August 23, 2017

Ryan Barry
Executive Director
Nunavut Impact Review Board
29 Mitik Street
P.O. Box 1360
Cambridge Bay
NU, X0B 0C0

RE: Mary River Project - Milne Inlet Fuel Storage Facility Capacity Increase Revised Request for Project Certificate Review

The purpose of this letter is to request the Nunavut Impact Review Board to provide a review of a revised proposed capacity increase of the Milne Inlet Fuel Storage Facility (Fuel Storage Facility) and indicate to Baffinland Iron Mines Corporation (Baffinland) and the Nunavut Water Board (NWB) if the proposed capacity increase is consistent with the Amended Project Certificate (Project Certificate) issued to the Mary River Project. The revised capacity increase consists of the addition of a 3.0 Ml tank and a 0.75 Ml tank to the existing Fuel Storage Facility at Milne Port.

On August 11, 2017, Baffinland submitted a request to the NIRB to review Baffinland's original Request for Modification to determine if an 18.75 Ml increase to the Fuel Storage Facility at Milne Port is consistent with the Project Certificate. On August 21, 2017, Baffinland received a request for more information regarding the proposed 18.75 Ml capacity increase.

Due to the limited shipping season at the Project and the urgent need for increased fuel capacity to support operations in 2018, Baffinland has decided to withdrawal its original Request for Modification and submit a revised Request for Modification to the NWB (submitted on August 22, 2017 and included as Attachment 1). The revised modification removes the 15 Ml Arctic Diesel (P50) tank included in Baffinland's original submission and proposes the addition of a 3 Ml and a 0.75 Ml tank to the Fuel Storage Facility at Milne Port. At this late stage in the summer it would not be possible to construct the 15Ml tank in time for the tank to be filled during the summer 2017 sealift. The two (2) additional tanks, which were included in Baffinland's original submission, will reduce the risk of fuel shortages and help

ensure the Project has enough fuel onsite to support the increased ore haulage associated with a 4.2 Mtpa operation in 2018.

It is Baffinland's understanding that this scaled down Request for Modification should be justifiable under the existing conditions of the Project Certificate and should allow for a determination by the NIRB without the need for public review. The NWB has submitted the revised Request for Modification for public comment.

Baffinland maintains the right to submit a subsequent Request for Modification for the 15 Ml diesel storage tank. If approved, the 15Ml diesel tank would be constructed during winter 2017/2018 and not filled with diesel until the 2018 summer sealift.

To expedite the NIRB's review of the revised capacity increase (3.75 Ml), Baffinland has responded to the NIRB's original information request in the subsections below. It should be noted that Baffinland's responses are based on the 3.75 Ml capacity increase proposed in the revised Request for Modification and not Baffinland's originally proposed 18.75 Ml capacity increase.

NIRB Information Request 1:

Discussion of how the proponent intends to comply with the oil handling facilities standards (TP 12402E), with specific information regarding the following items:

- Provide a description of the level and category of the proposed oil handling facility according to the maximum oil transfer rate in cubic metres per hour (with respect to each single oil product loaded or unloaded to or from a ship);
- Clarify whether the proposed additional fuel capacity would be expected to increase the minimum size of an oil pollution incident or spill size, beyond what was previously assessed by the NIRB for the approved Mary River Project, including Early Revenue Phase (ERP).

Baffinland Response:

Under the Oil Handling Facilities Standards (TP 12402E) issued by the Canadian Coast Guard, the proposed fuel capacity increase (addition of 3.75 Ml) will not change the Fuel Storage Facility's Level 1 classification since Baffinland does not plan on increasing the rate at which fuel is transferred at the Fuel Storage Facility. As a result, Baffinland's spill response supplies and procedures, as outlined in Baffinland's Oil Pollution Emergency Plan for the Milne Inlet Fuel Storage Facility (BAF-PH1-830-P16-0013), are sufficient and will meet the requirements set out in Section 2 of the Oil Handling Facilities

Standards following the 3.75 Ml fuel capacity increase. Baffinland current spill response supplies and equipment at Milne Port allow onsite personnel to effectively respond to a spill up to 3.5 cubic metres (m^3). In addition, Baffinland currently has an agreement with Oil Spill Response Limited (OSR). OSR is retained by Baffinland to provide third party spill response, oil spill response equipment resources, and technical advisory and spill management services on demand in the event of a marine oil spill.

Moreover, the proposed 3.75 Ml capacity increase would increase current fuel storage capacity at Milne Port by 7.7 percent. Based on the minor increase in fuel storage capacity at Milne Port, Baffinland does not believe an increase to the minimum size of an oil pollution incident or spill size, beyond what was previously assessed by the NIRB for the Mary River Project, is required.

NIRB Information Request 2:

Discussion of the environmental implications of increased fuel consumption, with specific notes regarding whether changes in greenhouse gas emissions, including effects on local air quality and climate change are to be expected due to facility upgrades, and noting whether or not additional emissions would be significantly different from what was previously assessed by the NIRB for the approved Mary River Project, including Early Revenue Phase (ERP);

Baffinland Response:

The proposed 3.75 Ml capacity increase would increase current fuel storage capacity at Milne Port and the Mary River Project by 7.7 percent and 7.4 percent, respectively. Based on this, Baffinland expects the proposed additional fuel storage capacity and associated marginal increase in fuel consumption to have negligible changes in local air quality near Project Sites.

Table 1 below outlines the fuel storage capacity approved under the Project Certificate issued by the NIRB and the current fuel storage capacity constructed to date. Based on the volumes outlined in Table 1, current fuel storage capacity is at approximately 21.8 percent of what was approved under the Project Certificate. The proposed increase of 3.75 Ml would increase current fuel storage capacity by 1.6 percent to 23.4 percent and therefore would be expected to have negligible effects on local air quality and greenhouse gas emissions for the Mary River Project as a whole.

Table 1 – Approved and Current Fuel Storage Capacity

Project Site	Approved Fuel Storage Capacity under Amended Project Certificate		Fuel Storage Capacity Constructed to Date (m^3)	
	Arctic Diesel (Ml)	Jet A-1 (Ml)	Arctic Diesel (Ml)	Jet A-1 (Ml)
Milne Port	**46**	**1.5**	**46**	**2.25**
Mary River Mine Site	**15**	**3**	**2**	**0.1**
Steensby Port	**160**	**5**	**0**	**0**
Total	**221**	**9.5**	**48**	**2.35**

Baffinland will continue to monitor air quality at Project Sites as outlined in the Project Certificate and report emissions as required by the Project Certificate and Environment and Climate Change Canada reporting requirements.

NIRB Information Request 3:

Information regarding the adequacy of the current emergency response procedures to address all potential accidents, spills, and or malfunctions associated with the proposed increase in Fuel Storage Facility capacity:

- Discussion of the anticipated timeline for the revision of Baffinland's Oil Pollution Emergency Plan (OPEP), including Fuel and Spill Contingency Plan reflecting the additional fuel capacity and upgrades to the facility;
- Discussion of the extent to which OPEP and other Baffinland's suite of environmental management plans will be updated and revised to reflect the new facility layout;
- Proponent should clarify which protective methods and best management practices will be employed for the construction and containment of additional fuel tanks and storage area to prevent any damage to the terrestrial ecosystem, including the adjacent marine environment.

Baffinland Response:

As mentioned above, under the Oil Handling Facilities Standards (TP 12402E) issued by the Canadian Coast Guard, the proposed fuel capacity increase (addition of 3.75 Ml) will not change the Fuel Storage Facility's Level 1 classification since Baffinland does not plan on increasing the rate at which fuel is transferred at the Fuel Storage Facility. As a result, Baffinland's spill response supplies and procedures, as outlined in Baffinland's Oil Pollution Emergency Plan for the Milne Inlet Fuel Storage Facility (BAF-

PH1-830-P16-0013), are adequate and will meet the requirements set out in Section 2 of the Oil Handling Facilities Standards following the 3.75 Ml fuel capacity increase.

Upon receiving approval for the additional tanks, Baffinland will update the OPEP and Baffinland's suite of environmental management plans prior to the commissioning of the new tanks. The revised management plans will be submitted by March 31, 2017 as part of the Project's annual reporting requirements. Revisions to the plans will be minor and will focus on the updating the Milne Inlet Fuel Storage Facility capacity and layout.

In regards to protective methods and best management practices, Baffinland will ensure construction and placement of the additional tanks is conducted in accordance with the Project's Environmental Protection Plan (BAF-PH1-830-P16-0008) and suite of environmental management plans. Construction and placement of the additional tanks will occur within the Milne Inlet Fuel Storage Facility's existing containment and on an existing laydown area west of the Fuel Storage Facility and will not occur on undisturbed areas. As a result, Baffinland foresees minimal effects from the tanks construction on the surrounding terrestrial and marine environment.

NIRB Information Request 4:

The Proponent should outline how it intends to comply with the Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations which came into full force June 12, 2008 (Canadian Environmental Protection Act, 1999), in addition to the following legislative requirement under the Canadian Shipping Act, 2001:

- *Pollutant Discharge Reporting Regulations, 1995 (SOR/95-351)*
- *Vessel Pollution and Dangerous Chemical Regulations (SOR 2012-69)*

Baffinland Response:

The additional tanks will be constructed in accordance with the Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations (Canadian Environmental Protection Act, 1999), the CCME Environmental Code of Practice for Aboveground and Underground Storage Tank Systems containing Petroleum and Allied Petroleum Products (PN1326) and other applicable Codes and Standards[1]. In accordance with the secondary containment requirements outlined in PN1326, the Fuel

[1] A list of relevant applicable Codes and Standards is available upon request.

Storage Facility's existing secondary containment has been assessed and demonstrated to have ample secondary containment to accommodate the additional tanks. For the secondary containment assessment, refer to the revised Request for Modification provided as Attachment 1.

In addition, Baffinland requires all contracted shipping companies to operate in accordance with the Canada Shipping Act and all applicable regulations made under the Canada Shipping Act, including the Pollutant Discharge Reporting Regulations, 1995 (SOR/95-351) and Vessel Pollution and Dangerous Chemical Regulations (SOR 2012-69).

NIRB Information Request 5:

Provide the rationale and justification for the proposed increase in fuel storage increase including the potential long term implications including effects on protected areas and closest communities.

Baffinland Response:

The proposed fuel storage capacity increase at Milne Port is necessary for the Mary River Project to reach full production of 4.2 Mtpa and complete sustaining capital projects including the proposed upgrades to the Tote Road to meet Department of Fisheries and Oceans (DFO) requirements. The capacity increase is expected to have minimal long term effects on the protected areas and closest communities (Pond Inlet) near Milne Port and at most will require an additional fuel ship to deliver the 3.75 Ml to the Fuel Storage Facility.

We trust that this information addresses items in NIRB's original information request and informs the NIRB of Baffinland's current fuel storage capacity increase proposal. Given the short summer sealift and the requirement to construct and fill the tanks before the end of the open water season, Baffinland requests that the NIRB provide a quick response and determination on whether the proposed minor capacity increase is consistent with the Project Certificate. Please do not hesitate to contact the undersigned or Andrew Vermeer should you have any questions or comments.

