patch kits for the onion tanks, hose and fitting replacements, tools, and a base station radio available at the WTP.

In the event that an incident occurs that requires emergency response, same basic steps should be immediately undertaken. The following lists some of the possible situations and a brief of the response steps.

4.8.2 Spills on the Ground

- Retrieve spill pad kit
- use gloves to handle
- dispose in drum
- Label and dispose.

4.8.3 Spills on Person

- Proceed to stationary emergency shower
- Notify secondary operator
- Secondary operator activates pump switch
- Pull handle and rinse for 10 mins
- If unable to proceed to stationary emergency shower, refer to “emergency response procedure”

4.8.4 Lime in Eyes

- If possible, proceed immediately to emergency eyewash station
- Activate emergency eyewash and rinse for 10 mins.
- Repeat if required
- Notify secondary operator
- If unable to proceed to emergency eyewash station, refer to “emergency response procedure”

4.8.5 Lime Spill

- Retrieve spill pad kit
- use gloves to handle
- dispose in drum
- Label and dispose.

4.9 APPENDICIES

Appendix A – Operations and Maintenance Manual for Mary River Mine Waste Rock Pile Water Treatment Plant

APPENDIX A – OPERATIONS & MAINTENANCE MANUAL FOR MARY RIVER MINE WASTE ROCK PILE WATER TREATMENT PLANT
20180817_v02

OPERATIONS & MAINTENANCE MANUAL FOR MARY RIVER MINE WASTE ROCK PILE WATER TREATMENT PLANT 20180817_v02

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Project No. 137-0001

TABLE OF CONTENTS

Page

1.0 INTRODUCTION

This documents outlines the Operations Manual for Baffinland Iron Mine Corporation's (BIM) Mary River Mine Waste Rock Pile water treatment plant (WTP).

2.0 PLANT OVERVIEW

2.1 General Process Description

The WTP employs a process of coagulation, pH adjustment, flocculation, and filtration to treat acid rock surface runoff collected in the pond at the base of the waste rock pile. The objective of the system operation is to treat water to within the parameters outlined in the Metal Mining Effluent Regulations (MMER), as specified to McCue by BIM, and summarized in Table 1.

Table 1: MMER Effluent Limits

Parameter	Unit	Maximum Authorized Monthly Mean Concentration	Maximum Authorized Concentrations in a Composite Sample	Maximum Authorized Concentration in a Grab Sample
Arsenic	mg/L	0.5	0.75	1.00
Copper	mg/L	0.3	0.45	0.60
Cyanide	NTU	1.00	1.50	2.00
Lead	mg/L	0.20	0.30	0.40
Nickel	mg/L	0.50	0.75	1.00
Zinc	mg/L	0.50	0.75	1.00
Total Suspended Solids	mg/L	15.00	22.50	30.00
Radium 226	Bq/L	0.37	0.74	1.11
pH	SU	6-9.5	6-9.5	6-9.5

The treatment steps are described in Section 2.2. Refer to drawings in Appendix A:

2.2 Brief Process Overview

2.2.1 *System Inlet*

Water is collected at an inlet storage pond (P-001) where it is held for treatment. Two diesel powered centrifugal trash pumps (PU-100A/B) are used to transfer water from the storage pond to an equipment enclosure where the WTP is housed.

At the WTP, the flow can be divided into two separate treatment trains (1 and 2), with each train having a flow meter on the inlet line to monitor flow.

Water is directed into two reactor tanks (TA-110 and TA-210) for processing.

2.2.2 *Step 1 – Iron Precipitation*

Ferric sulphate solution is injected into TA-110 and TA-210 to promote coagulation and precipitation of some heavy metals.

As of system commissioning in June 2018, ferric sulphate liquid solution (12% Fe) is used and injected directly into the process. Each process train utilizes an independent chemical pump to introduce chemical into the system.

The WTS also includes a ferric sulphate make down system, including a holding tank and mixer to allow for makeup of solution using dry ferric sulphate.

Each reactor tank includes a pH sensor to provide continuous monitoring of pH.

Each reactor tank is equipped with four air diffusers which supply air to the process and provide continuous mixing so that solids are kept suspended. Each train is supplied air by a dedicated blower.

2.2.3 *Step 2 – Hydroxide Precipitation and pH Adjustment*

Water flows by gravity from TA-110 and TA-210 to TA-120 and TA-220 respectively. Here, hydrated lime is injected into the process to increase pH and aid in further precipitation of some metals through hydroxide precipitation.

Hydrated lime solution is made manually by adding dry hydrated lime and raw influent water to a mixing tank (TA-020). A mixer is run continuously to ensure the hydrated lime slurry does not solidify.

One hydrated lime chemical pump is utilized to dose each reactor tank with chemical. Two motorized valves (MV-120 and MV-220) are used to control the flow of lime to each reactor tank. Each reactor tank includes a pH sensor to provide continuous monitoring of pH.

Each reactor tank is equipped with four air diffusers which supply air to the process and provide continuous mixing so that solids are kept suspended. Each train is supplied air by a dedicated blower.

2.2.4 *Step 3 – Flocculation*

Water flows by gravity from TA-120 and TA-220 to TA-130 and TA-230 respectively. Here, polymer is injected into the process to aid in flocculation of suspended solids prior to filtration.
Polymer solution is made manually by adding dry polymer and raw influent water to a mixing tank (TA-030). A mixer is run continuously to ensure uniformity of the polymer solution.

Two polymer chemical pumps are utilized to provide polymer dosing to each train. Polymer can be dosed directly into each reactor tank, or inline through a static mixer located directly downstream of the reactor tank.

2.2.5 *Step 4 – Filtration*

Water from TA-130 and TA-230 is pumped to a geotube pond via two diesel powered centrifugal trash pumps (PU-200A/B).

Water is directed to a manifold where it can be distributed to two geotube bags for solids filtration. Two additional geotube bags can be deployed in the pond once the currently operating geotube bags have reached capacity. These spare geotubes are currently stored in a warehouse for future use.

Filtered water leaves the geotube bags and is directed to a collection point at the North West corner of the pond. From here, water is pumped via one diesel trash pump (PU-300) to the Mary River discharge point, or recycled back to the inlet pond. A flow meter is installed on the discharge line to Mary River to allow for data logging of flow.

2.3 Major Equipment List

The WTP layout is provided in appendix A. A list of major equipment is provided in Table 2.

