Knight Piésold CONSULTING

MEMORANDUM

Date:	March 22, 2019	**File No.:**	NB102-00181/53-A.01
		Cont. No.:	NB19-00237
To:	Mr. Lou Kamermans		
Copy To:	Sara Wallace, Stantec		
From:	Amber Blackwell		
Re:	**Mary River Project - Phase 2 Proposal - Summary of Geochemistry Testing of Rock and Overburden Samples Representative of Quarries, Borrow Pits and Rock Cuts Along the North Railway**		

1.0 INTRODUCTION

Knight Piésold Ltd. (KP) is pleased to provide a summary of the geochemical testing that was completed to date along the proposed North Railway for the Mary River Project. This summary was prepared to support Baffinland Iron Mines Corporation's (Baffinland's) response to technical comments on the Addendum to the Final Environmental Impact Statement (FEIS) prepared for the Phase 2 Proposal (Baffinland, 2018).

2.0 APPLICABLE STUDIES

Regional bedrock geology is presented on Figure 1. Starting from Milne Port and moving south, the bedrock geology along the current Milne Inlet Tote Road and the proposed North Railway can be summarized as follows (Scott and de Kemp, 1998):

- **Km 0 to Km 20 -** Precambrian terrane, consisting of metamorphic magmatitic gneisses.
- **Km 20 to Km 93 -** Paleozoic rocks of the Gallery and Turner Cliffs Formations, Ship Point Formation, and the Baillarge Formation. These formations comprise primarily sedimentary rocks that are carbonate dominant (i.e. dolomitic sandstone, dolomite, and limestone).
- **KP 93 to Km 107 -** Precambrian terrane, consisting of metamorphic magmatitic gneisses.

A total of 76 samples have been tested as part of four separate geochemical evaluations (KP, 2007; AMEC, 2010; Hatch Ltd., 2017 and Hatch Ltd., in-progress). Table 1 identifies the number of samples collected in each rock type encountered within the transportation corridor.

Authors have used different descriptions of rock type, and so the rock type specified in the report was included in the table without interpretation. For example, Hatch's 2018 sampling (report in-progress) did not describe the geologic unit but included mineralogy testing that identified the presence or absence of calcite or dolomite. The carbonate-rich samples are likely the dolomitic limestone and sandstone of the Gallery and Turner Cliffs Formations and the non-carbonate-rich rocks are likely the Archean granitic gneiss.

Table 1 Summary of Geochemical Testing by Rock Type

Geological Unit	KP 2007	AMEC 2010	Hatch 2017/2018	Total
Overburden	6	14		20
Granitic Gneiss	6	21	7	34
Schist		3		3
Carbonate		9	6	15
Sandy Carbonate		3		3
Diabase			1	1
Total	**12**	**50**	**14**	**76**

NOTES:

1. GEOLOGY TAKEN FROM THE INDIVIDUAL REPORTS.
2. THE SCHIST SAMPLE IS A PART OF THE ARCHEAN METAMORPHIC BEDROCK AND IS CONSIDERED TO BE A MINOR LITHOLOGY.
3. THE DIABASE IS A DYKE THAT INTRUDED THE HOST BEDROCK AND IS CONSIDERED TO BE A MINOR LITHOLOGY.

3.0 ASSESSMENT OF ACID ROCK DRAINAGE POTENTIAL

Table 2 presents a summary of the results for key parameters used to establish acid rock drainage (ARD) generating potential. These results have been interpreted using the guidelines by Price (1997 and 2009), as follows:

- **Criterion 1:** If the sulphide concentration is greater than 0.3% by weight, the suggested classification is potentially acid generating (PAG).
- **Criterion 2:** If the neutralizing potential / acid potential (NP/AP) ratio is less than 1, the suggested classification is PAG. The NP and AP values are reported as equivalents of t $CaCO_3$/1,000 t.
- **Criterion 3:** If the NP/AP ratio is greater than 2, the suggested classification is Non-PAG. If the NP/AP ratio is between 1 and 2, the suggested classification is Uncertain.
- **Criterion 4:** If the sulphide concentration is less than 0.3% by weight, the suggested classification is Non-PAG. However, samples with a sulphide concentration between 0.01 and 0.3% by weight and an NP/AP ratio between 1 and 2 are characterized as Uncertain (due to the material being primarily composed of minerals that have poor NP values; Price, 2009).

With respect to Criterion 2 to 4, it should be noted that AP is calculated using the sulphide sulphur concentration. Therefore, if the sulphide concentration is below the laboratory minimum detection limit (MDL), the AP value is calculated from the MDL, which results in an AP value that is erroneously high. Similarly, if the carbonate concentration is below the MDL, the calculated NP value is inaccurate and erroneously high as well.