Regards,

Wayne McPhee,
Director Sustainable Development

Attachments:

Attachment 1: Milne Inlet Fuel Storage Facility- Revised Modification Request (Aug 22, 2017)

Cc: Solomon Amuno (NIRB)
Stephen Williamson Bathory (Qikiqtani Inuit Association)
Sean Joseph, David Hohnstein (NWB)
Sarah Forté, Karen Costello (INAC)
Todd Burlingame, Adam Grzegorczyk, Andrew Vermeer (Baffinland)

Attachment 1

Milne Inlet Fuel Storage Facility - Revised Modification Request (Aug 22, 2017)

August 22, 2017

Sean Joseph
Senior Technical Advisor, NWB
P.O. Box 119
Gjoa Haven, NU X0B 1J0

RE: Mary River Project - Milne Inlet Fuel Storage Facility Capacity Increase (Revised Modification Request) Water Licence 2AM-MRY1325 – Amend. No. 1

In accordance with Part G of Baffinland Iron Mines Corporation's (Baffinland) Type "A" Water Licence 2AM-MRY1325 – Amend. 1 (Type "A" Water Licence), the purpose of this letter is to request approval from the Nunavut Water Board (NWB) for a revised modification that involves increasing the capacity of the Milne Inlet Fuel Storage Facility (Fuel Storage Facility) at Mary River Project's Milne Port location. The revised modification involves the addition of a 3 Ml and a 0.75 Ml tank to the Fuel Storage Facility.

Background

On July 19, 2017, Baffinland Iron Mines Corporation (Baffinland) submitted a Request for Modification to the NWB to increase the Arctic Diesel (P50) and Jet A-1 capacity of the Fuel Storage Facility by 18 Ml and 0.75 Ml, respectively. On August 8, 2017, Baffinland received comments from Indigenous and Northern Affairs Canada (INAC) on the proposed capacity increase stating that the proposed capacity increase was outside the scope of the Project originally assessed by the Nunavut Impact Review Board (NIRB) and therefore INAC was of the opinion that the proposed capacity increase was not consistent with the Project Certificate issued for the Project by the NIRB. To address INAC's comments, Baffinland submitted a request to NIRB on August 11, 2017 to review Baffinland's original Request for Modification to determine if the proposed capacity increase to the Fuel Storage Facility is consistent with the Project Certificate.

Modification Request

Due to the late timing of the request, the limited shipping season at the Project and the urgent need for increased fuel capacity to support operations in 2018, Baffinland has decided to withdrawal its original Request for Modification and submit a scoped down revision of the Request for Modification to the

NWB. The revised modification removes the 15 Ml Arctic Diesel (P50) tank included in Baffinland's original submission and proposes the addition of a 3 Ml and a 0.75 Ml tank to the Fuel Storage Facility at Milne Port. These two (2) additional tanks, included in Baffinland's original submission, will ensure the Project has enough fuel onsite to support the increased ore haulage associated with a 4.2 Mtpa operation in 2018. It is Baffinland's understanding that this scoped down Request for Modification should be justifiable under the existing conditions of the Project Certificate and should allow for a determination by the NWB without the need for additional public review.

The Early Revenue Phase (ERP) Project Description included a Key Facts Table that estimated Arctic Diesel and Jet A-1 fuel requirements for a 3.5 Mtpa operation. Table 1 below shows the tank volume estimates from the Key Facts Table, the tank volume increased by 20% to account for the change in the approval from 3.5 to 4.2 Mtpa, and the revised tank volume increase proposed in this Request for Modification. As shown in Table 1, the proposed modification increases the Fuel Storage Facility's overall fuel capacity to a volume below the overall fuel capacity (Arctic Diesel and Jet A-1) required for a 4.2 Mtpa Early Revenue Phase operation and therefore should address INAC's comments on Baffinland's original Request for Modification.

Table 1: Proposed Fuel Storage Capacity Increase at Milne Port

Fuel Type	ERP Estimate (3.5 Mtpa)	Increased ERP (4.2 Mtpa)	Current Tank Volume	Proposed Tank Volume
Arctic Diesel	46 Ml	55.2 Ml	46 Ml	49 Ml
Jet A-1	1.5 Ml	1.8 Ml	2.25 Ml	3 Ml[1]
Total	47.5 Ml	57 Ml	48.25 Ml	52 Ml

Both tanks will be placed within the existing containment of the Fuel Storage Facility. As per CCME guidelines, an assessment of the Fuel Storage Facility's secondary containment, provided in Attachment 6, confirmed that there was sufficient secondary containment for Baffinland's original Request for Modification. Based on this original assessment, the Fuel Storage Facility's existing containment will not need to be modified and will have ample secondary containment to accommodate the two (2) additional fuel tanks proposed in this revised Request for Modification.

[1] 0.75 Ml tank may be used for Arctic Diesel (P50) instead of Jet A-1, depending on operational requirements

Under the Oil Handling Facilities Standards issued by the Canadian Coast Guard[2], the proposed fuel capacity increase (addition of 3.75 Ml) will not change the Fuel Storage Facility's Level 1 classification since Baffinland does not plan on increasing the rate at which fuel is transferred at the Fuel Storage Facility. As a result, Baffinland's spill response supplies and procedures, as outlined in Baffinland's Oil Pollution Emergency Plan for the Milne Inlet Fuel Storage Facility (BAF-PH1-830-P16-0013), are adequate and will meet the requirements set out in Section 2 of the Oil Handling Facilities Standards following the proposed fuel capacity increase.

The proposed modification to the Milne Inlet Fuel Storage Facility will occur within the Project's Development Area. Financial security for the works outlined in Baffinland's 2017 Work Plan Addendum, including the two (2) proposed fuel tanks, was posted by the Qikiqtani Inuit Association (QIA) on August 7, 2017.

To expedite the Nunavut Impact Review Board's (NIRB) review of this submission and determination on whether it is consistent with the Project Certificate (Project Certificate 005 – Amend. 1) issued for the Mary River Project, Baffinland will submit a review request to the NIRB in parallel with this submission to the NWB.

Details of the modification are provided in the subsections below and in the attached documentation, including issued-for-construction drawings, engineering documentation, construction methodology, and environmental mitigation measures to be implemented during construction.

The requested modification is described below and is consistent with the requirements of Part G of the Type "A" Water Licence.

a. Description of Facilitiies and/or Works to be Constructed

   The proposed capacity increase of the Milne Inlet Fuel Storage Facility involves the construction and placement of two (2) additional fuel tanks. Both tanks will be placed within the existing containment of the Fuel Storage Facility and are presented in Table 2 below.

[2] Oil Handling Facilities Standards (TP 12402), Canadian Coast Guard, 1995

Table 2 – Proposed Additional Fuel Tanks

Tag Number	Description	Fuel Stored	Diameter	Height
TK-010	750K Litre Tank	Jet A-1 or Arctic Diesel	10.25m	9.14m
TK-011	3M Litre Tank	Arctic Diesel	16.20m	15.25m

The design and construction of the proposed additional fuel tanks and associated piping will be similar to the Fuel Storage Facility's existing tanks and in accordance with the applicable guidelines and standards.

Attachments 1 & 2 show the process flow diagram and general layout for the Fuel Storage Facility, respectively, including the proposed additional fuel tanks and associated piping. Attachments 3, 4 & 5 show the earthworks for the additional fuel tanks and the Facility's overall piping layout. As mentioned above, Attachment 6 confirms the ability of the Facility's existing secondary containment to accommodate the additional fuel tanks. Attachment 7 discusses the construction methodology for the proposed additional fuel tanks and associated piping.

Moreover, the diesel piping system that runs from the Fuel Storage Facility to the Milne Port diesel generators, as shown in Attachment 2, was not completed during the construction of the Fuel Storage Facility in 2013. This diesel piping system, included in the Fuel Storage Facility's original design, will be completed during the installation of the fuel tanks and associated piping.

b. Proposed Location of the Structure

Both fuel tanks will be installed in the Milne Inlet Fuel Storage Facility's existing secondary containment at Milne Port, adjacent to existing fuel tanks. Associated piping, with the exception of the diesel piping system feeding the Milne Port generators, will be installed inside the Fuel Storage Facility's secondary containment to allow for fuel transfer with minimal additional piping and no additional dispensing modules. The coordinates of the tank earthworks setting out points are presented in Table 3 below.

Table 3 – Setting Out Points for Proposed Tanks

Tag Number	UTM (NAD83)		Tank Perimeter Levels (m.a.s.l.)
	Northing	Easting	
TK-010	7976164.948	503608.208	12.55
TK-011	7976273.168	503641.393	12.30

c. Identification of any Potential Impacts to the Receiving Environment

Baffinland foresees minimal impacts to the receiving environment during the construction and installation of the two (2) additional fuel tanks and associated piping at the Milne Inlet Storage Facility. As discussed in Attachment 6, the majority of the work will occur within the existing secondary containment of the Fuel Storage Facility and therefore sediment releases to nearby water bodies from earthworks are not expected. Appropriate crane pads and access ramps will be constructed at the Fuel Storage Facility to prevent mobile equipment from coming into contact and transferring hydrocarbon impacted soils outside the Facility's containment. In addition, construction activities at the Milne Inlet Fuel Storage Facility will be conducted in accordance with Baffinland's suite of environmental management plans, including but limited to:

- Waste Management Plan (BAF-PH1-830-P16-0028)
- Hazardous Materials and Waste Management Plan (BAF-PH1-830-P16-0011)
- Spill Contingency Plan (BAF-PH1-830-P16-0036)
- Environmental Protection Plan (BAF-PH1-830-P16-0008)

d. Monitoring

Environmental monitoring of construction activities will include periodic environmental inspections conducted by Baffinland's Environmental personnel in concert with the Contractor's Health, Safety and Environment Lead. Inspections will ensure Contractors are properly managing waste and hazardous materials and operating in accordance with Project's onsite procedures and management plans. Inspections will be documented by taking photos of any deficiencies and using Baffinland's existing environmental inspection forms. Deficiencies identified will be compiled and forwarded to the responsible Contractor to be corrected and addressed. In addition, before, during and after photographs of the tank construction and installation will be taken.

e. Schedule for Construction

Construction and installation of the two (2) additional tanks and associated piping at the Milne Fuel Storage Facility are planned to start as soon as approval has been received from NWB with the intent of completing construction prior to the arrival of the fuel sealift vessels in September 2017. Baffinland would appreciate that the NWB expedite their review of this request in order allow time for the tanks to be assembled prior to the end of the open water shipping season, so that the tanks can be filled before winter.

f. Drawings of Engineered Structures

Hatch Associates were retained to develop the design and construction plan for the proposed fuel tanks and associated piping at the Milne Inlet Fuel Storage Facility. Issued for construction drawings are provided in Attachments 2, 3, 4 and 5 of this submission.

g. Proposed Sediment and Erosion Control Measures

Baffinland does not foresee sedimentation and erosion as a likely environmental concern during the construction and installation of the additional fuel tanks and associated piping at the Milne Inlet Fuel Storage Facility. In the unlikely event that sedimentation and erosion become a concern during construction, Baffinland will employ a combination of sediment and erosion control measures (check dams, rip-rap, silt fences, etc.), as outlined in Baffinland's Environmental Protection Plan (BAF-PH1-830-P16-0008 – Rev. 1) and Surface Water and Aquatic Ecosystems Management Plan (BAF-PH1-830-P16-0026 - Rev. 4), to address and manage sedimentation and erosion concerns.

