5 September 2018

Assol Kubeisinova
Technical Advisor
Nunavut Water Board
P.O. Box 119
Gjoa Haven, NU, X0B 1J0

RE: Modification No. 10 - Upgrades at the Mary River Mine Site
Mary River Project, Water Licence 2AM-MRY1325 - Amendment No. 1

1 – INTRODUCTION

Baffinland Iron Mines Corporation (Baffinland) is pleased to submit this modification for upgrades at the Mary River Project (the Project) Mine Site, in accordance with Part G of Type 'A' Water Licence 2AM-MRY1325 - Amendment No. 1 (Type 'A' Water Licence). As part of this modification, consistent with guidance from the Nunavut Impact Review Board (NIRB), Baffinland has completed a self-assessment to demonstrate that the change proposed does not constitute a significant modification to the Project as originally approved under Project Certificate No. 005 (as Amended) and that the potential ecosystemic and socio-economic effects associated with the modification are not significant. Consistent with Part G, Item 1 of the Type 'A' Water Licence, Baffinland will proceed with the modifications contained herein 60 days following submission of this modification. Should the Nunavut Water Board (NWB) respond in writing before the 60 days that approval is not granted for specific works, Baffinland will not proceed with the works until written approval is granted.

On January 10, 2018, Baffinland submitted Rev. 1 of its 2018 Work Plan to the NWB and the Qikiqtani Inuit Association (QIA) (Baffinland, 2018a). On June 28, 2018, Baffinland prepared the 2018 Work Plan Addendum (Baffinland, 2018b; Addendum); an Addendum to the 2018 Work Plan (Rev. 1). The Addendum was provided to update the scope of activities detailed in the 2018 Work Plan (Rev. 1) and outline additional activities and infrastructure planned for 2018, such that reclamation security could be assessed for these items. This modification is for 2018 Work Plan Addendum Items No. 2018-A3 and 2018-A4:

- **Mine Site Landfill Expansion** (**Item No. 2018 A-3)** – Expansion of the Mine Site Landfill beyond the initial cell, but within the approved ultimate landfill boundary detailed in the Final Environmental Impact Statement (FEIS; Baffinland, 2012) and provided in Baffinland's original Type 'A' Water Licence Application. The expansion involves leveling, grading and placing non-hazardous waste and cover material within the ultimate landfill boundary, located within the Mine Site Potential Development Area (PDA).
- **Effluent Discharge Line** (**Item No. 2018 A-4)** – Installation of an effluent discharge line from the sewage treatment plant servicing the 800-person camp to the existing effluent discharge line, to allow for direct discharge of treated sewage effluent to the approved discharge location near the Mary River. This activity involves laying sections of 3" insulated, HDPE pipe on the tundra and installing four (4) utilities culverts along its alignment, all within the Mine Site PDA.

The above items are shown on Figure 1 (Attachment 1). Additional details on the proposed Mine Site Landfill Expansion and effluent discharge line are discussed in the subsections below and detailed in Attachment 2 and Attachment 3, respectively.

2 – SELF-ASSESSMENT OF PROPOSED MODIFICATIONS

Baffinland has undertaken a self-assessment of the proposed modifications in accordance with the *Process for Seeking Approval for Modifications to Previously-Approved Projects* (NIRB 2018). This self-assessment consists of four main components:

- Comparison of the modification with the scope of the Approved Project
- An assessment of significance applying the factors set out in Section 90 of the Nunavut Project Planning and Assessment Act (NuPPAA)
- Identification of other new or modified permits, licences or approvals necessary to complete the proposed modification
- Determination as to whether or not reconsideration of the existing Project Certificate is appropriate, considering Nunavut Agreement Section 12.8.2 and NuPPAA Section 112.

2.1 COMPARISON OF MODIFICATIONS TO APPROVED PROJECT

Baffinland undertook a comparison of the proposed modifications with the scope of the Approved Project, as described in the Final Environmental Impact Statement (FEIS) and the FEIS Addendum (Baffinland 2012 and 2013) for the Early Revenue Phase (ERP) of the Project. In completing this review, Baffinland considered the following question:

Was the modification activity assessed previously, or does it represent a reasonably expected modification or optimization of that which was assessed in the FEIS or FEIS Addendum?

This modification has been assessed previously. The results of this review are presented in Table 1.

Table 1 Comparison of Proposed Modifications to the Scope of the Approved Project

Item No.	Activity/Infrastructure	Comparison to the Scope of the Approved Project	FEIS Reference
2018 A-3	Mine Site Landfill Expansion	The Approved Project included the ultimate landfill boundary as outlined in this modification.	FEIS Vol 3, Section 2.1.10
2018 A-4	Effluent discharge line from the 800-person camp sewage treatment plant to the final discharge point (approx. 2,200 m)	An optimization consistent with the scope of the Approved Project and its assessment by NIRB. The 800-person camp was approved in 2017 (NWB, 2017).	FEIS Vol 3, Section 3.4.6

2.2 SIGNIFICANCE ASSESSMENT

A screening level assessment of potential changes to the assessment of the Approved Project effects was completed for each of the valued ecosystem components (VECs) and valued socio-economic components (VSECs) identified in the FEIS. This assessment is presented in Table 2.

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Table 2 Comparison of Effects of the Modification to Approved Project

Theme	FEIS VEC	FEIS Key Indicator	Change in Effect and Significance	Description of Change in Potential Effects	Additional Mitigation Measures
Atmospheric Environment	Climate change	Greenhouse gases (GHGs)	Change; not significant	One-time minor increase in annual GHG emissions of the ERP that is immeasurable in the context of the Life-of-Mine (LOM) GHG estimate of the Approved Project.	No additional mitigation required
		Climate change	Change; not significant	Immeasurable minor increase.	No additional mitigation required
	Air quality	Particulate matter, SO_2, NO_X	Change; not significant	Site characteristics and effects pathways are unchanged. Short-term localized increases in particulate matter and gaseous emissions associated with additional earthworks, entirely mitigated once proposed modifications are complete.	No additional mitigation required; implement existing Air Quality and Noise Abatement Management Plan.
	Noise and vibration	Atmospheric noise levels, marine noise levels, vibration	Change; not significant	Short-term localized noise increase associated with additional earthworks, entirely mitigated once proposed modifications are complete.	No additional mitigation required; implement existing Air Quality and Noise Abatement Management Plan.
Terrestrial Environment	Landforms, soil and permafrost	Sensitive landforms	No change	There are no sensitive landforms identified within the existing PDA where the proposed modifications will be undertaken.	No additional mitigation required; implement existing Environmental Protection Plan (EPP).
	Vegetation	Plant abundance and diversity Plants important to Inuit Plant health	No change	Assessment of the Approved Project assumed complete loss of vegetation within the PDAs. Since the proposed modifications will occur within the existing Mine Site PDA, no change to vegetation will occur relative to the Approved Project.	No additional mitigation required; implement existing EPP.
	Terrestrial wildlife and habitat	Caribou	No change	Assessment of the Approved Project assumed complete loss of terrestrial habitat within the PDAs. Since proposed modifications will occur within the existing Mine Site PDA, no change to terrestrial wildlife habitat will occur relative to the Approved Project.	No additional mitigation required; implement existing Terrestrial Environment Mitigation and Monitoring Plan (TEMMP).
	Migratory birds and habitat	Peregrine Falcon, Snow Goose, Eider, Red-throated Loon, shorebirds, songbirds, species at risk	No change	Assessment of the Approved Project assumed complete loss of habitat within the PDAs. The footprint of the proposed modifications will be surveyed for bird nests prior to work if being undertaken during the nesting season, in accordance with the TEMMP and EPP.	No additional mitigation required; implement existing TEMMP and EPP.
Freshwater Aquatic Environment	Surface water, including freshwater quality and quantity	Water quantity Water and sediment quality	Change; not significant	Additional earthworks represent a minor potential increase in sedimentation effects to local watercourses. No major diversions are proposed that will result in material impacts to water quantity.	No additional mitigation required; water management measures will be installed consistent with Baffinland's Civil Design Criteria and with applicable management plans: Surface Water and Aquatic Ecosystems Management Plan, Fresh Water, Sewage and Wastewater Management Plan, and EPP.

