

APPENDIX 5.1-1.

**HABITAT ASSESSMENT PROTOCOL AND SAMPLE
DATA SHEET USED FOR DESCRIBING AVAILABLE
AQUATIC HABITAT IN WATERCOURSES IN THE
RAILWAY/ACCESS ROAD AREA.**

MARY RIVER PROJECT RAILWAY/ACCESS ROAD WATERCOURSE CROSSING ASSESSMENT PROTOCOL

DRAFT

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1.0 OVERVIEW

The following protocol is intended as a guide to completing the *Mary River Project Rail Alignment Crossing Assessment* form. To increase efficiency, the assessment should not necessarily follow the order of the sections as they appear on the field form. For example, fish sampling may be done prior to habitat mapping and channel measurements.

1.1 EQUIPMENT LIST

- GPS Unit
- Current meter (Swoffer unit or equivalent)
- Digital camera
- Metre tape
- Pencils
- Clipboard
- Flagging tape and marker
- Clinometer
- Range finder
- Fish sampling gear
 - Fish sampling permit
 - Dipnet
 - Backpack electrofisher and associated safety gear
 - Ruler to measure fish lengths
 - Bucket (to contain fish)

1.2 GENERAL

Two general study reaches must be established for each stream crossing. Each reach will undergo a physical assessment (determines water body conditions and fish habitat), as well as a biological assessment (determines fish presence/absence at the time of the survey). For sites on the railway, one reach extends from the proposed crossing location upstream for a minimum of 100 m; the other reach extends downstream from the proposed crossing location for a minimum of 100 m, or the entire zone of impact (approximately 10 times the wetted width), whichever is greater. In 2007, an initial assessment will be conducted to obtain a general description of available habitat. A total of three transects, one downstream, one upstream, and one at the crossing will be established and surveyed for the amount and quality of habitat. In 2008, more detailed surveys will be conducted to obtain calculations of lost habitat. A total of 11 transects must be established in 2008, one at the proposed crossing, five within the upstream study reach (i.e., one every 20 m), and five within the downstream

study reach. The number of transects will be determined from the amount and quality of available habitat. The methods for assessing habitat at each transect will remain the same between years. The same procedure will be followed for access road stream crossing assessments, except the two study reaches will extend a minimum of 60 m upstream and downstream of the crossing site.

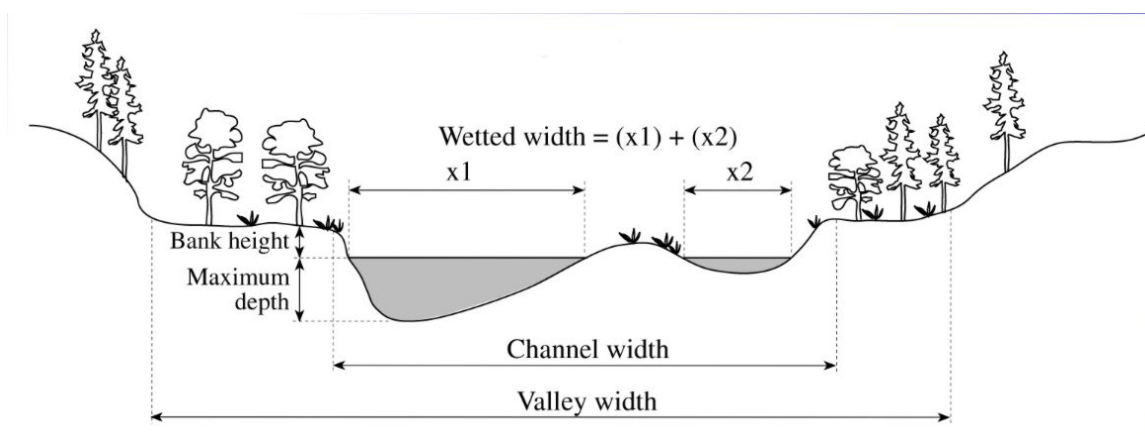
2.0 LOCATION

UTM coordinates will be provided for each watercourse crossing site. The GPS unit can then be used to measure distance travelled from the exact crossing location to areas of interest along the stream (e.g., an upstream or downstream barrier to fish movement).

3.0 CHANNEL PROFILES

At the watercourse crossing site, the following information pertaining to the channel profile should be collected for each transect:

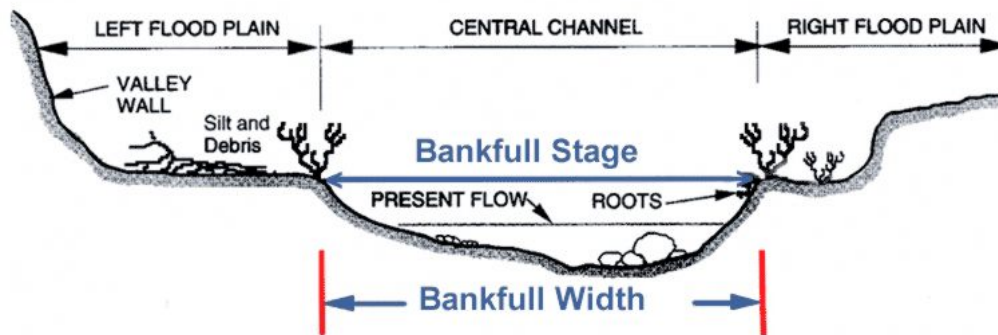
- wetted width (water's edge)
- water depth and velocity at 25%, 50%, and 75% of the wetted width, starting at the left bank
- channel width (i.e., high water width or bankfull width; bank to bank – usually defined by rooted terrestrial vegetation)



Once the location of a transect has been established, all required measurements/observations (e.g., riparian area/ floodplain, substrate, banks) should be completed before establishing the next transect.

4.0 RIPARIAN AREA/ FLOODPLAIN

For the stream as a whole within the study reaches, record the approximate average floodplain or valley distance and vegetation type(s) present, if applicable.



Generally, there are only three main types of riparian vegetation in the Railway/Access Road Study Area:

- grasses/wildflowers;
- mosses; and
- willows.

Canopy cover and woody debris are not applicable for this area and do not need to be recorded.

5.0 SUBSTRATE

At each transect, visually estimate the channel substrate composition (%), where:

Sand/silt (fines)	<2 mm
Gravel	2 – 16 mm
Small Cobble	17 – 64 mm
Large Cobble	65 – 256 mm
Boulder	>256 mm

The total substrate composition must equal 100 %.

6.0 BANKS

6.1 BANK HEIGHT

Measure the vertical height of each bank (LB & RB) from the waters' edge to the top of the bank. Left bank (LB) and right bank (RB) are determined as if you were facing upstream. The top of the bank is usually defined by the start of rooted vegetation, but may be higher in some Arctic streams. Record bank heights as a range for the entire survey reach.

6.2 BANK SHAPE

Record the bank shape for the entire survey reach, where:

V	vertical	steep sloping/vertical (45 – 90°)
UC	undercut	protruding over the water or 'wetted channel'
O	overhanging	banks protrude over a non-wetted portion of the channel
S	sloping	gradual or shallow slope (<45°)
FL	flooded	water levels have overflowed the banks
NV	near-vertical	almost completely vertical with a slight slope
R	rounded	banks are not straight but curved

6.3 BANK STABILITY

Visually estimate the stability of the banks, where:

H	highly stable	banks well vegetated or covered in large boulders
M	moderately stable	>50% vegetated or rocky and some undercut banks
L	low stability	<50% of the bank is vegetated or rocky (slumping may be observed)

7.0 STREAM GRADIENT

Take stream gradient measurements at each crossing. Have one crew member go up or downstream from the transect as far as possible, while maintaining visual contact, then record the clinometer reading (aiming at eye level with crew member). Alternatively, select a prominent landmark (e.g., large boulder) at distance upstream and record the clinometer reading while aiming at approximately the same height.

8.0 GENERAL MORPHOLOGY

This section provides an opportunity to reflect on the morphology of the entire surveyed portion of the watercourse.

8.1 PATTERN

Indicate the appropriate pattern.



Straight (ST)



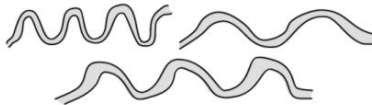
Sinuuous (SI)



Irregular, wandering (IR)



Irregular meandering (IM)



Regular meanders (ME)



Tortuous meanders (TM)

No diagram for braided (BR) channel (= multiple channelled, intertwined streams).

8.2 STAGE

Indicate the appropriate water level stage, where:

LOW	0 – 30% of bankfull level
NORMAL	30 – 90%
HIGH	>90%

100% bankfull is when the water has reached the top of the banks.

8.3 CONFINEMENT

Visually assess the channel confinement, or the ability of the channel to migrate laterally on a valley flat between surrounding slopes. Where,

C	Confined
PC	Partially confined
NC	Not confined

8.4 FLOW REGIME

Circle the appropriate flow regime for the watercourse, where:

PER Perennial Large river or stream channels with continuous flow during the open water period (persistent), except during extreme droughts. Larger watercourses may have some winter flow, but most either freeze to bottom in winter or are left with isolated shallow pools of water under the ice. These larger streams may provide fish habitat throughout the year.

INT Intermittent Intermediate streams with continuous flow for most of the open water season. They typically dry up in late summer or fall, or may be reduced to isolated pools. In some cases, streams are or may become spatially intermittent if flow is reduced to subsurface flow through coarse bed material. Intermittent streams freeze to bottom in winter. They provide fish habitat during periods of flow, provided that access is available, but fish use in winter is non-existent.

EPH Ephemeral Small streams with flow only during the spring freshet or following rain events. Ephemeral streams do not provide fish habitat except in the lowest reaches (i.e., where they empty into a lake or larger stream) where they may provide limited habitat for brief periods.

8.5 STREAM MORPHOLOGY

At each transect, indicate the morphology that best describes the water course with the per cent composition of each type. Morphology types present in Arctic streams include, but are not limited to: Riffle, Pool, Cascade, Rapids, Run, Flat. The percent compositions for all types in each stream must add up to 100.

9.0 CROSSING AREA SCHEMATIC AND COMMENTS

This section is intended to provide additional space for habitat mapping and any notes specific to the watercourse being surveyed. If possible, create an aerial sketch of the surveyed portion of the stream, indicating any barriers and the approximate distance to the nearest potential overwintering waterbody.

10.0 FISH HABITAT POTENTIAL

For each stream (or lake in the case of lake encroachments), determine the habitat potential for both Arctic char (*Salvelinus alpinus*) and nine-spine stickleback (*Pungitius pungitius*). For both species, record the potential (high, moderate, low, or none) for spawning, rearing, overwintering, and migration. An overall fish habitat quality rating (i.e., Important, Marginal or No Fish Habitat) will be assigned later.

Appendix A contains Arctic char and nine-spine stickleback habitat requirements for the Study Area.

11.0 PHOTOS

Typically take four photos at the proposed crossing: upstream of the crossing, downstream of the crossing, across the crossing (either bank is suitable, but maintain consistency at each stream), and a close-up of the substrate. Throughout the survey, photos should also be taken across the stream at each of transects. For lake encroachment sites, take photos of the substrate, the shoreline and, if possible, of the entire lake. At all sites take photos of any unique features, barriers, and other notable features. The more photos the better.

Photos may be taken in landscape or portrait. Choose the orientation that best suits the feature being photographed. For example, when taking photos across the stream at each transect (particularly when there are several transects), it is often best represented as a portrait. Try to have an object in the photo that can be used for scale (e.g., metre stick, pen, person)

For each photo taken, label with the direction the photographer was facing, the transect ID, and a brief description of the photo. Where:

US	upstream
DS	downstream
A	across
Subs	substrate

12.0 FISH SAMPLING

If possible, a backpack electrofisher will be used at sites where fish sampling is required. If backpack electrofishing is not possible (e.g., due to logistical constraints), use visual observation. Visual observation surveys are conducted by walking along the shore of the stream while scanning for the movements of fish. Clarity in Arctic streams is typically more than sufficient for effective visual scans.

12.1 BACKPACK ELECTROFISHING

Record the site's water temperature and the electrofisher settings used (amps, volts, etc.). For each study area, record the time spent (in seconds) electrofishing. Although the survey form allows for multiple passes within each study area, one pass from 50 m upstream of the crossing to 50 m downstream of the crossing should be sufficient to identify presence/absence for both native species of fish.

12.2 FISH CAPTURED

All fish captured during electrofishing surveys are to be enumerated, identified to species, and measured for fork length ($FL \pm 1$ mm). For visual observations, record the species and approximate number of fish present. If possible, record an estimate of fork length for observed fish. When recording, use the four letter code for each species: ARCH for Arctic char and NNST for ninespine stickleback.

When possible, identify the relative maturity for ninespine stickleback (adult vs. juvenile/young-of-the-year) as this can help identify potential spawning locations. All observed/captured Arctic char are likely to be juveniles, so maturity identification is not necessary. Upon completion of sampling, return all fish alive to the waterbody from which they were captured.

13.0 NOTES

The survey form provides extra space for recording notes and information (e.g. photos, habitat mapping, etc.). Appendix B provides a sample data entry sheet and Appendix C provides a list of abbreviations to be used during data collection.

APPENDIX A FISH SPECIES HABITAT REQUIREMENTS

Table A-1 Habitat requirements of Arctic char and ninespine stickleback within the Mary River Study Area.

Species	Spawning	Rearing (fry/juvenile)	Adult	Overwintering
Arctic char (<i>Salvelinus alpinus</i>) ARCH	Within the Study Area, ARCH spawning occurs only in lakes at depths >2 m. Spawning habitat is, therefore, unlikely to be encountered at the majority of railway survey sites.	Within the Study Area, ARCH juveniles can be found in any stream with connections to overwintering habitat and in most lakes. Preferred habitat includes cobble/boulder substrata with riffle/pool morphology.	Adult ARCH are typically found only in lakes and in a select few large rivers within the Study Area. Adult ARCH are unlikely to be encountered at the majority of railway survey sites.	Within the Study Area, overwintering only occurs in lakes with maximum depths > 3 m.
Ninespine stickleback (<i>Pungitius pungitius</i>) NNST	Spawning occurs primarily in shallow, silty, vegetated areas with low flow.	Within the Study Area, juvenile NNST are usually found along lake shorelines, streams, or flooded terrestrial vegetation, usually over fine substrates and in slow-moving water.	Adult NNST are typically found in the same habitat as juveniles, although not as consistently in water depths < 0.05 m.	Within the Study Area, overwintering only occurs in lakes with maximum depths > 3 m.