Table 2: Major WTP Equipment

Equipment	Description	Qty	Drawing Reference (If Available)
Pond Transfer Pump	Model: Prime Aire PA4A60-404ST Power: Diesel Driven Capacity: 140m3/hr	2	PU-100 A / PU-100 B
Inlet Flow Meter	Model: GF Signet 3-2551-P1-42	2	FT-100 / FT-200
Ferric Reaction Tank	Material: Polyurethane Size: 5.9m W x 1.5 H Capacity: 24,820 Liters	2	TA-110 / TA-210
Lime Reaction Tank	Material: Polyurethane Size: 5.9m W x 1.5 H Capacity: 24,820 Liters	2	TA-120 / TA-220
Polymer Reaction Tank	Material: Polyurethane Size: 5.9m W x 1.5 H Capacity: 24,820 Liters	2	TA-130 / TA-230
Aeration Blowers	Gast R7100A-3 Blower • 208 V / 3 HP / 60 Hz	2	BL-100A / BL-100B
pH Controller and Sensors	Model: Walchem W900 (Controller) Model: Walchem WEL-PHF-NN (Sensors)	1	pH-110/120/210/220
Motorized Ball Valve	Hayward 1” Ball Valve Model: HRSN2	2	MV-120 and MV-220
Level Transmitter	Model: Echosonic 11 LU27	2	LT-130 / LT-230
Bag Filter	Model: FTI830-2P-150-CS-BS-P13-DP Bag Size: 5 Micron	1	FIL-100
Ferric Chemical Pump	Model: Walchem EHE31E1-VC Power: 115 VAC/1hp/60Hz Capacity: 1 LPM @ 105m TDH	2	PU-010A / PU-010B
Lime Chemical Pump	Model: Flowmotion FR25-HR30HR Power: 230V/3hp/60Hz Capacity: 9.5 LPM @ 105 m TDH	1	PU-020
Polymer Chemical Pump	Model: Flowmotion FR25-HR30HR Power: 230V/3hp/60Hz Capacity: 16.5 LPM @ 105 m TDH	2	PU-030A / PU-030B
Ferric Mixing Tank	Material: Polyurethane Size: Ø 1.2m x 1.3m Height	1	TA-010
Lime Mixing Tank	Material: Polyurethane Size: Ø 1.8m x 1.7m Height	1	TA-020
Polymer Mixing Tank	Material: Polyurethane Size: Ø 1.6m x 1.6m Height	1	TA-030
Coarse Bubble Diffusers	Model: Maxair 24” SS	24	-

2.4 System Automation

The system is automated through a main control panel located in the system enclosure. The system P&ID is provided in Appendix A. Operation is outlined in Table 3.

Table 3: Control Panel Automation

Equipment ID	Equipment Description	Control Logic	PID Control Reference	Controls	Panel Indication
PU – 100 A/B	Inlet Pond Pump	Units can be controlled in Hand or in Auto. Pump will turn on in Hand in Auto or in Hand.	-	-	Pump icon will indicate run status
		Pump will turn off if high level is measured in TA-110 or TA-210	LSH-110 / LSH-210	Auto	High level alarm at panel
		Pump will turn off if high level measured in TA-130 or TA-230	LIT-130 / LIT-230	Auto - High level settable at panel	High level alarm at panel
BL-100 A/B	Blower	Units can be controlled in Hand or in Auto Blower will turn on in Auto or in Hand	-	-	Blower icon will indicate run status
		BL-100 A will turn off if low level is measured by LIT-130	LIT-130	Auto – Low level settable at panel	Low level alarm
		BL-100 B will turn off if low level is measured by LIT-230	LIT-230	Auto – Low level settable at panel	Low level alarm
pH-110	pH Sensor	Continuous monitoring of pH	-	-	Display pH on PLC
pH-210	pH Sensor	Continuous monitoring of pH	-	-	Display pH on PLC

pH-210	pH Sensor	If pH>9.5, close MV-120 - Alarm	MV-120	Auto – pH set point settable at panel	Display pH on PLC
pH-220	pH Dosage	If pH>9, close MV-220 - Alarm	MV-220	Auto – pH set point settable at panel	Display pH on PLC
PU-010A	Ferric Pump	Units can be controlled in Hand or in Auto	-	-	Pump icon will indicate run status
		If FIT-100 measures flow, PU-010A energizes.	FIT-100	Auto	Display run status on PLC
PU-010B	Ferric Pump	Units can be controlled in Hand or in Auto	-	-	Pump icon will indicate run status
		If FIT-200 measures flow, PU-010B energizes.	FIT-100	Auto	Display run status on PLC
PU-020	Lime Pump	Units can be controlled in Hand or in Auto	-	-	Pump icon will indicate run status
		Speed Control (1 train only) If pH-120> 8.5, PU-020 will reduce speed. If pH < 8, pump will increase pump speed. If pH is between 8 to 8.5, pump will maintain pump speed.	pH-110 / pH-120	Auto – pH set point adjustable at panel	Display run status on PLC
		Speed Control Disabled If flow is detected by both trains, speed control is disabled.	FIT-100 / FIT-200	Auto	Display run status on PLC
PU-030 A	Polymer Pump	Units can be controlled in Hand or in Auto	-	-	Pump icon will indicate run status

		Polymer pump energizes if PU-200 A is on	PU-200A	-	Display run status on PLC
PU-030 B	Polymer Pump	Units can be controlled in Hand or in Auto	-	-	Pump icon will indicate run status
		Polymer pump energizes if PU-200 B is on	PU-200B	-	Display run status on PLC
PU-200 A	Transfer Pump	Units can be controlled in Hand or in Auto	-	-	Pump icon will indicate run status
		If LT-130 measures < 3', PU-200A off. If LT-130 measures >3', PU-200A on.	LT-130	Auto – Set points adjustable at panel	Pump icon will indicate run status
		If LT-130 measures >4.5', PU-200A off. If LT-130<4.5', PU-200A on.	LT-130	Auto – Set points adjustable at panel	Pump icon will indicate run status
PU-200 B	Transfer Pump	Units can be controlled in Hand or in Auto	-	-	Pump icon will indicate run status
		If LT-230 measures < 3', PU-200B off. If LT-230 measures >3', PU-200B on.	LT-130	Auto – Set points adjustable at panel	Pump icon will indicate run status
		If LT-230 measures >4.5', PU-200B off. If LT-230<4.5', PU-200B on.	LT-130	Auto – Set points adjustable at panel	Pump icon will indicate run status
PU-300	Discharge Pump	Units can be controlled in Hand or in Auto	-	-	Pump icon will indicate run status
		Pump off at LSL-200	LSL-200	-	Level indicator on panel

		Pump on at LSH-200	LSH-200	-	Level indicator on panel
		High Level Alarm at LSHH-200	LSHH-200	-	High Level Alarm
MX-010 /020/030	Mixer	Units can be controlled on/off manually	-	-	-

3.0 GENERAL STARTUP PROCEDURE

3.1 After Dormancy Pre-start-up Procedures

The following steps shall be taken after extended periods of dormancy, prior to general startup of the WTP.

