APPENDIX E.10.2

2017 FRESHET MONITORING REPORT NO. 2

(Part 2)

APPENDIX C

Sequence of Events and Actions Taken by Spill Report (Including Photos)

APPENDIX C.1

Spill Report 17-161

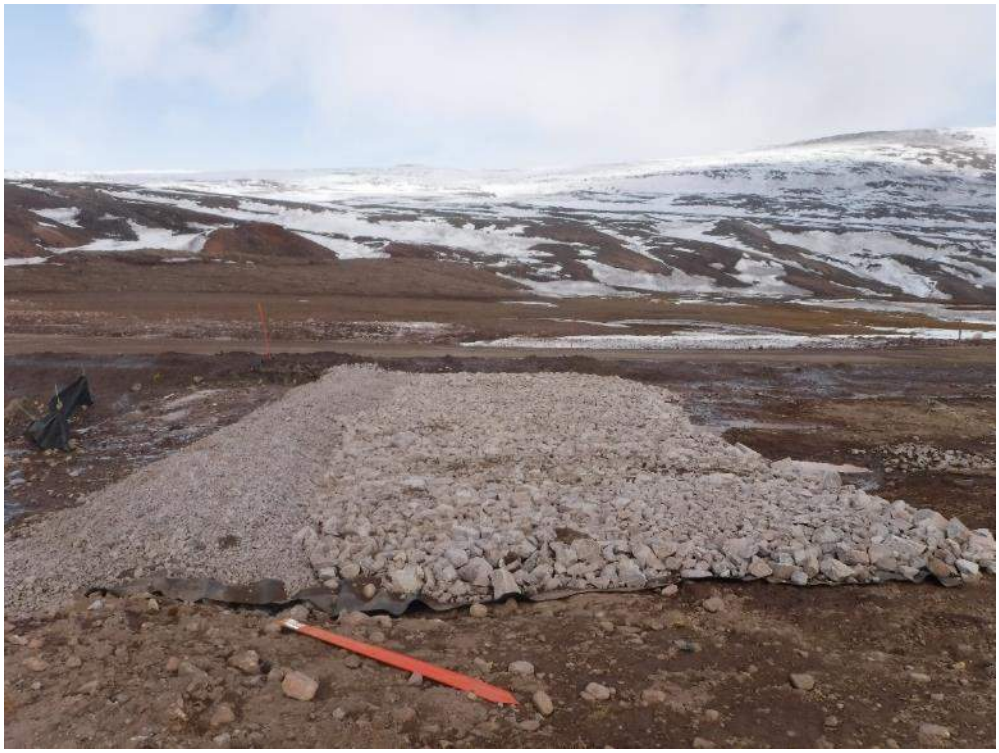
Table C.1 - Spill Report 17-161 - Sequence of Events and Corrective Actions Taken

Date	Description
April 2017	Culverts at CV-187 water crossing replaced and upgraded as proposed in Tote Road Earthworks Execution Plan (TREEP).
May 11, 12, 13	Snowmelt runoff containing sediments and turbid water were observed to flow into Sheardown Lake Tributary 1 (SDLT1) and Sheardown Lake. As outlined in Baffinland's Surface Water and Aquatic Ecosystems Management Plan (SWAEMP), sedimentation control measures (silt fences, spring berms) were installed to improve water quality and settle out sediments prior to discharge.
	Samples collected at water quality monitoring locations SDLT-OUT and LDFG-OUT for Sheardown Lake tributaries. Daily water sampling under Mine Site Freshet Monitoring Program initiated.
May 14	Sediment release to Sheardown Lake Tributary 1 (SDLT1) and Sheardown Lake reported to the NT-NU Spill Line and relevant regulators (**NT-NU Spill Report- 17-161**).
May 15	Berms built up along Tote Road near SDLT1 culvert (CV-186) to prevent road runoff from pooling and directly discharging into SDLT1.
May 16 - May 23	Road embankments near SDLT1 culvert (CV-186) armoured with aggregate (rip-rap). Check dams constructed near culverts CV-186 and CV-187 to control surface runoff entering SDLT1. Sediment ladened snow removed near SDLT1 and placed in natural sumps away from water bodies to allow for sediment settling. Water sampling conducted for additional parameters on May 16, 2017, including acute toxicity, metals, nutrients, oil & grease and major ions.
May 29	INAC Inspectors arrive onsite.
May 30	ECCC Inspector arrives onsite.
May 31 to June 1	ECCC and INAC inspectors inspect Mine Site, Milne Port and Tote Road.
May 18 - June 30	Daily water sampling under Mine Site Freshet Monitoring Program continued. Sedimentation control measures employed (silt fences, spring berms) as required.
November 2017	Culverts at CV-186 water crossing replaced and upgraded.