APPENDIX B STREAM SURVEY FORM

MARY RIVER PROJECT
RAIL/ROAD CROSSING ASSESSMENT

WATERCOURSE:

CROSSING WAYPOINT:

DATE AND TIME:

CREW:

GENERAL CHARACTERISTICS			
Pattern:	Confinement:	Channel Profile:	Stream Morphology:
Flow Regime (Per, Eph, Int):	Stage:	H ₂ O Temp:	
Stream gradient (range):	Bank height (range):	Bank shape:	

CHANNEL CHARACTERISTICS & VELOCITY											
Distance from Crossing (m)	Width (m)		Water Depth (m)				Water Velocity (m/s)				
	Wetted	High W	25%	50%	75%	Max	25%	50%	75%	Max	Min
100 U/S											
80 U/S											
60 U/S											
40 U/S											
20 U/S											
0 (crossing)											
20 D/S											
40 D/S											
60 D/S											
80 D/S											
100 D/S											

FISH HABITAT POTENTIAL (high, mod., or low for each species of interest)						
		Spawning	Rearing	Wintering	Migration Corridor	Comments
Entire Crossing Area	ARCH					
	NNST					

PHOTOS			
	Location	# Taken	Comments
Habitat			
Substrate			

FISH HABITAT											
Distance from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (< 0.2m)	Pool (> 0.2m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
100 U/S											
80 U/S											
60 U/S											
40 U/S											
20 U/S											
0 (crossing)											
20 D/S											
40 D/S											
60 D/S											
80 D/S											
100 D/S											

Comments: (Include mention of barriers)

APPENDIX C ABBREVIATIONS USED FOR HABITAT ASSESSMENTS

Channel width

UD: undefined
IP: isolated pools
FT: flooded terrestrial (also used for substrate composition)

Channel confinement

NC: not confined
PC: partially confined
C: confined

Fish species and terminology

ARCH: Arctic char
NNST: ninespine stickleback
YOY: young-of-year

Bank height

UD: undefined
FL: flooded

Bank shape

UC: undercut
V: vertical
UD: undefined
S: sloped
FL: flooded
NV: near vertical
R: rounded

Flow regime

INT: intermittent
PER: perennial
EPH: ephemeral

Hydrology and habitat characteristics

Chnls: channels

Channel pattern

UD: undefined

Other Codes

N/M: not measured
N/A: not applicable

APPENDIX 5.1-2.

DETAILED HABITAT ASSESSMENTS AND SUMMARY OF RESULTS FOR RAILWAY STREAM CROSSINGS.

Page

Table A5.1-2.1. Summary of results from Railway stream crossing surveys and assessments.	A5.1-2_1
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Table A5.1-2.1. Summary of results from Railway stream crossing surveys and assessments.

Site	CANARAIL Site Names (if different)	Surveyed	Survey Year	Survey Date	UTM Coordinates			Habitat Rating	ARCH seen ¹	NNST seen ¹	Comments
					Zone	Easting	Northing				
1 ²	not identified	Yes	2007	7-Aug	17W	563439	7911630	None	No	No	Used 2007 survey data
1A ²	not identified	Yes	2007	7-Aug	17W	563514	7911562	None	No	No	Used 2007 survey data
CV-000-1a ²	not identified	Yes	2007	7-Aug	17W	563762	7911338	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-000-1b ²	not identified	Yes	2007	7-Aug	17W	563787	7911317	Marginal	No	No	Moved, but close enough to old site, used 2007 survey data
CV-000-2 ²	not identified	Yes	2007	7-Aug	17W	563815	7911291	Marginal	No	No	Moved, but close enough to old site, used 2007 survey data
CV-000-3a ²	not identified	Yes	2007	7-Aug	17W	564005	7911096	Marginal	No	No	Moved, but close enough to old site, used 2007 survey data
CV-000-3b ²	not identified	Yes	2007	7-Aug	17W	564156	7910926	Marginal	No	No	Moved, but close enough to old site, used 2007 survey data
CV-001-1	-	Yes	2007	7-Aug	17W	564664	7910499	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-001-2	-	Yes	2008	15-Jul	17W	564717	7910478	Important	Yes	No	-
CV-002-1	-	Yes	2007	7-Aug	17W	565499	7910058	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-002-2	-	Yes	2007	8-Aug	17W	565756	7909823	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-003-1	-	Yes	2008	15-Jul	17W	565972	7909658	Important	Yes	No	-
CV-003-2	-	Yes	2007	8-Aug	17W	566716	7909224	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-004-1	-	Yes	2008	16-Jul	17W	567005	7908966	Important	Yes	No	-
CV-004-2	-	Yes	2007	8-Aug	17W	567196	7908792	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-004-3	-	Yes	2007	8-Aug	17W	567388	7908618	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-005-1	-	Yes	2007	8-Aug	17W	567678	7908383	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-005-2	-	Yes	2007	8-Aug	17W	568021	7908203	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-005-3	-	Yes	2007	8-Aug	17W	568072	7908202	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-006-1	-	Yes	2008	16-Jul	17W	568606	7907921	Important	Yes	No	-
CV-006-2	-	Yes	2007	8-Aug	17W	568744	7907850	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-006-3	-	Yes	2008	17-Jul	17W	569014	7907674	Important	Yes	No	-
CV-007-1	-	Yes	2008	18-Jul	17W	569318	7907453	Important	Yes	No	-
CV-007-2	-	Yes	2007	8-Aug	17W	569564	7907300	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-007-3	-	Yes	2007	8-Aug	17W	569737	7907201	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-008-1	-	Yes	2008	18-Jul	17W	570136	7906946	Important	Yes	No	-
BR-008-1	-	Yes	2008	18-Jul	17W	570799	7906523	Important	Yes	No	-
CV-008-2	-	Yes	2007	8-Aug	17W	570888	7906461	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-010-1	-	Yes	2008	18-Jul	17W	572330	7905370	None	No	No	-
BR-011-1	-	Yes	2008	23-Jul	17W	573099	7904907	Important	Yes	No	-
CV-012-1	-	Yes	2007	8-Aug	17W	574001	7904660	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-012-2	-	Yes	2007	8-Aug	17W	574236	7904530	None	No	No	Moved, but close enough to old site, used 2007 survey data; revisited in 2011 to confirm fish presence/absence

Table A5.1-2.1. Continued.

Site	CANARAIL Site Names (if different)	Surveyed	Survey Year	Survey Date	UTM Coordinates			Habitat Rating	ARCH seen ¹	NNST seen ¹	Comments
					Zone	Easting	Northing				
CV-013-1	-	Yes	2008	23-Jul	17W	574988	7904117	Marginal	Yes	No	-
CV-013-2	-	Yes	2007	8-Aug	17W	575210	7904017	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-014-1	-	Yes	2007	8-Aug	17W	575527	7903863	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-014-2	-	Yes	2007	8-Aug	17W	575666	7903777	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-014-3	-	Yes	2007	9-Aug	17W	575878	7903651	Marginal	Yes	No	Moved, but close enough to old site, used 2007 survey data; revisited in 2011 to confirm fish presence/absence
CV-015-1	-	Yes	2007	9-Aug	17W	576933	7903240	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-016-1	-	Yes	2008	20-Jul	17W	577142	7903135	Important	Yes	No	-
CV-016-2	-	Yes	2007	9-Aug	17W	577416	7902997	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-017-1	-	Yes	2008	20-Jul	17W	578074	7902639	Important	Yes	No	-
CV-017-2	-	Yes	2007	9-Aug	17W	578733	7902277	None	No	No	Used 2007 survey data
CV-018-1	-	Yes	2007	9-Aug	17W	578855	7902210	Important	Yes	No	Used 2007 survey data
CV-018-2	-	Yes	2007	9-Aug	17W	579063	7902106	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-018-3	-	Yes	2007	9-Aug	17W	579363	7902009	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-019-1	-	Yes	2008	23-Jul	17W	579874	7901941	Important	Yes	No	-
CV-019-2	-	Yes	2007	9-Aug	17W	580375	7901672	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-020-1	-	Yes	2007	9-Aug	17W	581148	7901424	Marginal	No	no	Moved, but close enough to old site, used 2007 survey data
CV-020-2	-	Yes	2007	9-Aug	17W	581312	7901354	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-021-1a	-	Yes	2007	9-Aug	17W	581642	7901289	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-021-1b	-	Yes	2007	9-Aug	17W	581786	7901233	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-021-2	-	Yes	2007	9-Aug	17W	582569	7901018	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-022-1	-	Yes	2008	24-Jul	17W	582846	7900965	None	No	No	-
CV-022-2	-	Yes	2007	9-Aug	17W	583058	7900918	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-022-3	-	Yes	2007	9-Aug	17W	583241	7900890	Marginal	Yes	No	Moved, but close enough to old site, used 2007 survey data
CV-022-4	-	Yes	2007	9-Aug	17W	583386	7900855	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-022-5	-	Yes	2008	24-Jul	17W	583535	7900806	None	No	No	-
CV-023-1	-	Yes	2008	24-Jul	17W	584019	7900636	Important	Yes	No	-
CV-024-1	-	Yes	2007	9-Aug	17W	584837	7900385	Marginal	No	No	Moved, but close enough to old site, used 2007 survey data
59 ²	not identified	Yes	2007	9-Aug	17W	585145	7900251	Marginal	No	No	Used 2007 survey data
CV-024-2	-	Yes	2007	9-Aug	17W	585256	7900159	None	No	No	Moved, but close enough to old site, used 2007 survey data
BR-025-1	-	Yes	2008	1-Sep	17W	585397	7900034	Important	Yes	No	-
CV-R01	CV-25-1	Yes	2008	1-Sep	17W	585831	7899673	None	No	No	-
CV-R02	CV-25-2	Yes	2008	1-Sep	17W	586176	7899452	None	No	No	-

Table A5.1-2.1. Continued.

Site	CANARAIL Site Names (if different)	Surveyed	Survey Year	Survey Date	UTM Coordinates			Habitat Rating	ARCH seen ¹	NNST seen ¹	Comments
					Zone	Easting	Northing				
CV-R03	NCV-26-1	Yes	2008	1-Sep	17W	586674	7899016	None	No	No	-
CV-R04	NCV-27-2	Yes	2008	1-Sep	17W	587469	7898625	Important	No	No	-
CV-R05	NCV-27-3	Yes	2008	1-Sep	17W	587559	7898562	None	No	No	-
CV-R06	NCV-27-4	Yes	2008	1-Sep	17W	587680	7898478	None	No	No	-
CV-R07	NCV-28-1	Yes	2008	2-Sep	17W	588151	7898234	Important	Yes	No	-
CV-R08	NCV-31-2	Yes	2008	2-Sep	17W	591337	7897150	None	No	No	-
CV-R09	NCV-34-1	Yes	2008	2-Sep	17W	593797	7896363	None	No	No	-
CV-R10	NCV-34-2	Yes	2008	2-Sep	17W	594249	7896161	None	No	No	-
CV-R11	not identified	Yes	2008	2-Sep	17W	594561	7896111	None	No	No	-
CV-R12	not identified	Yes	2008	2-Sep	17W	594594	7896105	None	No	No	-
CV-R13	NCV-35-1	Yes	2008	2-Sep	17W	594831	7896026	Important	Yes	No	-
CV-R14	not identified	Yes	2008	2-Sep	17W	594975	7895888	None	No	No	-
CV-R15	not identified	Yes	2008	2-Sep	17W	595065	7895608	None	No	No	-
CV-R16	NBR-36-1	Yes	2008	3-Sep	17W	595076	7895399	Important	Yes	Yes	-
CV-R17	NCV-36-1	Yes	2008	2-Sep	17W	595083	7895225	None	No	No	-
CV-R18	not identified	Yes	2008	3-Sep	17W	595111	7894902	None	No	No	-
CV-R19	not identified	Yes	2008	3-Sep	17W	595301	7894402	None	No	No	-
CV-R20	not identified	Yes	2008	3-Sep	17W	595338	7894313	None	No	No	-
CV-R21 + CV-R22 (banks of Ravn R.)	NBR-37-1	Yes	2008	3-Sep 4-Sep	17W	595417 595468	7894126 7894001	Important	No Yes	No Yes	-
CV-R23	NCV-38-1	Yes	2008	3-Sep	17W	595665	7893529	None	No	No	-
CV-R24	NCV-40-1	Yes	2008	11-Aug	17W	596479	7891599	None	No	No	-
CV-R25	not identified	Yes	2008	11-Aug	17W	596704	7891450	None	No	No	-
CV-R26	not identified	Yes	2008	11-Aug	17W	596749	7891407	None	No	No	-
CV-R27	NCV-40-2	Yes	2008	11-Aug	17W	596886	7891237	Important	No	Yes	-
CV-R28	NCV-41-2	Yes	2008	11-Aug	17W	597243	7890426	None	No	No	-
CV-R29	NCV-42-1	Yes	2008	3-Sep	17W	597433	7889759	Important	No	Yes	-
CV-R30	NCV-43-1	Yes	2008	4-Sep	17W	597272	7888578	Marginal	No	No	-
CV-R31	NCV-44-1	Yes	2008	4-Sep	17W	597364	7888229	None	No	No	-
CV-R32	NCV-44-2	Yes	2008	4-Sep	17W	597515	7887484	None	No	No	-
CV-R33	NBR-44-1	Yes	2008	4-Sep	17W	597481	7887335	Important	Yes	Yes	-
CV-R34	NBR-46-1	Yes	2008	5-Sep	17W	596723	7886534	Important	Yes	Yes	-

Table A5.1-2.1. Continued.

