Baffinland
Iron Mines Corporation

BHM Project No.: 14-084

BAFFINLAND IRON MINES CORPORATION

ANNUAL GEOTECHNICAL INVESTIGATION
MARY RIVER PROJECT
2014 INSPECTIONS

Prepared for:

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DRAWINGS

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Baffinland Iron Mines Corporation
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Attention: Jeff Bush
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RE: ANNUAL GEOTECHNICAL INSPECTIONS
BAFFINLAND IRON MINES CORPORATION
OUR REFERENCE NO. 14-084

1.0 INTRODUCTION

Barry H. Martin, P. Eng., Consulting Engineer completed the 7th annual water licence geotechnical inspection of the following on-site engineered facilities:

Pit Walls
Quarries
Landfills
Land farms
Bulk Fuel Storage Facilities
Sediment Ponds
Collection Ponds
Polishing and Waste Stabilization Ponds

The inspection that took place July 31st/August 5th is the first phase of a biannual inspection to be carried out within the open water shipping season at the two Baffinland sites in Mary River at the mine site and at Milne Inlet at the port facility. A second inspection took place September 25th/30th.

The inspections were carried out in accordance with the guidelines set out in "Dam Safety Guidelines 2007" as published by the Canadian Dam Association.

The inspections were completed by Mr. Barry H. Martin, P. Eng., the design Engineer for the initial containment facilities at both Mary River and Milne Inlet, the runway extension, initial bridges on the connecting road plus the solid waste disposal site.

The previous 6 annual water license geotechnical inspections were completed by Mr. Martin.

The facilities inspected are as per the following:

Mary River Site

1. Bulk Fuel Storage Containment
2. Genorator Fuel Storage Facility Containment
3. Polishing/Waste Stabilization Pond No. 1
4. Polishing/Waste Stabilization Ponds No. 2 and No. 3 (Constructed as a 2 cell structure)
5. Helicopter Fuel Cell Containment
6. Barrel Fuel Containment (Constructed as a 2 cell structure)
7. Hazardous Waste Storage
8. Enviro-Tank Storage (Constructed contiguous with hazardous waste storage and stove oil storage)
9. Stove Oil Storage
10. Jet Fuel Tank and Pump Containment
11. Solid Waste Disposal Site
12. Waste Oil Storage Containment
13. Minesite Steel Fuel Tank Farm Containment
14. Quarry

A site plan for the Mary River site showing most structures reviewed is attached.

Milne Inlet Site

1. Bulk Fuel Containment Facility
2. Existing Polishing/Waste Stabilization Pond
3. Barrel Fuel Storage (Constructed as a 2 cell structure)
4. Hazardous Waste Storage (Constructed as a 2 cell structure)
5. Oil and Antifreeze Containment
6. Jet “A” Pump Containment

7. Fuel Tank Farm

8. New Sewage Effluent Pond

9. Land farm

10. Contaminated Snow Containment

11. Sediment Ponds East and West

12. Quarry

A site plan for the Milne Inlet site is attached.

2.0 METHODOLOGY FOR INSPECTION

The geotechnical inspector was Barry H. Martin, P. Eng., who reviewed the two sites for the first of the biannual inspections on July 31st, 2014 to August 4th, 201, just as the annual shipping season commenced and on Sept 25th, 2014 to Sept. 30th, 2014 for the second inspection, just as the shipping season ended.

The inspections primarily focused on the following aspects:

1. The structures were inspected for conformance with the design basis as presented in "as-constructed" and "as-built drawings (provided in the first and subsequent reports).

2. The structures were specifically inspected for settlement, cracking, and seepage through the berms.

3. The areas around the structures were examined for evidence of seepage.

4. Quarry walls were reviewed for relative stability. I note that the quarries were active removal areas and long term stability was not yet established.

5. New structures under construction were reviewed for conformity with design drawings.

6. Photographs were taken to document observations made during the inspection and are attached.

3.0 MARY RIVER CAMP

3.01 General

As with other years, there had been a fair amount of rainfall at Mary River preceding the first inspection and it was expected that there would be some water in the containment dykes. Such was the case. During the second inspection we found ice at the bottom of the containment areas.