Of the 76 tested samples that were tested for ARD/ML potential:

- The average Total Sulphur concentration was 0.02% (by weight), with a maximum concentration of 0.07% (by weight).
- 11 samples had a Sulphide Sulphur concentration above the minimum detection limit (MDL), with an average concentration of 0.02% (by weight).
- The average Total Carbon concentration is 3.05% (by weight), with a minimum concentration of 0.02% (by weight).
- The minimum NP/AP value was 6.94, which is well above the conservative PAG cut-off of 2.0. It should be noted that most of the AP values were 0.62 t-$CaCO_3$/1000 t, which is calculated from a sulphur content below minimum detection limit (MDL). This suggests that the NP/AP ratios with sulphur content < MDL are higher than calculated and shown on Table 2.
- The average Net NP value was 269.2 t-$CaCO_3$/1000 t, which indicates good buffering capacity (NP).
- X-Ray Diffraction (XRD) on the 11 samples collected by Hatch (in-progress) was conducted and the results do not indicate the presence of sulphide species.
- ARD is not likely, given that all the samples have little to no AP with low to moderate NP.

4.0 ASSESSMENT OF METAL LEACHING POTENTIAL

The potential for the rock and overburden samples to leach metals was reviewed by screening short-term leach test results against the Metal and Diamond Mining Effluent Regulations (MDMER, 2019 and the Canadian Water Quality Guidelines for the Protection of Aquatic Life (Canadian Council of Ministers of the Environment, 2019). The water quality limits are outlined in Table 3 below.

Table 3 Water Quality Objectives

Parameter	MDMER[1,2]	CEGQ-PAL[3]
pH	6-9.5	6-9
Aluminum		0.1
Arsenic	1.0	0.005
Boron		29
Cadmium		0.001
Chromium		0.001
Copper	0.6	0.004
Lead	0.4	0.007
Nickel	1.0	0.15

Parameter	MDMER[1,2]	CEGQ-PAL[3]
Molybdenum		0.073
Phosphorus		0.1
Selenium		0.001
Silver		0.0003
Thallium		0.0008
Uranium		0.033
Zinc	1.0	0.037

NOTES:

1. METAL AND DIAMOND MINING EFFLUENT REGULATIONS (MDMER), 2019. *METAL AND DIAMOND MINE EFFLUENT REGULATIONS*. SOR/2002-222.
2. MDMER LIMITS ARE BASED ON SCHEDULE 4, MAXIMUM GRAB SAMPLE LIMITS.
3. CANADIAN COUNCIL OF MINISTERS OF THE ENVIRONMENT, 2019. *CANADIAN WATER QUALITY GUIDELINES FOR THE PROTECTION OF AQUATIC LIFE*.

AMEC (2010) and Hatch (2017 and in-progress) used shake flask extraction (SFE) tests. The SFE test analysis is used to determine the mass of soluble constituents within the sample at higher water to solid ratios. A 3:1 deionized water to solid ratio is used to represent the higher volume of water present. The water added to the sample is considered neutral, with a pH of approximately 7.0. Samples are gently shaken in a flask for 24 hours and supernatant fluids are analytically measured for dissolved constituents to help determine which elements are susceptible to leach at high water volumes. The use of a neutral pH water is more applicable if the rock is not acid-generating, which is the case with all the samples presented in Table 2. It should be noted that the SFE test is conservative (i.e. aggressive) in terms of evaluating acid-generating potential, despite the use of neutral pH water.

KP (2007) used the synthetic precipitation leaching procedure (SPLP 1312) test. The SPLP test was designed by the US Environmental Protection Agency (USEPA) to mimic metal leaching under acid rain conditions. The leaching reagent is a mixture of nitric and sulphuric acids adjusted to pH 4.2, with a 20:1 liquid to solid ratio (by wt.). The sample is crushed (if required) to less than 9.5 mm and both the sample and leaching reagent are placed in a flask, which is rotated end over end over a 24hr period. The leachate is then drained, filtered and analysed. An SPLP 1312 test is conservative and more aggressive than an SFE test due to the lower pH of the reagent.

Of the 76 samples, 9 exceeded the MDMER upper limit of 9.5 pH, and none were below the MDMER lower limit of 6.0 pH. One single sample from the 2007 dataset exceeded MDMER for copper. Several metals exceeded the CEQG-PAL limits under short-term leaching conditions. These include: aluminum, chromium, copper, iron, phosphorus, nickel, and zinc. Most of the metal exceedances were from the SPLP 1312 dataset, which indicates that they are prone to leaching under acidic conditions. However, based on the Modified ABA data, acid conditions are not expected, as most of the samples were net neutralizing. As such, metal leaching is not likely a concern, given the low ARD potential of the samples.

Both the SFE and the SPLP 1312 tests as they are completed on a crushed sample (increased surface area, compared to field conditions) exposed to either lower pH water or aggressive shaking. As such, the final pH derived from these short-term leach tests may overstate what is measured in the field. Many of the samples returned a high pH, and these same samples measured an aluminum concentration greater than the CEQG-PAL limit. This is not unexpected, as the solubility of aluminum is lowest at between pH 6 and 7 and increases at high pH (Langmuir, 1997).