Theme	FEIS VEC	FEIS Key Indicator	Change in Effect and Significance	Description of Change in Potential Effects	Additional Mitigation Measures
	Freshwater fish, fish habitat and other aquatic organisms	Arctic char	Change; not significant	None of the proposed modifications are situated within or immediately upstream of fish habitat. The potential for changes to water quality affecting fish could result from potential sedimentation during earthworks.	No additional mitigation required; implement existing Surface Water and Aquatic Ecosystems Management Plan, Fresh Water, Sewage and Wastewater Management Plan, and EPP.
Marine Environment	Sea ice	Area of shore fast ice in Steensby Inlet	No change	Not applicable to the proposed modifications.	No additional mitigation required.
	Water and sediment quality	Water and sediment quality parameters with established guidelines	No change	Not applicable to the proposed modifications.	No additional mitigation required; implement existing Surface Water and Aquatic Ecosystems Management Plan, Fresh Water, Sewage and Wastewater Management Plan, and EPP.
Human Environment	Land and resources use	Wildlife harvesting by Inuit Travel and camps	No change	The scale of the proposed modifications are minor and entirely confined to the existing Mine Site PDA and Commercial Lease boundaries. Changes to how Baffinland manages visitors and hunters will not be necessary.	No additional mitigation required.
	Cultural resources	Archaeological sites	No change	Effects to archaeology are not expected, as proposed modifications are located in an area previously surveyed (and mitigated, if necessary).	No additional mitigation required; implement existing Cultural Heritage Protection Plan and EPP.
	Other Valued Socio-economic Components (VSECs): - Population demographics - Education and training - Human health and wellbeing - Community infrastructure and public services - Governance and leadership - Livelihood and employment - Economic development and self-reliance - Contracting and business opportunities - Benefits, taxes and royalties		No change	Any additional employment and contracting will be undertaken in accordance with the provisions of the Inuit Impact and Benefit Agreement (IIBA) with the Qikiqtani Inuit Association (QIA).	No additional mitigation required.

The modification as a whole was evaluated against the significance criteria presented in Section 90 of the *Nunavut Project Planning and Assessment Act* (*NuPPAA*):

(a) The size of the geographic area, including the size of wildlife habitats, likely to be affected by the impacts

(b) The ecosystemic sensitivity of that area

(c) The historical, cultural and archaeological significance of that area

(d) The size of the human and animal populations likely to be affected by the impacts

(e) The nature, magnitude and complexity of the impacts

(f) The probability of the impacts occurring

(g) The frequency and duration of the impacts

(h) The reversibility or irreversibility of the impacts

An assessment of the proposed modifications in relation to Section 90 of the *NuPPAA* is presented in Table 3.

Table 3 Significant Modification Self-Assessment Using *NuPPAA* S.90 Significance Criteria

NuPPAA Section 90 Significance Criteria	Evaluation of Modification
(a) the size of the geographic area, including the size of wildlife habitats, likely to be affected by the impacts	Proposed modifications are located within the existing Project boundaries; the geographic extent of the Project remains unchanged.
(b) the ecosystemic sensitivity of that area	Proposed modifications are confined to the existing Project boundaries; no new environmental sensitivities have been identified.
(c) the historical, cultural and archaeological significance of that area	Proposed modifications are confined to the existing Project boundaries; no new features of historical, cultural or archaeological significance will be affected.
(d) the size of the human and the animal populations likely to be affected by the impacts	No change.
(e) the nature, magnitude and complexity of the impacts	Proposed modifications have effects that are consistent with the Approved Project.
(f) the probability of the impacts occurring	Proposed modifications have effects that are consistent with the Approved Project.
(g) the frequency and duration of the impacts	Proposed modifications have effects that are similar in frequency and duration to effects assessed for the Approved Project.
(h) the reversibility or irreversibility of the impacts	The proposed modifications have effects that range from fully reversible to irreversible, consistent with the Approved Project.
(i) the cumulative impacts that could result from the impacts of the project combined with those of any other project that has been carried out, is being carried out or is likely to be carried out	Marginal potential increases in the effects to air quality, noise, water quality and consequently fish and fish habitat are confined to the local study areas, and do not overlap with other past, present or reasonably foreseeable activities that would constitute new cumulative effects.
(j) any other factor that the Board considers relevant to the assessment of the significance of impacts	This criterion is not applicable to a proponent self-assessment.

The activities are confined within the boundaries of Baffinland's Commercial Lease and therefore do not represent a change to the previously assessed geographic extent of the Project. These activities will not be located in an area of particular ecosystem sensitivity and the areas of disturbance do not impact areas of historical, cultural or archeological significance. Human and wildlife are not likely to be adversely affected. The activities will not significantly change air emissions, impede water flow, impact aquatic life, hinder wildlife access or increase noise levels, and the activities will not directly interact with fish or fish habitat. Most of the effects are reversible as

reclamation will be carried out once the activity is complete. Additional cumulative effects are not expected given that there are no new residual effects predicted from the proposed modifications.

2.3 OTHER REQUIRED APPROVALS

In addition to requiring NWB approval as a modification under the Type 'A' Water Licence, the proposed modifications require approval from the QIA as land owner, as part of the Annual Work Plan approval process. Additionally, adequate reclamation security is required for the proposed modifications. On July 20, 2018 Baffinland and the QIA submitted a joint letter to the NWB (Baffinland, 2018c) outlining the marginal increase in reclamation security required for the activities proposed in the 2018 Work Plan Addendum (Baffinland, 2018b), including the proposed modifications included herein. Shortly after the submission of the joint letter to the NWB (Baffinland, 2018c), the required marginal increase in reclamation security was posted by Baffinland and is currently held by the QIA.

2.4 RECONSIDERATION OF THE PROJECT CERTIFICATE

Baffinland reviewed Section 12.8.2 of the Nunavut Agreement and Section 112 of the *NuPPAA* and has determined that reconsideration of the existing Project Certificate is not appropriate.

Section 112 of *NuPPAA* states the following:

> ***112 (1)*** *The Board may, on its own initiative or at the request of the Designated Inuit Organization, the proponent or any interested person, reconsider the terms and conditions set out in a project certificate that it has issued if*
>
> *(a) the terms and conditions are not achieving their intended purpose or are having effects that are significantly different from those anticipated at the time the certificate was issued;*
>
> *(b) the circumstances relating to the project are significantly different from those anticipated at the time the certificate was issued; or*
>
> *(c) technological developments or new information provides a more efficient method of achieving the intended purpose of the terms and conditions.*

Section 12.8.2 of the *Nunavut Agreement* presents nearly identical wording as *NuPPAA* Section 112.

The proposed modifications are consistent with the scope of the Approved Project, and hence Baffinland has concluded that the terms and conditions of the Project Certificate are achieving their purpose (Clause a); and that the circumstances related to the Project and its effects remain unchanged from the Approved Project (Clause b). No technological developments or new information have been identified in relation to Clause c. The proposed modifications do not warrant changes to existing conditions or new conditions within the Project Certificate. As such, reconsideration of the Project Certificate is not appropriate.

The proposed modifications are described in Section 3, in accordance with Part G, Item 3 of the Type 'A' Water Licence.

2.5 SELF-ASSESSMENT CONCLUSION

Based on the self-assessment provided in Sections 2.1 through Section 2.4, Baffinland has concluded that:

- The proposed modifications are all activities that were previously assessed by Baffinland.

- The effects of the proposed modifications are not significant.
- No other permits, licences or approvals (or modifications of existing approvals) are required, beyond this modification, and approval from QIA with respect to the reclamation security requirements.
- Reconsideration of the terms and conditions in Project Certificate No. 005 is not required.

3 – MODIFICATION

In accordance with Part G of Baffinland's Type 'A' Water Licence, the Licensee may carry out modifications after written notification has been provided to the NWB, provided such modifications do not place the Licensee in contravention of the Licence or the *Nunavut Waters and Nunavut Surface Rights Tribunal Act*, and such modifications are consistent with the NIRB Project Certificate.

In Section 2, Baffinland confirmed that the proposed modifications are consistent with the scope of the Approved Project, and that a reconsideration of the Project Certificate is not appropriate.

Baffinland has also reviewed the proposed modifications to determine if they potentially contravene the Type 'A' Water Licence.

The Mine Site Landfill Facility is currently identified in the Type 'A' Water Licence issued by the NWB. Moreover, the use of effluent discharge lines to transport and discharge compliant effluent at the Project is an approved activity under the Type 'A' Water Licence. Therefore, these modifications do not contravene the Type 'A' Water Licence. Baffinland will proceed with these works 60 days following submission of this modification. Should the NWB respond in writing before the 60 days that approval is not granted for specific works, Baffinland will not proceed with the works until written approval is granted. Baffinland will provide as-built documentation in accordance with the Type 'A' Water Licence and the Commercial Lease, to be submitted 90 days following completion of construction.

3.1 MINE SITE LANDFILL EXPANSION

3.1.1 Description of Facilities and/or Works to be Constructed

The current landfill cell (Cell 1) at the Mine Site (Figure 1.1; Attachment 2) contains an estimated 37,000 cubic metres (m^3) of waste (as of June 2018) and has nearly reached its capacity since construction in 2013. Baffinland requested Knight Piésold (KP) to outline a staged design of the landfill to accommodate future needs of the Project, utilizing the entire ultimate landfill boundary. The approved landfill area was divided into five (5) cells for progressive waste placement. Waste placement is currently occurring in Cell 1 and will continue until this cell has reached capacity. Subsequent landfilling will progress to Cells 2, 3, 4 and 5. Alternatively, Cell 5 may be used for landfarming activities, if required.

Berms will be constructed and maintained to define the landfill limits, to help contain the waste and assist with surface water diversion. Berm construction will be completed on an as required basis, as the landfill cells are developed. If settlement of the perimeter berms occurs, additional fill will be placed to reconstruct the berm to the design section. Berms located between cells may be re-purposed as landfilling progresses, if possible.