APPENDIX C.1 – Photo Journal

May 16, 2017 – Snow removal upstream of culvert CV-186 (Sheardown Lake Tributary 1)

May 16, 2017 - Construction of check dam north of culvert CV-186 (Sheardown Lake Tributary 1)



May 17, 2017 - Construction of check dam south of culvert CV-186 (Sheardown Lake Tributary 1)

May 23, 2017 – Armouring road embankment near culvert CV-186 (Sheardown Lake Tributary 1)

June 30, 2017 – Sheardown Tributary 1 outfall to Sheardown Lake

July 2, 2017 - Downstream of CV-187 (Upgraded in April 2017)

APPENDIX C.2

Spill Report 17-162

Table C.2 - Spill Report 17-162 - Sequence of Events and Corrective Actions Taken

Date	Description
May 13	Snowmelt runoff containing sediments and turbid water were observed to flow into Camp Lake Tributary 1 (CLT1) and Camp Lake. As outlined in Baffinland's Surface Water and Aquatic Ecosystems Management Plan (SWAEMP), sedimentation control measures (silt fences, spring berms) were installed to improve water quality and settle out sediments prior to discharge.
	Samples collected at water quality monitoring location CLT-OUT. Daily water sampling under Mine Site Freshet Monitoring Program initiated.
May 14	Sediment release to Camp Lake Tributary 1 (CLT1) and Camp Lake reported to the NT-NU Spill Line and regulators (**NT-NU Spill Report- 17-162**).
May 14 to May 23	Sediment ladened snow removed from ditches along Camp Lake Jetty Access Road (drains into Camp Lake Sedimentation Ponds) and placed in natural sumps away from water bodies to allow for sediment settling. Ditches near the north end of the airstrip armoured with aggregate (rip-rap) to improve water quality of surface water runoff.
May 17	Daily water sampling initiated at water quality monitoring location CLSP-OUT near Camp Lake Sedimentation Ponds (near Camp Lake Water Jetty) under Mine Site Freshet Monitoring Program.
May 17 to May 20	Road embankments near CLT1 culvert BG-01 armoured with aggregate (rip-rap). Sediment ladened snow near BG-01 removed and placed in natural sumps away from water bodies to allow for sediment settling.
May 18 to June 30	Daily water sampling under Mine Site Freshet Monitoring Program continued. Sedimentation control measures employed (silt fences, spring berms) as required.
May 23 & 24	Additional sedimentation mitigation measures implemented downstream of Camp Lake Sedimentation Ponds. Surface water upstream of sedimentations ponds diverted to ephemeral drainages to facilitate settling of sediments.
May 24	Berms of Camp Lake Sedimentation Ponds built up to increase capacity and residency time.
May 29	INAC Inspectors arrive onsite.
May 30	ECCC Inspector arrives onsite.
May 31 to June 1	ECCC and INAC inspectors inspect Mine Site, Milne Port and Tote Road.
June 11	Silt curtain installed in Camp Lake near outlet of Camp Lake Sedimentation Ponds to address sedimentation concerns.
October 2017	Culverts at BG-01 water crossing upgraded to improve surface water management and address sedimentation concerns.

APPENDIX C.2 – Photo Journal

May 14, 2017 – Initial snow removal from ditch along Camp Lake Water Jetty Access Road (Upstream of Camp Lake Sedimentation Ponds)

May 21, 2017 – Continued snow removal from ditch along Camp Lake Water Jetty Access Road (Upstream of Camp Lake Sedimentation Ponds)

May 21, 2017 – Armouring of road embankments near culvert BG-01 (Camp Lake Tributary 1)

May 23, 2017 – Armouring of drainage ditch on South end of Mine Site airstrip near Km 100 (Upstream of Camp Lake Tributary 1)

May 23, 2017 – Completion of drainage ditch armouring on South end of Mine Site airstrip near Km 100 (Upstream of Camp Lake Tributary 1)

June 11, 2017 – Installation of silt curtain on the outlet of Camp Lake Sedimentation Ponds. Spring berms and silt fences installed.