5.0 SUMMARY OF ARD/ML POTENTIAL

None of the 76 tested samples are PAG. Additionally, most of the samples have low to no potential for ML, given the neutral to alkaline nature of the tested material. Though some samples did demonstrate some elevated concentrations of metals above CEQG-PAL (Canadian Council of Ministers of the Environment, 2007), this was primarily under acidic laboratory conditions and is not indicative of field conditions.

6.0 REFERENCES

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Yours truly,
Knight Piésold Ltd.

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Project Geoscientist

REGISTERED PROFESSIONAL ENGINEER
S.R. AIKEN
LICENSEE
March 22/19
NWT/NU

PERMIT TO PRACTICE
KNIGHT PIESOLD LTD.
Signature
Date March 22 2019
PERMIT NUMBER: P 547
The Association of Professional Engineers, Geologists and Geophysicists of NWT/NU

Reviewed: Steven R. Aiken, P.Eng.
Manager, Environmental Services

Approval that this document adheres to the Knight Piésold Quality System: RAC

Attachments:

Table 2 Rev 0	Geochemical Testing Summary - North Railway
Figure 1 Rev 0	Regional Bedrock Geology and Geochemical Sample Locations Along North Railway

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TABLE 2

BAFFINLAND IRON MINES CORPORATION
MARY RIVER PROJECT

SUMMARY OF GEOCHEMISTRY TESTING OF ROCK AND OVERBURDEN SAMPLES REPRESENTATIVE OF QUARRIES, BORROW PITS AND ROCK CUTS ALONG THE NORTH RAILWAY
GEOMECHANICAL TESTING SUMMARY- NORTH RAILWAY