A monitoring program is in place to test storm water that does accumulate within the containment structures. As reviewed, the water that does not meet the water license effluent requirements is treated on site prior to release.

At the Bulk Fuel Storage Facility Containment, the water that collects within the dyke is treated at the end of the containment structure.

We report on the quarry and the steel fuel tank containment structure for the first time.

The bulk fuel storage containment is coming due for decommissioning and shall only be in use to accommodate jet "A" fuel until the end of this summer/autumn season.

3.02 Bulk Fuel Storage Facility

General Conditions

A new steel tank storage facility has been constructed at the mine site and it is intended that this facility shall replace the bulk fuel storage facility during this summer season at which time the remaining bladders still containing product shall be emptied.

Only Jet A fuel shall be accommodate by this facility until November at the latest when the total use of this facility shall be discontinued and it shall be due for decommissioning and a final decision has been made on land farming of oil impacted granular cover within the structure.

Stability

At the time of our first review, water had not been removed for a period from within the containment and water was ponding above the level of the gravel within the bottom of the containment. There was still considerable factor of safety against failure of oil holding bladders within the dykes with the water level as it exists. Such was the case during the second inspection, but the water had frozen.

The structure was visually inspected for any signs of cracking or subsidence. There was no indication of any settlement, seepage, or cracking in the soil structures that formed the dykes. As well, there was no indication of seepage at the base of the structure around the exterior.

The soil structure is considered stable in the present condition and is in conformance with the design basis for the facility.

The presence of water within the structure is an indication of the integrity of the liner.

Recommendations

We have one recommendation. There is limited storage for spills at the load out end of the facility. Water currently ponds above the gravel in this area confirming the integrity of the liner but minimizing the capacity of the structure for spill containment.

We recommend that this water be removed on a regular basis. If the water proves to be oil impacted, it may be pumped to within the storage containment for treatment at a future date.

3.03 Generator Fuel Storage Containment

General Conditions

The containment structure has not varied from its use since our 2010 annual inspection. At that time our recommendation was to limit the fuel contained in this containment facility to 77,376 litres.

There is currently one bladder in this containment facility that has a capacity when full of 120,000 litres. This bladder contains 77,376 litres when the bladder is 32" high. The guideline for Baffinland Iron Mines is to fill this bladder to no more than 76 cm (30") which represents 70,097 litres.

There is a sign posted to limit the bladder height at 30".

At the time of our visit on August 1, 2013, the bladder height was measured at 21". There was water ponding in the bottom of the containment at the time of our review. At the time of our seond review on Sept 26, 2014 the bladder height was measured at 20" and there was ice just above the gravel in the bottom of the containment.

Stability

The structure was visually inspected for any signs of subsidence or cracking and no such indications were noted. There was no sign of seepage at the base of the structure noted. The soil structure is considered to be stable in its present condition and is in conformance with our design principles.

Recommendation

We recommended that the water ponding above the bottom of the containment gravel cover be removed regularly by creating a sump in the gravel and pumping out the water to below the gravel surface.

We recommend that Baffinland Iron Mines continue to control the fuel in the bladder at a height of 30".

3.04 Polishing/Waste Stabilization Pond No. 1

General Conditions

PWSP No. 1 continues to be utilized as a holding facility for sewage plant effluent that does not meet water effluent quality criteria.

Currently the pond is being used primarily as a repository for sewage sludge that is periodically removed from the RBC.

The supernatant from PWSP No. 1 is periodically decanted to PWSPs Nos. 2 and 3 where it is tested and treated as required to meet Water Licence effluent requirements.

At the time of our first visit there was approximately 4' of freeboard to accommodate further sewage and the structure readily conforms to its design intent. At the time of our second visist, there was approximately 6' of freeboard.

Stability

Our review of the area around the pond at the base of the slopes showed no sign of seepage and hence we conclude that the liner has been effective in containing sewage and there are no tears or ruptures in the membrane, excepting some minor tears from past activity at the top of the dyke well above the allowable effluent level in the structure in the horizontal portion of the membrane.

A review of the top of the dyke showed no indication of cracking or settlement which would indicate stresses within the structure.