Task	Check
Perform a visual inspection of the system enclosure for signs of water/snow ingress.	☐
Inspect hose and pipe for signs of leaks, abrasion, or other physical damage.	☐
Inspect Reactor tanks as follows: • Signs of leaks, abrasion, or other physical damage. • Tank connections for signs of strain or stress. • Make sure that valves at the inlet and outlet are opened.	☐
Inspect Blowers as follows: • Signs of abrasion, or other physical damage on all external accessories such as relief valves, gauges and filters. • Make sure that valves at the inlet and outlet are opened.	☐
Inspect Diesel Pumps as follows: • Signs of leaks, abrasion, or other physical damage. • Check for and tighten loose attaching hardware. • Make sure that valves at the inlet and outlet are opened. • Check oil levels and lubricate as necessary.	☐
Inspect Ferric Sulphate pump as follows • Signs of leaks, abrasion, or other physical damage. • Make sure that valves at the inlet and outlet are opened.	☐
Inspect Hydrated Lime pumps as follows • Signs of leaks, abrasion, or other physical damage. • Inspect condition of internal pump hose. • Make sure that valves at the inlet and outlet are opened.	☐
Inspect Polymer pump as follows: • Signs of leaks, abrasion, or other physical damage. • Inspect condition of internal pump hose. • Make sure that valves at the inlet and outlet are opened.	☐
Inspect Level Transmitter as follows: • Monitor debris and ensure the sensor is level and mounted perpendicular to water level. • Check and roughly compare measurement on the PLC with the real on the field.	☐
Inspect pH sensors as follows: • Monitor debris and deposition of scaling on the transmitter. Perform a cleaning of the sensors as necessary.	☐

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Insect Bag Filter vessel as follows: • Signs of leaks, abrasion, or other physical damage. • Inspect filter bag and replace as necessary	☐
Inspect Inlet Flow Meter as follows: • Signs of leaks, abrasion, or other physical damage. • Inspect flow sensor for scaling. Clean as necessary.	☐
Inspect Geotube Bag as follows: • Ensure inlet connection points are securely attached. • Ensure height of bag does not exceed recommended limits. If so, decommission geotube bag. • Clean geotube surface of sediment and scaling to prevent fouling using a push broom, or gentle pressure washing.	☐

3.2 Commissioning

After pre-start-up procedures are completed, the system can be energized. The following procedure reflects a high level overview of equipment checks to be performed. Detailed instructions can be found in the product specific manuals. Before any mechanical intervention, disconnect the electrical supply.

3.2.1 *Hydrated Lime Pump / Polymer Pump*

Task	Check
Ensure that all protections (cover, cover window, ventilator hood, coupling protection) are in place before operating the pump.	☐
Check the direction of rotation of the pump.	☐
Make sure that valves at the inlet and outlet are opened.	☐
Start the pump by checking its direction of rotation through the cover window.	☐
Check the flow and discharge pressure and adjust rollers if these figures don't match the pump specifications.	☐

IMPORTANT: Ensure lime pump valves remains open during operation. Should valves be left in the closed position, the process line can over pressurize, leading to a rupture of the chemical hose.

3.2.2 *Blowers*

Task	Check
Ensure impeller rotation is correct.	☐
Check filters and inspect for signs of fouling. Replace if necessary.	☐

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Ambient temperature – Check room and discharge air temperatures. Exhaust air should not exceed 135ºC.	☐
Working pressure and vacuum values – Adjust relief valve pressure or vacuum setting, if needed.	☐
Motor current – Check that the supply current matches recommended current rating on product nameplate.	☐
Electrical overload cutout – Check that the current matches the rating on product nameplate.	☐

3.2.3 *Ferric Pump*

Task	Check
Ensure pump is energized.	☐
Make sure that valves at the inlet and outlet are opened.	☐
Start the pump manually, in order to prime and adjust dosing rates.	☐
Prime the pump. See manual for details.	☐
Adjust dosing according to inlet water flow rate. See below.	☐
Check dosing rate with calibration cylinder.	☐

3.2.4 *Motorized Valve*

Task	Check
Ensure valve is energized.	☐
Ensure valve opens/closes reliably in manual mode:	☐

3.2.5 *Diesel Pumps*

Task	Check
Check fuel level and oil levels in the engine, air compressor, pump bearings and seal housing.	☐
Consult engine operations manual before attempting to start the unit.	☐
Allow pump to prime.	☐
Adjust engine speed to desired output.	☐

3.2.6 *pH Sensors*

Task	Check
Ensure sensor is calibrated.	☐
Ensure the pH reading displayed locally at the Walchem panel is transmitted correctly to PLC.	☐

3.2.7 *Geotube*

Task	Check
Ensure surface is clean of sediment and debris.	☐
Ensure all inlet valve are open.	☐
Ensure height of geotube does not exceed manufacturer recommended limit.	☐

4.0 OPERATION

4.1 General Operating Instructions

Operation of the WTP will consist of ensuring major equipment (blowers, dosing pumps, motorized valves, level transmitters) is running correctly, and ensuring influent/effluent monitoring and sampling are conducted on schedule.

The drivers for pH adjustment and TSS treatment are operation of the Ferric Sulfate, Hydrated Lime and Polymer Pump, along with the proper performance of the aeration blowers and diffusers equipment.

The unit will run manually. During short term dormancy, the unit can be operated in a “Sleep Mode” where the system is run in a re-cycle status using two submersible pumps inside TA-130 and TA-230 to recirculate water from the end of each train to the beginning of each train. Chemical injection is disabled during dormancy, however, the lime mixer should remain on to maintain suspension of the hydrated lime slurry. Blowers will also remain on to ensure suspension of solids within the reactor tanks.

Parameters to be measured and recorded daily include temperature, pH (typical values are between 6.5 and 9), and TSS. The system must be monitored regularly to ensure pH does not drop below the low level set point or raise above the level set point.

The pH reading should be recorded daily. The pH should be cross referenced regularly with a hand held device. Should the pH differ from the hand held reading, the operator should clean the pH electrodes using a 2-5% solution of hydrochloric acid.

System data can be recorded in the spreadsheet provided in Appendix B. Regular daily monitoring of parameters such as pH, temperature, TSS, and Geotube height must be recorded to ensure proper operation.

4.2 Operating Procedure

The following section will outline the step-by-step procedures for operating the treatment system.

4.2.1 *Standard Operation*

Inlet

The inlet pond level should be checked and recorded prior to start up. Two pond pumps can be utilized to transfer raw water to the treatment system. Usage will depend on the volume of treatment required. At low pond levels, one pond pump and one process train can be utilized. At high levels, both pumps can be utilized to increase the treatment volume.