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Sample No.	Geology	Sample Location			Report	Modified Acid Base Accounting (ABA) Results								Static Metal Leaching Tests		ARD/ML Evaluation	
		Easting	Northing	Tote Road Chainage		NP	AP	Net NP	NP/AP	Total Sulphur	Sulphide	C	Carbonate	Metals Exceeding MDMER Schedule 4 Limits	Metals Exceeding CEQG - PAL	Acid Generating Potential	Metal Leaching Potential[5]
						t $CaCO_3$ / 1000t	t $CaCO_3$ / 1000t	t $CaCO_3$ / 1000t	ratio	%	%	%	%				
SC50	Overburden	505,806	7,971,897		KP, 2007	222	< 0.31	222	716	< 0.005	< 0.01	2.62	11.8	pH >9.5	Al	Non-PAG	Low[6]
SC51	Overburden	506,120	7,971,575		KP, 2007	172	< 0.31	172	555	< 0.005	< 0.01	2.11	9.25	pH >9.5	Al	Non-PAG	Low[6]
SC28	Overburden	529,366	7,926,975		KP, 2007	363	< 0.31	363	1170	< 0.005	< 0.01	4.55	19	pH >9.5	Al	Non-PAG	Low[6]
SC27	Overburden	529,371	7,926,671		KP, 2007	316	< 0.31	316	1020	< 0.005	< 0.01	3.82	16.2		Al	Non-PAG	Low[6]
SC02	Overburden	556,044	7,915,009		KP, 2007	3.7	< 0.31	3.4	11.9	< 0.005	< 0.01	0.035	0.055		Al, Cr, Fe, P	Non-PAG	Moderate[6]
SA1	Overburden	586,880	7,826,413		KP, 2007	5.1	< 0.31	4.8	16.4	< 0.005	< 0.01	0.019	0.02		Al, Fe	Non-PAG	Low[6]
BC12	Granitic Gneiss	595,511	7,802,321		KP, 2007	8.3	< 0.31	8	26.8	0.028	< 0.01	0.08	0.05		Al, Cr, Cu, Fe	Non-PAG	Moderate[6]
BC11	Granitic Gneiss	581,795	7,849,686		KP, 2007	7.9	< 0.31	7.6	25.5	< 0.005	< 0.01	0.087	0.05		Al, Cr, Cu, Fe	Non-PAG	Moderate[6]
BC10	Granitic Gneiss	605,673	7,848,344		KP, 2007	8.2	< 0.31	7.9	26.5	0.007	< 0.01	0.058	0.08		Al, Cr, Cu, Fe, Zn	Non-PAG	Moderate[6]
BC8	Granitic Gneiss	563,246	7,913,150		KP, 2007	8.7	< 0.31	8.4	28.1	0.015	< 0.01	0.11	0.015		Al, Cr, Cu, Fe, P, Zn	Non-PAG	Moderate[6]
BC9	Granitic Gneiss	541,089	7,926,876		KP, 2007	14	< 0.31	13.7	45.2	0.026	< 0.01	0.18	0.1		Al, Cr, Cu, Fe, Ni, Zn	Non-PAG	Moderate[6]
BC1	Granitic Gneiss	504,415	7,975,004		KP, 2007	9.5	< 0.31	9.2	30.6	0.014	0.01	0.11	0.14	Cu	Al, Cr, Cu, Fe, P, Zn	Non-PAG	Moderate[6]
10-TR-034 BH10-21	Schist			85+000	AMEC, 2010	12.5	0.31	12.2	40.3	0.015	< 0.01	0.096	0.282			Non-PAG	
10-TR-035 BH10-12	Schist			22+000	AMEC, 2010	10.2	0.77	9.43	13.3	0.06	0.02	0.052	0.054	pH >9.5	pH >9.0, Al	Non-PAG	None
10-TR-036 BH10-12	Schist			22+000	AMEC, 2010	10.4	0.41	9.99	25.6	0.023	0.01	0.049	0.023			Non-PAG	
10-TR-001 BH10-04	Granitic Gneiss			2+100	AMEC, 2010	7.9	0.31	7.59	25.5	0.014	< 0.01	0.059	0.103		Al	Non-PAG	None
10-TR-002 BH10-04	Granitic Gneiss			2+100	AMEC, 2010	8.1	0.31	7.79	26.1	<0.005	< 0.01	0.05	0.101			Non-PAG	
10-TR-003 BH10-04	Granitic Gneiss			2+100	AMEC, 2010	8.8	0.31	8.49	28.4	<0.005	< 0.01	0.064	0.137			Non-PAG	
10-TR-007 BH10-06	Granitic Gneiss			4+100	AMEC, 2010	7.5	0.31	7.19	24.2	<0.005	<0.01	0.036	0.048			Non-PAG	
10-TR-008 BH10-06	Granitic Gneiss			4+100	AMEC, 2010	7.3	0.31	6.99	23.5	0.008	<0.01	0.028	0.025			Non-PAG	
10-TR-009BH10-06	Granitic Gneiss			4+100	AMEC, 2010	7.7	0.31	7.39	24.8	0.006	<0.01	0.035	0.075	pH >9.5	pH >9.0, Al	Non-PAG	None
10-TR-010 BH10-07	Granitic Gneiss			5+000	AMEC, 2010	9.5	0.36	9.14	26.2	0.035	0.01	0.027	0.014			Non-PAG	
10-TR-011 BH10-07	Granitic Gneiss			5+000	AMEC, 2010	11.7	0.31	11.4	37.7	0.036	<0.01	0.038	0.027			Non-PAG	
10-TR-012 BH10-07	Granitic Gneiss			5+000	AMEC, 2010	11.5	0.31	11.2	37.1	0.019	<0.01	0.036	0.052			Non-PAG	
10-TR-013 BH10-08	Granitic Gneiss			6+000	AMEC, 2010	6.3	0.31	5.99	20.3	<0.005	<0.01	0.028	0.035			Non-PAG	
10-TR-014 BH10-08	Granitic Gneiss			6+000	AMEC, 2010	9.6	0.31	9.29	31	0.02	<0.01	0.044	0.38	pH >9.5	pH >9.0, Al	Non-PAG	None
10-TR-015 BH10-08	Granitic Gneiss			6+000	AMEC, 2010	10.4	0.31	10.1	33.5	0.028	<0.01	0.043	0.062			Non-PAG	
10-TR-016 BH10-09	Granitic Gneiss			7+000	AMEC, 2010	6.2	0.31	5.89	20	0.012	<0.01	0.02	0.034			Non-PAG	
10-TR-017 BH10-09	Granitic Gneiss			7+000	AMEC, 2010	7.1	0.31	6.79	22.9	0.012	<0.01	0.07	0.048	pH >9.5	pH >9.0, Al, Cr	Non-PAG	Low
10-TR-018 BH10-09	Granitic Gneiss			7+000	AMEC, 2010	6.6	0.31	6.29	21.3	0.038	<0.01	0.023	<0.005			Non-PAG	
10-TR-019 BH10-12	Granitic Gneiss			22+000	AMEC, 2010	8	0.31	7.69	25.8	0.029	<0.01	0.035	0.018	pH >9.5	pH >9.0, Al, Cr	Non-PAG	Low
10-TR-020 BH10-12	Granitic Gneiss			22+000	AMEC, 2010	10.4	0.4	10	26	0.028	0.01	0.051	0.071			Non-PAG	
10-TR-021 BH10-12	Granitic Gneiss			22+000	AMEC, 2010	8.8	0.31	8.49	28.4	0.006	<0.01	0.046	0.065			Non-PAG	
10-TR-022 BH10-13	Carbonate Bound Quartz Sandstone With Silty Interlayers			39+100	AMEC, 2010	229	0.31	229	739	<0.005	<0.01	2.77	12			Non-PAG	
10-TR-023 BH10-13	Carbonate Bound Quartz Sandstone With Silty Interlayers			39+100	AMEC, 2010	252	0.31	252	813	<0.005	<0.01	2.98	12.5			Non-PAG	
10-TR-024 BH10-13	Carbonate Bound Quartz Sandstone With Silty Interlayers			39+100	AMEC, 2010	273	0.31	273	881	<0.005	<0.01	3.25	14		pH >9.0, Cr	Non-PAG	Low
10-TR-025 BH10-14	Sandy Carbonate			45+200	AMEC, 2010	959	0.31	959	3095	<0.005	<0.01	11.1	54.3		pH >9.0, Al	Non-PAG	None
10-TR-026 BH10-14	Sandy Carbonate			45+200	AMEC, 2010	930	0.31	929	2998	<0.005	<0.01	10.8	52.3			Non-PAG	
10-TR-027 BH10-14	Sandy Carbonate			45+200	AMEC, 2010	956	1.29	955	742	0.071	0.04	11.2	54			Non-PAG	
10-TR-028 BH10-15	Carbonate With Minor Shale And Mudstone			50+000	AMEC, 2010	978	0.31	978	3155	0.014	<0.01	10.9	53.2			Non-PAG	
10-TR-029 BH10-15	Carbonate With Minor Shale And Mudstone			50+000	AMEC, 2010	953	0.77	952	1245	0.041	0.02	10.7	51.3		Al	Non-PAG	None
10-TR-030 BH10-15	Carbonate With Minor Shale And Mudstone			50+000	AMEC, 2010	945	0.34	945	2749	0.02	0.01	10.7	51.5			Non-PAG	