Due to the presence of permafrost and rock, the area method will be used to place waste in the landfill. Waste will be deposited on the prepared ground surface, worked with appropriate heavy equipment, and packed against a constructed berm. Once the first stage is complete and covered, a second stage will be formed on top of the first.

Sand and gravel will be used as the operational cover material for the landfill site. The operational cover will be about 0.3 metre (m) thick over the compacted waste. This cover will be placed during the spring or fall or when the waste deposited is 3 m wide. In order to achieve permafrost encapsulation for the final landfill, the final cover has been designed to be thicker than the anticipated active layer. Based on an active layer of approximately 1 m, the final cover will be 1.5 m thick. Further details are provided in the design memo (Attachment 2).

3.1.2 Proposed Location of the Structure

The proposed work will occur within the existing PDA at the Mine Site, as shown on Figure 1 (Attachment 1), within the ultimate landfill boundary detailed in the Final Environmental Impact Statement (FEIS; Baffinland, 2012) and provided in Baffinland's original Type 'A' Water Licence Application.

3.1.3 Identification of any Potential Impacts to the Receiving Environment

The Mine Site Landfill is consistent with the Approved Project and the potential impacts of the activity have been assessed in the FEIS (Table 1). Sedimentation and erosion mitigation measures, as required, shall be in place before commencing construction.

3.1.4 Monitoring

Periodic environmental inspections will be conducted by Baffinland's Environmental personnel in conjunction with the Contractor's Health, Safety and Environment Lead. Inspections will ensure that Contractors are complying with the conditions of the Type 'A' Water Licence (in particular Part D, Conditions Applying to Construction and Operation) and Baffinland's management plans and procedures. Inspections will be documented by taking photos and using Baffinland's environmental inspection forms. This includes inspections and photos before and after the work, and during the course of the work to document any deficiencies. Documented deficiencies will be forwarded to the responsible Contractor for corrective action.

Baffinland will prepare a Construction Summary Report for the ground preparation and berm construction associated with the construction of Cell 2, in accordance with Part D, Item 17 of the Type 'A' Water Licence. The Construction Summary Report will include the information specified in Schedule D of the Type 'A' Water Licence.

During operation, monitoring downstream surface water drainage at monitoring stations MS-MRY-13A and MS-MRY-13B will be carried out in accordance with the Type 'A' Water Licence. No change in the monitoring parameters or locations are warranted at this time; however, as the landfill is expanded over the life of the Project, additional monitoring stations may be warranted. Existing management plans for the Project are sufficient to address the ongoing monitoring and management of the landfill expansion. New monitoring stations will be added where warranted to relevant management/monitoring plans (i.e., the Fresh Water Supply, Sewage and Wastewater Management Plan, and the Surface Water and Aquatic Ecosystems Management Plan).

3.1.5 Schedule for Construction

Construction of Cell No. 2 is expected to begin 60 days following submission of this modification in accordance with Part G, Item 1 of the Type 'A' Water Licence, or upon written approval from the NWB in accordance with Part G, Item 2. Ground preparation (i.e. grading) and berm construction for Cell 2 is anticipated to take approximately ten (10) days. Following the construction of Cell No. 2, expansion of the Mine Site Landfill and the development of the additional cells (Cells 3 to 5) will proceed on an as-needed basis, as described in the Mine Site Landfill Expansion Design Brief, provided as Attachment 2.

3.1.6 Drawings of Engineered Structures

The following engineering documents, provided in Attachment 2, provide details on the design of the proposed Mine Site Landfill Expansion:

- Landfill Expansion – Site Plan - Drawing 100, Rev 0 (KP, 2018)
- Landfill Expansion – Cell 2 – Plans and Sections - Drawing 110, Rev 0 (KP, 2018)
- Landfill Expansion – Closure Plans - Drawing 200, Rev 0 (KP, 2018)

3.1.7 Proposed Sediment and Erosion Control Measures

Baffinland will employ a combination of sediment and erosion control measures (check dams, rip-rap, silt fences, etc.), as outlined in the Project's EPP and Surface Water and Aquatic Ecosystems Management Plan to address and manage sedimentation concerns during construction. Existing management plans for the Project are sufficient to address the ongoing monitoring and management of the proposed Mine Site Landfill Expansion.

3.2 EFFLUENT DISCHARGE LINE FROM THE 800 PERSON CAMP SEWAGE TREATMENT PLANT

3.2.1 Description of Facilities and/or Works to be Constructed

The 800-person camp was approved on September 20, 2017 by the NWB (Motion 2017-10-03; NWB, 2017) as Modification Request No. 4 under the Type 'A' Water Licence. Treated sewage effluent from the camp's dedicated sewage treatment plant is currently transported by truck to the approved discharge location near Mary River. This modification proposes to construct an effluent discharge line from the camp's sewage treatment plant to the existing effluent discharge line, to allow for direct discharge of treated sewage effluent from the 800-person camp (refer to Attachment 3).

The modification involves laying approximately 1,660 m of new 3" (75 mm) insulated and heat traced HDPE pipe on the tundra and installing four (4) utilities culverts where the discharge line crosses existing site service roads.

Details on the new effluent discharge line and associated infrastructure are provided as notes in the design drawing, provided as Attachment 3.

3.2.2 Proposed Location of the Structure

The proposed work will occur within the existing PDA at the Mine Site, as shown in Attachments 1 and 3.

3.2.3 Identification of any Potential Impacts to the Receiving Environment

The effluent discharge line is consistent with the Approved Project and the potential impacts of the activity have been assessed in the FEIS (Table 1). Sedimentation and erosion mitigation measures, as required, shall be in place before commencing construction.

3.2.4 Monitoring

Periodic environmental inspections will be conducted by Baffinland's Environmental personnel in conjunction with the Contractor's Health, Safety and Environment Lead. Inspections will ensure that Contractors are complying with the conditions of the Type 'A' Water Licence (in particular Part D, Conditions Applying to Construction and Operation) and Baffinland's management plans and procedures. Inspections will be documented by taking photos and using

Baffinland's environmental inspection forms. This includes inspections and photos before and after the work, and during the course of the work to document any deficiencies. Documented deficiencies will be forwarded to the responsible Contractor for corrective action.

Baffinland will prepare a Construction Summary Report for the proposed modifications described herein, in accordance with Part D, Item 17 of the Type 'A' Water Licence. The Construction Summary Report will include the information specified in Schedule D of the Type 'A' Water Licence.

For operations, the Fresh Water Supply, Sewage and Wastewater Management Plan will be updated to include the new effluent discharge line, however as there is no change in the discharge location, there are no expected changes to the monitoring program. Existing management plans for the Project are sufficient to address the ongoing monitoring and management of effluent discharged.

3.2.5 Schedule for Construction

Construction is expected to begin 60 days following submission of this modification in accordance with Part G, Item 1 of the Type 'A' Water Licence, or upon written approval from the NWB in accordance with Part G, Item 2. The work is expected to be completed before the end of 2018, and would proceed approximately as follows:

- Initiation of construction (60 days from submission)
- Install sedimentation and erosion controls (1 day)
- Install 4 utilities culverts (2 days)
- Lay effluent discharge line along proposed alignment, tie new discharge line into sewage treatment plant and existing effluent discharge line (7 days)

Note that the above schedule is provided for reference only, and is subject to change based on weather conditions, material and contractor availability, equipment availability, and unforeseen circumstances.

3.2.6 Drawings of Engineered Structures

The following engineering drawing, provided as Attachment 3, provides additional details on the design of the proposed effluent discharge line:

- Mine Site Mine Effluent and Raw Water Pipeline Overall Layout
  H353004-10000-240-272-0001-0001, Rev 2 (Hatch, 2018)

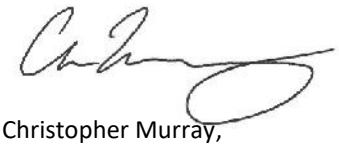
3.2.7 Proposed Sediment and Erosion Control Measures

Baffinland will employ a combination of sediment and erosion control measures (check dams, rip-rap, silt fences, etc.), as outlined in the Project's EPP and Surface Water and Aquatic Ecosystems Management Plan to address and manage sedimentation concerns during construction.

4 – CLOSURE

We trust that this information meets the requirements under Part G of Baffinland's Type 'A' Water Licence and look forward to the NWB's response. Please do not hesitate to contact the undersigned should you have any questions or comments.

Regards,



Christopher Murray,
Environmental & Regulatory Compliance Manager

Cc:
Karén Kharatyan (Nunavut Water Board)
Fai Ndofor, Sean Joseph (Qikiqtani Inuit Association)
Bridget Campbell, Sarah Forté, Ian Parsons (Crown-Indigenous Relations and Northern Affairs Canada)
Solomon Amuno (Nunavut Impact Review Board)
Grant Goddard, Megan-Lord Hoyle, Timothy Ray Sewell, Andrew Vermeer (Baffinland)

ATTACHMENTS

1 Figure 1 - 2018 Mine Site Upgrades
2 Mary River Project - Mine Site Landfill Expansion Design Brief and IFC Drawings (KP, 2018)
3 Mine Site Mine Effluent and Raw Water Pipeline Overall Layout
H353004-10000-240-272-0001-0001, Rev 2 (Hatch, 2018)

REFERENCES:

Baffinland Iron Mines Corporation (Baffinland). 2012. *Mary River Project - Final Environmental Impact Statement*. February 2012.