All pump discharge valves must be opened. The pumps (PU-100 A/B) shall be placed in “Hand” at the PLC. This will energize the pumps and begin transfer of water to the treatment system. The pumps will only turn on if a high level is measured by LSH-110/210 or LT-130/230.

Operators must ensure the inlet pond level is monitored, as the pumps do not include a low level shut off.

Ferric Pumps (PU-010 A/B)

Water is transferred from the inlet pond to two reactor tanks (TA-110 and TA-210) where ferric sulphate is injected. The dosage rate of the ferric pumps is determined by the inlet quality of the raw water and can range from 0 to 20 mg/l. The dosage rate is to be determined by the operator.

The dosage rate must be set manually at the pump. Once set, the pump can be set to “Auto” at the control panel. The ferric pumps, PU-010 A and PU-010 B, will energize when flow is detected by FIT-100 and FIT-200 respectively.

Before starting the pumps, all discharge valves must be opened.

Lime Pump (PU-020)

After coagulant addition, water flows by gravity to TA-120 and TA-220 where hydrated lime is injected into the process. The dosage rate of the Lime pump is determined by the inlet quality of raw water and the pH required, and can range from 0 to 300 mg/l. The dosage rate is to be determined by the operator.

In manual mode, the speed of the pump can be set at the pump VFD, located on the lime pump stand.

Pump speed will be dependent on the pH measured by pH-120, and the pH set point entered into the panel (adjustable by an operator). At a setpoint of 8.5, the pump will increase speed if pH-120 measures a pH below 8. If pH-120 measures a pH above 9, pump speed will decrease. If pH is measured between 8 to 8.5, the dosage rate will remain the same.

-

At a pH above 9.5, MV-120 and MV-220 will close.

The lime pump will operate continuously, with chemical consistently recirculated to the lime mixing tank (TA-020). This is done to ensure the lime slurry does not settle and solidify in the piping system. At the end of every shift, clean water must be flushed through the piping in order to prevent fouling. Flushing may be required more frequently depending on operational conditions.

Due to the possibility of fouling, the lime pump system must be monitored for pressure consistently.

Lime Solution Make Up

Hydrated lime solution is made manually, with the solution concentration ranging from 5-10% depending on volume of raw water to be treated. A concentration of 5% is recommended to minimize line fouling caused by the lime slurry. Higher concentrations can be made, but more frequent line flushing will be required.

The lime tank mixer is operated from the panel, and should be operated continuously to prevent the slurry from solidifying.

Polymer Pumps (PU-030 A/B)

The dosage rate of the ferric pumps is determined by the inlet quality and can range from 0 to 3 mg/l.

The dosage rate must be set manually at the pump. Once set, the pump can be set to “Auto” at the control panel. The polymer pumps, PU-020 A and PU-020 B, will energize when the transfer pumps, PU-200 A and PU-200 B are energized.

Before starting the pumps, all discharge valves must be opened.

Polymer Solution Make Up

Polymer solution is made manually, with concentration ranging from 0.1 to 0.25% depending on volume to be treated.

The polymer tank mixer is operated from the panel, and should be kept on at all times to maintain uniformity of the solution.

Blowers

The blowers are operated from the panel, and should be energized at all times when raw water is being processed in the reactor tanks.

Both blowers (BL-100A and BL-100B) can be set in “Auto” at the panel, at which point they will run continuously until the water level in TA-130 and TA-230 is measured to be less than 6”. This level is settable at the panel.

Raw Water Bag Filter

The bag filter provides filtration of water required for chemical makeup. The filter bags should be replaced periodically when differential pressure across the filter exceeds approximately 20 psi.

Geotube Bags

Water is transferred from the final reactor tanks (TA-130 and TA-230) by diesel generated trash pumps (PU-200 A and PU-200 B) to the geotube pond. The transfer pumps, PU-200A and PU-200B are operated based on the level measured by the reactor tank level transmitters, LT-130 and LT-230 respectively. These set points are adjustable at the panel.

The height of the geotube bags must be monitored regularly.

4.3 Daily Operator Checklist

The following steps outline day-to-day operational procedures for the WTS.

Standard Operation

Task	Check
Check inlet pond and record water level	☐
Check lime and polymer solutions, make up additional solution as required.	☐
Place PU-100 A (and PU-100 B if necessary) in Hand mode at the control panel.	☐
Set Ferric Sulphate pump (PU-010 A / B) dose rate and place pump in Auto at control panel. Ensure pump energizes when flow is detected by FIT-100 or FIT-200.	☐
Turn on hydrated lime pump (PU-020 A) manually. Adjust dose rate based on flow measured by inlet flow meters.	☐
Monitor hydrated lime pump pressure gauge. If pressure gauge is showing a pressure greater than 15 psi, flush line with water.	☐
Set polymer pump dose rate at panel. Set in “remote” mode. Set pump to auto at panel. Pump will turn on when PU-200A/B energize.	☐
Set Blowers (BL-100 A / BL-100B) to Hand.	☐
Once onion tanks are full, set PU-200A/B to Auto (if using both trains). Ensure downstream valves to geotube bags are open.	☐

Observe reactor tank water levels to ensure inlet and outlet flows are balanced.	☐
Observe and record height of geotube bags. Height must not exceed 6 feet.	☐
Set PU-300 to auto in the panel. Once the water in the pond reaches the operating float switch, the pump will be energized.	☐
Discharge vales must be set manually to allow for discharge to the creek, or recycle back to the inlet pond. Set valves in correct position.	☐

Daily Shutdown

Task	**Check**
Set inlet pump to Off position	
Allow reactor tanks to be pumped down to ¼ volume.	☐
Turn off chemical pumps.	☐
Flush lime line with water	☐
Keep lime mixer (Mix-020) on to ensure hydrated lime slurry remains in liquid form.	☐
If tanks are lowered, blowers can be turned off. If tanks are kept full, energize recirculation pumps.	☐
Check lime and polymer solutions, make up additional solution if required.	☐
Turn transfer pumps (PU-200 A/B) and discharge diesel pump (PU-300) off.	☐

APPENDIX A –DRAWINGS

NOTES:

PU-200A/B- Transfer Pump
PU-300- Discharge Pump
FT-300- Flow Meter
LS- Level Switch
-LSHH 200
-LSH 200
-LSL 200