Site	CANARAIL Site Names (if different)	Surveyed	Survey Year	Survey Date	UTM Coordinates			Habitat Rating	ARCH seen ¹	NNST seen ¹	Comments
					Zone	Easting	Northing				
CV-R35	CV-43-2	Yes	2008	4-Sep	17W	596577	7886207	None	No	No	-
CV-044-1	-	Yes	2008	4-Sep	17W	596561	7885802	Important	No	No	-
CV-044-2	-	Yes	2007	11-Aug	17W	596550	7885502	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-044-3	-	Yes	2008	4-Sep	17W	596551	7884976	Marginal	Yes	Yes	-
CV-045-1	-	Yes	2007	11-Aug	17W	597159	7884188	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-047-1	-	Yes	2007	11-Aug	17W	598223	7882688	None	No	No	Used 2007 data
CV-049-1	-	Yes	2007	11-Aug	17W	597961	7881470	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-049-2	-	Yes	2007	11-Aug	17W	597790	7881238	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-049-3	-	Yes	2007	11-Aug	17W	597451	7880777	Marginal	No	No	Used 2007 data
CV-050-1	-	Yes	2007	11-Aug	17W	597346	7880635	None	No	No	Used 2007 data
CV-050-2	-	Yes	2007	11-Aug	17W	596937	7880079	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-051-1	-	Yes	2007	11-Aug	17W	596682	7879662	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-051-2	-	Yes	2008	4-Sep	17W	596622	7879337	Marginal	Yes	Yes	-
CV-052-1	-	Yes	2007	11-Aug	17W	596972	7878562	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-052-2	-	Yes	2008	5-Sep	17W	597276	7878344	Important	No	Yes	Revisited in 2011 to confirm fish presence/absence
CV-053-1	-	Yes	2007	11-Aug	17W	597682	7878063	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-056-1	-	Yes	2008	4-Sep	17W	598812	7875711	None	No	No	-
CV-057-1	-	Yes	2007	11-Aug	17W	599439	7874631	None	No	No	Moved, but close enough to old site, used 2007 survey data
BR-057-1	-	Yes	2008	5-Sep	17W	599447	7874417	Important	Yes	Yes	-
BR-059-1	-	Yes	2008	5-Sep	17W	598858	7872547	Marginal	No	No	-
CV-060-1	-	Yes	2007	11-Aug	17W	598646	7871712	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-062-1	-	Yes	2008	5-Sep	17W	598242	7869614	Important	Yes	Yes	Revisited in 2011 to confirm fish presence/absence
CV-063-1	-	Yes	2007	12-Aug	17W	598618	7868739	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-064-1	-	Yes	2008	5-Sep	17W	599006	7867836	None	No	No	-
CV-065-1	-	Yes	2007	12-Aug	17W	599134	7867537	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-065-2	-	Yes	2007	12-Aug	17W	599243	7867284	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-067-1	-	Yes	2007	12-Aug	17W	600269	7866042	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-068-1	-	Yes	2008	4-Aug	17W	601078	7865463	None	No	No	-
CV-069-1	-	Yes	2007	12-Aug	17W	601904	7864757	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-069-2	-	Yes	2007	12-Aug	17W	602125	7864370	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-071-1	-	Yes	2007	12-Aug	17W	602564	7862400	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-073-1	-	Yes	2007	12-Aug	17W	603092	7861082	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-074-1	-	Yes	2007	12-Aug	17W	603759	7859894	None	No	No	Moved, but close enough to old site, used 2007 survey data

Table A5.1-2.1. Continued.

Site	CANARAIL Site Names (if different)	Surveyed	Survey Year	Survey Date	UTM Coordinates			Habitat Rating	ARCH seen ¹	NNST seen ¹	Comments
					Zone	Easting	Northing				
CV-075-1	-	Yes	2008	26-Jul	17W	603763	7859336	None	No	No	-
CV-075-2	-	Yes	2008	26-Jul	17W	603944	7858901	None	No	No	-
CV-076-1	-	Yes	2008	26-Jul	17W	604251	7858661	None	No	No	-
CV-076-2	-	Yes	2008	26-Jul	17W	604309	7858624	None	No	No	-
CV-076-3	-	Yes	2008	26-Jul	17W	604396	7858569	None	No	No	-
CV-077-1	-	Yes	2008	6-Sep	17W	605007	7857943	None	No	No	-
CV-077-2	-	Yes	2008	6-Sep	17W	605069	7857825	None	No	No	-
CV-078-1	-	Yes	2008	4-Aug	17W	605518	7856472	Marginal	No	Yes	-
CV-078-2	-	Yes	2007	12-Aug	17W	605517	7856234	Marginal	No	No	Moved, but close enough to old site, used 2007 survey data
CV-078-3	-	Yes	2007	12-Aug	17W	605514	7856111	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-079-1	-	Yes	2007	12-Aug	17W	605510	7855880	Marginal	No	No	Moved, but close enough to old site, used 2007 survey data
CV-079-2	-	Yes	2007	12-Aug	17W	605517	7855672	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-079-3	-	Yes	2007	12-Aug	17W	605523	7855495	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-079-4a	CV-079-4	Yes	2007	12-Aug	17W	605545	7855098	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-080-1a	CV-080-1	Yes	2007	12-Aug	17W	605532	7854925	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-080-2	-	Yes	2007	12-Aug	17W	605514	7854688	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-080-3	-	Yes	2007	12-Aug	17W	605509	7854492	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-080-4	-	Yes	2007	12-Aug	17W	605508	7854446	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-080-5	-	Yes	2007	12-Aug	17W	605503	7854219	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-081-2	CV-081-1	Yes	2007	12-Aug	17W	605498	7854036	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-081-3	CV-081-2	Yes	2007	12-Aug	17W	605496	7853945	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-081-4a	CV-081-3	Yes	2007	12-Aug	17W	605489	7853690	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-081-5a	CV-081-4	Yes	2008	12-Aug	17W	605556	7853306	None	No	No	Moved, but close enough to old site, used 2008 survey data
CV-081-6a	CV-081-5	Yes	2007	12-Aug	17W	605622	7853205	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-081-6b ³	CV-081-6	Yes	2007	12-Aug	17W	605651	7853174	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-082-1a	CV-082-1	Yes	2007	12-Aug	17W	605767	7853073	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-082-2a	CV-082-2	Yes	2007	12-Aug	17W	605904	7852967	Marginal	No	No	Moved, but close enough to old site, used 2007 survey data
CV-082-3a	CV-082-3	Yes	2007	12-Aug	17W	605966	7852920	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-082-4a	CV-082-4	Yes	2007	12-Aug	17W	606116	7852804	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-082-4b ³	CV-082-5	Yes	2007	12-Aug	17W	606153	7852773	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-083-1a	CV-083-1	Yes	2007	12-Aug	17W	606351	7852522	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-083-2a	CV-083-2	Yes	2007	12-Aug	17W	606426	7852288	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-083-3a	CV-083-3	Yes	2007	12-Aug	17W	606432	7852073	None	No	No	Moved, but close enough to old site, used 2007 survey data

Table A5.1-2.1. Continued.

Site	CANARAIL Site Names (if different)	Surveyed	Survey Year	Survey Date	UTM Coordinates			Habitat Rating	ARCH seen ¹	NNST seen ¹	Comments
					Zone	Easting	Northing				
CV-083-4a	CV-083-4	Yes	2007	12-Aug	17W	606409	7851649	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-084-1	-	Yes	2007	12-Aug	17W	606386	7851181	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-084-2	-	Yes	2007	12-Aug	17W	606406	7850987	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-085-1	-	Yes	2007	12-Aug	17W	606352	7850306	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-085-2	-	Yes	2007	12-Aug	17W	606381	7850063	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-086-1	-	Yes	2007	12-Aug	17W	606180	7848859	None	No	No	Moved, but close enough to old site, used 2007 survey data
BR-091-1	-	Yes	2007	13-Aug	17W	605934	7843776	None	No	No	Moved, but close enough to old site, used 2007 survey data
BR-092-1	-	Yes	2007	13-Aug	17W	606356	7842767	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-093-1	-	Yes	2007	13-Aug	17W	606496	7842468	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-093-2	-	Yes	2007	13-Aug	17W	606649	7842218	None	No	No	Moved, but close enough to old site, used 2007 survey data
BR-095-1	-	Yes	2008	4-Aug	17W	607951	7840793	Important	No	No	-
BR-096-1	-	Yes	2008	4-Aug	17W	608545	7840211	Important	Yes	No	-
BR-096-2	-	Yes	2008	17-Jul	17W	608708	7839705	Important	Yes	No	-
BR-099-1	-	Yes	2007	13-Aug	17W	608459	7837169	None	No	No	Used 2007 data
CV-099-1	-	Yes	2007	13-Aug	17W	608594	7837414	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-101-1	-	Yes	2007	13-Aug	17W	607062	7836041	None	No	No	Moved, but close enough to old site, used 2007 survey data
BR-105-1	-	Yes	2007	13-Aug		604165	7833828	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-105-1	-	Yes	2007	13-Aug	17W	603377	7833541	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-107-1	-	Yes	2007	13-Aug	17W	601557	7833054	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-109-1	-	Yes	2008	3-Aug	17W	600761	7831883	None	No	No	-
CV-110-1	-	Yes	2008	3-Aug	17W	599832	7830830	None	No	No	-
CV-111-1	-	Yes	2008	3-Aug	17W	599060	7830203	None	No	No	-
CV-117-1	-	Yes	2008	3-Aug	17W	597976	7825752	None	No	No	-
CV-117-2	-	Yes	2008	3-Aug	17W	598198	7825571	Important	Yes	No	-
CV-117-3	-	Yes	2008	3-Aug	17W	598230	7825513	None	No	No	-
CV-118-1	-	Yes	2008	3-Aug	17W	598367	7825258	None	No	No	-
CV-118-2	-	Yes	2008	2-Aug	17W	598603	7824545	Important	Yes	No	-
CV-119-1	-	Yes	2008	2-Aug	17W	598585	7824286	None	No	no	-
CV-119-2	-	Yes	2008	2-Aug	17W	598535	7823963	None	No	No	-
CV-119-3	-	Yes	2007	13-Aug	17W	598604	7823370	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-120-1	-	Yes	2007	13-Aug	17W	598639	7822779	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-121-1	-	Yes	2008	3-Aug	17W	598596	7822248	None	No	No	-
CV-121-2	-	Yes	2008	2-Aug	17W	598571	7822105	None	No	No	-

Table A5.1-2.1. Continued.

Site	CANARAIL Site Names (if different)	Surveyed	Survey Year	Survey Date	UTM Coordinates			Habitat Rating	ARCH seen ¹	NNST seen ¹	Comments
					Zone	Easting	Northing				
CV-121-3	-	Yes	2008	2-Aug	17W	598549	7821976	None	No	No	-
CV-121-4	-	Yes	2008	1-Aug	17W	598523	7821859	Marginal	No	No	-
CV-121-5	-	Yes	2008	1-Aug	17W	598368	7821404	Marginal	Yes	No	-
CV-123-1	-	Yes	2007	13-Aug	17W	598386	7820275	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-123-2	-	Yes	2007	13-Aug	17W	598451	7820128	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-123-3	?	Yes	2008	6-Aug	17W	598478	7819899	Marginal	Yes	No	-
CV-123-4a	?	Yes	2008	28-Aug	17W	598464	7819667	Important	Yes	No	Moved, but close enough to old site, used 2008 survey data
CV-123-5a	?	Yes	2008	28-Aug	17W	598463	7819647	Important	No	No	Moved, but close enough to old site, used 2008 survey data
CV-123-6a	CV-123-3	Yes	2008	28-Aug	17W	598462	7819621	Important	No	No	Moved, but close enough to old site, used 2008 survey data
CV-123-7a	CV-123-4	Yes	2008	30-Aug	17W	598459	7819558	Marginal	No	No	Moved, but close enough to old site, used 2008 survey data; revisited in 2011 to confirm fish presence/absence
CV-124-1a	CV-124-1	Yes	2008	30-Aug	17W	598452	7819361	Important	No	No	Moved, but close enough to old site, used 2008 survey data; revisited in 2011 to confirm fish presence/absence
CV-124-2a	CV-124-2	Yes	2008	30-Aug	17W	598450	7819296	Important	No	No	Moved, but close enough to old site, used 2008 survey data
CV-124-3a	CV-124-3	Yes	2008	30-Aug	17W	598446	7819194	Important	Yes	No	Moved, but close enough to old site, used 2008 survey data
CV-124-4a	CV-124-4	Yes	2007	13-Aug	17W	598433	7818881	Marginal	No	No	Moved, but close enough to old site, used 2007 survey data
CV-125-1a	CV-125-2	Yes	2007	13-Aug	17W	598250	7818322	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-125-3	-	Yes	2007	13-Aug	17W	598388	7817669	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-126-1	-	Yes	2007	13-Aug	17W	598585	7817430	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-127-1	-	Yes	2007	13-Aug	17W	598533	7816272	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-127-2	CV-127-3	Yes	2008	3-Aug	17W	598585	7815834	None	No	No	-
CV-129-1	-	Yes	2008	3-Aug	17W	599372	7814493	Important	Yes	Yes	-
CV-131-1	-	Yes	2007	13-Aug	17W	600628	7812716	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-133-1	-	Yes	2007	13-Aug	17W	600977	7811319	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-133-2	-	Yes	2007	13-Aug	17W	600858	7810618	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-134-1	-	Yes	2010	26-Aug	17W	600609	7810415	None	No	No	-
CV-134-3	CV-134-2	Yes	2007	13-Aug	17W	600192	7810294	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-136-1	-	Yes	2007	13-Aug	17W	598958	7809569	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-136-2	-	Yes	2007	13-Aug	17W	598552	7809072	Marginal	No	No	Moved, but close enough to old site, used 2007 survey data
BR-137-1	-	Yes	2008	25-Jul	17W	598663	7807981	Important	Yes	No	-
CV-138-1	-	Yes	2007	13-Aug	17W	598855	7806965	None	No	No	Moved, but close enough to old site, used 2007 survey data
CV-140-1	-	Yes	2007	13-Aug	17W	598138	7805589	None	No	No	Moved, but close enough to old site, used 2007 survey data
BR-141-1	-	Yes	2008	24-Jul	17W	597527	7805029	Important	Yes	Yes	-

Table A5.1-2.1. Continued.