June 22, 2017 – Geotextile installation at check dams in ditch along Camp Lake Water Jetty Access Road

June 23, 2017 – Removing sediment from Camp Lake Sedimentation Ponds

June 26, 2017 – Berm maintenance at Camp Lake Sedimentation Ponds

APPENDIX C.3

Spill Report 17-178

Table C.3 - Spill Report 17-178 - Sequence of Events and Corrective Actions Taken

Date	Description
May 25	Milne Port Ore Stockpile East Sedimentation Pond (MP-05) observed to be overflowing into Milne Inlet. A sudden rise in ambient temperature caused the snow around Milne Port to quickly melt and migrate to the ditches, causing a mass influx of surface water to MP-05. Based upon the erosion/sedimentation concerns caused by the overflow and the significant volumes of water entering MP-05, a controlled emergency discharge was initiated using a pump.
	Monitoring and water sampling program of MP-05 initiated to characterize the water quality of discharges. Water sampling conducted every 2 hours during periods of discharge. Water samples primarily analyzed for total suspended solids (TSS), total dissolved solids (TDS), pH and turbidity.
May 26	Overflow and controlled emergency discharge of MP-05 reported to the NT-NU Spill Line and relevant regulators (**NT-NU Spill Report- 17-178**).
	Control measures (i.e. armouring of bank with aggregate, culvert installation downstream of pond spillway) implemented to mitigate bank erosion downstream of MP-05.
May 27	Water quality samples collected at MP-05 for general chemistry (pH, TSS, etc.), acute toxicity, metals, nutrients, oil & grease and major ions.
May 29	INAC Inspectors arrive onsite.
May 30	ECCC Inspector arrives onsite.
May 31 to June 1	ECCC and INAC inspectors inspect Mine Site, Milne Port and Tote Road.
May 26 - June 7	Intermittent controlled discharges from MP-05 to Milne Inlet conducted to prevent further overflows. Water sampling conducted every 2 hours during periods of discharge. Water samples primarily analyzed for total suspended solids (TSS), total dissolved solids (TDS), pH and turbidity. Discharges to Milne Inlet ended on June 7, 2017 with a cumulative total volume of 18,900 m^3 of effluent discharged from MP-05 to Milne Inlet during freshet 2017 (May 15 to June 30, 2017).
June 25	Culvert and the emergency spillway modifications removed as directed by the INAC Inspector. Eroded and scour areas downstream of MP-05 graded and armored with aggregate (rip rap).

APPENDIX C.3 – Photo Journal

May 26, 2017 – Silt fences installed to mitigate sand washed out from MP-05 overflow

May 26, 2017 – Rip rap used to fill in beach area that was eroded by MP-05 overflow

June 7, 2017 – Aerial view of controlled discharge from MP-05

June 29, 2017 – Additional re-grading of locations that experienced erosion during MP-05 overflow