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

Regards,

Wayne McPhee,
Director Sustainable Development

Attachments:

Attachment 1: Port Site TM001 Fuel System Process Flow Diagram
(H353004-48000-210-282-0001-0001, Rev. 3)
Attachment 2: Port Site TM001 Fuel System Overall Layout
(H353004-48400-240-272-0003, Rev. 0)
Attachment 3: Port Site TM001 Fuel System Piping Layout (H353004-48400-240-272-0002, Rev. 5)
Attachment 4: Milne Port Fuel Tanks 010 & 011 Setting Out Earthworks
(H353004-40000-220-260-0003-0001, Rev. 1)
Attachment 5: Milne Port Fuel Tanks 010 & 011 Details Typical Sections
(H353004-40000-220-273-0001-0001, Rev. 1)
Attachment 6: Memo: Calculations of Tank Farm Containment Capacity
(H353004-00000-240-202-0001, Rev. A)
Attachment 7: Construction Methodology Milne Inlet Fuel Storage Facility System
(H353004-40000-400-050-0002, Rev. 1)

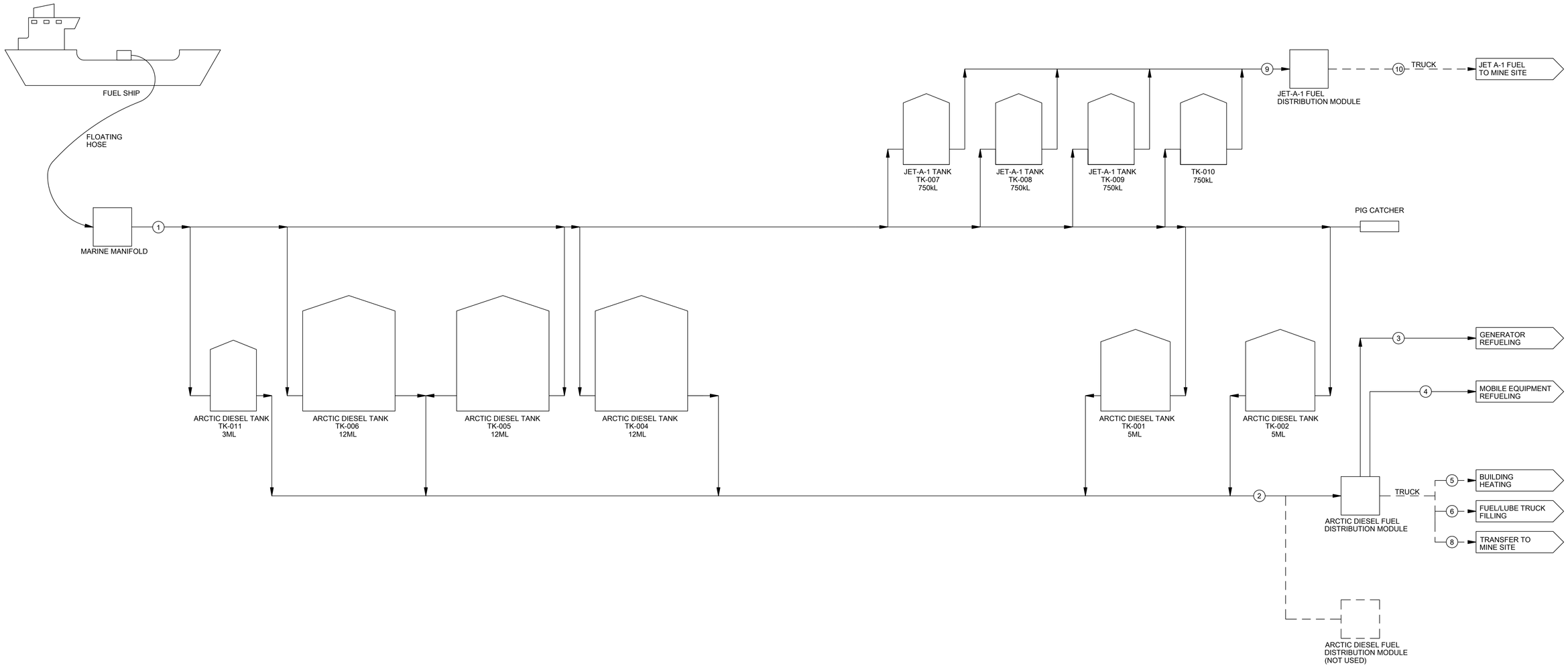
Cc: Stephen Williamson Bathory (Qikiqtani Inuit Association)
Manager of Licensing, David Hohnstein (NWB)
Justin Hack, Jonathan Mesher, Sarah Forté, Karen Costello (INAC)
Todd Burlingame, Adam Grzegorczyk, Andrew Vermeer (Baffinland)

Attachment 1

Port Site TM001 Fuel System Process Flow Diagram

(H353004-48000-210-282-0001-0001, Rev. 3)

DWG. No. H353004-48000-210-282-0001-0001



STREAM NUMBER	UNIT	1	2	3	4	5	6		8	9	10
DESIGN FLOW	L/min	2,500	1,600	100	100	1,500	1,500		1,500	1,500	1,500
MAX FLOW	ML/YR	55,3	-	8	1,8	1,4	4,4		38,7	-	3
DESIGN TEMPERATURE(MAX)	°C	20	20	20	20	20	20		20	20	20
DESIGN TEMPERATURE(MIN)	°C	-54	-54	-54	-54	-54	-54		-54	-54	-54

NOTES
1. TANKS ARE FILLED ONE AT A TIME
2. TANKS ARE DRAWN DOWN ONE AT A TIME
3. TANKS FILLED TO 95% OF NOMINAL CAPACITY

REGISTERED PROFESSIONAL ENGINEER — E.E. BUTTS — LICENSEE — NT/NU

NAME
SIGNATURE
ENG REG NUMBER
REVISION DATE
ORIGINAL DATE
REG. PROFESSIONAL

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HATCH

Baffinland

No.	DESCRIPTION	BY	CHK'D	DATE
3	APPROVED FOR USE	SJM	SS	17/09/17
2	GENERAL UPDATE; ISSUED FOR USE	S.S.	MMI	07/06/17
1	APPROVED FOR USE	S.S.	MMI	07/05/17
0	APPROVED FOR FEASIBILITY STUDY	N.M.		27-03-2017

ROLE	NAME	SIGNATURE	DATE
DRAFTSPERSON	J. MCNEIL	J McNeil	17/08/17
DESIGNER	M. MACINTYRE	Michael MacIntyre	17/08/17
CHECKER	S. SKINNER		17/09/17
DESIGN COORD.	M. MACINTYRE	Michael MacIntyre	17/08/17
RESP. ENG.	F. BUTTS	E Butts	17/08/17
LEAD DISC. ENG.	F. BUTTS	E Butts	17/08/17
ENG. MANAGER	J. HOWES		
PROJ. MANAGER	SVEN HEINER		

DRAWING APPROVAL STATUS: APPROVED FOR USE

DRAWING No. | DRAWING TITLE
REFERENCE DRAWINGS

MARY RIVER PROJECT
BAFFINLAND IRON MINES LP

PORT SITE
TM001 FUEL SYSTEM
PROCESS FLOW DIAGRAM

SCALE 1:1 OR AS NOTED | DWG. No. H353004-48000-210-282-0001-0001 | REV 3

SHEET SIZE: A1

Attachment 2

Port Site TM001 Fuel System Overall Layout

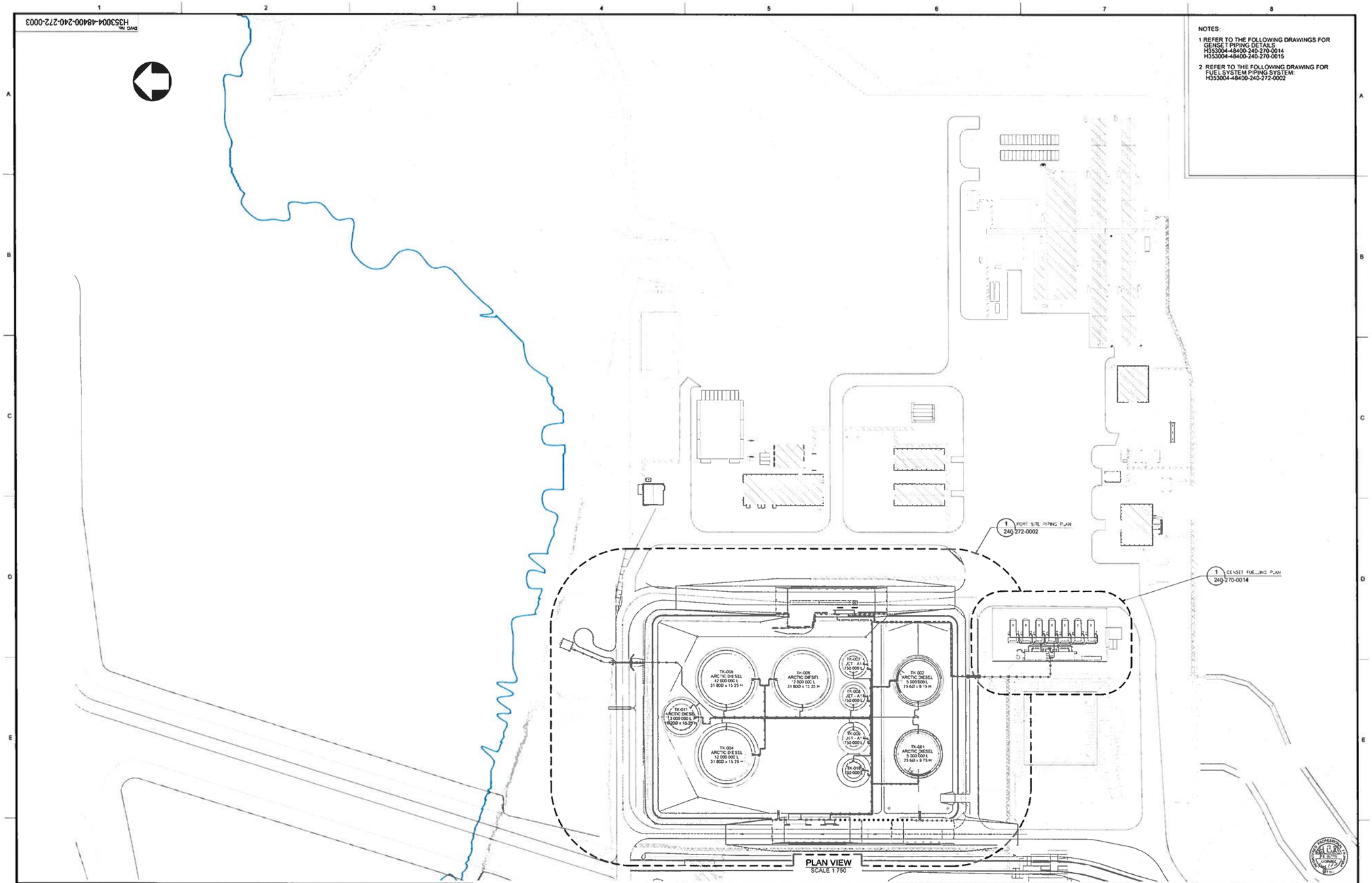
(H353004-48400-240-272-0003, Rev. 0)

DWG No. H353004-48400-240-272-0003

NOTES:

1 REFER TO THE FOLLOWING DRAWINGS FOR GENSET PIPING DETAILS:
H353004-48400-240-270-0014
H353004-48400-240-270-0015

2 REFER TO THE FOLLOWING DRAWING FOR FUEL SYSTEM PIPING SYSTEM:
H353004-48400-240-272-0002



PLAN VIEW
SCALE 1:750

DRAWING No	DRAWING TITLE	NAME					
REFERENCE DRAWINGS		SIGNATURE					
		ENG REG NUMBER					
		REVISION DATE					
		ORIGINAL DATE					
		REG. PROFESSIONAL					
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REVISIONS

HATCH

ROLE	NAME	SIGNATURE	DATE
DRAFTSPERSON	S. SKINNER		NR
DESIGNER	V. VACATYR		NR
CHECKER			
DESIGN COORD			
RESP. ENG			
LEAD DISC. ENG			
ENG. MANAGER			
PROJ. MANAGER			