Baffinland Iron Mines Corporation (Baffinland). 2013. *Mary River Project - Addendum to the Final Environmental Impact Statement for the Early Revenue Phase*. June 2013.

Baffinland Iron Mines Corporation (Baffinland). 2017. *Modification Request – Mine Site Accommodations Camp Upgrade, Water Licence 2AM-MRY1325 – Amend. No. 1.* Letter dated July 26, 2017.

Baffinland Iron Mines Corporation (Baffinland). 2018a. *2018 Work Plan*. Rev. 1. January 10, 2018.

Baffinland Iron Mines Corporation (Baffinland). 2018b. *2018 Work Plan Addendum*. June 28, 2018.

Baffinland Iron Mines Corporation (Baffinland). 2018c. *Baffinland-QIA Joint Submission to the Nunavut Water Board*. Letter dated July 20, 2018.

Nunavut Impact Review Board (NIRB). 2018. *Process for Seeking Approval for Modifications to Previously-Approved Projects*. Memorandum dated February 14, 2018 issued to the Nunavut Wide Distribution List.

Nunavut Water Board (NWB). 2017. Type 'A' Water Licence No. 2AM-MRY1325 – *Amendment No. 1; Approval of Modification No. 4 Application from Baffinland Iron Mines Corporation for Proposed Upgrade to Accommodations Camp at Mary River Project' Mine Site*. Letter from NWB to Baffinland dated September 20, 2017.

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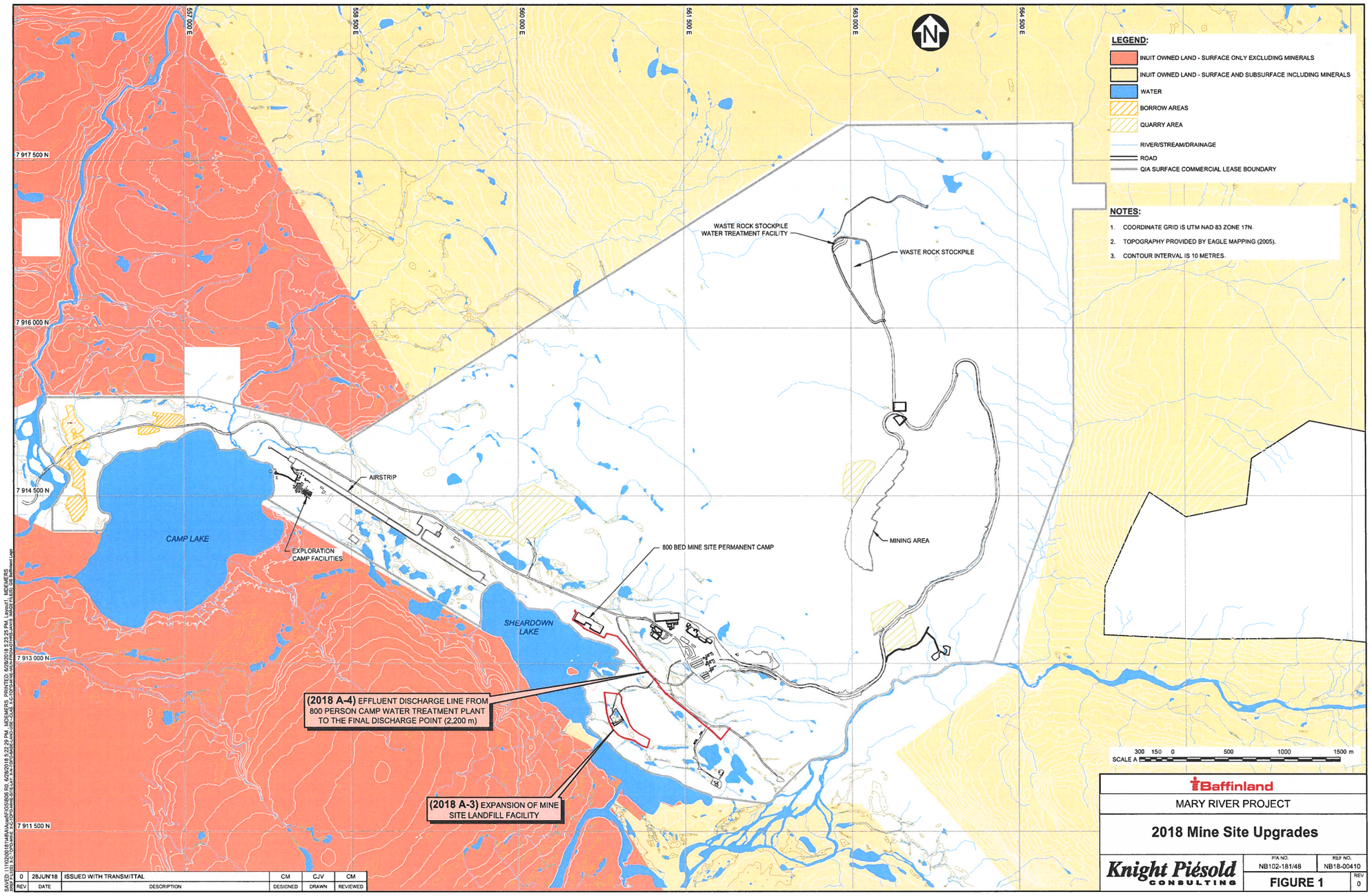
Attachment 1

Figure 1 - 2018 Mine Site Upgrades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LEGEND:
INUIT OWNED LAND - SURFACE ONLY EXCLUDING MINERALS
INUIT OWNED LAND - SURFACE AND SUBSURFACE INCLUDING MINERALS
WATER
BORROW AREAS
QUARRY AREA
RIVER/STREAM/DRAINAGE
ROAD
QIA SURFACE COMMERCIAL LEASE BOUNDARY
NOTES:
1. COORDINATE GRID IS UTM NAD 83 ZONE 17N.
2. TOPOGRAPHY PROVIDED BY EAGLE MAPPING (2005).
3. CONTOUR INTERVAL IS 10 METRES.
WASTE ROCK STOCKPILE
WATER TREATMENT FACILITY
WASTE ROCK STOCKPILE
AIRSTRIP
CAMP LAKE
EXPLORATION
CAMP FACILITIES
800 BED MINE SITE PERMANENT CAMP
MINING AREA
SHEARDOWN
LAKE
(2018 A-4) EFFLUENT DISCHARGE LINE FROM 800 PERSON CAMP WATER TREATMENT PLANT TO THE FINAL DISCHARGE POINT (2,200 m)
(2018 A-3) EXPANSION OF MINE SITE LANDFILL FACILITY
300 150 0 500 1000 1500 m
SCALE A
Baffinland
MARY RIVER PROJECT
2018 Mine Site Upgrades
Knight Piésold CONSULTING
P/A NO. NB102-181/48
REF NO. NB18-00410
FIGURE 1
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0 | 28JUN'18 | ISSUED WITH TRANSMITTAL | CM | CJV | CM
REV | DATE | DESCRIPTION | DESIGNED | DRAWN | REVIEWED

Baffinland

Attachment 2

Mary River Project - Mine Site Landfill Expansion Design Brief and IFC Drawings

(KP, 2018)

August 31, 2018

Mr. Jeff Bush
Project Specialist / Camp Manager
Baffinland Iron Mines Corporation
#300 - 2275 Upper Middle Road East
Oakville, Ontario
Canada, L6H 0C3

Knight Piésold Ltd.
1650 Main Street West
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Re: Mary River Project – Final Mine Site Landfill Expansion Design Brief and IFC Drawings

1.0 INTRODUCTION

Knight Piésold Ltd. (KP) is pleased to provide Baffinland Iron Mines Corporation (Baffinland) with this design brief and accompanying Issued for Construction (IFC) drawings to expand its landfill at the Mary River Project.

The current landfill cell (Cell 1) at the Mine Site (Figure 1.1) contains an estimated 37,000 m^3 of waste (as of June 2018) and has nearly reached its capacity since constructed in 2013.

Baffinland requested KP to outline a staged design of the landfill to accommodate future needs of the Project, utilizing the entire ultimate landfill boundary.