July 1, 2017 - Additional rip-rap placed downstream of MP-05

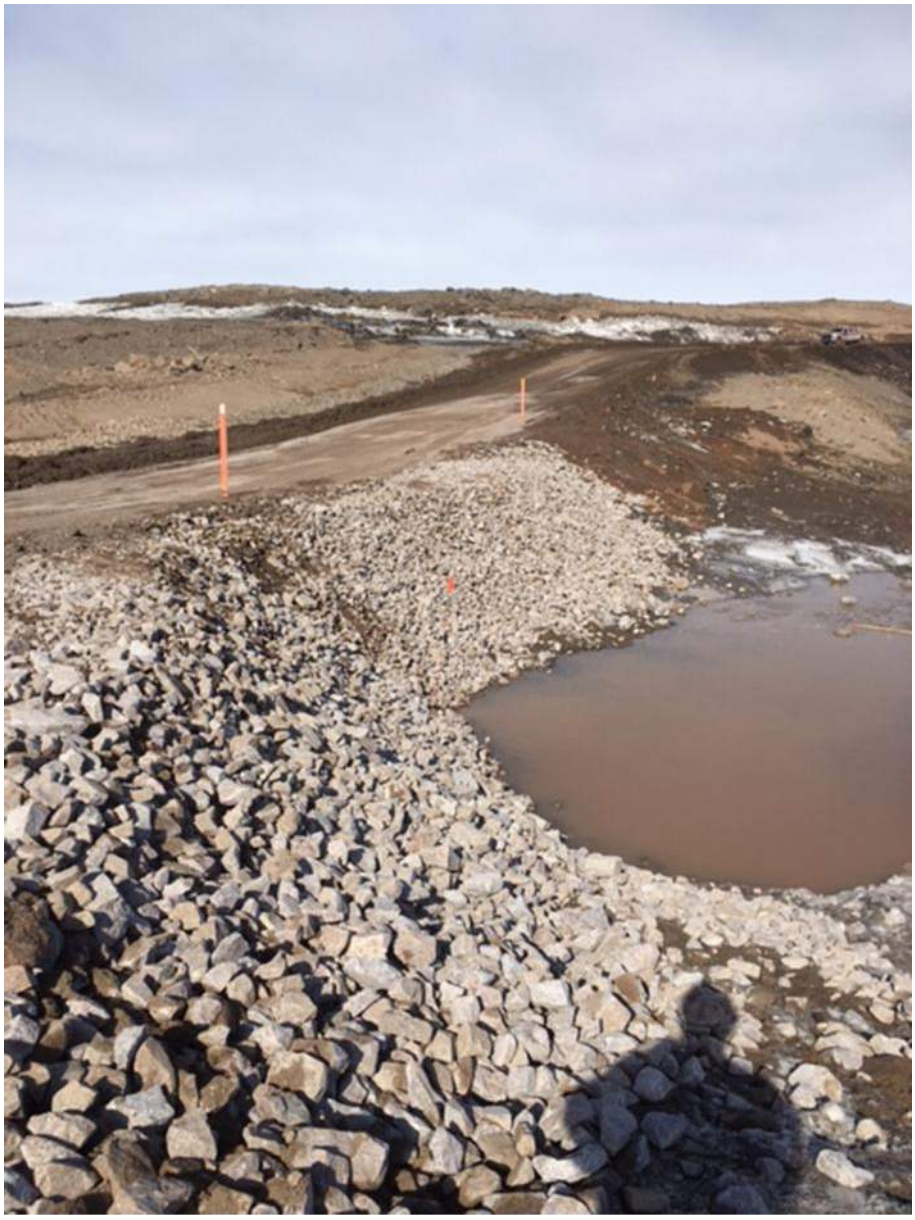
APPENDIX C.4

Spill Report 17-209

Table C.4 - Spill Report 17-209 - Sequence of Events and Corrective Actions Taken

Date	Description
May 12 to May 23	Water quality sampling initiated at select Tote Road water crossings, including BG-01, BG-24, BG-30, CV-225, CV-186 and CV-187.
May 12 to June 30	Sedimentation controls measures employed (silt fences, spring berms, rip rap, check dams, etc.) and surface water management upgrades implemented, as required, near Tote Road water crossings to address sedimentation concerns. Refer to photographs below showing the control measures and surface water management upgrades completed during freshet 2017 along the Tote Road by Operations and onsite Environment Department.
May 23 to July 2	Water quality sampling initiated upstream and downstream of fisheries water crossings and select non-fisheries water crossings under the Tote Road Freshet Monitoring Program. Water samples analyzed for TSS, TDS, turbidity and pH. Refer to Appendix D for monitoring program framework.
May 23	Turbid water observed to be flowing downstream of Tote Road water crossings BG-17, BG-27, BG-30, and CV-001.
May 28	Turbid water observed to be flowing downstream of Tote Road water crossings BG-32 and CV-071.
May 29	INAC Inspectors arrive onsite.
May 30	ECCC Inspector arrives onsite.
May 31 to June 1	ECCC and INAC Inspectors inspect Mine Site, Milne Port and Tote Road.
June 2 and June 3	Turbid water observed to be flowing downstream of Tote Road water crossings BG-04, CV-106, CV-112, CV-114 and CV-129.
June 7	Turbid water observed to be flowing downstream of Tote Road water crossings CV-174.
June 10 - June 15	Road embankments and ditching reinforced with aggregate (rip rap) upstream and downstream of water crossing CV-174.
June 14	Sediment release for elevated TSS conditions at Tote Road water crossings reported to NT-NU Spill Line and regulators (**NT-NU Spill Report- 17-209**).
Ongoing	Baffinland continues to upgrade the surface water management infrastructure along the Tote Road to address sedimentation concerns, including upgrades outlined the Tote Road Earthworks Execution Plan (TREEP).