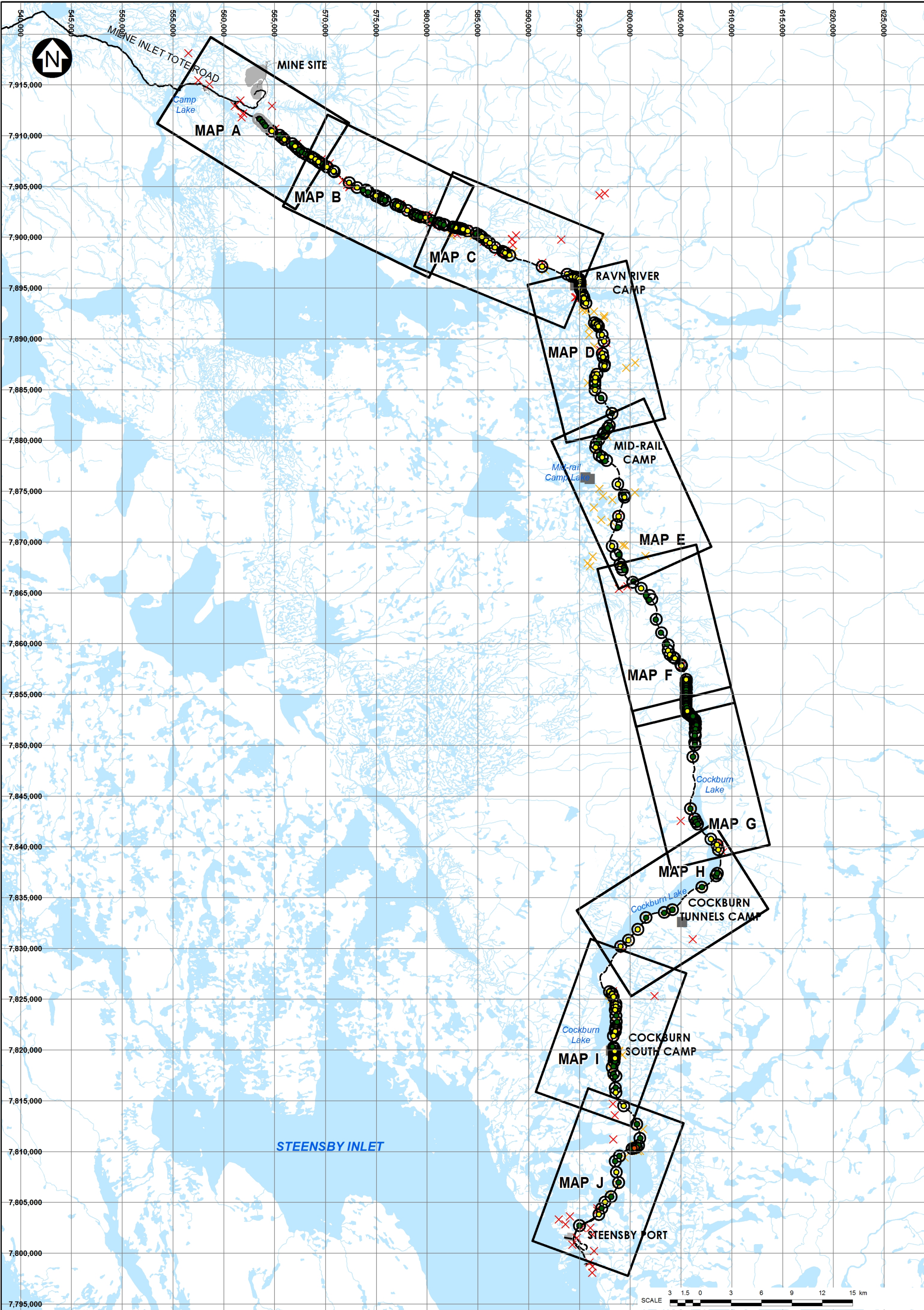
Site	CANARAIL Site Names (if different)	Surveyed	Survey Year	Survey Date	UTM Coordinates			Habitat Rating	ARCH seen ¹	NNST seen ¹	Comments
					Zone	Easting	Northing				
CV-142-1	-	Yes	2007	13-Aug	17W	597201	7804426	None	No	No	Used 2007 data
CV-142-2	-	Yes	2008	24-Jul	17W	596927	7803835	Important	Yes	Yes	-
217 ²	not identified	Yes	2007	14-Aug	17W	594998	7802718	Marginal	No	No	Used 2007 survey data

¹ - includes all ARCH or NNST that were captured.

² - No culvert identified by engineers, but stream still crossed by Railway.

³ - Second branch downstream, but close enough to old site, used 2007 survey data.

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LEGEND:

- | | |
|--|--|
| <ul style="list-style-type: none">● 2007● 2008● 2010○ STREAM CROSSING○ STREAM CROSSING (APPROX.)○ FISH BARRIER (CONFIRMED)○ FISH BARRIER (AERIAL PHOTO INTERPRETATION) | <ul style="list-style-type: none">— MILNE INLET TOTE ROAD (EXISTING)- - - RAILWAY ALIGNMENT (PROPOSED)- - - CONSTRUCTION ACCESS ROAD (PROPOSED)■ WATER■ INFRASTRUCTURE |
|--|--|

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3. PROPOSED RAILWAY ALIGNMENT PROVIDED BY CANRAIL CONSULTANTS INC.
4. PROPOSED RAILWAY CONSTRUCTION ACCESS ROAD ALIGNMENT PROVIDED BY CANRAIL CONSULTANTS INC. DRAWING NO.: RAILWAY ALIGNMENT AND CONST ACCESS RD - MARY RIVER STEENSBY 2010 - 12AUG2010.DWG
5. LOCATION OF PROPOSED INFRASTRUCTURE IS APPROXIMATE AND SUBJECT TO FIELD ADJUSTMENTS

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

Railway Stream Crossing Sites



P/A NO
-
DATE: 19/11/2010

REF NO.
-
REV
2

Path: G:\MARYRIV_GDB\GIS\UpdatedMapping\Baseline appendices\7C4-19_to_7C7-19_App4_4-3_MapsAtoJ.mxd



LEGEND:

- RAILWAY CROSSING SURVEY YEAR

2007

2008

2010

STREAM CROSSING

STREAM CROSSING (APPROX.)

FISH BARRIER (CONFIRMED)

FISH BARRIER (AREAL INTERPRETATION)
- CONTOUR

MILNE INLET TOTE ROAD (EXISTING)

RAILWAY ALIGNMENT (PROPOSED)

CONSTRUCTION ACCESS ROAD (PROPOSED)

WATER

INFRASTRUCTURE

NOTES:

1. BASE MAP 1:50,000 © HER MAJESTY THE QUEEN IN RIGHTS OF CANADA DEPARTMENT OF NATURAL RESOURCES (2009). ALL RIGHTS RESERVED.
2. TOPOGRAPHY PROVIDED BY EAGLE MAPPING (2005).
3. PROPOSED RAILWAY ALIGNMENT PROVIDED BY CANRAIL CONSULTANTS INC.
4. PROPOSED RAILWAY CONSTRUCTION ACCESS ROAD ALIGNMENT PROVIDED BY CANRAIL CONSULTANTS INC. DRAWING NO. RAILWAY ALIGNMENT AND CONST ACCESS RD - MARY RIVER STEENSBY 2010 - 12AUG2010 DWG.
5. LOCATION OF PROPOSED INFRASTRUCTURE IS APPROXIMATE AND SUBJECT TO FIELD ADJUSTMENTS
6. CONTOUR INTERVAL IS 25 AND IS IN METRES.

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

Railway Stream Crossing Sites (Map A)

North/South Consultants Inc.
Aquatic Environment Specialists

P/A NO.	REF NO.
-	-
DATE: 15/12/2011	REV 2

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: 1
UTM Coordinates: 17 W 563473 7911679

Date/Time Surveyed: 7-Aug-07 / 19:45

General Physical Characteristics

Floodplain Width (m):	>100	Channel Pattern:	Braided, flooded terrestrial	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	1.5°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
0	6.37	6.37	0.01	0.03	0.01	0.03				

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 90 s **Electrofisher Settings:** 500V, 60Hz

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	0	-	-	-
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

Channel morphology was 30% pool and 70% riffle and substrate composition was 70% flooded terrestrial, 10% fines and 20% cobble. Barriers present – dry upstream of crossing. Lake(s) present – shallow lake downstream.

Water too low and marshy to be suitable fish habitat; water is likely present only as a result of recent rain. Electrofished downstream of the crossing and no fish were observed or captured.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: 1
UTM Coordinates: 17 W 563473 7911679

Date/Time Surveyed: 7-Aug-07 / 19:45

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: 1 A **Date/Time Surveyed:** 7-Aug-07 / 21:01
UTM Coordinates: 17 W 563583 7911598

General Physical Characteristics

Floodplain Width (m): ~70	Channel Pattern: Braided	Stage: N/A
Channel Confinement: NC	Channel Gradient (range): 6°	Flow Regime: EPH
Bank Height (range in m): UD	Bank Shape: UD	T_w (°C): N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted: N **Effort (min):** N/A **Electrofisher Settings:** N/A

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

High water channel width was 11.15 m. Barriers present – dry at crossing. Lake(s) present – shallow lake downstream.

Crossing dry, no fish habitat present.

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: 1 A
UTM Coordinates: 17 W 563583 7911598

Date/Time Surveyed: 7-Aug-07 / 21:01

Photographs



Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-000-1a
UTM Coordinates: 17 W 563768 7911403

Date/Time Surveyed: 7-Aug-07 / 19:10

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	Braided, flooded terrestrial	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	2°	Flow Regime:	EPH
Bank Height (range in m):	0.10	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 120 s **Electrofisher Settings:** 500V, 60 Hz

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	0	-	-	-
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

The wetted width at the crossing was 20 m and high water channel width was 50 m. The maximum depth was < 0.05 m. Channel morphology was 95% flat and 5% riffle and the substrate was 50% flooded terrestrial, 20% fines, 10% gravel, 10% boulder and 10% cobble. Stream cover was 10% boulder. Barriers present – dry 30-40m upstream of crossing. Lake(s) present – shallow lake downstream. Bank stability was low.

Too far US from more suitable substrate and habitat to be important to fish.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-000-1a
UTM Coordinates: 17 W 563768 7911403

Date/Time Surveyed: 7-Aug-07 / 19:10

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-000-2 and CV-000-1b
UTM Coordinates: 17 W 563824 7911323

Date/Time Surveyed: 7-Aug-07 / 20:16

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	Braided, flooded terrestrial	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	2°	Flow Regime:	INT
Bank Height (range in m):	0.10	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	Low	No
NNST	Low	No	Low	No

Comments & Summary

The maximum depth at this crossing was 0.1 m and the wetted and high water channel widths were 22.5 m and 45.0 m respectively. The channel morphology composition was 50% riffle and 50% pool and substrate composition was 20% flooded terrestrial, 10% fines, 30% gravel, 30% cobble and 10% boulder. Stream cover was 10% boulder and bank stability was low. Lake(s) present – shallow lake downstream.

At low water fish wouldn't use this tributary. Lots of flooded terrestrial grasses suggest recent rains (~2 days ago) may have increased water levels. Extensive use of this watercourse by fish is unlikely this far upstream.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – MARGINAL

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-000-2 and CV-000-1b
UTM Coordinates: 17 W 563824 7911323

Date/Time Surveyed: 7-Aug-07 / 20:16

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-000-3a
UTM Coordinates: 17 W 563996 7911084

Date/Time Surveyed: 7-Aug-07 / 21:53

General Physical Characteristics

Floodplain Width (m):	>100	Channel Pattern:	Flooded terrestrial	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	3°	Flow Regime:	EPH
Bank Height (range in m):	none.	Bank Shape:	N/M	T_w (°C):	N/M

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
0	10.15	10.15	0.01	0.04	0.07	0.07				

Fisheries Information

Electrofishing Conducted: N **Effort (min):** N/A **Electrofisher Settings:** N/A

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	Low	No
NNST	Low	No	Low	No

Comments & Summary

The channel morphology composition was 30% pool and 70% riffle and substrate composition was 89% flooded terrestrial, 10% cobble and 1% boulder. Stream cover was 1% boulder. Barriers present – low water levels downstream. Lake(s) present – downstream.

Fish present in DS pool, but low water levels DS of the crossing created a marshy area that prevents fish from reaching the crossing. The crossing itself is entirely flooded terrestrial and there is no defined channel. One dead fish (ARCH, ~15 cm) was found in the marshy area ~100m DS from crossing. Upstream of the crossing there is suitable fish habitat, but fish use of this area would only be possible during the spring when water levels are high, or during high-water years.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – MARGINAL

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-000-3a
UTM Coordinates: 17 W 563996 7911084

Date/Time Surveyed: 7-Aug-07 / 21:53

Photographs



Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-000-3b
UTM Coordinates: 17 W 564103 7910941

Date/Time Surveyed: 7-Aug-07 / 23:25

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	Sinuuous, braided	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	1°	Flow Regime:	PER
Bank Height (range in m):	UD/ 0.03	Bank Shape:	UD / S	T_w (°C):	N/M

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
0	9.7	9.7	0.01	0.11	0.13	0.24				

Fisheries Information

Electrofishing Conducted: N **Effort (min):** N/A **Electrofisher Settings:** N/A

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	Low	No
NNST	Low	No	Low	No

Comments & Summary

The channel morphology composition was 90% pool and 10% riffle and substrate composition was 50% flooded terrestrial, 20% fine and 30% cobble. Barriers present – low water levels downstream. Lake(s) present – downstream.

Shares a DS pool with crossing CV-000-2, which contains fish. Fish are unable to reach the crossing site due to low water levels. Orange, thick periphyton is extremely abundant at the crossing site itself, indicating an absence of fish. Fish use of habitat at the crossing would only be possible during the spring when water levels are high, or during high-water years.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – MARGINAL

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-000-3b
UTM Coordinates: 17 W 564103 7910941

Date/Time Surveyed: 7-Aug-07 / 23:25

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-001-1
UTM Coordinates: 17W 564627 7910549

Date/Time Surveyed: 7-Aug-07 / 22:38

General Physical Characteristics

Floodplain Width (m):	41.1	Channel Pattern:	Braided	Stage:	N/M
Channel Confinement:	PC	Channel Gradient (range):	3°	Flow Regime:	INT
Bank Height (range in m):	0.10	Bank Shape:	UC	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-001-1
UTM Coordinates: 17W 564627 7910549

Date/Time Surveyed: 7-Aug-07 / 22:38

Comments & Summary

At the crossing the wetted channel width and high water channel width were 1.5 m and 6.5 m, respectively. The maximum water depth was 0.5 m. The stream morphology was 100% pool (< 0.2m) and the substrate was 45% small cobble, 45% boulders and 10% fines.

Very little flow; most wetted area is under and between boulders. Isolated pools offer habitat but they are inaccessible.