DRAWING APPROVAL STATUS: Approved for Permitting

Baffinland

MARY RIVER PROJECT
BAFFINLAND IRON MINES LP

PORT SITE
TM001 FUEL SYSTEM
2017 OVERALL LAYOUT

SCALE	DWG No	REV
1:750	H353004-48400-240-272-0003	0

SHEET SIZE A1

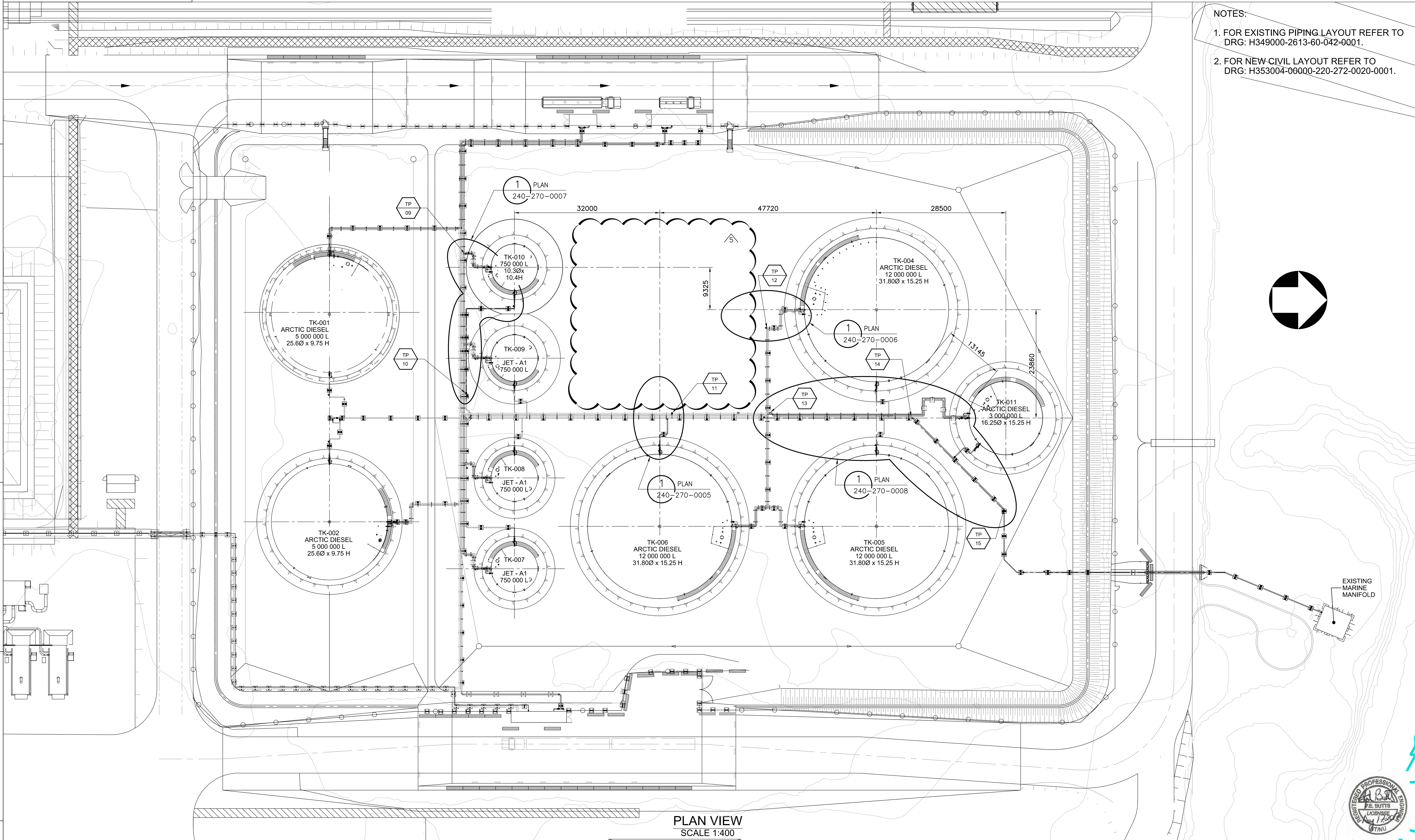
Attachment 3

Port Site TM001 Fuel System Piping Layout

(H353004-48400-240-272-0002, Rev. 5)

NOTES:

1. FOR EXISTING PIPING LAYOUT REFER TO DRG: H349000-2613-60-042-0001.
2. FOR NEW CIVIL LAYOUT REFER TO DRG: H353004-00000-220-272-0020-0001.



PLAN VIEW
SCALE 1:400

DRAWING No.	DRAWING TITLE
REFERENCE DRAWINGS	

NAME	
SIGNATURE	
ENG REG NUMBER	
REVISION DATE	
ORIGINAL DATE	
REG. PROFESSIONAL	

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No.	DESCRIPTION	BY	CHK'D	DATE
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4	GENERAL UPDATE; ISSUED FOR CONSTRUCTION			
3	MANIFOLD RELOCATION AND MARINE FUEL LINE ON HOLD			
2	TK-003 LOCATION REVISED FOR CODE COMPLANCE TO SUIT TANK SHOP DRAWINGS			
1	BACKGROUND UPDATED; ISSUED FOR CONSTRUCTION			
0	ISSUED FOR CONSTRUCTION			

REVISIONS

HATCH

ROLE	NAME	SIGNATURE	DATE
DRAFTSPERSON		[signature]	17/08/17
DESIGNER		[signature]	17/08/17
CHECKER		[signature]	17/08/17
DESIGN COORD.		[signature]	17/08/17
RESP. ENG.		[signature]	17/08/17
LEAD DISC. ENG.		[signature]	17/08/17
ENG. MANAGER			
PROJ. MANAGER			

DRAWING APPROVAL STATUS: Approved for Construction

Baffinland

MARY RIVER PROJECT
BAFFINLAND IRON MINES LP

PORT SITE
TM001 FUEL SYSTEM
PIPING LAYOUT

SCALE: AS NOTED OR AS NOTED

DWG. No. H353004-48400-240-272-0002 REV 5

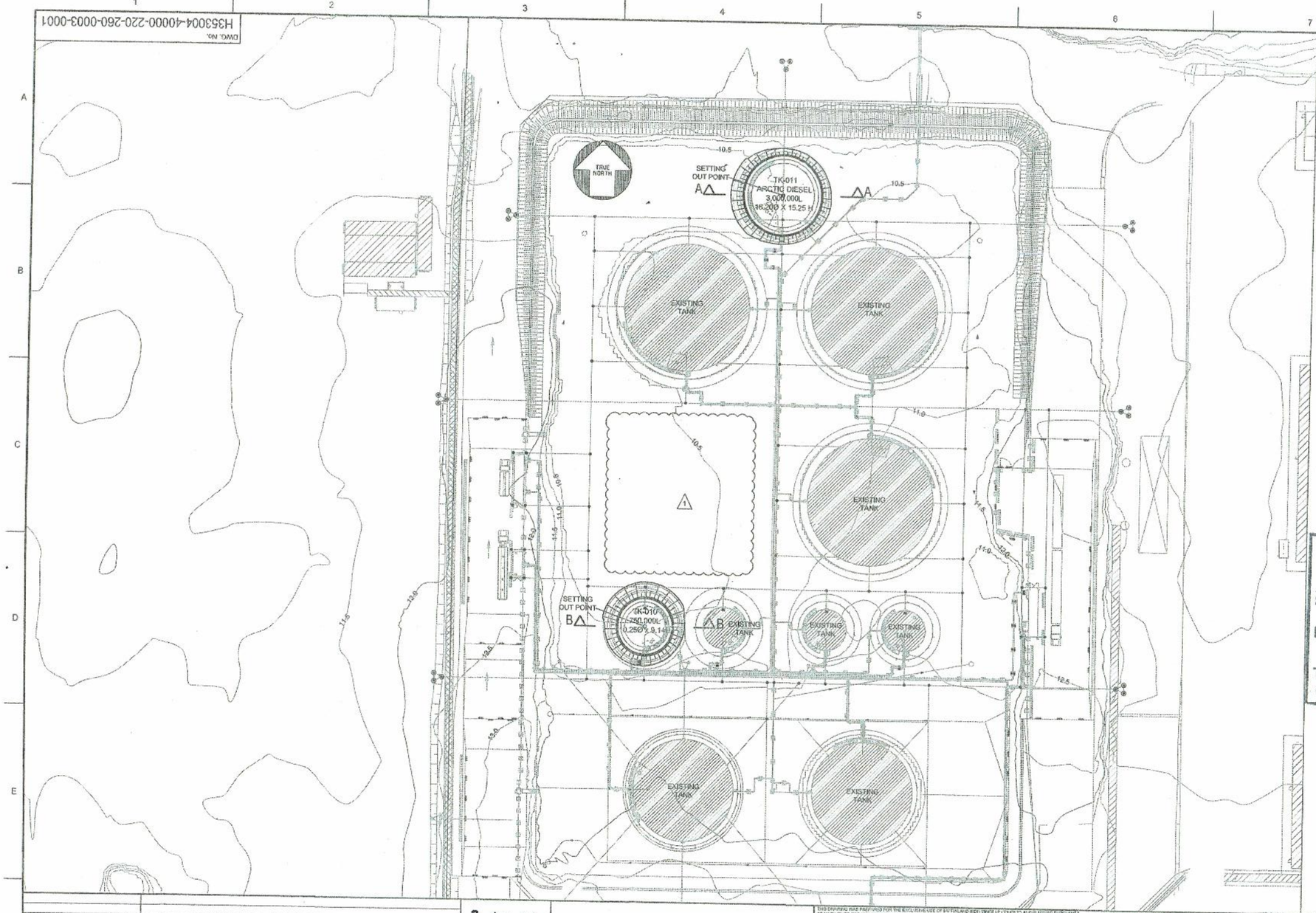
SHEET SIZE: A1

Attachment 4

Milne Port Fuel Tanks 010 & 011 Setting Out Earthworks

(H353004-40000-220-260-0003-0001, Rev. 1)

DWG. No. H353004-40000-220-260-0003-0001



MATERIAL VOLUMES

TK010

CRUSHER FINES MATERIAL (-2mm)	= 16m3
FILL MATERIAL (TYPE 5)	= 410m3
TOTAL FILL MATERIAL REQUIRED	= 426m3
TOTAL SURFACE AREA	= 341m2

TK011

CRUSHER FINES MATERIAL (-2mm)	= 35m3
FILL MATERIAL (TYPE 5)	= 525m3
TOTAL FILL MATERIAL REQUIRED	= 560m3
TOTAL SURFACE AREA	= 495m2

TOTALS

CRUSHER FINES MATERIAL (-2mm)	= 51m3
FILL MATERIAL (TYPE 5)	= 935m3
TOTAL FILL MATERIAL REQUIRED	= 986m3
TOTAL SURFACE AREA	= 836m2

TANK EARTHWORKS SETTING OUT POINT (CENTRE OF TANK)

TANK No.	N	E	TANK PERIMETER LEVEL (EL)
TANK 011	7976273.188	503641.393	11.95
TANK 010	7976184.948	503608.208	12.30

NOTES:

1. LIDAR SURVEY PROVIDED BY PHOTSAT (2016)
2. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METERS.
3. CONTOURS ARE IN METERS. CONTOUR INTERVAL IS 0.5m.
4. FOR TYPICAL CROSS SECTIONS REFER TO DRAWING No. H353004-40000-220-273-0001-0001

PERMIT TO PRACTICE
HATCH LTD.
Signature _____
Date AUG 21, 2017
PERMIT NUMBER: P 512
The Association of Professional Engineers, Geologists and Geophysicists of NWT/NU

REGISTERED PROFESSIONAL ENGINEER
R.A.H
L1247
R. A. HALIM
LICENSEE
21/08/2017
NWT/NU

H353004-40000-220-273-0001-0001	FUEL TANK 010 & 011 DETAILS - TYPICAL SECTIONS	
DRAWING No.	DRAWING TITLE	
REFERENCE DRAWINGS		