APPENDIX C.4 – Photo Journal



May 30, 2017 – Armouring of road embankments near BG-29

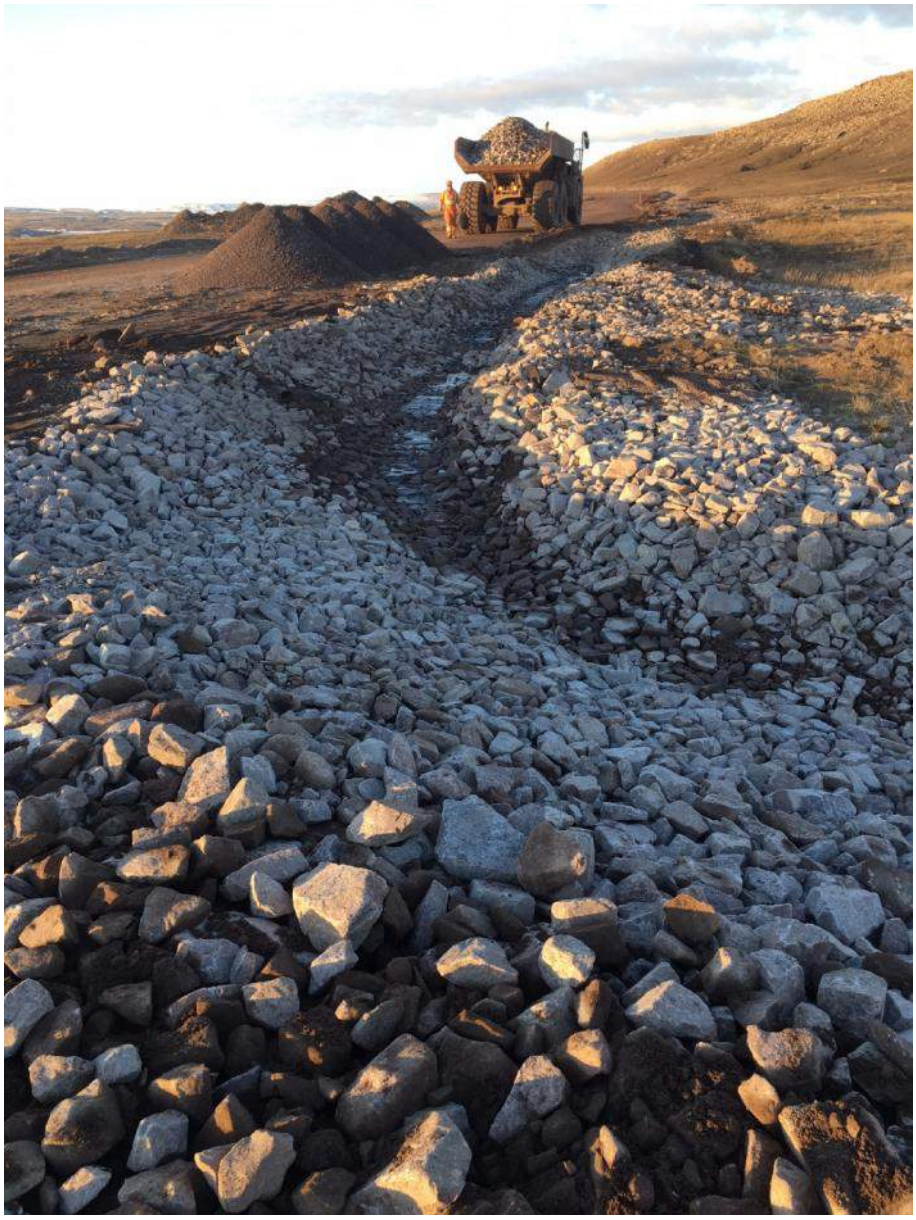
June 10, 2017 – Placement of aggregate (rip rap) near outlet of CV-174