Process lines
Instrumentation lines

Process based on conceptual desgin by Golder Associates

REVISION TABLE

No.	DESCRIPTION	DATE
0	Original Issue	2018/04/30
1	Record Drawing	2018/07/31

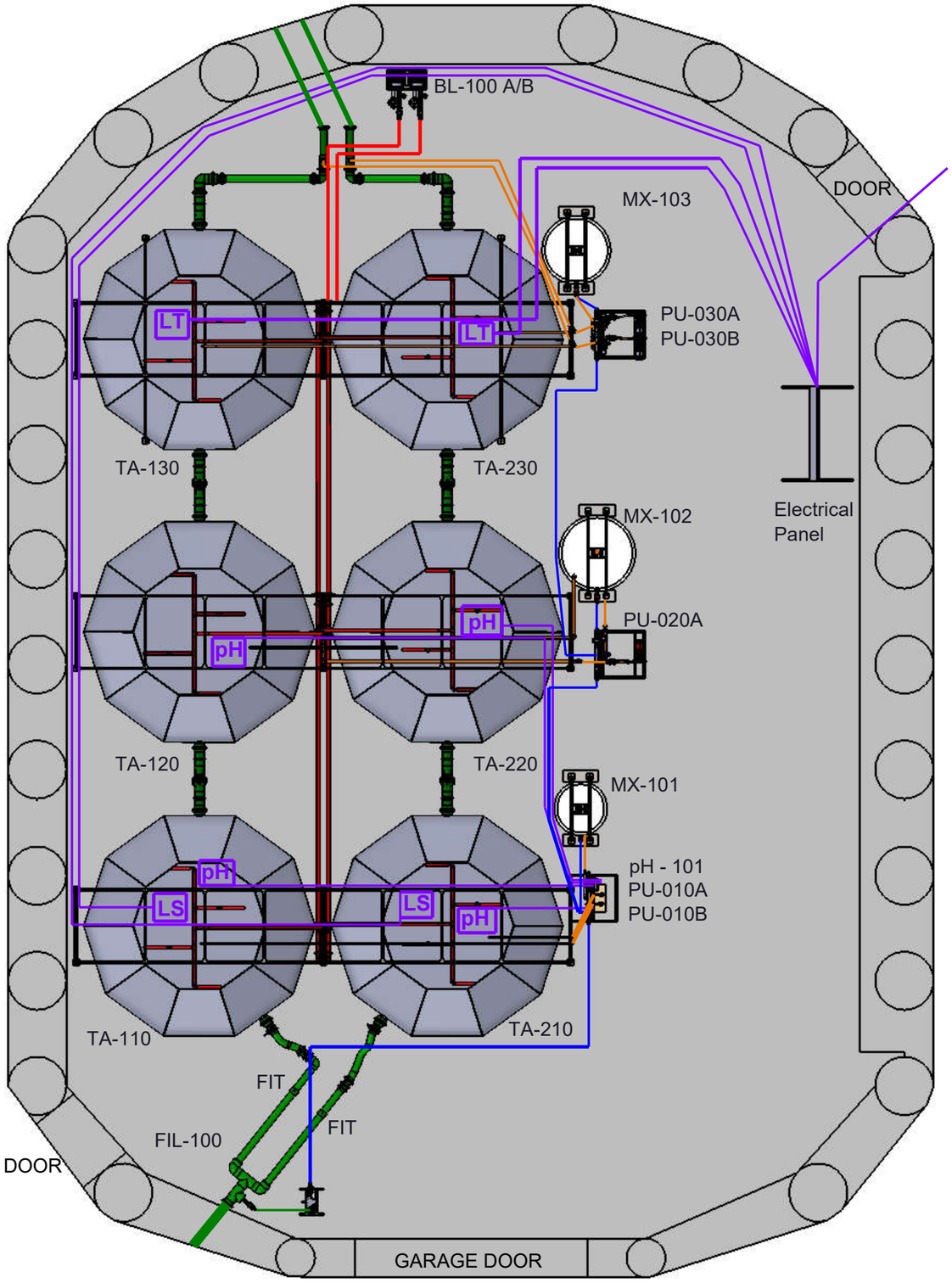
McCUE ENGINEERING CONTRACTORS

CLIENT:

BAFFINLAND IRON MINES CORPORATION

FULL SITE LAYOUT
GENERAL ARRANGEMENT DRAWING
Waste Rock Pile Water Treatment Plant

DATE: July 31, 2018	SCALE: NTS
DATA BY: R.B.	MCCUE JOB NO: 137-0001
DRAWN BY: L.S	FIG: GA-001



LEGEND

BL-100 A/B - Blower
FIL-100 - Bag Filter
MX-101 - Ferric Mixing Station
MX-102 - Lime Mixing Station
MX-103 - Polymer Mixing Station
PU-010 A/B - Ferric Pump
PU-020 - Lime Pump
PU-030 A/B - Polymer Pump
TA-110 - Ferric Process Tank (Train 1)
TA-210 - Ferric Process Tank (Train 2)
TA-120 - Lime Process Tank (Train 1)
TA-220 - Lime Process Tank (Train 2)
TA-130 - Polymer Process Tank (Train 1)
TA-230 - Polymer Process Tank (Train 2)
pH-101 - pH Controller
FIT - Flow Meter
pH - pH Sensor
LS - Level Switch
LT - Level Transmiter

Notes:

- Process Lines
- Water Make-up Lines
- Chemical Lines
- Air Lines
- Instrumentation Line

Process based on conceptual design by Golder Associates

REVISION TABLE		
No.	DESCRIPTION	DATE
0	Original Issue	2018/05/01
1	Record Drawing	2018/08/17