R. HALIM	NAME
RAH	SIGNATURE
L1247	ENG REG NUMBER
21/08/2017	REVISION DATE
03/07/2017	ORIGINAL DATE
REG. PROFESSIONAL	

No.	DESCRIPTION	BY	CHK'D	DATE
1	APPROVED FOR CONSTRUCTION	KT	MB	21/08/2017
0	APPROVED FOR CONSTRUCTION	FH	MB	30/06/2017

REVISIONS

HATCH

ROLE	NAME	SIGNATURE	DATE
DRAFTSPERSON	K TEFFU	NR	21/08/2017
DESIGNER	K TEFFU	NR	21/08/2017
CHECKER	F HUGO		21/08/2017
DESIGN COORD.	R GOOSEN		21/08/2017
RESP. ENG.	R HALIM	RAH	21/08/2017
LEAD DISC. ENG.	A GROBBELAAR		21/08/2017
AREA MANAGER	J HOWES		21/08/2017
PROJ. MANAGER			
CLIENT			
DRAWING APPROVAL STATUS:	Approved for Construction		

Baffinland

BAFFINLAND IRON MINES LP
MARY RIVER PROJECT

MILNE PORT
FUEL TANKS 010 & 011 SETTING OUT EARTHWORKS

SCALE	DWG. No.	REV
1:500 OR AS NOTED	H353004-40000-220-260-0003-0001	1

SHEET SIZE: D

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Attachment 5

Milne Port Fuel Tanks 010 & 011 Details Typical Sections

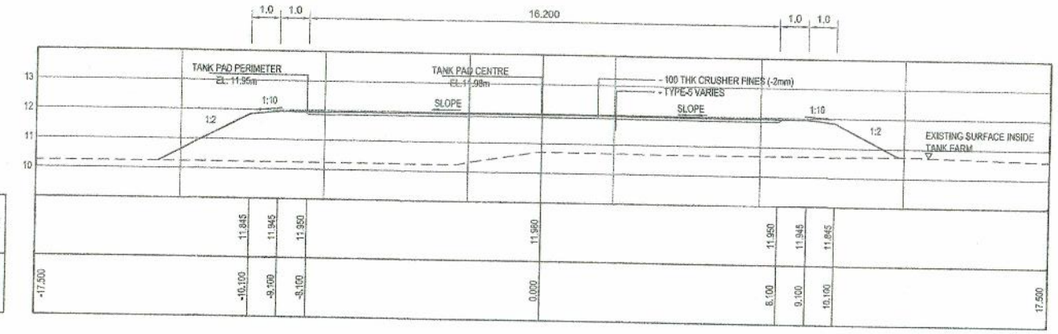
(H353004-40000-220-273-0001-0001, Rev. 1)

DWG. No. H353004-40000-220-273-0001-0001

SCALES:
Horizontal 1:100
Vertical 1:100

DATUM 9.000

TERRACE LEVELS THROUGH CENTRE	11.845	11.945	11.950	11.950	11.950	11.945	11.845	
DISTANCE(m)	-17.500	-10.100	-9.100	-8.100	0.000	8.100	9.100	10.100	17.500

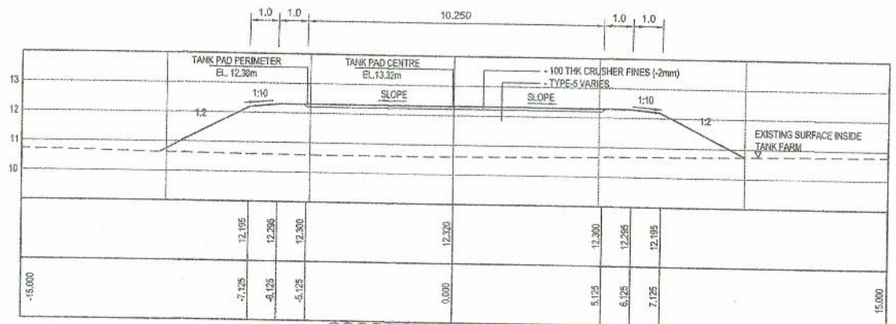


SECTION A-A THROUGH TK011 TERRACE
FROM -17,500 TO +17,500

SCALES:
Horizontal 1:100
Vertical 1:100

DATUM 9.000

VERTICAL PROFILE GRADES	12.195	12.295	12.300	12.300	12.300	12.295	12.195	
DISTANCE(m)	-15.000	-7.125	-6.125	-5.125	0.000	5.125	6.125	7.125	15.000



SECTION B-B THROUGH TK010 TERRACE
FROM -15.000 TO +15.000

PERMIT TO PRACTICE
HATCH LTD.
Signature
Date Aug 21, 2017
PERMIT NUMBER: P 512
The Association of Professional Engineers, Geologists and Geophysicists of NWT/NU

REGISTERED PROFESSIONAL ENGINEER
R.A.H
L1247
R. A. HALIM
LICENSEE
21/08/2017
NWT/NU

No.	DESCRIPTION	BY	CHK'D	DATE
1	APPROVED FOR CONSTRUCTION	KT	MB	21/08/2017
0	APPROVED FOR CONSTRUCTION	FH	MB	30/06/2017

REVISIONS

ROLE	NAME	SIGNATURE	DATE
DRAFTSPERSON	K TEFFU	NR	21/08/2017
DESIGNER	K TEFFU	NR	21/08/2017
CHECKER	F HUGO		21/08/2017
DESIGN COORD.	R GOOSEN		21/08/2017
RESP. ENG.	R HALIM	RAH	21/08/2017
LEAD DISC. ENG.	A GROBBELAAR		21/08/2017
AREA MANAGER	J HOWES		21/08/2017
PROJ. MANAGER			
CLIENT			

DRAWING APPROVAL STATUS: Approved for Construction

HATCH

Baffinland

BAFFINLAND IRON MINES LP
MARY RIVER PROJECT

MILNE PORT
FUEL TANKS 010 & 011 DETAILS
TYPICAL SECTIONS

SCALE	DWG. No.	REV
1:100 OR AS NOTED	H353004-40000-220-273-0001-0001	1

SHEET SIZE: D

REFERENCE DRAWINGS

DRAWING No.	DRAWING TITLE
H353004-40000-220-260-0003-0001	NEW FUEL TANKS SETTING OUT DETAILS

REG. PROFESSIONAL

NAME	R.HALIM
SIGNATURE	RAH
ENG REG NUMBER	L1247
REVISION DATE	21/08/2017
ORIGINAL DATE	07/07/2017

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21-AUG-2017
16:59
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Attachment 6

Memo: Calculations of Tank Farm Containment Capacity

(H353004-00000-240-202-0001, Rev. A)

Baffinland HATCH

Calculation Cover Sheet

Client:	Baffinland Iron Mines LP		
Project Title:	Mary River Project		
Discipline:	Mechanical		
Calculation No.:		**File No:**	**Number of Sheets:** 7

Description:

The Mary River tank farm located on Baffin Island will be modified to include the installation of one 15 ML Marine Diesel Tank, one 3ML Marine Diesel Tank and one 750,000l Jet Fuel tank. The attached calculations provide the volume required by code, and the approximate available volume within the dyke.

Category of calculation verification required *tick box* ☑ 1 ☐ 2 ☐ 3 ☐ 4

Prepared by:	Michael Doodeman	**Date:**	22 June 2017
Print Name >	(Responsible Engineer)		
Preliminary Review by:	James Cleland	**Date:**	22 June 2017
Print Name >			

Can the calculation now be released for work? ☑ Yes ☐ No **To the Client?** ☑ Yes ☐ No

Checked by: by:		**Date:**	
Print Name >			
Reviewed by:	M. MacIntyre	**Date:**	27 June 2017
Print Name >	Michael MacIntyre		
Approved by:	J. Butts	**Date:**	27 June 2017
Print Name >	Floyd Butts		

General Notes:

The referenced 3d model (Baffinlands_Dyke_Storage_17_06_27.dwg) was utilized to establish overall available dyke volume based on As-Built data. The available dyke volume is 4.73 % greater than code requirements.
Required Liquid Volume: 20,461m3
Actual Dyke Liquid Volume: 21,476m3

Revisions

Rev.	Date	Prepared by	Checked by	Approved by	Description

Superseded by Calculation No. **Date:**

Reason voided:

Milne Port Dyke Calculations to NFC Requirements

11 Tank Combined Dyke (two tier)		**353004 Earth Dyke**
Tanks 4, 5 & 6 Diameter (3 Tanks)	31.80	m
Tanks 4, 5 & 6 Height	15.3	m
Tanks 3 Diameter (1 Tank)	32.65	m
Tanks 3 Height	18.15	
Tanks 1 & 2 Diameter (2 Tanks)	25.6	m
Tanks 1 & 2 Height	9.76	m
Tanks 7, 8, 9 & 10 Diameter (4 Tanks)	10.25	
Tanks 7, 8, 9 &10 Height	9.14	
Tanks 11 Diameter (1 Tank)	16.25	
Tanks 11 Height	15.10	
Tanks 4, 5 & 6 Capacity	12,151,658	Litre
Tank 3 Capacity	15,196,126	
Tanks 1 & 2 Capacity	5,023,653	Litre
Tanks 7, 8, 9 & 10 Capacity	754,195	
Tanks 11 Capacity	3,131,652	
Total Tank Volume	67,846,841	Litre
Tank Volume	67,847	m^3
Required Volume	20,461	m^3
Number of Tanks	11	
Dyke - Overall Height	1.7	m
Dyke - Crest Width	0.6	m
Max Liquid Height	1.400	m
Freeboard	0	m

Useable volume from 3D Model	21,476 m3	
Difference	1,014.803	4.73%
	1,015	

Pad Containment Volume (m^3)							
Zone / Area	Dimension	Length of Zone	Width of Zone	Elevation	Height	Volume	Notes & Assumptions
Blue Zone	Top of Dyke	125.20	141.10	12.35	1.55	26,597.37	**Used dyke liner elevation as top. Elevation change along width of pad ignored for conservative estimate. Floor length is measured from edge of the dyke at the top of the 350 THK Type 5 fill.
	Toe/Floor of Dyke	120.20	138.60	10.80			
Green Zone	Top of Dyke	125.20	49.10	12.35	0.80	4,855.50	**Volume found by using cross section trapezoidal area across the zones.
	Toe/Floor of Dyke	123.80	48.40	11.55			

Tank Pedestal Volume & Tank Volume (Below Top of Dyke) m^3								
Tank	Tank # / Zone	Dimension	Radius	Height	Quantity	Unit Volume	Volume	Notes & Assumptions
750000 L	TK 7,8 - Blue	Top/Inner Radius	7.16	0.95	2.00	197.00	394.00	**No 150 THK Type 7 Fill as floor of pedestal. **Truncated cone volume used i.e trapezoidal cross section assumed.
		Floor/Outer Radius	9.06					
	Tank Volume	Constant Radius	5.16	0.60	2.00	50.11	100.22	
	TK 9,10 - Blue	Top/Inner Radius	7.16	1.50	2.00	356.62	713.23	** Constant floor elevations assumed for each pedestal; if the height of the pad is greater than the dyke liner height, the dyke liner height governs for height/volume calculation. ** Tank Pad Perimeter Elevation used as constant top height of truncated cone. Top radius includes distance to pad perimeter until meeting slope from base.
		Floor/Outer Radius	10.16					
	Tank Volume	Constant Radius	5.16	0.05	2.00	4.18	8.35	
3 ML	TK 11 - Blue	Top/Inner Radius	10.10	1.15	1.00	458.84	458.84	
		Floor/Outer Radius	12.40					
	Tank Volume	Constant Radius	8.10	0.40	4.00	82.45	329.79	
5 ML	TK 1,2 - Green	Top/Inner Radius	14.01	0.80	1.00	555.66	555.66	
		Floor/Outer Radius	15.71					
	Tank Volume	Constant Radius	12.80					
12 ML	TK 4 - Blue	Top/Inner Radius	18.00	1.45	1.00	1,726.48	1,726.48	
		Floor/Outer Radius	20.90					
	Tank Volume	Constant Radius	16.00	0.10	1.00	80.42	80.42	
	TK 5,6 - Blue	Top/Inner Radius	18.00	1.15	2.00	1,326.50	2,653.00	
		Floor/Outer Radius	20.30					
	Tank Volume	Constant Radius	16.00	0.40	2.00	321.70	643.40	
15 ML	TK 3 - Blue	Top/Inner Radius	18.25	1.55	1.00	1,952.76	1,952.76	
		Floor/Outer Radius	21.75					
	Tank Volume	Constant Radius	16.25					