June 15, 2017 - Sedimentation control measures installed at CV-174

June 17, 2017 – Armouring of ditching near CV-174

June 25, 2017 – Silt fences installed near BG-17 (upstream)

June 25, 2017 – Silt fences installed near CV-001 (downstream)



June 25, 2017 – Reconstructed and armoured ditch at Km 85.5

June 26, 2017 - Silt fences installed near BG-30 (upstream)

June 30, 2017 - Downstream of CV-129

June 30, 2017 - Downstream of CV-114

June 30, 2017 – Downstream of CV-112

July 1, 2017 – Downstream of BG-30

July 1, 2017 - Downstream of BG-27

July 1, 2017 - Downstream of BG-17

July 1, 2017 - Downstream of BG-04

July 1, 2017 - Downstream of CV-001

July 1, 2017 - Downstream of CV-106

July 1, 2017 - Downstream of CV-071

July 1, 2017 - Downstream of BG-32

July 2, 2017 - Downstream of CV-187 (Upgraded in April 2017)

July 4, 2017 – Completion of ditch and slope armouring near Km 90

July 10, 2017 – Completion of slope stabilization at Km 90

APPENDIX C.5

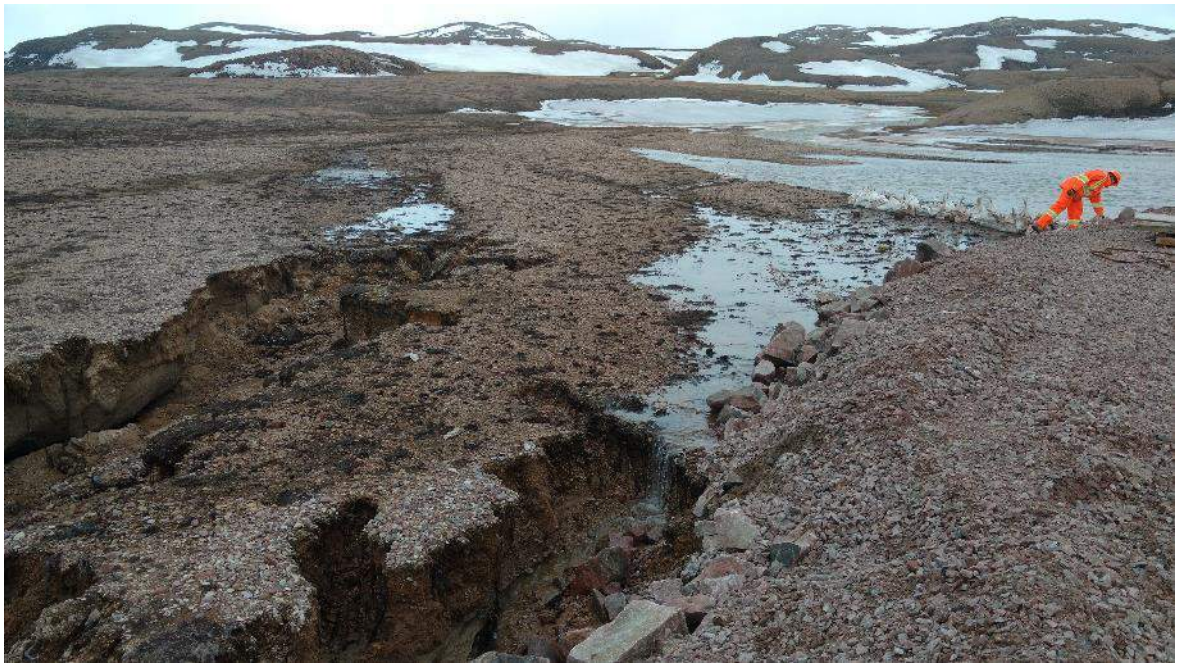
Spill Report 17-214

Table C.5 - Spill Report 17-214 - Sequence of Events and Corrective Actions Taken