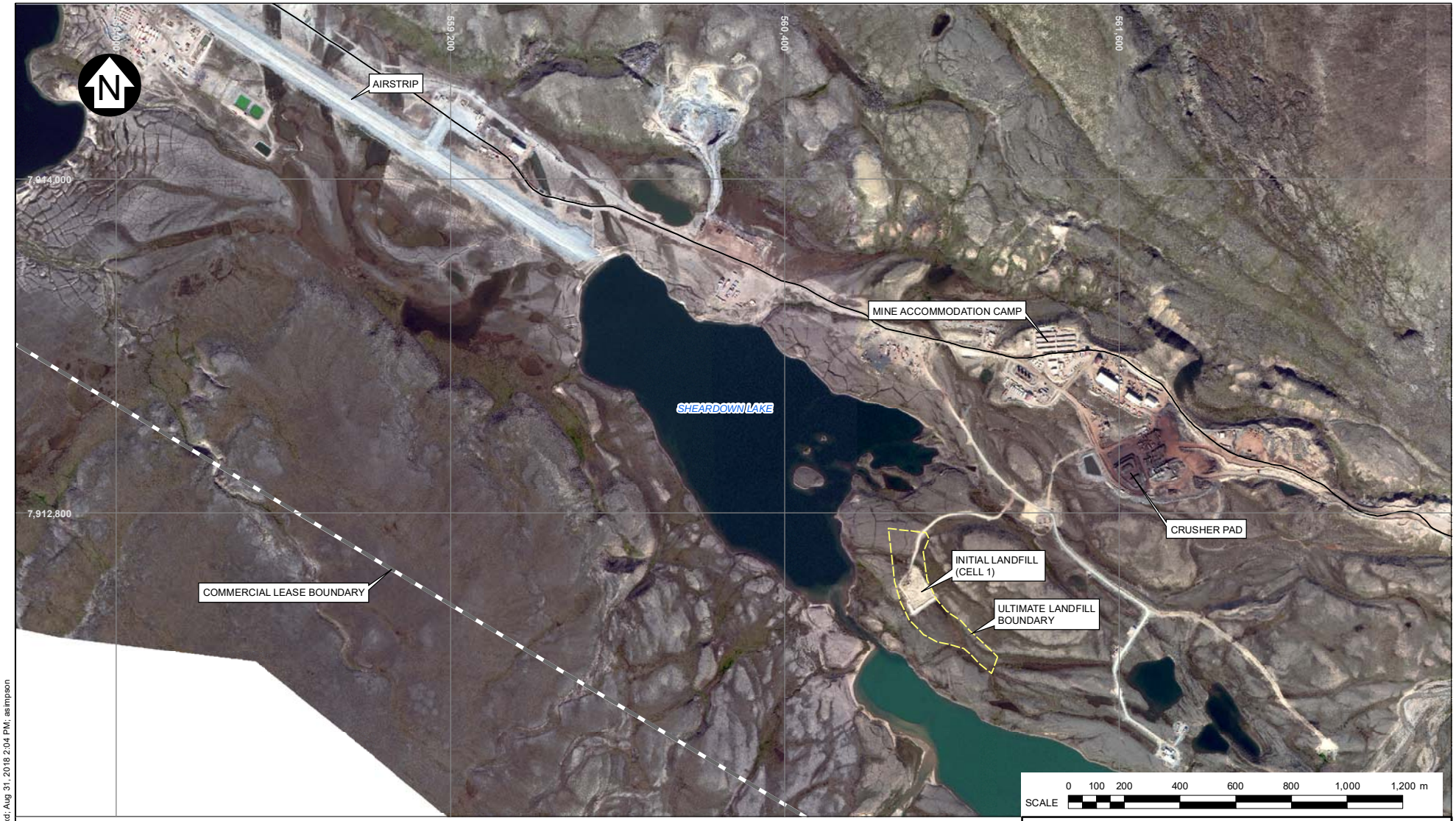
2.0 BACKGROUND

The current landfill was designed by KP (2008) and was initially permitted but not constructed under Type B Water Licence No. 2BB-MRY0710 (Nunavut Water Board, 2007) in support of Baffinland's 2008 bulk sample program. The Final Environmental Impact Statement (FEIS; Baffinland, 2012) presented the same initial landfill along with an ultimate landfill boundary. Baffinland's application for a Type A Water Licence provided design drawings showing the current initial landfill and the ultimate landfill boundary (Hatch Ltd., 2011). The initial landfill (Cell 1) and the ultimate landfill boundary are shown on Figure 1.1.

3.0 LANDFILL EXPANSION DESIGN

Details of the Mary River Landfill expansion design including the design criteria, expansion sequencing, berm design, fill and cover placement and the estimated landfill capacity are provided in the following sections. Issued for Construction Drawings are included with this letter. The design is consistent with the original design (KP, 2008) and guidance established by the Government of the Northwest Territories, prepared by Ferguson Simek Clark (FSC, 2003).

File No.: NB102-00181/47-A .01
Cont. No.: NB18-00580



LEGEND:

- MILNE INLET TOTE ROAD
- COMMERCIAL LEASE BOUNDARY
- ULTIMATE LANDFILL BOUNDARY

NOTES:

1. IMAGERY BASED ON INFORMATION PROVIDED BY BAFFINLAND IRON MINES CORPORATION, DATED AUGUST 2016.

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
0	31AUG'18	ISSUED WITH LETTER	RWT	AS	SRA

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

MINE SITE LANDFILL LOCATION

Knight Piésold CONSULTING

P/A NO. NB102-181/47

REF NO. NB18-00580

FIGURE 1.1

REV 0

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3.1 DESIGN CRITERIA

The following design criteria were used as a basis for the Landfill Expansion:

- The landfill will be used to store non-hazardous wastes
- The landfill will continue to be operated according to the Mary River Landfill Design Report (KP, 2008)
- The subgrade will be filled and graded (~0.5%) as required to provide a gently sloping surface
- The berm materials will be sourced from local borrow sources and are to be random fill comprised of well graded sand, gravel and cobbles
- The "area method for waste disposal with a second layer" will be used for landfill placement (FSC, 2003)
- Each Landfill cell will include two stages of fill placement in order to maximize the overall landfill capacity
- Sand and gravel will be used as operational cover material during landfilling operations (FSC, 2003)
  The closure cover will consist of a 1.5 m thick cover over the surface of the landfill. The cover will be compacted and contoured to shed precipitation from the surface. It is anticipated that this cover will comprise a well graded sand and gravel material.

3.2 LANDFILL EXPANSION SEQUENCING

The approved landfill area was divided into five (5) cells for progressive waste placement. Waste placement is currently occurring in Cell 1 and will continue until this cell has reached capacity. Subsequent landfilling will progress to Cells 2, 3, 4 and 5. Alternatively, Cell 5 may be used for landfarming activities, if required. Access roads will be created and removed as required. Drawing 100 shows the planned landfill expansion sequencing.

3.3 LANDFILL BERM DESIGN

Due to the granular nature of the existing foundation soils and the presence of permafrost, it was determined that the slope stability of the perimeter berms and bearing capacity of the foundation soils would be adequate for the landfill (KP, 2008). It is expected that differential settlement of the foundation soils would not be an issue (KP, 2008). The landfill berms are assessed biannually and stability issues are addressed based on recommendations provided in Baffinlands Biannual Geotechnical Inspection Reports. These reports are a requirement of Baffinlands Type A Water Licence 2AM-MRY1325 Amendment No. 1.

Berms will be constructed and maintained to define the landfill limits, to help contain the waste and assist with surface water diversion (KP, 2008). Berm construction will be completed on an as required basis, as the landfill cells are developed. If settlement of the perimeter berms occurs, additional fill will be placed to reconstruct the berm to the design section (KP, 2008). Berms located between cells may be re-purposed as landfilling progresses, if possible.

Berms will be constructed with random fill, consisting of a well graded mixture of sand, gravel and cobbles. The berms will be constructed in 0.5 m lifts and compacted by track walking with a medium sized bulldozer. A minimum of six passes will be completed of the entire surface of the lift. Berms will be constructed with an upstream slope of 3H: 1V and a downstream slope of 2H: 1V (FSC, 2003). The berms will be constructed to a height of 2.0 m with a crest width of 2.0 m. The typical landfill berm design is shown on Drawing 110.

The perimeter berms constructed for waste placement will direct surface water around the landfill site. The landfill expansion sequencing was planned to best mitigate surface water flowing through landfill area.

Estimated construction volumes for Cells 2 through 5 (for both Stages 1 and 2) are provided on Table 3.1.