Many of the tears that had occurred in the liner on the top of the dyke have been patched during the period between reviews in 2008 and 2009 and are holding well. As well, there are no signs of weather related deterioration of the liner where it is exposed.

Monitoring points have been set up on the top of the dyke and have been monitored since 2009. Settlements have occurred since that time. These settlements have not led to any stress cracks in the structure. These settlements are an indication of consolidation in the berm structure and the active layer beneath the dyke and are not considered to be of any concern.

It now can be seen where the structure has settled slightly relative to the soils away from the structure.

There appears to be no sign of erosion of the dykes, even with the large amount of precipitation that occurred this current summer season.

The settlements have had little effect on the integrity of the structure.

Recommendations

We see no reason to continue the monitoring of the top of the berm on an annual basis. With the excellent condition of the dyke construction, we see no reason to continue this function.

3.05 Polishing Ponds/Waste Stabilization Ponds #2 and #3

General Conditions

This structure was designed and constructed as a 2 cell structure.

The supernatant from PWSP #1 is currently discharged to PWSPs Nos. 2 and 3. The treated effluent is tested for Water Licence effluent requirements, treated if necessary, and discharged to the environment.

At the time of our visits there was considerable freeboard to accommodate further sewage and the structure readily conforms to its design intent. There was 5' of freeboard in one cell and the second cell was empty at the time of our second inspection.

Stability

Our review of the area around the pond at the base of the slopes showed no sign of seepage and hence we conclude that the liner has been effective in containing the sewage and there are no tears or ruptures in the membrane.

Longitudinal cracking which appeared in the dykes of PWSP#3 due to the melt of permafrost wedges in 2009 has not reoccurred and we consider this structure to be stable in its present condition.

Monitoring points have been set upon the top of the dyke and have been monitored since 2009. Settlements have occurred since that time. These settlements have not led to any stress cracks in the structure.

There appears to be no sign of erosion of the dykes and plants are continuing to seed themselves on the dykes. This growth is minimal however.

Recommendations

We see no reason to continue the monitoring of the top of the berm on an annual basis. With the excellent condition of the dyke construction, we see no reason to continue this function.

3.06 Helicopter Fuel Tank Containment

General Conditions

The structure was designed and constructed as a single cell structure that contains a 1000 gal fuel storage tank.

The structure currently conforms to its design intent,

In the past, a liner clad wood curb had been added to the top of the berm to prevent the erosion of gravel off the berm, caused by pulling the fuel hose from within the dyke out to the helicopters to provide them with fuel.

Stability

Our review of the area around the pond at the base of the slopes showed no sign of seepage. There is a minor amount of water ponding in the bottom of the containment indicating the integrity of the liner.

A review of the exterior and the top of the berms showed no sign of cracking or settlement which would indicate stress within the structure.

The structure is considered to be stable in its present condition.

Recommendation

We have no recommendations with respect to this structure.

3.07 Barrel Fuel Containment

General Conditions

This particular structure which we called “Barrel Fuel Containment” in our previous inspection reports is a two cell structure which is currently used to accommodate cubes of lubricant and barrels in the east cell and cubes of lubricant and antifreeze in the west cell.

Stability

Our review of the area around this containment structure showed no sign of seepage. This shows that there is reasonably little chance of tearing or rupture of the membrane having taken place.

A review of the exterior and top of the dyke showed no sign of cracking or settlement which would indicate stresses within the structure.

The structure is considered to be stable in its present condition.

Recommendations

We have no recommendations with respect to this structure.

3.08 Hazardous Waste Storage

General Conditions

This particular cell was constructed contiguous with an existing cell, which is referred to on site as the “Enviro Tank Storage”, from drawings by our office in 2010 and conforms to our drawings. It is also contiguous with the Stove Oil Storage cell.

This structure contains barrels and bags of hazardous waste.

Stability

Our review of the area around this cell at the base of the slopes, showed no sign of seepage.

The structure appears stable in its present condition.

Recommendation

There are no recommendations at this time.

3.09 Enviro Tank Storage

General Conditions

This particular structure is constructed contiguous with the Hazardous Waste Storage constructed in 2010 and the Stove Oil Storage cell. It is now utilized as a wash down cell.