Date	Description
June 12	Scour and erosion of the beach foreshore observed east of Milne Port. Scour and erosion determined to be a result of ice/snow dams redirecting surface flows of a tributary that flows east of Milne Port. Redirected flows observed to be bypassing and discharging east of the tributary's normal outfall into Milne Inlet.
	Excavator used in an attempt to clear ice/snow dam however due to poor access and associated environmental, health and safety concerns, the excavator proved to be ineffective.
June 13	Additional efforts to clear ice/snow dam manually proved to be unsuccessful due to health and safety concerns.
June 14	A clear path through the ice/snow dam was eventually developed resulting in water levels receding and surface water flows returning to the tributary's natural flow path.
June 15	During a follow-up site inspection, it was observed that water levels had increased significantly and the tributary's surface water flows were once again being diverted to areas that had previously been eroded. Sand bags were placed to reduce flows toward the eroded beach areas. Follow up inspections of the tributary noted that water levels continued to recede.
June 16	Follow up inspections of the tributary continued to note receding water levels and flows returning to the tributary's normal path. Observations from an aerial investigation indicated that the sudden rise in water levels may have been a result of a recent ice dam break.
June 17	Sediment release to Milne Inlet reported to the NT-NU Spill Line and relevant regulators (**NT-NU Spill Report- 17-214**).
June 17 to July 10	Monitored water levels during rain events and spring melt continued to remain low.

APPENDIX C.5 – Photo Journal

June 15, 2017 - Sand bags installation (looking NE)



June 15, 2017 – Sand bags installation (looking SE)

June 16, 2017 – Aerial view of tributary and diverted flow path

APPENDIX C.6

Spill Report 17-217

Table C.6 - Spill Report 17-217 - Sequence of Events and Corrective Actions Taken

Date	Description
May 29	INAC Inspectors arrive onsite.
May 30	ECCC Inspector arrives onsite.
May 31 to June 1	ECCC and INAC inspectors inspect Mine Site, Milne Port and Tote Road.
June 9	Baffinland receives INAC's Inspector's Direction regarding the constructed camp pad at Milne Port.
June 18	Construction of the camp pad reported to the NT-NU Spill Line and relevant regulators (**NT-NU Spill Report- 17-217**).
June 23	Baffinland submits water licence modification request to the NWB to construct a surface water diversion system around the new camp pad.
July 19	Baffinland resubmits water licence modification request for surface water diversion system as per NWB's request. Revised scope of modification request includes proposed camp and associated support infrastructure planned to be constructed on new camp pad.
September 8	Baffinland receives approval letter from NWB to construct the proposed surface water diversion system.
October 26	Baffinland completes construction of the surface water diversion system.

APPENDIX C.6 – Photo Journal

September 12, 2017 – Constructed New Milne Port Camp Pad
(white camp modules stored on top of pad)

October 2017 – Construction of Milne Port Camp Pad Diversion Ditch

October 2017 – Post-construction overview of Milne Port Camp Pad Diversion Ditch

APPENDIX D

Tote Road Freshet Monitoring Program

Tote Road Freshet Monitoring Program
(May 15 – June 30)

Visual Inspection of Fisheries Crossings

A water quality visual inspection of identified fisheries crossings along the Tote Road will be conducted every 5 days during freshet (May 15 to June 31) by onsite Environmental personnel.

Identification of Areas showing Elevated Total Suspended Solids and Sources of Sediment

Personnel will identify areas with elevated total suspended solids (TSS) and the sources of sedimentation by visual inspection. Areas identified during inspections will based on the following criteria:

- Total suspended solids (TSS) is suspected to be greater than 30 mg/L in areas where construction is determined to be the main contributor to elevated TSS levels.
- Total suspended solids (TSS) is suspected to be greater than 15 mg/L in areas where construction cannot be determined as the main contributor to elevated TSS levels.

Project Related Source

Implementation of Erosion and Sedimentation Controls

- silt fences, silt curtains, check dams, rip-rap, geotextile, embankment reinforcement, etc.