Other Volumes (m^3)			
Zone / Area	Dimension	Volume	Notes & Assumptions
Access Ramp	Whole Ramp	418.93	**See attatched hand calculation for details & assumptions. Note this calculation is very rough, likely within 20% of actual value (doesn't take into account overlapping volume with dyke i.e conservative estimate)

Diesel Volume (L)	Diesel Volume w/o 15ML (biggest tank)	Minimum Volume Needed	Spill Volume Available	
			m^3	L
67,000,000.00	52,000,000.00	20,200,000.00	**21,417.78**	**21,417,782.47**

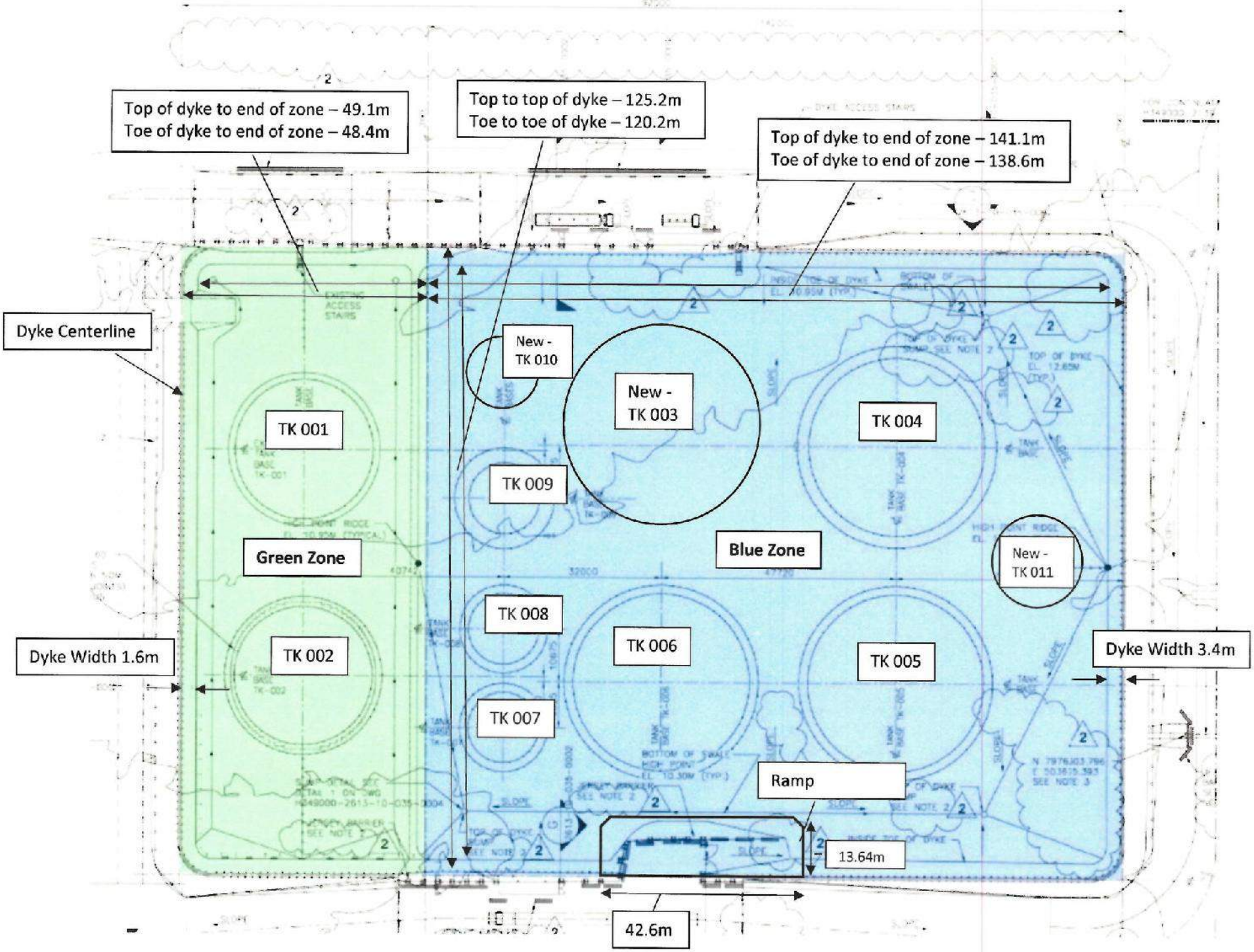
Spill Volume Available > Minimum Volume Needed

Pad Containment Volume (m^3)							
Zone / Area	Dimension	Length of Zone	Width of Zone	Elevation	Height	Volume	Notes & Assumptions
Blue Zone	Top of Dyke	125.20	141.10	12.35	1.55	26,597.37	**Used dyke liner elevation as top. Elevation change along width of pad ignored for conservative estimate. Floor length is measured from edge of the dyke at the top of the 350 THK Type 5 fill.
	Toe/Floor of Dyke	120.20	138.60	10.80			
Green Zone	Top of Dyke	125.20	49.10	12.35	0.80	4,855.50	**Volume found by using cross section trapezoidal area across the zones.
	Toe/Floor of Dyke	123.80	48.40	11.55			

Tank Pedestal Volume & Tank Volume (Below Top of Dyke) m^3								
Tank	Tank # / Zone	Dimension	Radius	Height	Quantity	Unit Volume	Volume	Notes & Assumptions
750000 L	TK 7,8 - Blue	Top/Inner Radius	7.16	0.95	2.00	197.00	394.00	**No 150 THK Type 7 Fill as floor of pedestal. **Truncated cone volume used i.e trapezoidal cross section assumed. ** Constant floor elevations assumed for each pedestal; if the height of the pad is greater than the dyke liner height, the dyke liner height governs for height/volume calculation. ** Tank Pad Perimeter Elevation used as constant top height of truncated cone. Top radius includes distance to pad perimeter until meeting slope from base.
		Floor/Outer Radius	9.06					
	Tank Volume	Constant Radius	5.16	0.60	2.00	50.11	100.22	
	TK 9,10 - Blue	Top/Inner Radius	7.16	1.50	2.00	356.62	713.23	
		Floor/Outer Radius	10.16					
	Tank Volume	Constant Radius	5.16	0.05	2.00	4.18	8.35	
3 ML	TK 11 - Blue	Top/Inner Radius	10.10	1.15	1.00	458.84	458.84	
		Floor/Outer Radius	12.40					
	Tank Volume	Constant Radius	8.10	0.40	4.00	82.45	329.79	
5 ML	TK 1,2 - Green	Top/Inner Radius	14.01	0.80	1.00	555.66	555.66	
		Floor/Outer Radius	15.71					
	Tank Volume	Constant Radius	12.80					
12 ML	TK 4 - Blue	Top/Inner Radius	18.00	1.45	1.00	1,726.48	1,726.48	
		Floor/Outer Radius	20.90					
	Tank Volume	Constant Radius	16.00	0.10	1.00	80.42	80.42	
	TK 5,6 - Blue	Top/Inner Radius	18.00	1.15	2.00	1,326.50	2,653.00	
		Floor/Outer Radius	20.30					
	Tank Volume	Constant Radius	16.00	0.40	2.00	321.70	643.40	
15 ML	TK 3 - Blue	Top/Inner Radius	18.25	1.55	1.00	1,952.76	1,952.76	
		Floor/Outer Radius	21.75					
	Tank Volume	Constant Radius	16.25					

Other Volumes (m^3)			
Zone / Area	Dimension	Volume	Notes & Assumptions
Access Ramp	Whole Ramp	418.93	**See attatched hand calculation for details & assumptions. Note this calculation is very rough, likely within 20% of actual value (doesn't take into account overlapping volume with dyke i.e conservative estimate)

Diesel Volume (L)	Diesel Volume w/o 15ML (biggest tank)	Minimum Volume Needed	Spill Volume Available	
			m^3	L
67,000,000.00	52,000,000.00	20,200,000.00	**21,417.78**	**21,417,782.47**


Top of dyke to end of zone – 49.1m
Toe of dyke to end of zone – 48.4m
Top to top of dyke – 125.2m
Toe to toe of dyke – 120.2m
Top of dyke to end of zone – 141.1m
Toe of dyke to end of zone – 138.6m
Dyke Centerline
New - TK 010
New - TK 003
TK 001
TK 004
TK 009
Green Zone
Blue Zone
New - TK 011
TK 008
TK 006
TK 005
TK 002
Dyke Width 1.6m
Dyke Width 3.4m
TK 007
Ramp
13.64m
42.6m

HATCH

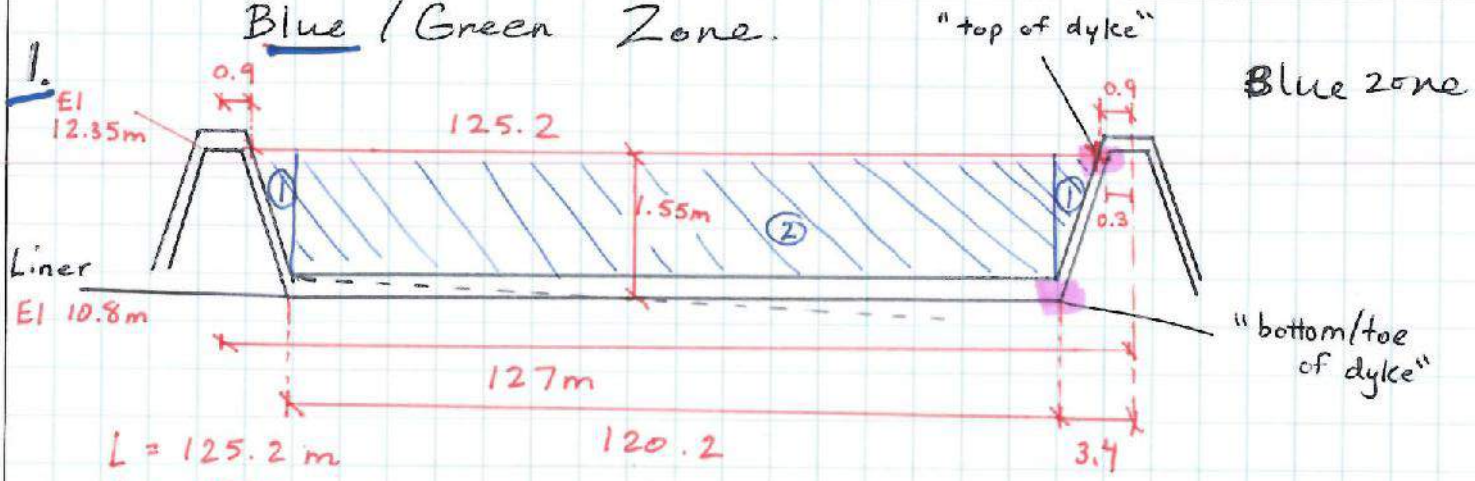
CALCULATION SHEET

SHEET NO. 1 OF 3

DESCRIPTION	PROJECT NO	MADE BY	CHECKED BY
"Fuel Pad Containment Volume"	"H353004"	"MD" DATE	DATE

Blue / Green Zone.