Table 3.1 Estimated Berm Construction Volumes

Cell	Stage 1 (m^3)	Stage 2 (m^3)	Total (m^3)
2	3,800	3,800	7,600
3	4,400	4,400	8,800
4	6,800	6,800	13,600
5	5,100	5,100	10,200
Total			**40,200**

NOTES:

1. BERM QUANTITIES WERE ESTIMATED USING NEAT LINE CALCULATIONS AND SHRINK AND SWELL FACTORS WERE NOT CONSIDERED.

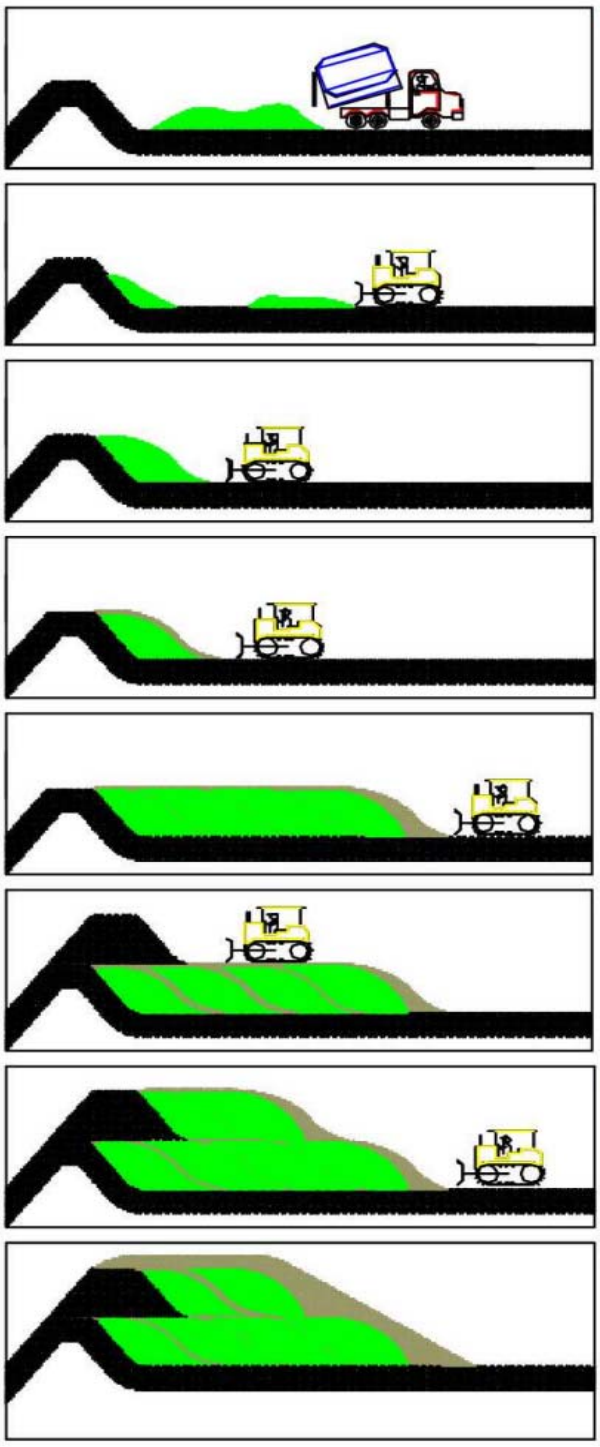
3.4 FILL PLACEMENT AND COVER

Due to the presence of permafrost and rock, the area method will be used to place waste in the landfill (FSC, 2003). Waste will be deposited on the prepared ground surface, worked with appropriate heavy equipment (FSC, 2003), and packed against a constructed berm. Once the first stage is complete and covered, a second stage will be formed on top of the first. The sequence of actions for the area method for waste disposal with a second layer is shown on Figure 3.1.

Compaction of the waste will be undertaken if required, depending on the nature of the waste. This will typically occur once per week or in combination with collection frequency, depending on the nature of the waste. Generally, the waste will be worked and compacted as it is dumped (FSC, 2003). The Guidelines state that a density of 0.099 t/m^3 is acceptable for un-compacted waste (FSC, 2003). This density will likely be exceeded in the landfill due to the dense nature of material being deposited (i.e. scrap metal, plastic). The proposed compaction rate of 3:1 in the Guidelines (FSC, 2003) is not expected to be feasible due to the anticipated high density of the waste, so a conservative rate of 1:1 was used for planning purposes. The landfill density is subject to variability in order to satisfy geotechnical stability.

The placement of waste and operational cover will progress as shown on Drawing 100 and on Figure 3.1. The cover material will be compacted and graded in the direction provided on Drawing 100. Once covered, a second 2 m high berm will be constructed on the placed material and the landfilling process will continue on the section stage. Further details, including the Cell 2 Plans and Sections, are provided on Drawing 110.

Sand and gravel will be used as the operational cover material for the landfill site (FSC, 2003). The operational cover will be about 0.3 m thick over the compacted waste. This cover will be placed during the spring or fall or when the waste deposited is 3 m wide (FSC, 2003).



1. Build berm, 2 m high. Dump garbage near the berm.
2. Drive over the garbage 3 to 5 times. Work the garbage up the berm a little at a time to pack it. Do this once per week.
3. Alternate between dumping and packing garbage until packed garbage is 2 m high.
4. In spring or fall, or when garbage is 3 m wide, cover garbage with 0.3 m of granular material to make a cell.
5. Repeat steps 1 to 4 until site is full. Then cover all garbage with 0.3 m of granular material. Pack and add more granular material until top is level.
6. Build new 2 m berm on top of cells.
7. Repeat steps 1 to 5.
8. To close out site, put 0.6 m of granular material on cells then pack with bulldozer so that water runs off.

NOTES:

1. INFORMATION RETRIEVED FROM 'GUIDELINES FOR THE PLANNING DESIGN, OPERATIONS AND MAINTENANCE OF MODIFIED LANDFILL SITES IN THE NWT" (FSC, 2003).

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

LANDFILL EXPANSION
AREA METHOD FOR WASTE DISPOSAL WITH A SECOND LAYER

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0	31AUG'18	ISSUED WITH LETTER	RWT	SRA

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P/A NO. NB102-181/47

REF. NO. NB18-00580

FIGURE 3.1

REV 0

In order to achieve permafrost encapsulation for the final landfill, the final cover has been designed to be thicker than the anticipated active layer (FSC, 2003). Based on an active layer of approximately 1 m, the final cover will be 1.5 m thick. The estimated final cover volume for the landfill expansion is 65,000 m^3. The estimated final cover quantities for each cell are provided on Table 3.2.

Table 3.2 Estimated Final Cover Quantities

Cell	Quantity (m^3)
2	11,900
3	16,100
4	26,300
5	10,700
Total	**65,000**

NOTES:

1. FINAL COVER QUANTITIES WERE ESTIMATED USING NEAT LINE CALCULATIONS AND SHRINK AND SWELL FACTORS WERE NOT CONSIDERED.

3.5 ESTIMATED LANDFILL CAPACITY

The overall capacity of the landfill expansion (Cells 2 to 5) is approximately 172,800 m^3. The estimated landfill capacity includes both landfilled waste and operational cover material. Table 3.3 provides the estimated capacity for each cell.

Table 3.3 Estimated Landfill Expansion Capacity

Cell	Capacity (m^3)
2	31,500
3	42,900
4	70,100
5	28,300
Total	**172,800**

NOTES:

2. THE ESTIMATED LANDFILL CAPACITY INCLUDES BOTH STAGE 1 AND STAGE 2.

4.0 CONSTRUCTION CONSIDERATIONS

The following construction considerations related to the Landfill Expansion Design are provided below:

- The setting out points provided on Drawing 100 will be located using suitably accurate surveying methods

- Disturbance to the original ground (excavation, scarifying etc.) should be minimized as to not impact current permafrost conditions
- Berm construction and maintenance will be completed as required based on fill placement progression
- All landfill activities will remain within the approved landfill limits

5.0 REFERENCES

Baffinland Iron Mines Corporation (Baffinland), 2012. *Mary River Project - Final Environmental Impact Statement.* February.

Ferguson Simek Clark (FSC), 2003. *Guidelines for the Planning, Design, Operations and Maintenance of Modified Solid Waste Sites in the Northwest Territories.* Prepared for Municipal and Community Affairs, Government of the Northwest Territories. Yellowknife, Northwest Territories. FSC Project No: 2001-1330.

Hatch Ltd., 2011. *Baffinland Iron Mines Corporation - Mary River Project - Drawing No. H337697-4350-10-014-0001 - Mine Site Landfill and Landfarm Site Layout*. Rev. A dated August 29, 2011.

Knight Piésold Ltd. (KP), 2008. *Mary River Project Bulk Sampling Program Landfill Design and Operations*. March 31. North Bay, Ontario. Ref. No. NB102-00181/10-6, Rev 1.

Nunavut Water Board, 2007. Type B Water Licence No. 2BB-MRY0710, Amendment No. 1. Issued to Baffinland Iron Mines Corporation. July 16, 2007.

6.0 CLOSURE

Yours truly,
Knight Piésold Ltd.