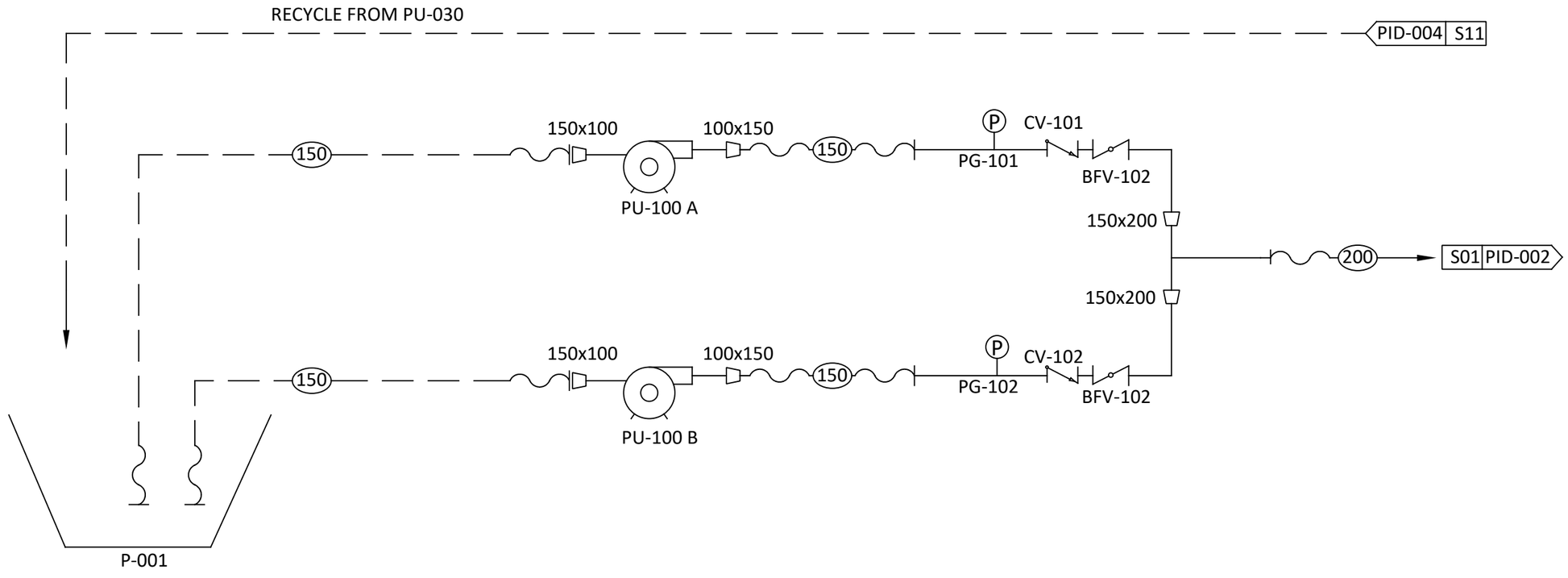
McCUE ENGINEERING CONTRATORS

CLIENT:

BAFFINLAND IRON MINES CORPORATION

BUILDING LAYOUT
GENERAL ARRANGEMENT DRAWING
Waste Rock Pile Water Treatment Plant

DATE: August 17, 2018	SCALE: AS SHOWN
DATA BY: R.B	JOB NO: 137-0001
DRAWN BY: L.S	FIG: GA-002



P-001
Inlet Storage Pond

PU-100 A/B
Pond Transfer Pump
Model: Prime Aire PA4A60-404ST
Power: Diesel Driven
Capacity: 140m³/hr

LEGEND :

- Hose
- Sch. 80 PVC Pipe
- Butterfly Valve
- Check Valve
- Reducer
- Pressure Gauge

Process based on conceptual design by Golder Associates

NO.	REVISION TABLE	DATE
0	Original Issue	April 30, 2018
1	Record Drawing	July 31, 2018

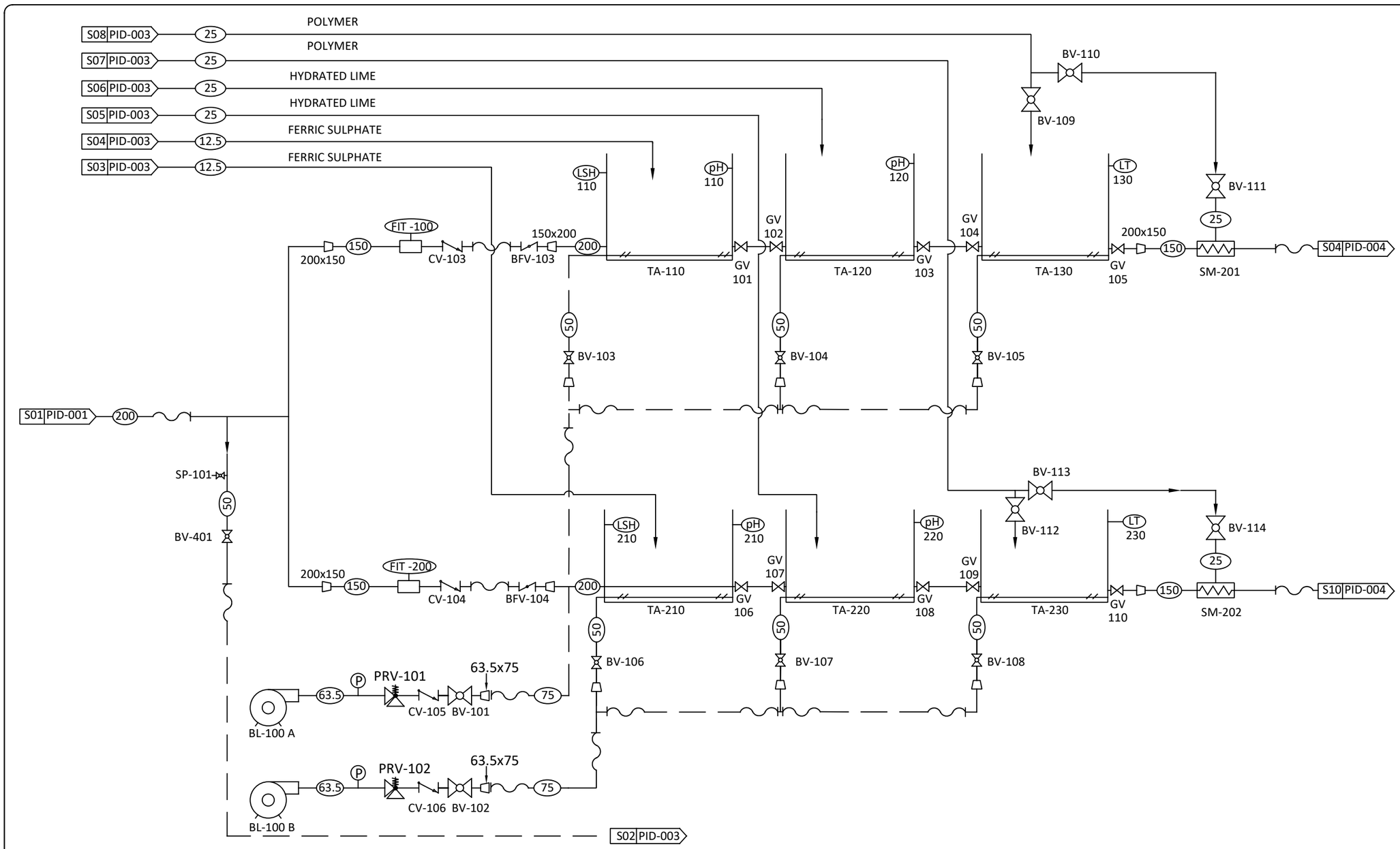
McCUE ENGINEERING CONTRACTORS

CLIENT:

BAFFINLAND IRON MINES CORPORATION

Waste Rock Water Storage Pond
PROCESS & INSTRUMENTATION DIAGRAM
Waste Rock Pile Treatment Plant

DATE: July 31, 2018	SCALE: NTS
DATA BY: R.B.	MCCUE JOB NO: 137-0001
DRAWN BY: M.T.	FIG: PID-0001



LEGEND:

- Hose
- Sch. 80 PVC Pipe
- Butterfly Valve
- Check Valve
- Reducer
- Pressure Gauge
- Static Mixer
- Gate Valve
- Pressure Relief Valve
- Ball Valve
- Sample Port
- Flow Meter
- Level Switch
- pH Sensor
- Level Transmitter

Process based on conceptual design by Golder Associates

NO.	REVISION TABLE	DATE
0	Original Issue	April 30, 2018
1	Record Drawing	July 31, 2018

McCUE ENGINEERING CONTRACTORS

CLIENT:

BAFFINLAND IRON MINES CORPORATION

REACTION TANKS
PROCESS & INSTRUMENTATION DIAGRAM
Waste Rock Pile Water Treatment Plant

DATE: July 31, 2018	SCALE: NTS
DATA BY: R.B.	MCCUE JOB NO: 137-0001
DRAWN BY: M.T.	FIG: PID-0002

BL-100 A/B
Blower
Model: Gast R7100A-3
Power: 208V/3hp/60Hz
Capacity: 500m³/hr @ 1.9m TDH

TA-110/210
Ferric Reaction Tank
Material: Polyurethane
Size: 5.9m W x 1.5 H
Capacity: 24,820 Liters

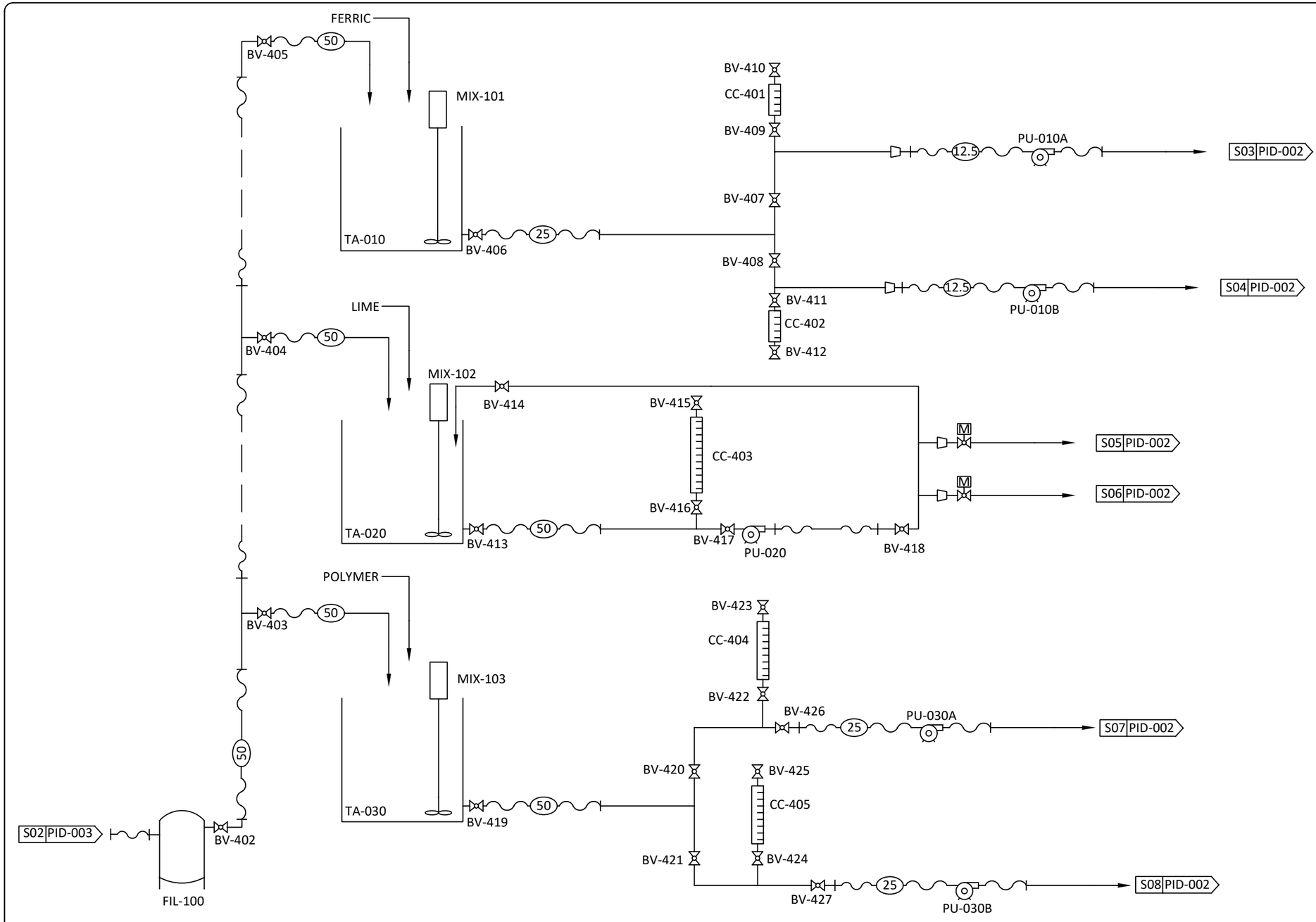
TA-120/220
Lime Reaction Tank
Material: Polyurethane
Size: 5.9m W x 1.5 H
Capacity: 24,820 Liters

TA-130/230
Polymer Reaction Tank
Material: Polyurethane
Size: 5.9m W x 1.5 H
Capacity: 24,820 Liters

FT-100/200
Influent Flow Meter
Model: GF Signet 3-2551-P1-41

LT-130/230
Level Transmitter
Model: Echosonic 11 LU27

pH-110/120/210/220
pH Meter
Model: Walchem WEL-PHF-NN



LEGEND:

- Hose
- Sch. 80 PVC Pipe
- Ball Valve
- Reducer
- Motorized Ball Valve

Process based on conceptual design by Golder Associates

NO.	REVISION TABLE	DATE
0	Original Issue	April 30, 2018
1	Record Drawing	July 31, 2018

McCUE ENGINEERING CONTRACTORS

CLIENT:

BAFFINLAND IRON MINES CORPORATION

CHEMICAL MAKEUP
PROCESS & INSTRUMENTATION DIAGRAM
Waste Rock Pile Water Treatment Plant