Photographs



A



B



C

Figure 1. View of habitat, (A) View upstream of crossing , (B) View across crossing from left bank, (C) View downstream of crossing

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-001-02
UTM Coordinates: 17 W 564717 7910477

Date/Time Surveyed: 15-Jul-08 / 20:48

General Physical Characteristics

Floodplain Width (m): 93.27	Channel Pattern: Sinuous	Stage: Normal
Channel Confinement: PC	Channel Gradient (range): 0.5-15°	Flow Regime: PER
Bank Height (range in m): 0.0-1.0	Bank Shape: S, somewhat UD	T_w (°C): 6.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
100D	7.45	10.0	0.03	0.11	0.02	0.12	0.08	0.44	0.39	0.75
80D	5.27	7.45	0.11	0.12	0.02	0.12	0.10	0.26	0.01	0.26
60D	5.10	6.10	0.04	0.06	-	0.06	0.30	0.64	-	0.64
40D	8.67	11.08	0.05	0.21	0.01	0.21	0.09	0.12	0.04	0.36
20D	6.70	10.07	0.05	0.05	0.02	0.10	0.33	0.41	0.44	0.41
0	7.07	8.40	0.06	0.03	0.06	0.06	0.15	0.95	0.01	0.95
20U	2.7	4.8	0.01	0.07	0.01	0.07	0.08	0.67	0.23	0.68
40U	1.25	1.81	0.07	0.08	0.09	0.09	0.75	0.69	0.07	0.69
60U	0.5	7.95	uniform	0.36	uniform	0.36	uniform	0.25	uniform	0.25
80U	0.84	4.1	0.12	0.30	0.29	0.30	0.01	0.49	0.58	0.58
100U	3.05	9.71	0.20	0.20	0.17	0.25	0.04	0.02	0.0	0.70

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
100D		30			70			5	40	50	5
80D	10	90							20	60	20
60D		40			60			5	30	35	30
40D	10				90					50	50
20D		60			40			5	45	20	30
0		30			70			20	30	35	15
20U		60			40		30	20	10	25	15
40U	95	5						25	25	25	25
60U			100				60	40			
80U	50		50					30	30	30	10
100U	50	40	10				40	5		35	20

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-001-02
UTM Coordinates: 17 W 564717 7910477

Date/Time Surveyed: 15-Jul-08 / 20:48

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 14:24 **Electrofisher Settings:** 400V, 60Hz, 40%

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	37	2.57	53-140	3-25
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	High	No
NNST	No	No	Low	No

Comments & Summary

Fish Habitat: U/S barrier at UTM 17 W 565097 7910673. Seven fish captured in cascade just downstream of crossing, 9 fish caught at crossing and upstream. Caught whole size range all the way up.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-001-02
UTM Coordinates: 17 W 564717 7910477

Date/Time Surveyed: 15-Jul-08 / 20:48

Photographs



A



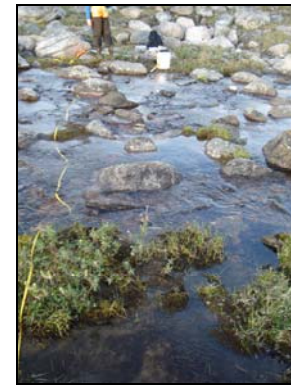
B



C



D



E



F



G



H



I



J



K

Figure 1. Views of available stream habitat at 20 m intervals starting at 100 m downstream (A) and ending at 100 m upstream (K).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-002-1
UTM Coordinates: 17W 565501 7910060

Date/Time Surveyed: 7-Aug-07 / 23:10

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	Slightly meandering	Stage:	N/M
Channel Confinement:	NC	Channel Gradient (range):	10°	Flow Regime:	INT
Bank Height (range in m):	0.15	Bank Shape:	UC	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

At the crossing the wetted channel width and high water channel width were 0.80 m and 25.0 m, respectively. The maximum water depth was 0.25 m. The stream morphology was 50 % pool (> 0.2 m) and 50 % cascade. The substrate was made up of 75% small cobble, 10% fines, 10% gravel, and 5% boulders. Bank stability was low to moderate. The stream cover was 5% boulder, 5% boulder, 5% deep pool, and 20% UC banks. Lake present –downstream.

Flooded vegetation (e.g. willow), steep gradient and low flow are unsuitable for extensive juvenile fish use. Region DS of crossing is marginal to important habitat depending on water levels, but the shoreline of the lake that it empties into has sand/gravel substrate, which is not ideal habitat for ARCH or NNST.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-002-1
UTM Coordinates: 17W 565501 7910060

Date/Time Surveyed: 7-Aug-07 / 23:10

Photographs



A



B

Figure 1. View of habitat (A) View DS of crossing looking upstream, (B) View DS of crossing across from right bank

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-002-2
UTM Coordinates: 17W 565757 7909827

Date/Time Surveyed: 8-Aug-07 / 00:28

General Physical Characteristics

Floodplain Width (m):	15.5	Channel Pattern:	Nearly straight	Stage:	N/M
Channel Confinement:	PC	Channel Gradient (range):	8°	Flow Regime:	INT
Bank Height (range in m):	0.4	Bank Shape:	NV	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 7:00 **Electrofisher Settings:** 500 V, 60 Hz

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	0	-	-	-
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality-NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-002-2
UTM Coordinates: 17W 565757 7909827

Date/Time Surveyed: 8-Aug-07 / 00:28

Comments & Summary

At the crossing, the wetted and high water channel width were 1.8 and 3.0 m, respectively. The maximum water depth was 0.24 m. The stream morphology was 85% pool (< 0.2 m) and 15% cascade. The substrate was 35% large cobble, 35% small cobble, 20% gravel and 10% boulders. Bank stability was low to moderate. Stream cover was 10% boulders, 10% deep pool and large cobble.

A nearly vertical water fall (< 1 m in height) located downstream of crossing is likely a barrier to fish movement. Stretch below falls leading down to lake is accessible to fish and likely important habitat for juvenile fish (ARCH were observed), especially YOY.

Photographs



A



B



C

Figure 1. View of habitat (A) View upstream of crossing, (B) View across crossing from left bank, (C) View downstream of crossing.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-003-1
UTM Coordinates: 17 W 565971 7909658

Date/Time Surveyed: 15-Jul-08 / 22:50

General Physical Characteristics

Floodplain Width (m):	91.44	Channel Pattern:	Sinuuous, braided	Stage:	Normal
Channel Confinement:	PC	Channel Gradient (range):	1-15°	Flow Regime:	PER
Bank Height (range in m):	UD – 0.35	Bank Shape:	50% UC/50% V	T_w (°C):	N/M

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
100D	LAKE									
80D	1.05	5.70	0.11	0.13	0.06	0.13	0.01	0.34	0.05	0.34
60D	2.66	6.16	0.02	0.01	0.01	0.02	0.24	0.16	0.11	0.24
40D	5.22	9.47	0.03	0.02	0.07	0.07	0.20	0.11	0.51	0.51
20D (2 ch)	6.76	9.40	0.02	0.02	0.02	0.06	0.12	0.20	0.45	0.45
0	8.85	10.35	0.01	0.02	0.01	0.07	0.58	0.61	0.34	0.70
20U	7.50	13.15	0.08	0.10	0.05	0.10	0.01	0.20	0.33	0.33
40U	6.40	7.80	0.13	0.10	0.07	0.10	0.12	0.54	0.05	1.20
60U	BARRIER									

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
100D	LAKE										
80D	50	50					5	80	15		
60D	90	10						60	40		
40D	60	35			5		5	50	40	5	
20D		80			20		5	35	35	20	5
0		40			60		10	20	25	40	5
20U		50			50		5	20	30	40	5
40U		20			80			10	10	30	50
60U	BARRIER										

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-003-1
UTM Coordinates: 17 W 565971 7909658

Date/Time Surveyed: 15-Jul-08 / 22:50

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 12:00 **Electrofisher Settings:** 400V, 60Hz, 40%DC

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	27	2.25	88 - 155	8 - 38
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	High	No
NNST	No	No	Low	No

Comments & Summary

A barrier to further fish movement exists 50 m upstream of the crossing area (UTM – 17 W 565992 7909694). Juvenile Arctic char were captured consistently from the confluence with the downstream lake up to the barrier. In general, this area provides important fish habitat although it is only limited to approximately 150 m.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-003-1
UTM Coordinates: 17 W 565971 7909658

Date/Time Surveyed: 15-Jul-08 / 22:50

Photographs



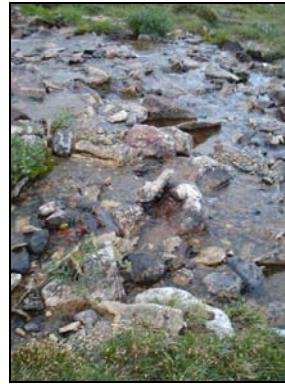
A



B



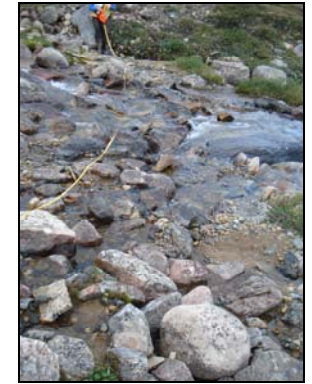
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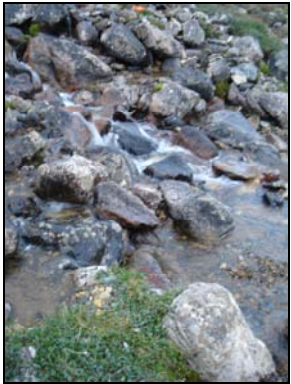
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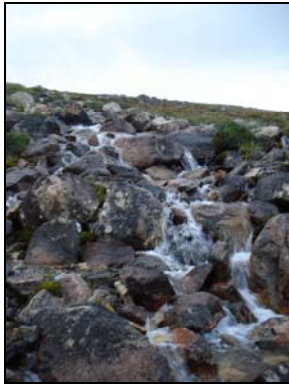
E



F



G



H



I

Figure 1. View of habitat 80 (A), 60 – right channel (B), 40 – right channel (C), and 20 m – right channel (D) downstream of the crossing, at the crossing (E), and 20 (F) and 40 m (G) upstream of the crossing. Views upstream (H) and downstream (I) from the fish barrier are also presented.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-003-2
UTM Coordinates: 17W 566717 7909224

Date/Time Surveyed: 8-Aug-07/ 01:50

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	Sinuuous	Stage:	N/M
Channel Confinement:	PC	Channel Gradient (range):	2°	Flow Regime:	INT
Bank Height (range in m):	N/M	Bank Shape:	N/M	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-003-2
UTM Coordinates: 17W 566717 7909224

Date/Time Surveyed: 8-Aug-07/ 01:50

Comments & Summary

Crossing dry, no fish habitat present. Downstream there was a lake present.

The high water channel width was 1.46 m. Barrier present-marsh D/S.

Photographs



A



B



C

Figure 1. View of habitat, (A) View upstream of crossing, (B) View across crossing 10 from left bank, (C) View downstream of crossing.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-004-1
UTM Coordinates: 17 W 567005 7908965

Date/Time Surveyed: 16-Jul-08 / 3:12

General Physical Characteristics

Floodplain Width (m): 59.45	Channel Pattern: Sinuous	Stage: Normal
Channel Confinement: PC	Channel Gradient (range): 1-4°	Flow Regime: PER
Bank Height (range in m): UD – 0.45	Bank Shape: 50% UC/20% S/20% UD	T_w (°C): 6.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
100D	6.50	14.15	0.04	0.04	0.05	0.15	0.01	0.19	0.23	0.37
80D	3.75	5.12	0.07	0.20	0.04	0.20	0.60	0.36	0.31	0.60
60D	8.52	10.20	0.05	0.15	0.14	0.15	0.10	0.14	0.44	0.48
40D	6.45	12.96	0.06	0.05	0.13	0.13	0.02	0.42	0.33	0.89
20D	6.86	10.25	0.06	0.14	0.16	0.20	0.61	0.49	0.67	1.37
0	7.30	10.00	0.15	0.14	0.11	0.15	0.12	0.02	0.32	0.54
20U	4.74	8.49	0.05	0.07	0.06	0.11	0.13	0.63	0.34	0.63
40U	8.60	9.46	0.07	0.10	0.20	0.20	0.36	0.04	0.22	0.83
60U	3.96	5.63	0.13	0.16	0.32	0.32	0.08	0.67	0.38	0.67
80U	5.00	7.16	0.10	0.10	0.16	0.16	0.03	0.32	0.56	0.56
100U	7.68	10.20	0.15	0.17	0.05	0.24	0.24	0.30	0.17	0.56

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
100D	100						5		75	20	
80D	70	10			20				15	80	5
60D	80	20					10	10	20	58	2
40D	70	30							10	75	15
20D	20	30			50				10	60	30
0	40	40			20				15	65	20
20U	80	20							20	45	35
40U	45	45			10				10	30	60
60U	80	20							10	60	30
80U	65	30			5				10	60	30
100U	60	40							30	45	25

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-004-1
UTM Coordinates: 17 W 567005 7908965

Date/Time Surveyed: 16-Jul-08 / 3:12

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 7:48 **Electrofisher Settings:** 400V, 60Hz, 40%DC

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	24	3.08	67 - 180	4 - 43
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	High	No
NNST	No	No	Low	No

Comments & Summary

A barrier to further fish movement exists approximately 300 m upstream of the crossing area (UTM – 17 W 567205 7909169). Juvenile Arctic char were captured both up and downstream of the crossing area. In general, this area provides abundant, important juvenile fish habitat.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-004-1
UTM Coordinates: 17 W 567005 7908965

Date/Time Surveyed: 16-Jul-08 / 3:12

Photographs

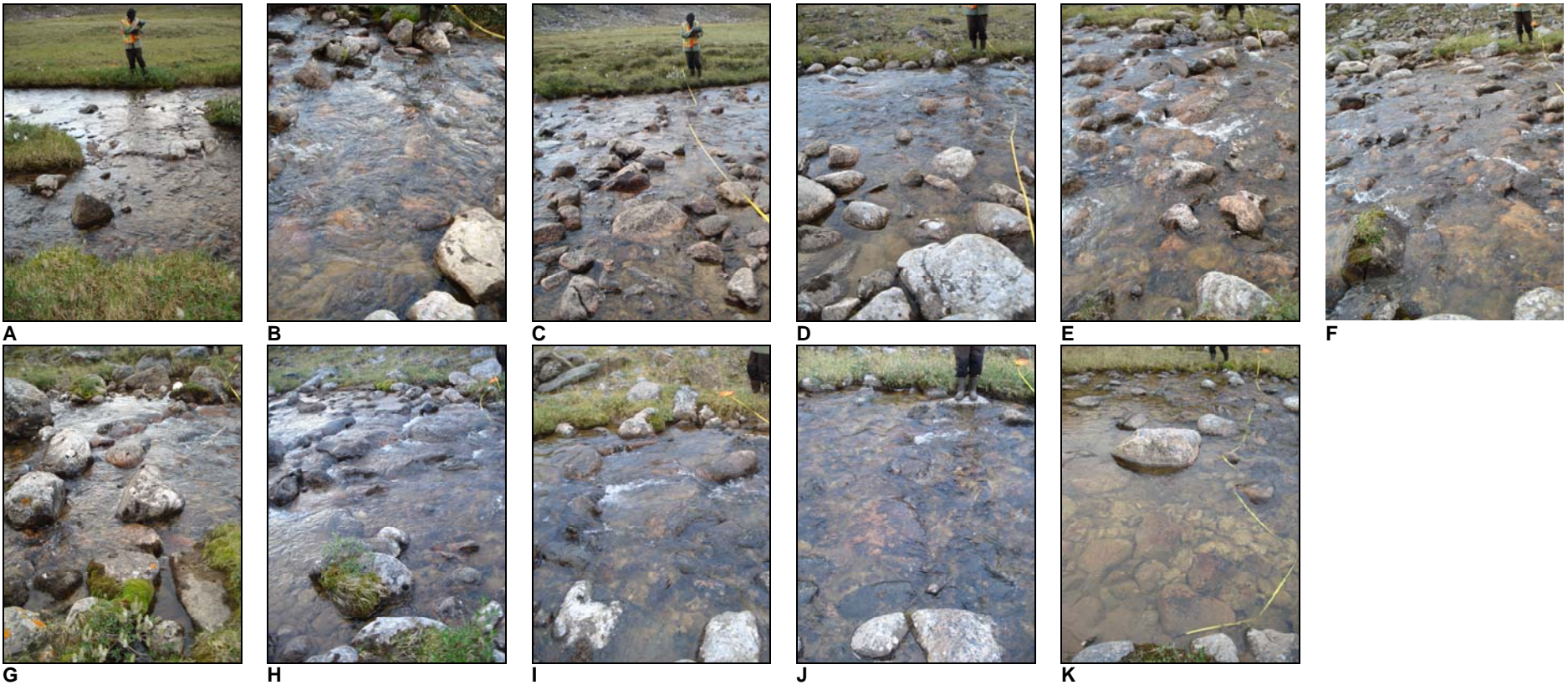


Figure 1. View of habitat 100 (A), 80 (B), 60 (C), 40 (D), and 20 m (E) downstream of crossing, at the crossing (F), and 20 (G), 40 (H), 60 (I), 80 (J), and 100 m (K) upstream of the crossing.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-004-2 **Date/Time Surveyed:** 8-Aug-07 / 01:38
UTM Coordinates: 17W 567121 7908861