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KNIGHT PIESOLD LTD.
Signature
Date August 31/2018
PERMIT NUMBER: P 547
The Association of Professional Engineers, Geologists and Geophysicists of NWT/NU

Prepared:

Ryan Tibbles, B.Sc.
Project Scientist

Reviewed:

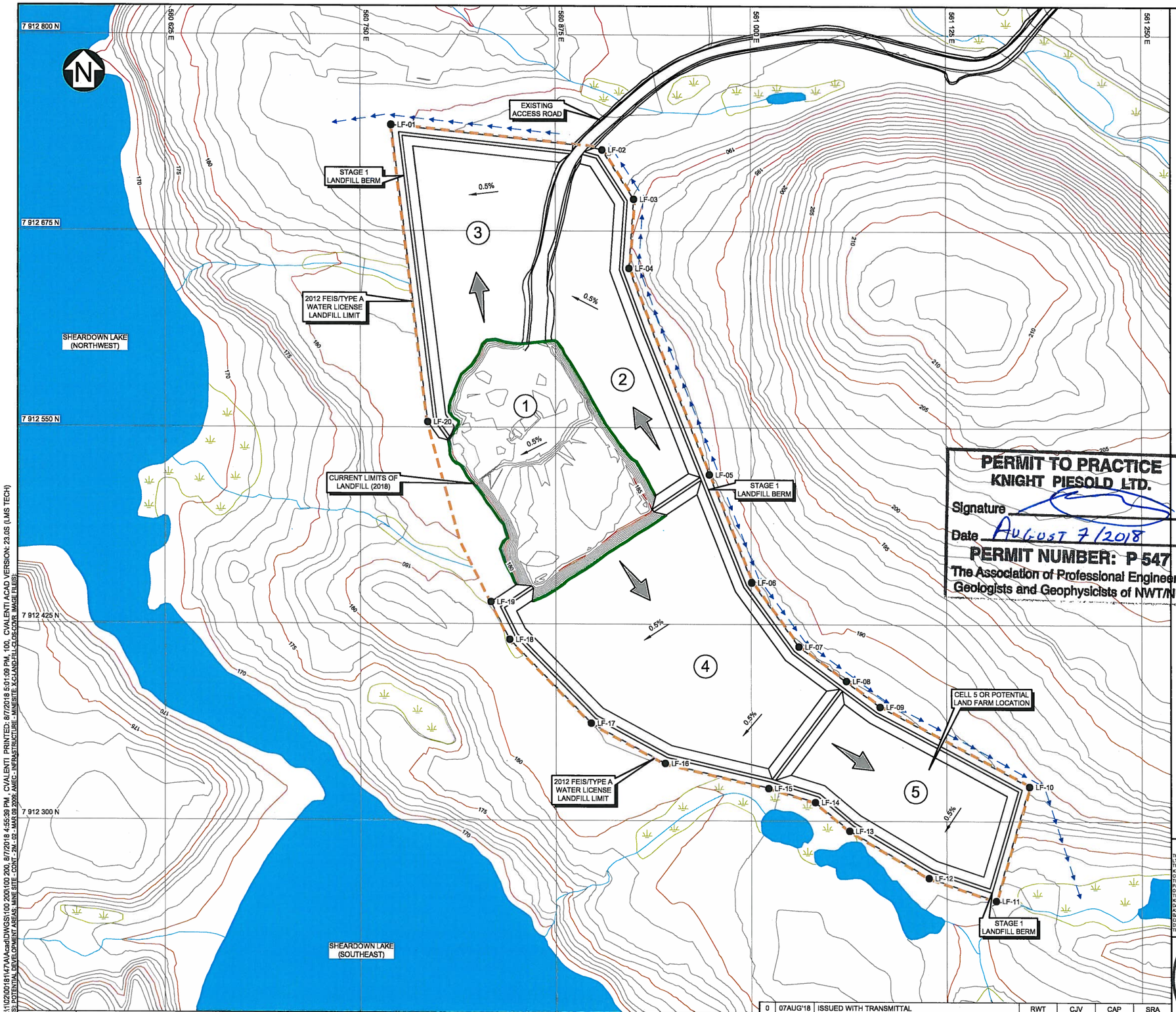
REGISTERED PROFESSIONAL ENGINEER
S.R. AIKEN
LICENSEE
Aug 31/18
NWT/NU

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

Approval that this document adheres to Knight Piésold Quality Systems:

Attachments:
Drawing 100, Rev 0 - Landfill Expansion - Site Plan
Drawing 110, Rev 0 - Landfill Expansion - Cell 2 - Plans and Sections
Drawing 200, Rev 0 - Landfill Expansion - Closure Plan

/rt



SETTING OUT POINTS		
DESCRIPTION	NORTHING	EASTING
LF-01	7912742.32	560769.97
LF-02	7912726.72	560905.13
LF-03	7912695.35	560925.35
LF-04	7912651.28	560922.28
LF-05	7912520.15	560973.30
LF-06	7912451.70	561000.53
LF-07	7912410.80	561030.55
LF-08	7912388.99	561060.92
LF-09	7912372.67	561082.33
LF-10	7912322.09	561178.14
LF-11	7912249.56	561156.63
LF-12	7912263.88	561113.64
LF-13	7912293.74	561062.93
LF-14	7912311.91	561041.12
LF-15	7912320.67	561010.97
LF-16	7912336.40	560944.92
LF-17	7912361.71	560897.89
LF-18	7912415.08	560845.40
LF-19	7912438.99	560833.43
LF-20	7912553.36	560793.01

LEGEND:

- WATER
- MARSH
- CURRENT LIMIT OF LANDFILL
- 2012 FEIS/TYPE A WATER LICENSE LANDFILL AND LANDFORM LIMIT
- APPROXIMATE RUNOFF DIRECTION
- (5) LANDFILL CELL
- 0.5% DIRECTION OF SURFACE GRADING
- PROPOSED DIRECTION OF FILL PLACEMENT
- SETTING OUT POINT

NOTES:

1. COORDINATE GRID IS UTM (NAD83) ZONE 17.
2. TOPOGRAPHY AND LANDFILL SURVEY BASED ON INFORMATION PROVIDED BY EAGLE MAPPING AND BAFFINLAND (2008 AND 2018).
3. CONTOURS ARE IN METRES. CONTOUR INTERVAL IS 1 METRE FOR TOPOGRAPHY AND 0.5 METRES FOR LANDFILL SURVEY.
4. DIMENSIONS AND ELEVATIONS ARE IN METRES, UNLESS NOTED OTHERWISE.
5. CELL NUMBERING INDICATES ASSUMED CONSTRUCTION SEQUENCING.

SCALE A 25 12.5 0 25 50 75 100 125 m

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MARY RIVER PROJECT

LANDFILL EXPANSION SITE PLAN

P/A NO.	DRAWING NO.	REVISION
NB102-181/47	100	0

DRG. NO.	DESCRIPTION
REFERENCE DRAWINGS	

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
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REVISIONS

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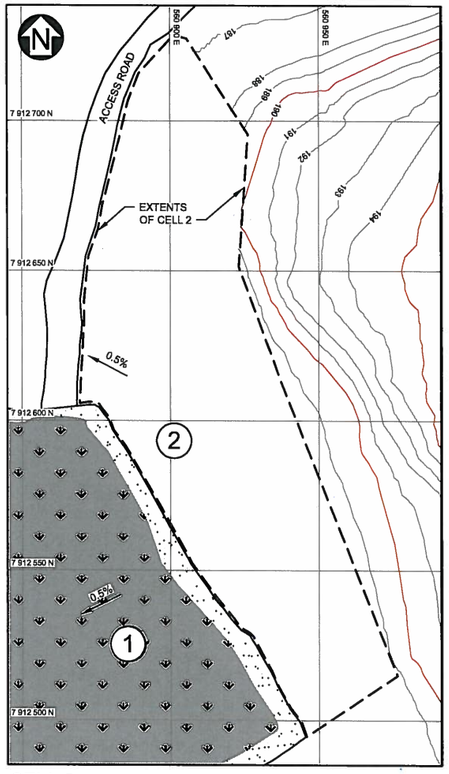
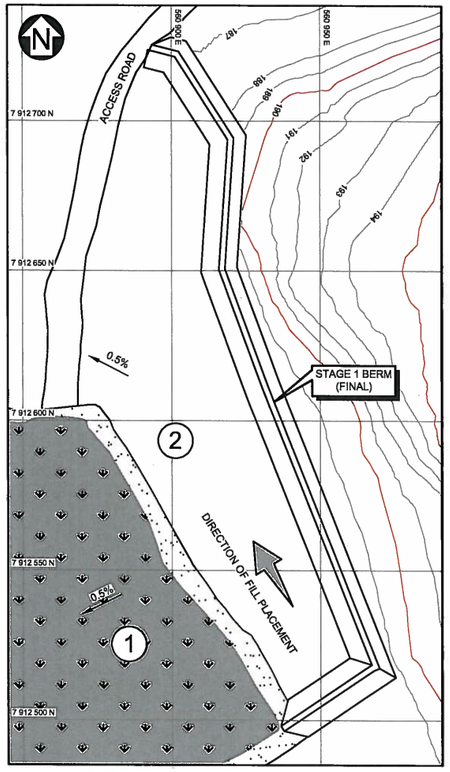
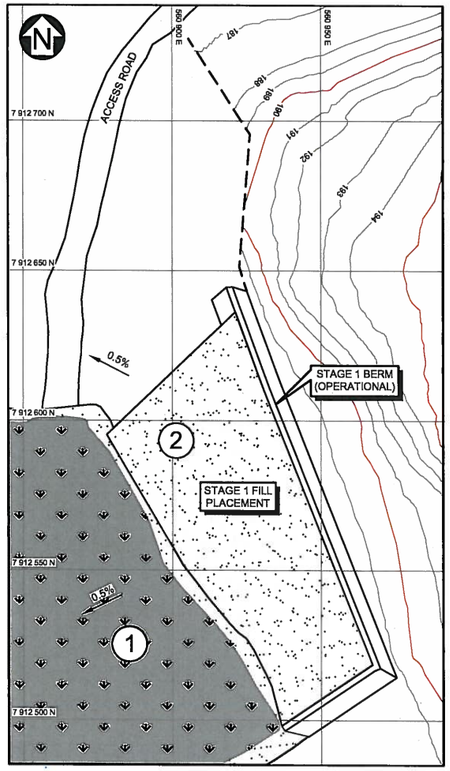