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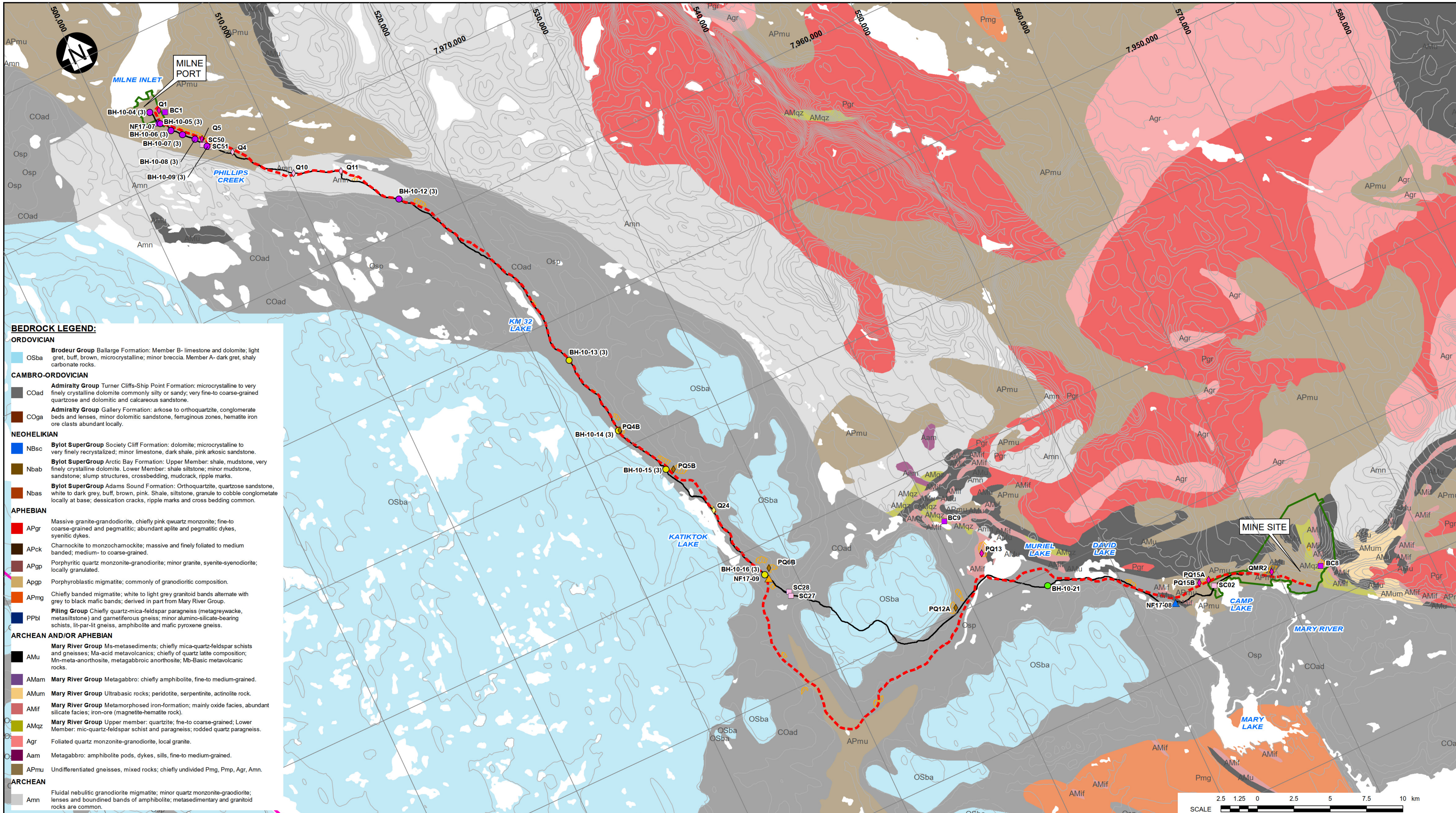
						t $CaCO_3$ / 1000t	t $CaCO_3$ / 1000t	t $CaCO_3$ / 1000t	ratio	%	%	%	%				
10-TR-031 BH10-16	Carbonate			61+500	AMEC, 2010	965	0.31	965	3114	<0.005	<0.01	10.8	53.5			Non-PAG	
10-TR-032 BH10-16	Carbonate			61+500	AMEC, 2010	961	0.31	960	3099	<0.005	<0.01	10.7	52.9			Non-PAG	
10-TR-033 BH10-16	Carbonate			61+500	AMEC, 2010	954	0.31	953	3076	<0.005	<0.01	10.7	52.1		pH >9.0	Non-PAG	None
10-TR-004 BH10-05	Granitic Gneiss			3+100	AMEC, 2010	7.4	0.31	7.09	23.9	0.02	<0.01	0.041	0.059			Non-PAG	
10-TR-005 BH10-05	Granitic Gneiss			3+100	AMEC, 2010	6.6	0.31	6.29	21.3	0.015	<0.01	0.032	0.033	pH >9.5	pH >9.0, Al	Non-PAG	None
10-TR-006 BH10-05	Granitic Gneiss			3+100	AMEC, 2010	6.2	0.44	5.76	14.2	0.038	0.01	0.029	0.028			Non-PAG	
S449-10	Sand/Gravel				AMEC, 2010	678	0.31	677	2185	0.011	<0.01	7.86	33.9		Cr	Non-PAG	Low
S450-10	Sand/Gravel				AMEC, 2010	699	0.31	699	2256	<0.005	<0.01	8.02	36			Non-PAG	
S451-10	Sand/Gravel				AMEC, 2010	237	0.31	237	765	<0.005	<0.01	2.92	11.7			Non-PAG	
S452-10	Sand/Gravel				AMEC, 2010	250	0.31	249	805	0.014	<0.01	2.89	12.4			Non-PAG	
S453-10	Sand/Gravel				AMEC, 2010	267	0.31	266	861	<0.005	<0.01	3.22	13.9			Non-PAG	
S454-10	Sand/Gravel				AMEC, 2010	5.3	0.31	4.99	17.1	<0.005	<0.01	0.061	0.016		Al, Cr	Non-PAG	Low
S455-10	Sand/Gravel				AMEC, 2010	37.5	0.31	37.2	121	<0.005	<0.01	0.41	0.255			Non-PAG	
S456-10	Sand/Gravel				AMEC, 2010	150	0.31	149	482	0.007	<0.01	1.82	6.2			Non-PAG	
S457-10	Sand/Gravel				AMEC, 2010	172	0.31	171	554	<0.005	<0.01	1.44	5.37			Non-PAG	
S458-10	Sand/Gravel				AMEC, 2010	86.7	0.31	86.4	280	0.007	<0.01	1.12	4.17		pH >9.0, Al	Non-PAG	None
S459-10	Sand/Gravel				AMEC, 2010	309	0.31	309	998	<0.005	<0.01	3.87	16.2			Non-PAG	