Document and Monitor Area(s) showing Elevated TSS

- Identify area(s) of concern on inspection form (refer to Attachment A)
  - New areas of concern and controls implemented to date
  - Status of previous areas of concern identified and the effectiveness of implemented controls to date
- Photos (new and previous areas of concern identified)
- Collect in-situ parameters (pH, turbidity, Sp. Cond. DO) and water samples (TSS, TDS, pH, turbidity, Sp. Cond.)
  - Initial water quality samples at new areas showing elevated TSS levels
  - Follow-up water quality samples (within 120 hours) at areas that had shown elevated TSS levels during previous inspections

Non-Project Related Source

Document and Monitor Natural Sedimentation Events

- Document on inspection form (refer to Attachment A)
  - New natural sedimentation events
  - Status of natural sedimentation events identified during previous inspection
- Photos – New and previously identified natural sedimentation events
- Collect in-situ parameters (pH, turbidity, Sp. Cond., DO) and water samples (TSS, TDS, pH, turbidity, Sp. Cond.)
  - Initial samples at new sedimentation events
  - Follow-up water quality samples (within 120 hours) for natural sedimentation events identified in previous inspections if TSS was greater than applicable guideline

Attachment A - Tote Road Freshet Monitoring Inspection Form

Tote Road Freshet Monitoring					
Date/Time:		Project Related: Yes ☐		No ☐	
Culvert #		Initial Samples taken Yes ☐		No ☐	If no,why?
Samplers:		Follow up samples? Yes ☐		No ☐	If no,Why?
Pictures Taken: Yes ☐		**No ☐**	**Number of Pictures #**		
YSI Model: YSI Pro DSS ☐		**YSI 6820 ☐**	**6000QS ☐**		
YSI Calibrated Yes ☐		**No ☐**			
Sedimentation Controls Implemented		**Silt Fences ☐**	**Silt Curtains ☐**	**Check Dams ☐**	
Fisheries Regulated: Yes ☐ No ☐		**Rip-rap ☐**	**Geotextile ☐**	**Spring Berm ☐**	
Water Level: Dry ☐	Stagnant ☐	Low ☐	Moderate ☐	High ☐	
Water Quality:	Turbid ☐	Clear ☐	Sheen ☐		

YSI Measurements					
Location	pH	Temp. (°C)	Conductivity (µs/cm)	Turbidity (NTU)	DO%

Notes:
Flow taken: Yes ☐ No ☐
Velocity: **Depth:**

Tote Road Freshet Monitoring					
Date/Time:		Project Related: Yes ☐		No ☐	
Culvert #		Initial Samples taken Yes ☐		No ☐	If no,why?
Samplers:		Follow up samples? Yes ☐		No ☐	If no,Why?
Pictures Taken: Yes ☐		**No ☐**	**Number of Pictures #**		
YSI Model: YSI Pro DSS ☐		**YSI 6820 ☐**	**6000QS ☐**		
YSI Calibrated Yes ☐		**No ☐**			
Sedimentation Controls Implemented		**Silt Fences ☐**	**Silt Curtains ☐**	**Check Dams ☐**	
Fisheries Regulated: Yes ☐ No ☐		**Rip-rap ☐**	**Geotextile ☐**	**Spring Berm ☐**	
Water Level: Dry ☐	Stagnant ☐	Low ☐	Moderate ☐	High ☐	
Water Quality:	Turbid ☐	Clear ☐	Sheen ☐		

YSI Measurements					
Location	pH	Temp. (°C)	Conductivity (µs/cm)	Turbidity (NTU)	DO%

Notes:
Flow taken: Yes ☐ No ☐
Velocity: **Depth:**

Attachment B - Fish-Bearing Streams (Culverts) along the Tote Road

Culvert ID
CV-166
CV-129
CV-128
CV-115
CV-114
CV-112
CV-111
CV-106
CV-104
CV-102
CV-099
CV-079
CV-078
CV-076
CV-072
CV-060
CV-059
CV-058
CV-057
BG-50
CV-049
CV-030
BG-32
CV-217
CV-216
BG-30
BG-29
BG-27
BG-24
BG-17
BG-04
CV-001
CV-223
CV-224
CV-225
BG-01
CV-186
CV-187