1.



$L = 125.2\ m$

$h = 1.55m$

width top = 141.1m

width floor = 138.6m

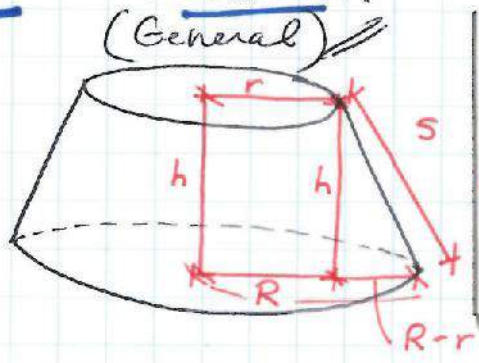
$V = A \times l_{avg}$

$= (① + ②)\, l_{avg}$

$= \left[\frac{1.55(125.2-120.2)}{2} + 120.2(1.55)\right]\left(\frac{141.1+138.6}{2}\right)$

$= 26,597.37\ m^3$

2. Tank or (General)



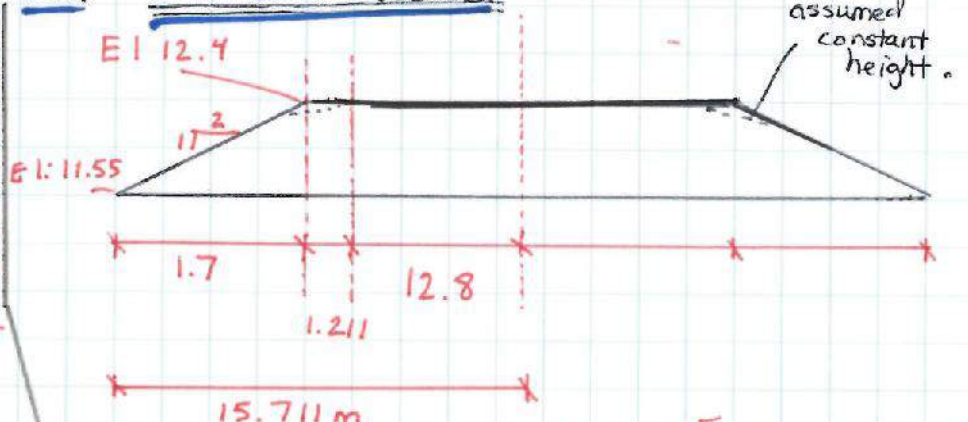
$S = \sqrt{(R-r)^2+h^2}$

LAT S.A. $= \pi(R+r)S$

~~Fo~~

$V = \frac{\pi h}{3}\left[Rr + R^2 + r^2\right]$

2a. 5 ML Pedestal



$R = 15.711m$

$r = 14.01m$

Since El > 12.35

use 12.35 as top elevation

& 11.55 as floor elevation

$\therefore h = 0.8$

$\Rightarrow V = \frac{\pi(0.8)}{3}\left[(15.711)(14.01) + 15.711^2 + 14.01^2\right]$

$= 555.62\ m^3$

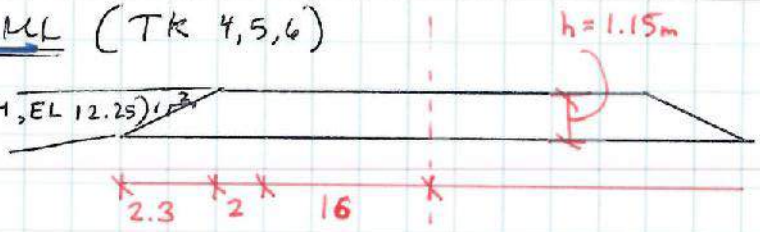
HATCH

CALCULATION SHEET

SHEET NO. 2 OF 3

DESCRIPTION	PROJECT NO	MADE BY	CHECKED BY
" "	" "	" "	
		DATE	DATE

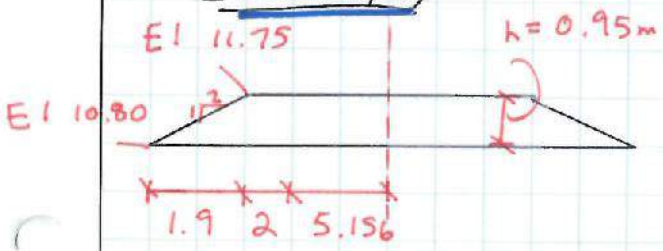
2b 3-12 ML (TK 4,5,6)



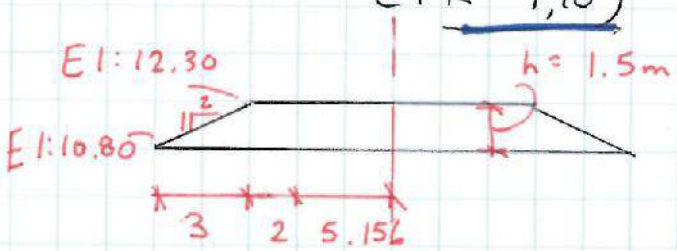
R = 20.3
r = 18

R = 20.90
r = 18

2c ~~4~~ x750 kL

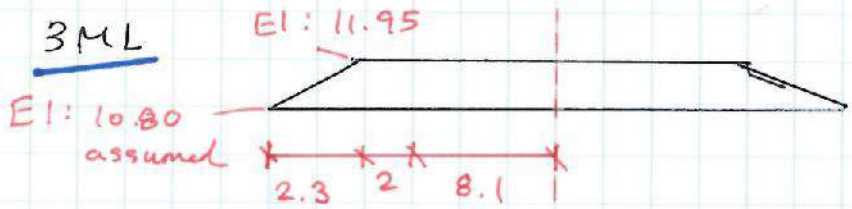


R = 9.056m
r = 7.156m



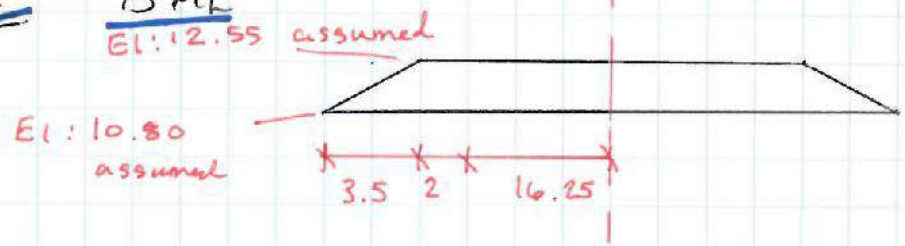
R = 10.156 m
r = 7.156 m

2d 3ML



R = 10.1 m
r = 12.4 m

2e 15 ML



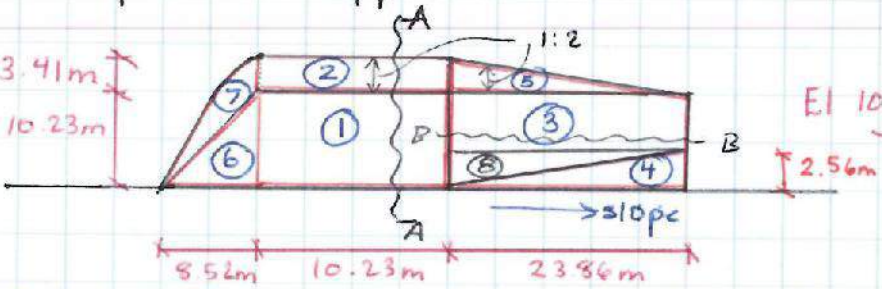
R = 21.75m
r = 18.25m

HATCH | CALCULATION SHEET | SHEET NO. 3 OF 3

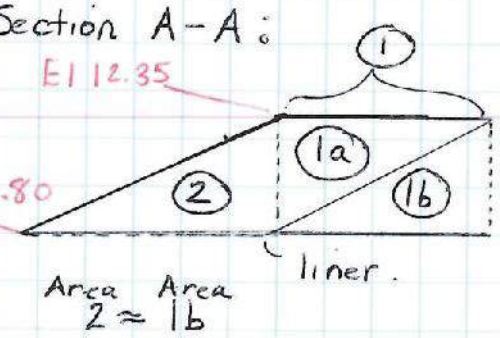
DESCRIPTION | PROJECT NO | MADE BY / DATE | CHECKED BY / DATE

3 Ramp

Top View Approximated



Section A-A:



Area 2 ≈ Area 1b

* Since (1b) already calculated with dyke volume consideration & since (2) ≈ (1b) ∴ total volume of (1) & (2) can be approximated by (1a) + (1b)

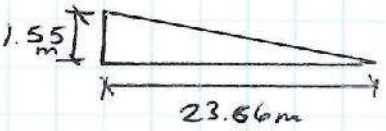
Volume (1) & (2)

$V = 10.23m(10.23m)(12.35-10.8) = 162.21m^3$.

* Assume (4) is at top elevation ~~∴ (4) ≈ (5)~~ ∴ let's assume full height (4) ≈ (4) + (8) + (5)

~~Slope~~ : B : B

Volume (4), (5), (8)



$V = \left[\frac{1}{2}(23.86)(2.56)\right]1.55$

$= 47.34m^3$.

Total Volume $= \sum_{i=1}^{8} V_i$

$= 418.93m^3$.

Volume (3) using section B : B :

$V = \frac{1}{2}(1.55)(23.86)(10.23-2.56)$

$= 141.83m^3$

Volume (6) (7) Since overestimate used for ~~4, 5, 8~~, neglect (7).

So (6):

$V = \frac{1}{2}(8.52)(10.23)(1.55)$

$= 67.55m^3$.

Attachment 7

Construction Methodology Milne Inlet Fuel Storage Facility System

(H353004-40000-400-050-0002, Rev. 1)

Plan

Construction Methodology Milne Inlet Fuel Storage Facility

2017-08-21	1	Approved for Use	G Sterling / N Mills	J Howes	S Heiner	M Weaver
2017-07-11	0	Approved for Use	L Langlois	T Bruce	S Heiner	M Weaver
Date	**Rev.**	**Status**	**Prepared By**	**Checked By**	**Approved By**	**Approved By**
			HATCH			**Employer**

Construction Methodology – Milne Inlet Fuel Storage Facility

1. Overview

Capacity increase of the current Milne Inlet Fuel Storage Facility (Fuel Storage Facility) is required to ensure sufficient fuel is available to achieve full production (4.2 Mtpa) and execute operational plans for the upcoming year from September 2017 until July 2018.

2. Scope of Work

The scope of work encompasses the construction and placement of two (2) additional fuel tanks at the Milne Inlet Fuel Storage Facility. The 2 fuel tanks to be added to the Fuel Storage Facility include: a 3M litre diesel fuel tank and a 750K litre fuel tank along with all associated piping.

Both tanks will be placed within the existing containment of the Fuel Storage Facility and in the specific positions as shown in Hatch document: Milne Port Fuel Tanks 010 & 011 Setting Earthworks (H353004-40000-220-260-0003-0001). Tank 011 will be fabricated onsite. Tank 010 will arrive to site prefabricated and will be placed in the Fuel Storage Facility using onsite equipment (cranes).

In addition, one (1) existing piping sub-system will need to be relocated and two (2) new piping sub-systems will need to be installed within the Fuel Storage Facility's containment in order to tie in the two (2) new tanks into the existing piping system and ultimately into the existing Fuel Storage Facility's fuel distribution module(s). Moreover, the incomplete diesel piping system between the Fuel Storage Facility and the Milne Port diesel generators will be completed.