General Physical Characteristics

Floodplain Width (m):	22.9	Channel Pattern:	Braided	Stage:	N/M
Channel Confinement:	PC	Channel Gradient (range):	15°	Flow Regime:	INT-PER
Bank Height (range in m):	0.10	Bank Shape:	V	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted: N **Effort (min):** N/A **Electrofisher Settings:** N/A

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-004-2
UTM Coordinates: 17W 567121 7908861

Date/Time Surveyed: 8-Aug-07 / 01:38

Comments & Summary

At the crossing the wetted and high water channel width were 1.3 m and 13.7 m, respectively. The maximum water depth was 0.02 m. The stream morphology was 50 % pool (0.2 m) and 50% cascade. The substrate was 75% gravel, 10 % fines, 10% gravel and 5% boulders. Bank stability was low to moderate. Stream cover was 5% boulder. Lake present-downstream

Low water level and steep gradient make the crossing site unsuitable habitat for any fish. DS of the crossing site it joins with the watercourse from crossing #11, which is fish habitat.

Photographs



A



B



C

Figure 1. View of habitat, (A) View upstream of crossing, (B) View across crossing from left bank, (C) View downstream of crossing.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-004-3
UTM Coordinates: 17W 567389 / 7908618

Date/Time Surveyed: 8-Aug-07 / 02:04

General Physical Characteristics

Floodplain Width (m):	UD	Channel Pattern:	Braided	Stage:	N/M
Channel Confinement:	NC	Channel Gradient (range):	2°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

Crossing dry, no fish habitat present.
 The high water channel width was 14.0m. Lake present-downstream.

Baffinland Iron Mines
 Mary River Project



Fish Habitat Quality –NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-004-3
UTM Coordinates: 17W 567389 / 7908618

Date/Time Surveyed: 8-Aug-07 / 02:04

Photographs



A



B



C

Figure 1. View of habitat, (A) View upstream of crossing, (B) View across crossing from right bank, (C) View downstream of crossing.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-005-1
UTM Coordinates: 17W 567696 7908397

Date/Time Surveyed: 8-Aug-07 / 02:16

General Physical Characteristics

Floodplain Width (m):	11.0	Channel Pattern:	Braided	Stage:	N/M
Channel Confinement:	NC	Channel Gradient (range):	4°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

Crossing dry, no fish habitat present. Even if there were water present, a downstream cascade would prevent fish from reaching the crossing. The high water channel width was 9.0 m. Lake present-downstream.

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

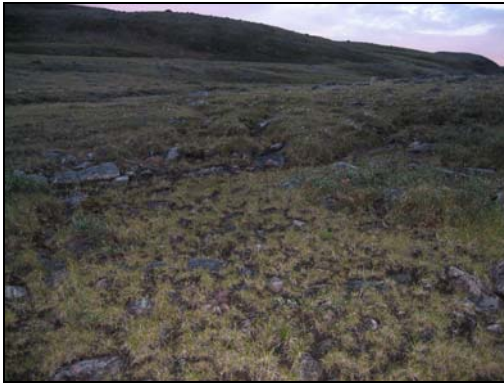
Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-005-1
UTM Coordinates: 17W 567696 7908397

Date/Time Surveyed: 8-Aug-07 / 02:16

Photographs



A



B



C

Figure 1. View of habitat, (A) View upstream of crossing, (B) View across crossing from left bank, (C) View downstream of crossing.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-005-2
UTM Coordinates: 17W 568006 7908236

Date/Time Surveyed: 8-Aug-07 / 02:30

General Physical Characteristics

Floodplain Width (m):	67.7	Channel Pattern:	Meandering, flooded terrestrial	Stage:	N/M
Channel Confinement:	NC	Channel Gradient (range):	N/M	Flow Regime:	EPH
Bank Height (range in m):	0.17/ 0.10	Bank Shape:	R	T_w (°C):	N/M

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
0	1.23	2.47	0.01	0.04	0.02	0.07				

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
0		100					100 FT				

Fisheries Information

Electrofishing Conducted: N **Effort (min):** N/A **Electrofisher Settings:** N/A

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-005-2
UTM Coordinates: 17W 568006 7908236

Date/Time Surveyed: 8-Aug-07 / 02:30

Comments & Summary

Unlikely fish habitat due to very low water levels and substrate that is entirely flooded terrestrial vegetation. Even at high water levels, fish could not move upstream to crossing due to steep incline downstream that would become a cascade. Barriers present downstream. Bank stability is moderate.

Photographs



A



B



C

Figure 1. View of habitat, (A) View upstream of crossing, (B) View across crossing from right bank, (C) View downstream of crossing.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-005-3
UTM Coordinates: 17W 568072 7908202

Date/Time Surveyed: 8-Aug-07 / 02:14

General Physical Characteristics

Floodplain Width (m):	68.6	Channel Pattern:	Straight, flooded terrestrial	Stage:	N/M
Channel Confinement:	PC	Channel Gradient (range):	1°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

Unlikely fish habitat due to very low water levels and substrate that is entirely flooded terrestrial vegetation and 2% boulders. Even at high water levels, fish could not move upstream to crossing due to steep incline downstream that would become a cascade.

Maximum water depth was 0.01 m.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-005-3
UTM Coordinates: 17W 568072 7908202

Date/Time Surveyed: 8-Aug-07 / 02:14

Photographs



A



B



C

Figure 1. View of habitat, (A) View upstream of crossing, (B) View across crossing from left bank, (C) View downstream of crossing.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-006-1
UTM Coordinates: 17 W 568605 7907920

Date/Time Surveyed: 16-Jul-08 / 00:48

General Physical Characteristics

Floodplain Width (m):	>183	Channel Pattern:	Meandering, braided	Stage:	Normal
Channel Confinement:	PC	Channel Gradient (range):	1.0-5.0°	Flow Regime:	PER
Bank Height (range in m):	0.05-0.20	Bank Shape:	S	T_w (°C):	8

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
80D (4 chnls)	8.63	8.63	0.01	0.03	0.1	0.15	0.19	0.58	0.31	0.56
60D (4 chnls)	7.56	7.56	0.02	0.12	0.14	0.14	0.11	0.94	0.25	0.94
40D (5 chnls)	10.27	10.27	0.04	0.03	0.1	0.14	0.08	0.2	0.69	0.69
20D (3 chnls)	12.46	12.46	0.04	0.14	0.20	0.20	0.22	0.68	0.03	0.84
0 (3 chnls)	6.08	6.08	0.18	0.2	0.01	0.2	0.73	0.49	0.2	0.73
20U (2 chnls)	6.25	6.25	0.2	0.02	0.04	-	0.88	0.06	0.27	1.35
40U (2 chnls)	5.55	5.55	0.36	0.26	0.06	-	0.24	0.53	0.7	-
60U (2 chnls)	6.55	6.55	0.2	0.2	0.13	-	0.64	1.05	0.76	1.05
80U (1 chnls)	4.82	4.82	0.17	0.4	0.11	0.4	0.3	0.86	0.1	1.15
100U	6.12	6.12	0.07	0.36	0.51	-	0.29	0.14	0.1	0.67

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
80D	85	15					20	30	40	10	
60D	75	25					10	20	45	25	
40D	70	30					20	20	40	20	
20D	45	50			5			20	64	15	1
0	30	70					1	20	69	10	
20U	45	20			35		5	25	45	20	5
40U		25	10		65			10	35	50	5
60U	50	20			30		5	20	35	35	5
80U		50			50			15	20	15	50
100U		30			70				10	20	70

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-006-1
UTM Coordinates: 17 W 568605 7907920

Date/Time Surveyed: 16-Jul-08 / 00:48

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 7:00 **Electrofisher Settings:** N/M

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	14	2.00	75-111	5-11
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	High	No
NNST	No	No	Low	No

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

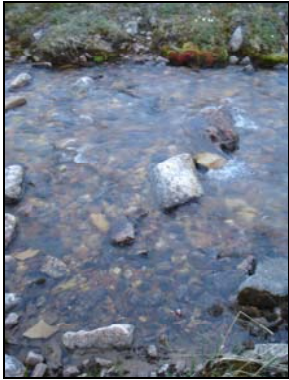
Rail Alignment Watercourse Crossing Assessment

Location

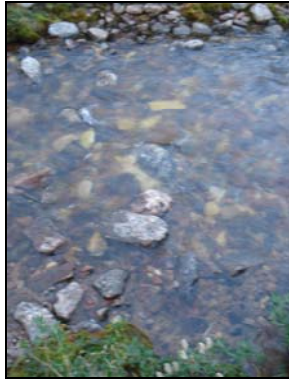
Crossing ID: CV-006-1
UTM Coordinates: 17 W 568605 7907920

Date/Time Surveyed: 16-Jul-08 / 00:48

Photographs



A



B



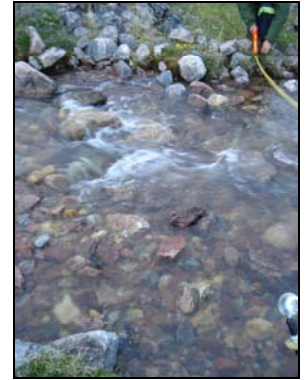
C



D



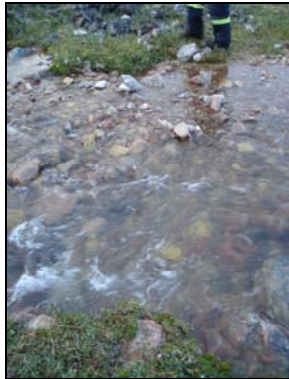
E



F



G



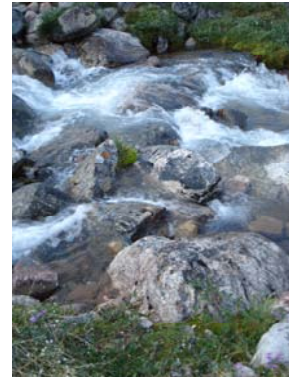
H



I



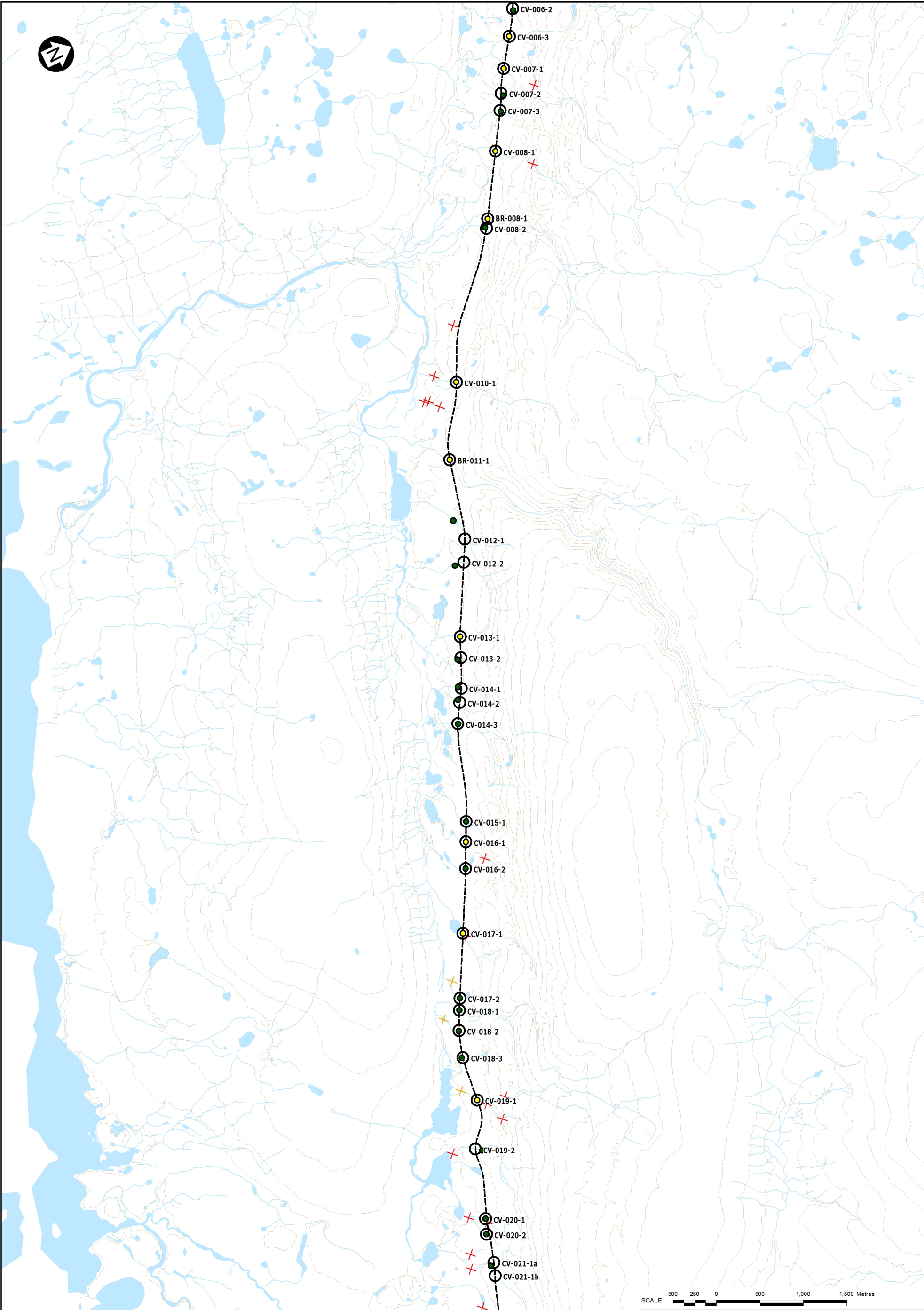
J



K

Figure 1. View of habitat 100 (A), 80 (B), 60 (C), 40 (D), and 20 m (E) downstream of crossing, at the crossing (F), and 20 (G), 40 (H), 60 (I), 80 (J), and 100 m (K) upstream of the crossing.