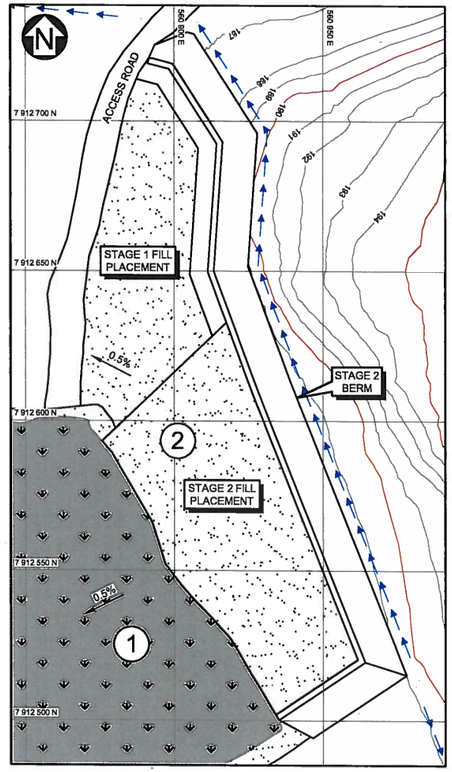
CELL 2
EXISTING CONDITIONS
SCALE A



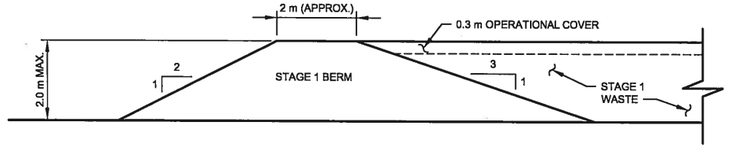
CELL 2
SITE PREPARATION
SCALE A



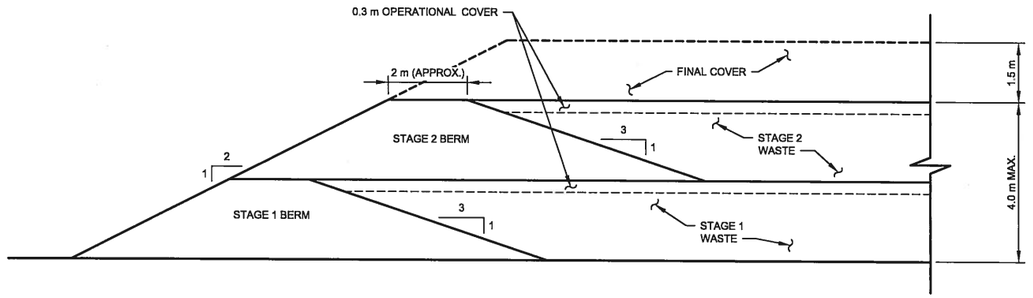
CELL 2
STAGE 1 - OPERATIONS
SCALE A



CELL 2
STAGE 2 - OPERATIONS
SCALE A



1 SECTION
TYPICAL LANDFILL BERM - STAGE 1
SCALE B



2 SECTION
TYPICAL LANDFILL BERM - ULTIMATE ARRANGEMENT
SCALE B

LEGEND:

- FINAL COVER
- FILL PLACEMENT WITH OPERATIONAL COVER
- CELL 2 EXTENTS
- APPROXIMATE RUNOFF DIRECTION
- (1) LANDFILL CELL
- 0.5% DIRECTION OF SURFACE GRADING
- PROPOSED DIRECTION OF FILL PLACEMENT

NOTES:

1. COORDINATE GRID IS UTM (NAD83) ZONE 17.
2. TOPOGRAPHY BASED ON INFORMATION PROVIDED BY EAGLE MAPPING (2008).
3. CONTOURS ARE IN METRES. CONTOUR INTERVAL IS 1 METRE.
4. DIMENSIONS AND ELEVATIONS ARE IN METRES, UNLESS NOTED OTHERWISE.
5. BERMS TO BE CONSTRUCTED OF RANDOM FILL CONSISTING OF A WELL GRADED MIXTURE OF SAND, GRAVEL, AND COBBLES. TO BE PLACED IN 0.5 METRE LIFTS AND COMPACTED BY TRACK WALKING WITH A MEDIUM SIZED BULLDOZER (I.E. CAT D5 OR LARGER) A MINIMUM OF 6 PASSES OVER THE ENTIRE SURFACE OF THE LIFT.

SCALE A: 20 10 0 20 40 60 80 100 m
SCALE B: 1.5 0.75 0 2.5 5.0 7.5 m

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S.R. AIKEN
LICENSEE
Aug 7/18
NWT/NU

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BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

LANDFILL EXPANSION - CELL 2
PLANS AND SECTIONS

P/A NO.	DRAWING NO.	REVISION
NB102-181/47	110	0

DRG. NO.	DESCRIPTION
REFERENCE DRAWINGS	

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
REVISIONS						

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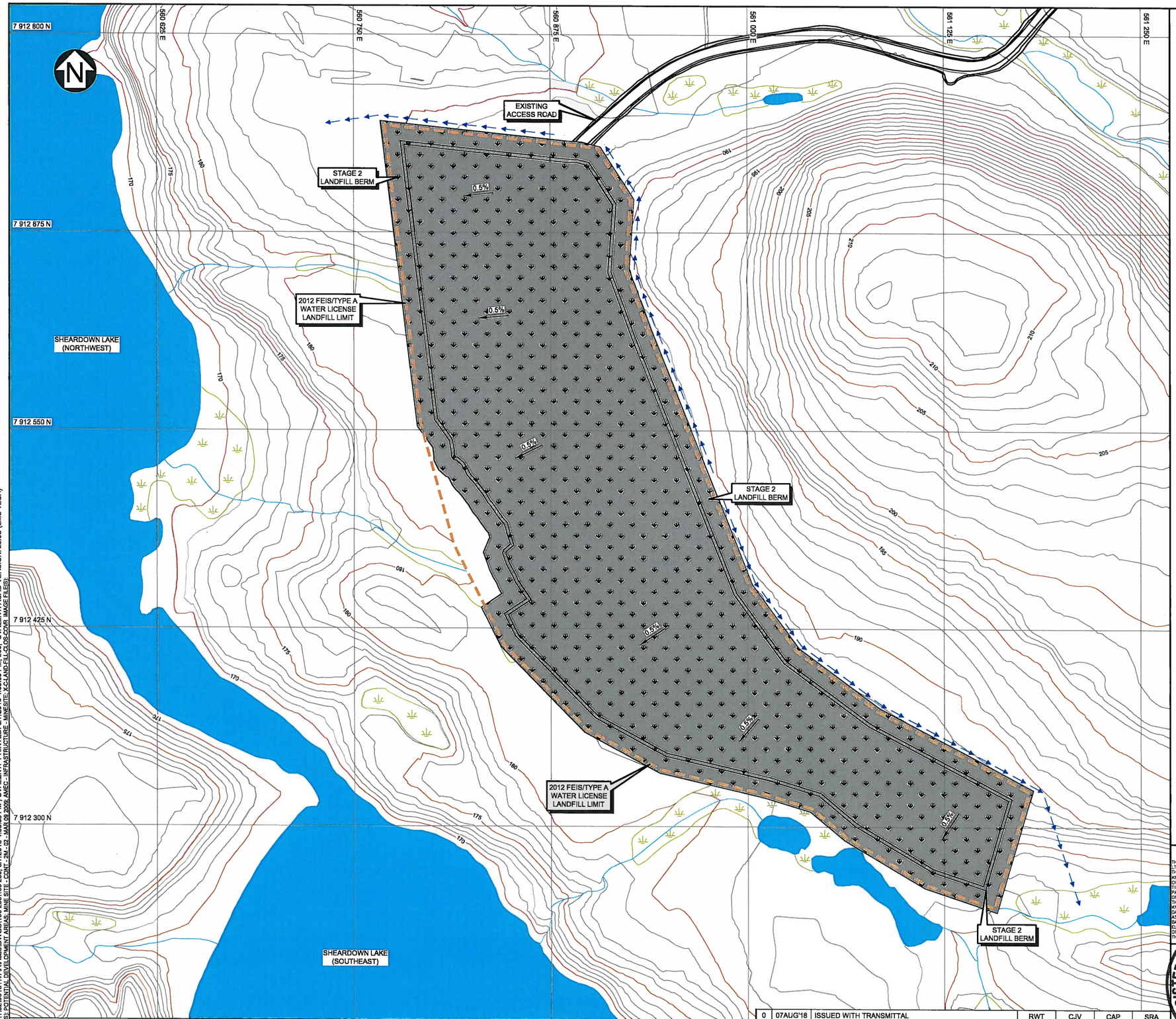

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SCALE A 25 12.5 0 25 50 75 100 125 m

REGISTERED PROFESSIONAL ENGINEER
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BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

LANDFILL EXPANSION CLOSURE PLAN

P/A NO.	DRAWING NO.	REVISION
NB102-181/47	200	0