DATE: July 31, 2018	SCALE: NTS
DATA BY: R.B.	MCCUE JOB NO: 137-0001
DRAWN BY: M.T.	FIG: PID-003

FIL-100
Bag Filter
Model: FTI 830-2P-150-CS-BS-P13-DP
Bag Size: 5 Micron

PU-010A/B
Ferric Chemical Pump
Model: Welchmen EHE31E1-VC
Power: 115 VAC/1hp/60Hz
Capacity: 21 LPM @ 106m TDH

PU-020
Lime Chemical Pump
Model: Flowmotion FR25-HR30HR
Power: 230V/3hp/60Hz
Capacity: 570 LPM @ 42m TDH

PU-030
Polymer Chemical Pump
Model: Flowmotion FR25-HR30HR
Power: 230V/3hp/60Hz
Capacity: 990 LPM @ 42m TDH

MIX-101
Ferric Mixer
Model: Dynamix DMX-5505K-1
Power: 0.5 HP, 230V/1Ph/60Hz
Shaft: 1" Diameter x 41" Long

MIX-102
Lime Mixer
Model: Dynamix DMX-5505K-2
Power: 0.5 HP, 230V/1Ph/60Hz
Shaft: 1" Diameter x 52" Long

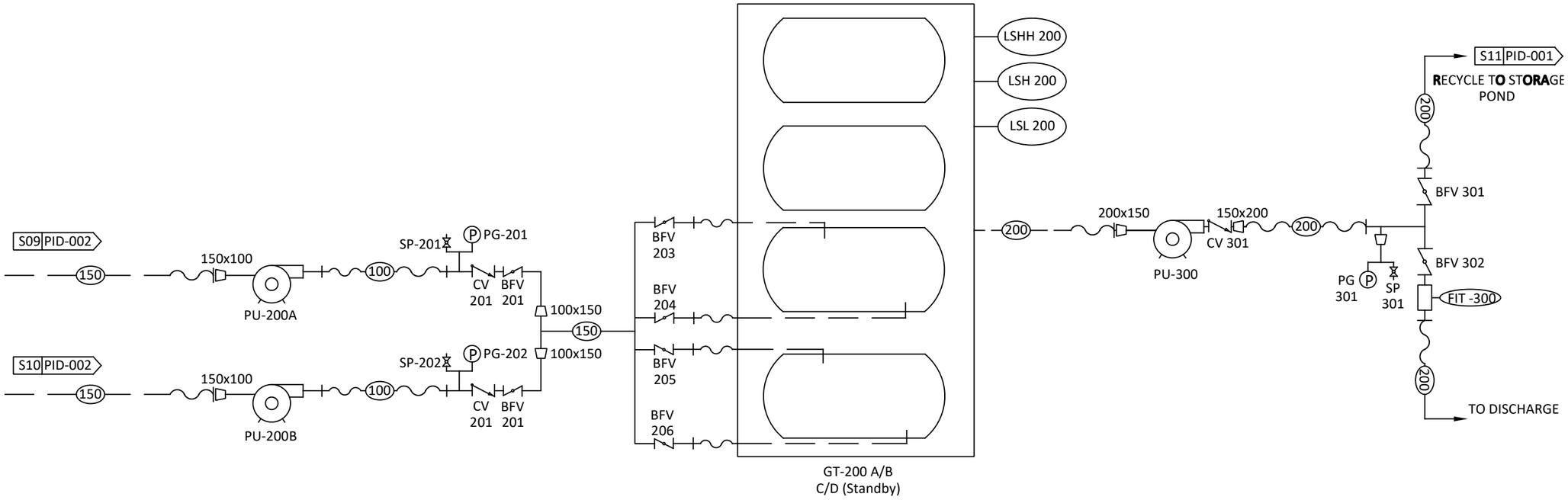
MIX-103
Polymer Mixer
Model: Dynamix DMX-5505K-1
Power: 0.5 HP, 230V/1Ph/60Hz
Shaft: 1" Diameter x 49" Long

TA-010
Ferric Mixing Tank
Material: Polyurethane
Size: Ø 1.2m x 1.3m Height

TA-020
Lime Mixing Tank
Material: Polyurethane
Size: Ø 1.8m x 1.7m Height

TA-030
Polymer Mixing Tank
Material: Polyurethane
Size: Ø 1.6m x 1.6m Height

CC-401/402/403/404/405
Calibration Column



LEGEND:

- Hose
- Sch. 80 PVC Pipe
- Butterfly Valve
- Check Valve
- Reducer
- Pressure Gauge
- Sample Port
- Level Switch

Process based on conceptual design by Golder Associates

NO.	REVISION TABLE	DATE
0	Original Issue	April 30, 2018
1	Record Drawing	July 31, 2018

McCUE ENGINEERING CONTRACTORS

CLIENT:

BAFFINLAND IRON MINES CORPORATION

GEOTUBE FIELD
PROCESS & INSTRUMENTATION DIAGRAM
Waste Rock Pile Water Treatment Plant

DATE: July 31, 2018	SCALE: NTS
DATA BY: R.B.	MCCUE JOB NO: 137-0001
DRAWN BY: M.T.	FIG: PID-004

PU-200A/B
Transfer Pump
Model: Prime Aire PA4A60-404ST
Power: Diesel Driven
Capacity: 140m³/hr

GT-200 A/B/C/D
Geotube
Model: Tencare GT500
Dimensions: 60' Circumference x 100' Long

PU-300
Discharge Pump
Model: Prime Aire PA4A60-404ST
Power: Diesel Driven
Capacity: 280m³/hr

FT-300
Flow Meter
Model: Toshiba GFG32

APPENDIX B - MONITORING

McCUE ENGINEERING CONTRACTORS EST. 2000

BROWNFIELDS TO GOLD MINES

Monitoring Spreadsheet

Project Name: BaffinLand Iron Mine
Waste Pile Water Treatment

			Inlet Quality			Train 1						Train 2						Discharge							
Date	Time	OP	Temp	Inlet pH	Inlet TSS	FIT-100	pH-110	pH-120	Ferric Dosage	Lime Dosage	Polymer Dosage	FIT-200	pH-210	pH-220	Ferric Dosage	Lime Dosage	Polymer Dosage	FIT-300	FIT-300 Totalizer	Geotube Pond pH	Geobag 1 Height	Geobag 2 Height	Discharge pH	Discharge Turbidity	Discharge TSS
			ºC		mg/L	(L/s)			Stroke/Speed	Hz	Hz	(L/s)			Stroke/Speed	Hz	Hz	(gpm)	(gpm)		(m)	(m)		NTU	(mg/L)

Observations

Chemical Availability	Week #1 Date:	Week #2 Date:	Week #3 Date:	Week #4 Date:
Ferric Sulphate				
Hydrated Lime				
Polymer				