Tag Number	Description	Fuel Stored	Diameter	Height
TK-010	750,000 Litre tank	-	10.25m	9.14m
TK-011	3,000,000 Litre Tank	Arctic Diesel	16.20m	15.25m

3. Planning, Coordination & Security

Perimeter fencing will be maintained throughout the execution of the scope of work. A section of the existing perimeter fence near the equipment access ramp, as shown in Figure 1, will be removed and replaced with a similar height and type fencing which can be opened and closed. This will allow the required mobile equipment to access the Fuel Storage Facility during construction. This equipment access route (gate) will be kept locked when not in use, with care and control of the keys to be maintained by the Construction Manager, the HS&E lead and the responsible Baffinland Operations person designated as the authority. Under no

circumstances will other personnel have access to the keys for this equipment access route (gate).

All signs and lighting will be maintained throughout the execution of the scope of work. All construction personnel will access the construction area through the existing man gates.

An authorized person as designated by the responsible Baffinland Operations department will deliver an area specific orientation program. All personnel involved with the scope of work will be required to attend before they can participate with construction. Should any additional training requirements be required, all relevant personnel will be required to attend. The identity of these authorized personnel will be maintained on a registry which will be held by the Contractor's HS&E lead.

Due to the nature of the scope of work and its execution methodology, the entire Fuel Storage Facility will be considered a Hot Work Zone. At the start of each shift, a JHA (Job Hazard Analysis) will be developed with the involvement of all relevant personnel. A Hot Work Permit process will be approved and implemented in coordination with the Baffinland Health & Safety department and the relevant contractors. A Hot Work Permit will be required to start work at the beginning of each shift. The Contractor's H&SE lead will be present and will ensure that all personnel participating in the JHA have signed the document, are identified on the hot work permit and are also listed on the authorized personnel registry.

The existing Baffinland card identification system will be implemented for this scope of work. All personnel, will participate as required in the scheduled security drills and security exercises.

Upon completion of the scope of work, the Fuel Storage Facility will be reinstated by installing the facility's original perimeter fencing.

Targeted planning sessions will be held between relevant Baffinland Operations personnel and the responsible contractors to develop strategies and coordinate activities for the scope of work and subsequent fuel deliveries (sealifts).

Reference(s):
Milne Inlet Marine Facility Security Plan (BAF-PH1-310-P16-0001, Rev. 7)
Milne Port Fuel Tanks 010 & 011 Setting Earthworks
(H353004-40000-220-260-0003-0001)

4. Construction Methodology

4.1 Civil

Construction of the tanks will commence upon completion of the decontamination activities within the Fuel Storage Facility's containment. Decontamination activities will consist of treating hydrocarbon impacted storm water within the Fuel Storage Facility's containment using the onsite mobile Oily Water Treatment System operated by Baffinland.

The contract for the mechanical scope of work has been awarded to an experienced tank fabricating contractor (Mechanical Contractor) that has substantial northern experience and significant previous experience constructing tanks at the Milne Inlet Fuel Storage Facility.

Upon completion of the decontamination activities, a small contingent of the Mechanical Contractor's personnel will be mobilized for a brief period to reroute the existing marine receiving piping system which is located inside the facility's containment area. This relocation is required since the current route of the piping system is in the location planned for the new 3M litre diesel tank.

A civil contract has been awarded to a contractor (Civil Contactor) with significant previous experience onsite.

Prior to the execution of any earthworks related activities, a topographical survey will be undertaken to determine the elevation of the existing contours within the Fuel Storage Facility's containment. This activity will assist in safeguarding the integrity of the underlying HDPE liner when the placed materials (i.e., access ramp, crane pads) are recovered.

Along the west side of the Fuel Storage Facility, a temporary access ramp, as shown in Figure 1, will be built on top of the existing berm using fine material and configured in a diagonal direction to enable entry of light equipment such as a tracked Skid Steer and crane. This temporary access ramp will facilitate the access and egress of equipment, materials, and consumables during the construction of the tanks and associated piping. This overbuild approach will ensure that mobile equipment used for the scope of work do not come in contact with any hydrocarbon impacted soils present within the Fuel Storage Facility's containment and do not transfer the impacted soils outside the boundaries of the existing Fuel Storage Facility's containment.

Refer to Section 4.5 for details on the decommissioning and recovery of the temporary access ramp and crane pads.

Reference:
Milne Inlet Marine Facility Security Plan (BAF-PH1-310-P16-0001, Rev 7)

New foundations (pedestals) will be constructed of fine material for the two (2) tanks, as shown in Hatch document: Milne Port Fuel Tanks 010 & 011 Setting Earthworks (H353004-40000-220-260-0003-0001). No heavy, steel tracked equipment will be utilized within the Fuel

Storage Facility's containment and all material will be transported into the facility's containment using rubber tired loaders and rubber tracked Skid Steers. The tank foundation design (pedestal) will be constructed of the same material and in the same configuration as the Fuel Storage Facility's existing tanks.

Determined by the capacity of the cranes being used, 2 locations, as shown in Figure 1, have been identified for the crane position and pads at the Fuel Storage Facility. Construction of the crane pads will involve the placement of fine material followed by the placement of wooden crane pads on top of the fine material to ensure the weight is distributed evenly and consistently. The selected locations for the crane positions and pads will enable a 360° swing radius and enable the crane to pick up and place materials within the Fuel Storage Facility.

References:
Milne Port Fuel Tanks 010 & 011 Setting Earthworks
(H353004-40000-220-260-0003-0001)

4.2 Plate Work

For all hot work (i.e., welding) associated with the Fuel Storage Facility, a Hot Work Policy (referenced below) will be instated, and all relevant procedures followed.

The Mechanical Contractor will be mobilized to the Fuel Storage Facility to begin tank construction of Tank 011 prior to the civil work being completed in the Facility's containment. All associated equipment such as welding units, compressors and tooling will be set up. Plate work will commence with the placement and welding of the floor plates on a temporary level platform outside the Facility's containment, west of the Facility. After the completion of the civil work in the Facility's containment, and after the tank floor plate work is completed, the tank floor will be lifted into place utilizing a crane with the correct capacity. The floor will be positioned in its final location and level checked. Upon verification that the floor is correct, the installation of the first course of the tank shell (wall) will occur. All shell plate welding will start with the vertical joints and then, upon completion, the shell will be fitted and welded to the floor.

The erection of each course will start with the fitting and welding of all external vertical welds followed by the welding of the same vertical welds on the inside of the tank. Upon completion of the vertical welds, the horizontal welds will be completed in the same sequence, starting with the external welds and ending with the internal welds. Each course will follow this same sequence.

Upon completion of the shell section, internal columns and roof purlins will be installed and bolted for alignment and welded followed by the fitment and welding of the roof section.

Phased array ultrasonic testing will be ongoing throughout the construction process as well as the installation of the prefabricated nozzles.

During the tank construction and placement, the fabrication and installation of the external circular staircase, complete with hand rails, and the roof top handrails and walkways will be completed. All material will be constructed of pre-galvanized steel.

Taking into account labour densities and respecting the crane hoisting location and activities, installation of concrete pipe supports and pre-spooled piping will be completed during the construction of the tanks.

4.3 Electrical

The earth grounding system for the new tanks will be similar to the Fuel Storage Facility's existing system. As-built documentation for the Fuel Storage Facility will be consulted to determine the location of the buried grounding system. Once the location is determined, the existing buried grounding system will be manually exposed with shovels. The new system will be joined with the existing grounding system with CADWELD connections and hand covered with shovels to reinstate.

4.4 Miscellaneous Piping

The diesel piping system that runs from the Fuel Storage Facility to the Milne Port diesel generators was not completed during the construction of the Fuel Storage Facility in 2013. Currently the diesel piping system exits the Fuel Storage Facility on its south side over a berm via a pipe bridge and follows a previously constructed pipe bench but terminates short of the Milne Port diesel generators. The diesel piping system, consisting of 2" diameter piping, will be extended to the Milne Port diesel generators and commissioned.

4.5 Completion

Upon completing the scope of work detailed above, all material previously placed in the Fuel Storage Facility for the crane pads and access ramp will be recovered. Recovered material will be assessed for hydrocarbon contamination. Material determined to be contaminated will be transferred to the Milne Port Landfarm Facility or transferred into Quatrex bags for shipment offsite for proper disposal at a licensed waste facility.

If during execution, any mobile equipment comes in contact with hydrocarbon impacted soils contained in the Fuel Storage Facility's containment, contaminated components (i.e., wheels, tracks) will be wash-down within the Fuel Storage Facility's containment prior to demobilization.

5. Reference Documents

Table 5-1: Reference Documents

Document Identification	Document Title	Author
BAF-PH1-310-P16-0001, Rev.7	***Milne Inlet Marine Facility Security Plan***	***Baffinland***
H353004-40000-220-260-0003-0001	***Milne Port Fuel Tanks 010 & 011 Setting Earthworks***	***Hatch***

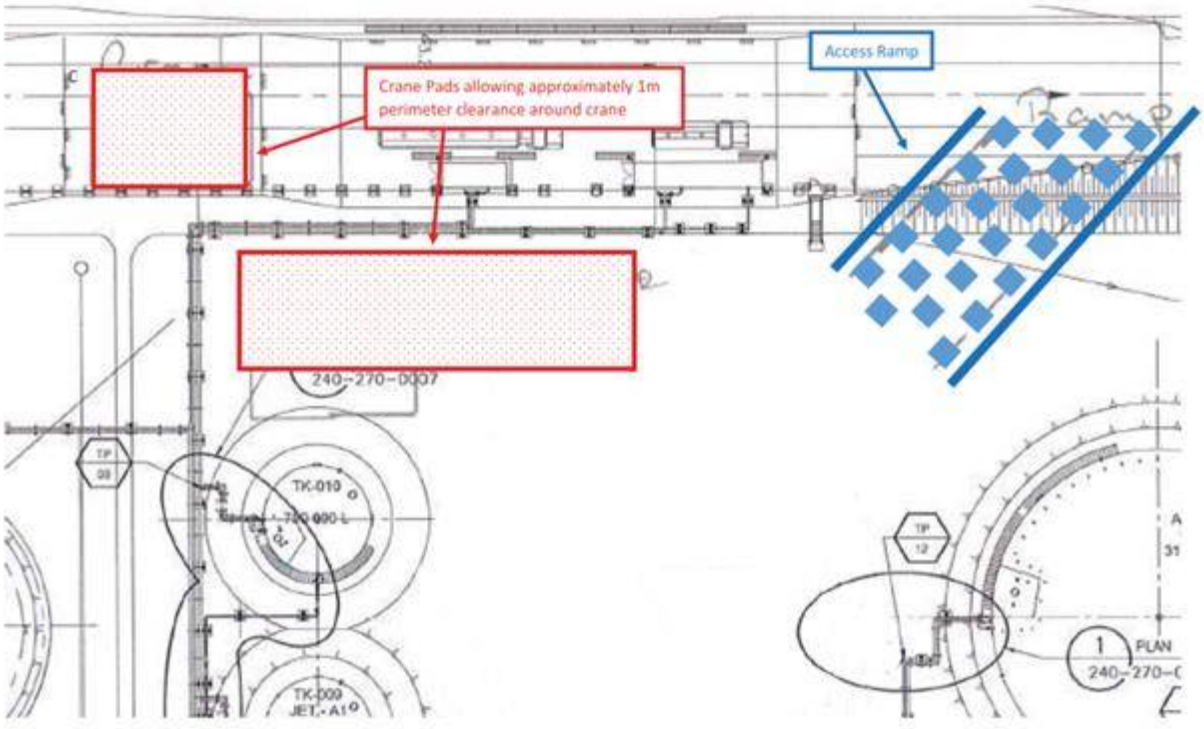


Figure 1: Crane Pad Locations and Access Ramp