S460-10	Sand/Gravel				AMEC, 2010	137	0.31	136	441	<0.005	<0.01	1.71	7.29			Non-PAG	
S461-10	Sand/Gravel				AMEC, 2010	192	0.31	192	621	0.005	<0.01	2.33	10.2		pH >9.0, Al, Cr	Non-PAG	Low
S462-10	Sand/Gravel				AMEC, 2010	310	0.31	310	1001	0.007	<0.01	3.75	16.7			Non-PAG	
NF17-07	Granitic Gneiss			~ km 3	Hatch, 2017	6.1	0.67	5.43	9.1	0.035	< 0.02	0.044	0.11			Non-PAG	
NF17-08	Diabase			~ km 95	Hatch, 2017	11	0.67	10.6	16.9	0.042	< 0.02	0.061	< 0.025			Non-PAG	
NF17-09	Limestone			~ km 62	Hatch, 2017	1077	0.67	1077	1608	0.029	< 0.02	11.1	54.1			Non-PAG	
Q1	Granitic Gneiss	504,087	7,975,305		Hatch, 2019	12	0.62	10.9	18.5	< 0.005	< 0.02	0.106	0.145		pH >9.0, Al	Non-PAG	None
Q5	Granitic Gneiss	505,934	7,972,277		Hatch, 2019	12	0.62	11.1	18.9	0.006	< 0.02	0.048	< 0.025		Al, Cu	Non-PAG	None
PQ4B	Calcite-Rich Rock	523,505	7,941,976		Hatch, 2019	958	0.62	958	1546	< 0.005	< 0.02	11.4	50.9		Al	Non-PAG	None
PQ5B	Calcite-Rich Rock	525,723	7,937,982		Hatch, 2019	1185	0.62	1184	1911	0.006	< 0.02	11.3	54		Al	Non-PAG	None
Q24	Dolomite-Rich Rock	527,045	7,934,268		Hatch, 2019	975	0.62	975	1561	0.02	0.02	11	52.9		Al, Cu	Non-PAG	Low
PQ6B	Calcite-Rich Rock	528,798	7,929,044		Hatch, 2019	1135	0.62	1134	1831	< 0.005	< 0.02	11.1	52		Al, Cr	Non-PAG	Low
PQ12A	Calcite-Rich Rock	539,277	7,921,138		Hatch, 2019	870	1.25	868	696	0.032	0.04	11.2	42.1		pH >9.0	Non-PAG	None
PQ13	Granitic Gneiss	542,481	7,923,782		Hatch, 2019	5.4	0.62	4.78	8.71	< 0.005	< 0.02	0.07	0.105		Al	Non-PAG	None
PQ15B	Granitic Gneiss	555,185	7,915,620		Hatch, 2019	4.8	0.62	4.18	7.74	< 0.005	< 0.02	0.05	0.1		Al, Fe	Non-PAG	Low
PQ15A	Granitic Gneiss	555,849	7,915,556		Hatch, 2019	5.6	0.62	4.98	9.03	< 0.005	< 0.02	0.032	0.035			Non-PAG	None
QMR2	Granitic Gneiss	560,022	7,914,204		Hatch, 2019	4.3	0.62	3.68	6.94	0.005	< 0.02	0.033	0.07		pH >9.0, Al	Non-PAG	None