Path: G:\MARYRIV_GDB\EIS_Figures\MXD\Synthesis_RailLine_AccessRoad\Rev2\Apdx\20101119_ApdxRW_sg.mxd



LEGEND:

- RAILWAY CROSSING SURVEY YEAR

 - 2007
 - 2008
 - 2010
- STREAM CROSSING

 - STREAM CROSSING (APPROX.)
- FISH BARRIER (CONFIRMED)

 - FISH BARRIER (AREAL INTERPRETATION)
- CONTOUR

 - MILNE INLET TOTE ROAD (EXISTING)
 - RAILWAY ALIGNMENT (PROPOSED)
 - CONSTRUCTION ACCESS ROAD (PROPOSED)
- WATER

 - INFRASTRUCTURE

NOTES:

1. BASE MAP 1:50,000 © HER MAJESTY THE QUEEN IN RIGHTS OF CANADA DEPARTMENT OF NATURAL RESOURCES (2005.) ALL RIGHTS RESERVED.
2. TOPOGRAPHY PROVIDED BY EAGLE MAPPING (2005).
3. PROPOSED RAILWAY ALIGNMENT PROVIDED BY CANRAIL CONSULTANTS INC.
4. PROPOSED RAILWAY CONSTRUCTION ACCESS ROAD ALIGNMENT PROVIDED BY CANRAIL CONSULTANTS INC. DRAWING NO. RAILWAY ALIGNMENT AND CONST ACCESS RD - MARY RIVER STEENSBY 2010 -12AUG2010 DWG
5. LOCATION OF PROPOSED INFRASTRUCTURE IS APPROXIMATE AND SUBJECT TO FIELD ADJUSTMENTS
6. CONTOUR INTERVAL IS 25 AND IS IN METRES.

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

Railway Stream Crossing Sites (Map B)

North/South Consultants Inc.
Aquatic Environment Specialists

P/A NO.	REF NO.
-	-
DATE: 19/11/2010	REV 2

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-006-2
UTM Coordinates: 17W 568765 7907848

Date/Time Surveyed: 8-Aug-07 / 03:44

General Physical Characteristics

Floodplain Width (m):	56.7	Channel Pattern:	Braided, flooded terrestrial	Stage:	N/M
Channel Confinement:	NC	Channel Gradient (range):	2°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

At the crossing the wetted and high water channel width were 10.5 m and 17.0 m, the maximum water depth was 0.05 m. The stream morphology was 100% pool (< 0.2 m) and the substrate was 48% small cobble, 30% fines, 20% gravel and 2% boulders. Barriers present-dry downstream. Not enough water or flow present to be fish habitat.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-006-2
UTM Coordinates: 17W 568765 7907848

Date/Time Surveyed: 8-Aug-07 / 03:44

Photographs



A



B



C

Figure 1. View of habitat, (A) View upstream of crossing, (B) View across crossing from left bank, (C) View downstream of crossing.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-006-3
UTM Coordinates: 17 W 569014 7907673

Date/Time Surveyed: 17-Jul-08 / 2:20

General Physical Characteristics

Floodplain Width (m): 23.77	Channel Pattern: Sinuous, braided	Stage: Normal
Channel Confinement: PC	Channel Gradient (range): 5-7°	Flow Regime: PER
Bank Height (range in m): UD – 0.40	Bank Shape: 20% UC/80% UD	T_w (°C): 7.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
100D	5.87	12.69	0.07	0.06	0.06	0.11	0.06	0.12	0.93	0.93
80D	5.90	15.95	0.12	0.01	0.05	0.12	0.25	0.88	0.41	0.88
60D (2 ch)	9.80	17.50	0.04	0.06	0.02	0.06	0.35	0.75	0.21	0.75
40D (2 ch)	6.30	12.30	0.03	0.04	0.11	0.12	0.15	0.70	0.61	0.70
20D (3 ch)	6.40	15.50	0.07	0.07	0.06	0.07	0.90	0.58	0.09	0.90
0 (3 ch)	3.20	15.70	0.12	0.09	0.06	0.12	0.12	0.13	0.94	0.94
20U (3 ch)	2.80	14.20	0.05	0.14	0.04	0.15	0.93	0.01	0.47	1.07
40U (2 ch)	3.00	11.10	0.03	0.10	0.05	0.10	0.09	0.52	0.28	0.57
60U (2 ch)	4.60	6.60	0.04	0.08	0.10	0.10	0.41	0.44	0.39	0.44
80U	1.40	1.40	0.07	0.05	0.11	0.11	0.29	0.88	0.52	0.88
100U	1.30	1.50	0.11	0.03	0.01	0.11	0.16	0.74	0.05	0.78

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
100D	40	30			30			20	40	25	15
80D	25	45			30			40	30	20	10
60D	70	20			10			35	35	20	10
40D	60	20			20			50	25	20	5
20D	35	35			30		5	40	44	10	1
0	20	40			40			20	25	35	20
20U	40	40			20			35	35	20	10
40U	40	20			40			30	45	25	
60U	80	10			10			30	50	20	
80U	80	10			10			40	40	20	
100U	65	10			25			35	40	25	

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-006-3
UTM Coordinates: 17 W 569014 7907673

Date/Time Surveyed: 17-Jul-08 / 2:20

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 7:32 **Electrofisher Settings:** 500V, 60Hz, 40%DC

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	16	2.12	80 - 125	9 - 22
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	High	Moderate
NNST	No	No	Low	No

Comments & Summary

A barrier to further fish movement exists approximately 700-750 m upstream of the crossing area (UTM – 17 W 569683 7907631). Juvenile Arctic char were captured both up and downstream of the crossing area. In general, this area provides abundant, important juvenile fish habitat up until the fish barrier.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-006-3
UTM Coordinates: 17 W 569014 7907673

Date/Time Surveyed: 17-Jul-08 / 2:20

Photographs



A



B



C



D



E



F



G



H



I



J



K

³
Figure 1. View of habitat 100 (A), 80 (B), 60 (C), 40 (D), and 20 m (E) downstream of crossing, at the crossing (F), and 20 (G), 40 (H), 60 (I), 80 (J), and 100 m (K) upstream of the crossing.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-007-1
UTM Coordinates: 17 W 569318 7907453

Date/Time Surveyed: 18-Jul-08 / 2:15

General Physical Characteristics

Floodplain Width (m):	42.98	Channel Pattern:	Sinuous	Stage:	Normal
Channel Confinement:	PC	Channel Gradient (range):	5-9°	Flow Regime:	PER
Bank Height (range in m):	UD – 0.30	Bank Shape:	35% UC/65% V	T_w (°C):	6.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
100D	4.60	6.00	0.02	0.04	0.03	0.08	0.12	0.23	0.31	0.40
80D	2.90	4.20	0.05	0.06	0.02	0.07	0.85	0.24	0.15	0.85
60D	3.00	4.60	0.08	0.05	0.05	0.10	0.23	0.03	0.32	0.72
40D	2.70	2.80	0.10	0.03	0.07	N/M	0.79	0.25	0.06	0.79
20D	2.50	4.20	0.15	NM	0.05	0.21	0.83	NM	0.24	1.02
0	1.10	5.70	0.16	NM	0.20	0.21	0.16	NM	0.19	0.43
20U	2.70	9.50	0.04	0.03	0.02	0.06	0.52	0.26	0.22	0.52
40U	1.60	1.70	0.15	NM	0.14	N/M	0.31	NM	0.64	0.72
60U	1.20	5.90	0.10	NM	0.19	0.32	0.70	NM	0.44	0.82
80U	0.60	2.40	0.14	NM	0.11	0.14	0.55	NM	0.60	0.60
100U	2.00	4.10	0.05	0.05	0.06	0.07	0.21	0.14	0.47	0.47

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
100D	80	20						20	30	35	15
80D	70	10			20			20	50	30	
60D	80	20						10	50	30	10
40D	45	20			35			10	30	40	20
20D	30	40			30			10	20	60	10
0	90				10		20 FT	30	25	25	
20U	100							15	55	30	
40U	40	20			40			10	30	40	20
60U	20	40			40				30	40	30
80U	40	30	10		20		20 FT		40	30	10
100U	40	10			50		5 FT		40	55	

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-007-1
UTM Coordinates: 17 W 569318 7907453

Date/Time Surveyed: 18-Jul-08 / 2:15

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 7:33 **Electrofisher Settings:** 400V, 60Hz, 30%DC

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	17	2.25	81 - 208	5 - 80
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	High	Moderate
NNST	No	No	Low	No

Comments & Summary

A barrier (the same upstream barrier as for CV-006-3) to further fish movement exists approximately 450 m upstream of the crossing area (UTM – 17 W 569683 7907631). Juvenile Arctic char were captured both up and downstream of the crossing area. In general, this area provides abundant, important juvenile fish habitat up until the fish barrier.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-007-1
UTM Coordinates: 17 W 569318 7907453

Date/Time Surveyed: 18-Jul-08 / 2:15

Photographs



A



B



C



D



E



F



G



H



I



J



K

Figure 1. View of habitat 100 (A), 80 (B), 60 (C), 40 (D), and 20 m (E) downstream of crossing, at the crossing (F), and 20 (G), 40 (H), 60 (I), 80 (J), and 100 m (K) upstream of the crossing.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-007-2
UTM Coordinates: 17W 569596 7907308

Date/Time Surveyed: 8-Aug-07 / 05:32

General Physical Characteristics

Floodplain Width (m):	50.3	Channel Pattern:	Sinuuous	Stage:	N/M
Channel Confinement:	NC	Channel Gradient (range):	2°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

Crossing dry, no fish habitat present. Lake present downstream.

The high water channel width was 2.2 m.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-007-2
UTM Coordinates: 17W 569596 7907308

Date/Time Surveyed: 8-Aug-07 / 05:32

Photographs



A



B



C

Figure 1. (A) View upstream of crossing, (B) View across crossing from left bank, (C) View downstream of crossing.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-007-3
UTM Coordinates: 17W 569752 / 7907206

Date/Time Surveyed: 8-Aug-07 / 05:49

General Physical Characteristics

Floodplain Width (m):	38.4	Channel Pattern:	Meandering	Stage:	N/M
Channel Confinement:	PC-C	Channel Gradient (range):	7°	Flow Regime:	PER
Bank Height (range in m):	0.15/ 0.10	Bank Shape:	UC	Tw (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 9:00 **Electrofisher Settings:** 500 V, 60Hz

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	0	-	-	-
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality –NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-007-3
UTM Coordinates: 17W 569752 / 7907206

Date/Time Surveyed: 8-Aug-07 / 05:49

Comments & Summary

At the crossing the wetted and high channel water width was 3.6 m and 5.0 m, respectively. The maximum water depth was 0.10 m. The channel was 40% pool and 60% cascade. The substrate was 10% fines, 10% gravel, 60% cobble and 20% boulder. The stream cover was 20% boulder, 5% deep pool, and 20% large cobble.

Suitable fish habitat is present at the crossing, but access must be denied due to a downstream barrier because there are no fish present.

Photographs



A



B



C

Figure 1. (A) View upstream of crossing, (B) View across crossing from left bank, (C) View downstream of crossing.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-008-1
UTM Coordinates: 17 W 570136 7906945

Date/Time Surveyed: 18-Jul-08 / 03:42

General Physical Characteristics

Floodplain Width (m): 54.9	Channel Pattern: Braided, meandering	Stage: Normal
Channel Confinement: PC	Channel Gradient (range): 5-15°	Flow Regime: PER
Bank Height (range in m): UD – 0.45	Bank Shape: Mostly UD-Rock	T_w (°C): 6.5

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
100D (2 ch)	2.4	43.9	0.15	0.12	0.04	N/M	0.54	0.11	0.26	N/M
80D	4.2	45.7	0.03	0.03	0.05	0.11	0.19	0.46	0.55	N/M
60D	4.7	35.7	0.01	0.11	0.06	N/M	0.20	0.57	0.32	N/M
40D	4.7	40.23	0.30	0.26	0.11	0.37	0.28	0.01	0.23	0.58
20D (1 ch)	10.0	22.9	0.17	0.05	0.01	0.2	0.15	0.57	0.33	0.90
0	3.8	21.9	0.07	0.20	0.04	N/M	0.11	0.54	0.25	0.91
20U (2 ch)	5.8	29.3	0.16	0.13	0.06	N/M	0.52	0.01	0.61	0.91
40U (2 ch)	2.8	22.9	0.18	0.09	0.15	0.33	0.02	0.64	0.14	1.30
60U (1 ch)	5.2	28.3	0.04	0.13	0.08	N/M	0.73	0.12	0.44	0.83
80U	5.2	29.3	0.08	0.17	0.06	0.18	0.71	0.44	0.13	1.58
100U	3.9	N/M	0.17	0.34	0.02	0.4	0.04	0.25	0.66	0.73

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
100D	70	20			10			10	50	30	10
80D	65	10			25			30	38	30	2
60D	30	40			30			20	50	28	2
40D	25	10	40		25			40	30	20	10
20D	35	35			30			30	30	15	25
0	20	25	5		50			10	45	15	30
20U	10	35	10		45			10	30	20	30
40U	15	20	30		35			10	35	20	35
60U	40	30			30			15	20	40	25
80U	25	30			45			10	30	15	45
100U	20		40		40			15	15	40	30

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-008-1
UTM Coordinates: 17 W 570136 7906945

Date/Time Surveyed: 18-Jul-08 / 03:42

Fisheries Information

Electrofishing Conducted: Y Effort (min): 5:16 Electrofisher Settings: 400V, 60Hz, 30%DC

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	9	1.71	125-195	21 – 71
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	High	Low
NNST	No	No	No	No

Comments & Summary

Fish can pass all potential barriers as far as we could walk. Final U/S barrier at UTM 17 W 570487 7907250.