There was concern for the integrity of this cell as the cell was dry and the geotextile is exposed from heavy traffic during our initial inspection. During our second inspection, the cell was holding a small amount of water confirming the integrity of the liner.

Recommendations

We recommend that the geotextile over the liner and the granular cover be made good prior to continuing use of this cell as a wash down cell.

3.10 Stove Oil Storage

General Conditions

This particular structure had been used to store barrels of stove fuel in 2011

The structure again contains barrels of stove oil and some Jet "A" fuel.

This structure was constructed in accordance with a standardized drawing provided by this office utilizing a one piece liner.

Stability

Our review of the area around the containment structure shows no sign of seepage. This shows that there is reasonably little chance of tearing or rupture of the membrane having taken place.

A review of the exterior and the top of the dyke showed no sign of cracking or settlement which would indicate stresses with the structure.

The structure is considered to be stable in its present condition.

3.11 Jet Fuel Tank and Pump Containment

This particular structure was reconstructed based on our recommendation of the 2012 Geotechnical Inspection.

The construction was completed in accordance with our recommendations for such structures and the liner was constructed as a one piece liner with geotextile protection on both sides and gravel over the geotextile as protection.

The construction appears proper and the structure is in good condition.

Minor water ponding confirms the integrity of the liner.

Stability

Our review of the area around this cell at the base of the slopes showed no sign of seepage.

The structure is stable in its present condition.

Recommendations.

There are no recommendations at this time.

3.12 Solid Waste Disposal Site

Berms appear stable and no erosion appears to have taken place on the back and both sides of the site.

Solid waste was being placed at the front edge of the site and was awaiting salvage of wood and lumber prior to the placing of cover at the time of our first site review in August. There was considerably more waste covered during the time of our second review on September 25th.

The disposal was being done in exact conformity with plans prepared and guidelines set out for the disposal of solid waste.

The current footprint as established by the existing covered material and the "blow control" fence at the front of the immediate site shall soon be filled and the site footprint shall have to be expanded within the plans and guidelines set out for this solid waste disposal site.

Surveying for the expansion of the site was taking place at the time of our second review in September.

3.13 Waste Oil Storage Containment

This facility has been decommissioned and removed from the site.

3.14 Minesite Steel Fuel Tank Farm Containment

This fuel tank farm has been constructed since the last annual inspection in 2013 in accordance with drawings and specifications prepared by Hatch Engineering under their supervision.
Drawings setting out the construction details are attached to this report.

All work appears to be complete excepting the installation of the sump pits that are on site awaiting installation and which shall be utilized to facilitate the removal of water that collects from precipitation.

Stability

All work appears to have been completed in accordance with drawings and we have no concerns with the stability of this containment structure.

Recommendations

We have no recommendations to make with respect to this containment once the sump is installed.

3.15 Quarry

General Conditions

The quarry has well defined benches. The quarry faces at the benches shall be scaled when quarry operations cease and the benches shall be cleaned and berms placed at the edges of the bench to control the movement of weather induced loose in the long term.

Currently overburden from the top surface is being cleaned and pushed as thawing permits, to serve as long term protection against moving aggregate and the establishment of long term stability.

It is expected that the quarry shall be closed on a permanent basis by next year in 2015.

Stability

The quarry shall be closed in a manner as set out to maintain long term stability.

3.16 Overview

This report is the 7th annual Geotechnical Inspection at Mary River and Milne Inlet completed by this author on behalf of Baffinland Iron Mines Corporation and the first report covering two inspections in one shipping season.

As set out in our past reports, there has been little or no erosion take place from wind or rain and the dykes constructed of the sand/gravel soil have remained stable at slopes of 3:1 and 4:1.

There are only just now, signs of settlement appearing at PSWP's 1, 2 and 3. The settlements are not differential settlements of the dykes but are minor overall settlements of the total structures with respect to the surrounding area.

These settlements appear to be settlements within the one metre ± active layer above the permafrost and are of little concern as the PWSP's are temporary structures and the settlements have no effect on the dyke stability.

It is expected that many of the structures that form the basis for the inspections set out in the biannual Geotechnical inspections shall be decommissioned as the mine facilities are finalized.