I:\1\02\00181\53\A\Correspondence\NB19-00237 - Memo - North Rail Geochem Summary\[Geochemistry Summary 2019-03-22 SRA edits.xlsm] Table 2

NOTES:

1. KNIGHT PIESOLD LTD. (KP), 2007. *RE: PRELIMINARY RESULTS OF PHASE I GEOCHEMICAL CHARACTERIZATION PROGRAM.* MARCH 16. NORTH BAY, ONTARIO. REF NO. NB07-00232 (NB102-181/4).
2. AMEC EARTH & ENVIRONMENTAL (AMEC), 2010. *BAFFINLAND MARY RIVER PROJECT - TRUCKING FEASIBILITY STUDY INTERIM ML/ARD ASSESSMENT OF TOTE ROAD QUARRY AND BORROW PIT SAMPLES.* DECEMBER 10. MISSISSAUGA. PROJECT NO. TC10510, FILE NO. 017.
3. HATCH, 2017. MEMORANDUM TO: M. WEAVER. RE: *INVESTIGATIONS - ACID ROCK DRAINAGE ASSESSMENT.* SEPTEMBER 11. REF NO. H353004.
4. HATCH, IN PROGRESS. *BORROW SOURCE INVESTIGATION FACTUAL DATA REPORT.* REF NO. H353004-30000-229-230-0002, REV A.
5. METAL LEACHING RESULTS WERE SCREENED AGAINST THE MMER CRITERIA UTILIZED IN AMEC, 2010.
6. LEACH TESTING WAS COMPLETED AT AN ACIDIC pH OF 4.2, AS SUCH METALS WERE LEACHED UNDER ACIDIC CONDITIONS, WHICH IS NOT INDICATIVE OF THE MODIFIED ABA TEST RESULTS.

REV	DATE	DESCRIPTION	PREP'D	RVW'D
0	22MAR'19	ISSUED WITH MEMO NB19-00237	MJJ	AMB



BEDROCK LEGEND:

ORDOVICIAN

- OSba — **Brodeur Group** Ballarge Formation: Member B- limestone and dolomite; light gret, buff, brown, microcrystalline; minor breccia. Member A- dark gret, shaly carbonate rocks.

CAMBRO-ORDOVICIAN

- COad — **Admiralty Group** Turner Cliffs-Ship Point Formation: microcrystalline to very finely crystalline dolomite commonly silty or sandy; very fine-to coarse-grained quartzose and dolomitic and calcareous sandstone.
- COga — **Admiralty Group** Gallery Formation: arkose to orthoquartzite, conglomerate beds and lenses, minor dolomitic sandstone, ferruginous zones, hematite iron ore clasts abundant locally.

NEOHELIKIAN

- NBsc — **Bylot SuperGroup** Society Cliff Formation: dolomite; microcrystalline to very finely recrystalized; minor limestone, dark shale, pink arkosic sandstone.
- Nbab — **Bylot SuperGroup** Arctic Bay Formation: Upper Member: shale, mudstone, very finely crystalline dolomite. Lower Member: shale siltstone; minor mudstone, sandstone; slump structures, crossbedding, mudcrack, ripple marks.
- Nbas — **Bylot SuperGroup** Adams Sound Formation: Orthoquartzite, quartzose sandstone, white to dark grey, buff, brown, pink. Shale, siltstone, granule to cobble conglometate locally at base; dessication cracks, ripple marks and cross bedding common.

APHEBIAN

- APgr — Massive granite-grandodiorite, chiefly pink qwuartz monzonite; fine-to coarse-grained and pegmatitic; abundant aplite and pegmatitic dykes, syenitic dykes.
- APck — Charnockite to monzocharnockite; massive and finely foliated to medium banded; medium- to coarse-grained.
- APgp — Porphyritic quartz monzonite-granodiorite; minor granite, syenite-syenodiorite; locally granulated.
- Apgp — Porphyroblastic migmatite; commonly of granodioritic composition.
- APmg — Chiefly banded migmatite; white to light grey granitoid bands alternate with grey to black mafic bands; derived in part from Mary River Group.
- PPbl — **Piling Group** Chiefly quartz-mica-feldspar paragneiss (metagreywacke, metasiltstone) and garnetiferous gneiss; minor alumino-silicate-bearing schists, lit-par-lit gneiss, amphibolite and mafic pyroxene gneiss.

ARCHEAN AND/OR APHEBIAN

- AMu — **Mary River Group** Ms-metasediments; chiefly mica-quartz-feldspar schists and gneisses; Ma-acid metavolcanics; chiefly of quartz latite composition; Mn-meta-anorthosite, metagabbroic anorthosite; Mb-Basic metavolcanic rocks.
- AMam — **Mary River Group** Metagabbro: chiefly amphibolite, fine-to medium-grained.
- AMum — **Mary River Group** Ultrabasic rocks; peridotite, serpentinite, actinolite rock.
- AMif — **Mary River Group** Metamorphosed iron-formation; mainly oxide facies, abundant silicate facies; iron-ore (magnetite-hematite rock).
- AMqz — **Mary River Group** Upper member: quartzite; fne-to coarse-grained; Lower Member: mic-quartz-feldspar schist and paragneiss; rodded quartz paragneiss.
- Agr — Foliated quartz monzonite-granodiorite, local granite.
- Aam — Metagabbro: amphibolite pods, dykes, sills, fine-to medium-grained.
- APmu — Undifferentiated gneisses, mixed rocks; chiefly undivided Pmg, Pmp, Agr, Amn.

ARCHEAN

- Amn — Fluidal nebulitic granodiorite migmatite; minor quartz monzonite-graodiorite; lenses and boundined bands of amphibolite; metasedimentary and granitoid rocks are common.

LEGEND:

- PROPOSED NORTH RAILWAY
- MILNE INLET TOTE ROAD
- POTENTIAL DEVELOPMENT AREA
- QUARRY AREA

GEOCHEMICAL TESTING BY:

- AMEC (2010)
- KNIGHT PIESOLD LTD. (2007)
- HATCH (2017)
- HATCH (2019)

GEOLOGY TYPE

- CARBONATE
- NON-CARBONATE ROCK
- CALCITE-RICH ROCK
- DIABASE
- DOLOMITE-RICH ROCK
- GRANITIC GNEISS
- LIMESTONE
- OVERBURDEN
- SCHIST WITH PEGMATITE VEINING

NOTES:

1. COORDINATE GRID IS IN KILOMETRES.
   COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N.
2. REGIONAL BEDROCK GEOLOGY FROM SCOTT AND KEMP, 1998.
3. HATCH AND AMEC SAMPLE LOCATIONS BASED ON TOTE ROAD CHAINAGES.
4. BODIES OF WATER ARE SHOWN IN WHITE.
5. FIGURE CREATED BY KNIGHT PIESOLD LTD.

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

REGIONAL BEDROCK GEOLOGY AND GEOCHEMICAL SAMPLE LOCATIONS ALONG NORTH RAILWAY

Knight Piésold CONSULTING

P/A NO.	REF NO.	
NB102-181/53	NB19-00237	
FIGURE 1		REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
0	22MAR19	ISSUED WITH MEMO	RAC	AS	SRA

SAVED: I:\1\02\00181\53\A\GIS\Figs\B08 R0.mxd; Mar 22, 2019 3:55 PM; asimpson