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-008-1
UTM Coordinates: 17 W 570136 7906945

Date/Time Surveyed: 18-Jul-08 / 03:42

Photographs



A



B



C



D



E



F



G



H



I



J



K



Figure 1. View of habitat 100-channel 1 (A), 80 (B), 60 (C), 40 (D), and 20 m (E) downstream of crossing, at the crossing (F), and 20 (G), 40 (H), 60 (I), 80 (J), and 100 m (K) upstream of the crossing. (A-D are channel 1)

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: BR-008-1
UTM Coordinates: 17 W 570799 7906523

Date/Time Surveyed: 18-Jul-08 / 20:47

General Physical Characteristics

Floodplain Width (m): 61.26 **Channel Pattern:** Braided, sinuous **Stage:** Normal-high
Channel Confinement: PC **Channel Gradient (range):** 7-15° **Flow Regime:** PER
Bank Height (range in m): UD **Bank Shape:** 50% UD-rocks, 50% V **T_w (°C):** 6.5

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
40D (2 ch)	22.86	29.26	0.40	0.41	0.14	0.41	0.07	0.19	1.38	1.76
20D (1 ch)	13.72	16.46	0.21	0.09	0.23	0.44	1.00	0.52	1.72	2.22
0	9.60	13.72	0.08	0.42	0.25	0.67	2.40	0.10	0.83	
20U	11.89	16.46	0.42	0.80	0.50		0.05	0.53	1.36	1.36
40U	9.60	22.86	0.15	0.25	0.28	0.37	1.58	1.07	1.82	

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
40D	10	5	25		20	Rapid = 40	10	10	30	30	20
20D			25		30	Rapid = 35	10		30	30	30
0		5	20		20	Rapid = 55	15	10	30	25	20
20U			15		20	Rapid = 65	10	10	20	20	40
40U			10		15	Rapid = 75	10		20	45	25

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 8:23 **Electrofisher Settings:** 400V, 60Hz, 30%DC

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	2	0.239	174-175	58 - 59
NNST	0	-	-	-

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: BR-008-1
UTM Coordinates: 17 W 570799 7906523

Date/Time Surveyed: 18-Jul-08 / 20:47

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	High	Low
NNST	No	No	No	No

Comments & Summary

Only larger juveniles can use crossing. At 40 m downstream, there were two channels and 40 m upstream pictures were taken from the right bank.

Photographs



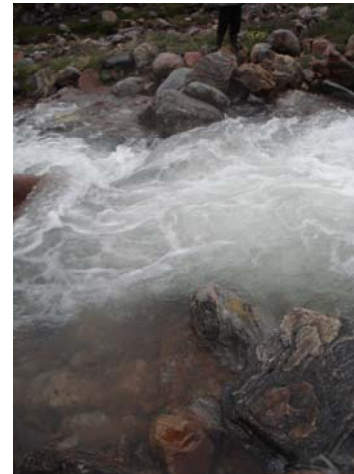
A



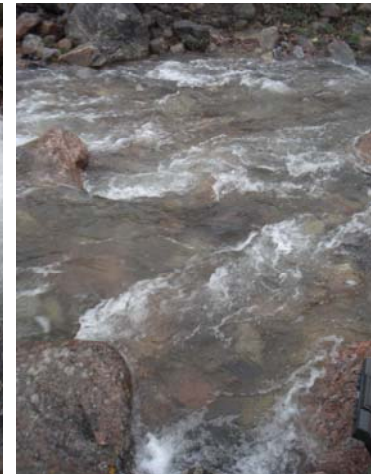
B



C



D



E

Figure 1: View of habitat 40 (A), and 20 m downstream of crossing (B), at the crossing (C), and 20 (D) and 40 m upstream of crossing (E).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-008-2
UTM Coordinates: 17W 570872 7906452

Date/Time Surveyed: 8-Aug-07 / 21:48

General Physical Characteristics

Floodplain Width (m):	71.3	Channel Pattern:	Slightly meandering	Stage:	N/M
Channel Confinement:	NC	Channel Gradient (range)	1°	Flow Regime:	EPH
Bank Height (range in m)	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
0	2.6	UD	0.02	0.13	0.08	0.13				

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
0	50	50					44FT 50 fl		5		1

Fisheries Information

Electrofishing Conducted: N **Effort (min):** N/A **Electrofisher Settings:** N/A

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

At the crossing site there is a shallow channel running though an area of flooded terrestrial vegetation. NNST might use this habitat if accessible; however, access is likely restricted. Downstream of the crossing there is a very steep cascade that fish could not climb even with increased water levels.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-008-2
UTM Coordinates: 17W 570872 7906452

Date/Time Surveyed: 8-Aug-07 / 21:48

Photographs



A



B



C

Figure 1. (A) View upstream of crossing, (B) View across crossing from left bank, (C) View downstream of crossing.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-010-1
UTM Coordinates: 17 W 572330 7905370

Date/Time Surveyed: 18-Jul-08 / 21:48

General Physical Characteristics

Floodplain Width (m): 57.61	Channel Pattern: Single, meandering	Stage: Normal
Channel Confinement: PC-UC	Channel Gradient (range): 5-10°	Flow Regime: PER
Bank Height (range in m): 0.05-0.40	Bank Shape: 50% V, 50% UC	T_w (°C): 5.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
0	2.7	2.7	0.17	0.16		0.35	1.73	0.11		

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
0	20	25	5		45			10	40	48	2

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 3:49 **Electrofisher Settings:** 400V, 60Hz, 30%DC

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	0	-	-	-
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-010-1
UTM Coordinates: 17 W 572330 7905370

Date/Time Surveyed: 18-Jul-08 / 21:48

Comments & Summary

The stream contains excellent fish habitat. Downstream barrier approximately 50m long at UTM 17 W 578121 7902674.

Photographs



A



B



C

Figure 1. View of habitat downstream of crossing (A), at the crossing (B), and upstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: BR-011-1
UTM Coordinates: 17 W 573099 7904907

Date/Time Surveyed: 23-Jul-08 / 21:50

General Physical Characteristics

Floodplain Width (m): 54.86	Channel Pattern: Sinuous, braided	Stage: High
Channel Confinement: C	Channel Gradient (range): 3-5°	Flow Regime: PER
Bank Height (range in m): UD	Bank Shape: UD-V	T_w (°C): 7.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
40D (2 chnls)	24.0	68.6	0.10	0.35	0.50	0.75-1.00	0.92	0.45	0.20	1.50-2.00
20D (2 chnls)	80.5	64.0	0.30	0.32	0.55	0.75-1.00	0.78	0.62	0.20	1.50-2.00
0 (2 chnls)	16.0	64.0	0.54	0.20	0.40	0.75-1.00	0.83	0.75	0.92	1.50-2.00
20U (1 chnls)	45.7	62.2	0.20	0.15	0.42	0.75-1.00	0.80	0.41	0.22	>2.00
40U (1 chnls)	25.0	59.4	0.45	N/M	N/M	>1.00	0.92	N/M	N/M	>2.00

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Rif/Rap	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
40D	70	15	15						30	50	20
20D	50	30	20						30	50	20
0	85	5	10				5	5	25	45	20
20U	75	10	15				5	5	25	45	20
40U	40	10	30	20							

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 5:00 **Electrofisher Settings:** 600V, 40Hz, 30%DC

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	6	1.2	90-155	9-30
NNST	0	-	-	-

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: BR-011-1
UTM Coordinates: 17 W 573099 7904907

Date/Time Surveyed: 23-Jul-08 / 21:50

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	High	Low
NNST	No	No	Low	No

Comments & Summary

At 40 D/S water too fast to get across to measure.

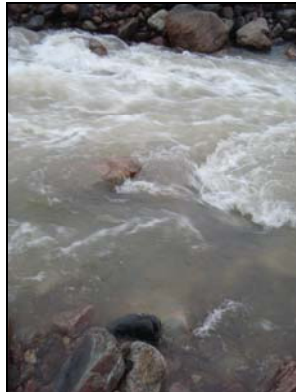
Photographs



A



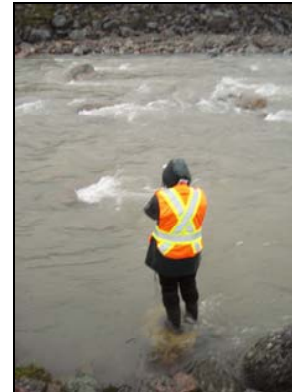
B



C



D



E

Figure 1. View of habitat 40 (A), and 20 m downstream of crossing (B), at the crossing (C), and 20 (D), and 40 m upstream of crossing (E). (A-C pictures are from Channel 1).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-012-1
UTM Coordinates: 17W 573748 7904634

Date/Time Surveyed: 8-Aug-07 / 22:41

General Physical Characteristics

Floodplain Width (m):	27.4	Channel Pattern:	Straight	Stage:	N/A
Channel Confinement:	PC	Channel Gradient (range):	1°	Flow Regime:	PER
Bank Height (range in m):	UD/ 0.07	Bank Shape:	UD/ UC	T_w (°C):	N/M

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
0	1.5	4.3	0.09	0.18	0.06	0.18				

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
0	30	70					60 10FT	20	10		

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 1:00 **Electrofisher Settings:** 500V, 60Hz

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	0	-	-	-
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-012-1
UTM Coordinates: 17W 573748 7904634

Date/Time Surveyed: 8-Aug-07 / 22:41

Comments & Summary

Excellent habitat for NNST, but downstream of the crossing the water flows beneath boulders. The area near the crossing is, therefore, inaccessible. Lake present downstream.

Photographs



A



B



C

Figure 1. (A) View upstream of crossing, (B) View across crossing from left bank, (C) View downstream of crossing.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-012-2
UTM Coordinates: 17W 574223 7904423

Date/Time Surveyed: 8-Aug-07 / 23:35

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	Braided	Stage:	N/A
Channel Confinement:	PC	Channel Gradient (range):	3°	Flow Regime:	PER
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
0	3.0	17.9	0.03	0.39	0.02	0.39				

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
0		50			50		80	15			5

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 10:00 **Electrofisher Settings:** 700 V, 60 Hz, 12%

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	0	-	-	-
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-012-2
UTM Coordinates: 17W 574223 7904423

Date/Time Surveyed: 8-Aug-07 / 23:35

Comments & Summary

Ideal ARCH and NNST habitat present at the crossing, but due to a downstream cascade and low water levels, fish would be unable to reach the crossing site. During periods of high water, larger juvenile ARCH may be able to move upstream of the cascades to the crossing. Many juvenile ARCH were observed DS of the barrier.

In 2007, electrofishing (500V, 60 Hz) was conducted for 6:00 and no fish were captured. The site was revisited on 14-Aug-2011 and an additional round of electrofishing was conducted to confirm fish presence/absence. Once again, no fish were captured (2011 results listed in the Fisheries Information section above). As a result, the site's Fish Habitat Quality rating was adjusted from Marginal to No Fish Habitat.

Photographs



A



B



C

Figure 1. (A) View upstream of crossing, (B) View across crossing from left bank, (C) View downstream of crossing.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-013-1
UTM Coordinates: 17 W 574988 7904117

Date/Time Surveyed: 23-Jul-08 / 20:20

General Physical Characteristics

Floodplain Width (m): 25.60	Channel Pattern: Sinuous	Stage: High
Channel Confinement: UC-PC	Channel Gradient (range): 2-15°	Flow Regime: INT
Bank Height (range in m): 0.05-0.40	Bank Shape: 50% S, 50% V	T_w (°C): 5.5

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
100D	0.90	73.15	0.20	0.22	0.22	0.22	0.09	0.22	0.07	0.93
60D	1.30	8.30	0.10	0.12	0.16	0.16	0.48	0.50	0.61	1.24
20D	1.40	2.50	0.16	0.15	0.10	0.22	0.33	1.05	0.0	1.08
0	0.75	4.30	0.14	0.20	0.02	0.35	0.88	0.50	0.17	1.16
20U	0.60	1.60	0.10	0.21	0.10	0.25	0.29	0.34	1.14	1.31
60U	1.00	1.00	0.12	0.16	0.14	0.16	0.56	0.24	0.29	1.42
100U	2.70	2.70	0.10	0.10	0.10	0.25	0.40	0.44	0.28	1.78

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
100D		50	10		40		35	35	25	5	
60D	20	40			40		20	40	25	15	
20D		30			70		20	20	35	20	5
0		40			60		20	20	25	30	5
20U	10	40	10		40		10	10	30	50	
60U		25			75		5	5	5	70	15
100U		25			75			5	5	70	20

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – MARGINAL

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-013-1
UTM Coordinates: 17 W 574988 7904117

Date/Time Surveyed: 23-Jul-08 / 20:20

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 5:00 **Electrofisher Settings:** 400V, 40Hz, 30%DC

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	1	0.2	-	-
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	Low	No
NNST	No	No	No	No

Comments & Summary

No obvious barrier, but only one fish. Marginal habitat may be relatively dry most of the time, but heavy rain recently. 100 D/S, 60D/S, 20 D/S, and at crossing the stream was unconfined. At 20 U/S, 60 U/S the stream was partially confined. At 100 U/S, it was confined at a 15° gradient.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – MARGINAL

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-013-1
UTM Coordinates: 17 W 574988 7904117

Date/Time Surveyed: 23-Jul-08 / 20:20

Photographs



A



B



C



D



E



F

Figure 1. View of habitat 100 (A), 60 (B), and 20 m (C), downstream of crossing, at the crossing (D), 20 (E), and 60 m (F) upstream of the crossing.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-013-2
UTM Coordinates: 17W 575210 7903974

Date/Time Surveyed: 8-Aug-07 / 23:20

General Physical Characteristics

Floodplain Width (m):	> 200	Channel Pattern:	Braided (two main channels)	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	13°	Flow Regime:	EPH
Bank Height (range in m):	0.08 / 0.10	Bank Shape:	UC	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

At the crossing the wetted width was 1.3 m and the maximum water depth was 0.10 m. The high water channel width was undefined. The stream morphology was 40% pool (< 0.2 m) and 60% cascade. The substrate was 35% small cobble, 25% fines, and 40% gravel. Barrier present-steep drop approximately 50 m D/S, dry U/S. Bank stability was moderate.

The crossing site has very little water, it is on a hill with a steep slope, and it is not near a major body of water. All these factors make it unsuitable fish habitat.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-013-2
UTM Coordinates: 17W 575210 7903974

Date/Time Surveyed: 8-Aug-07 / 23:20

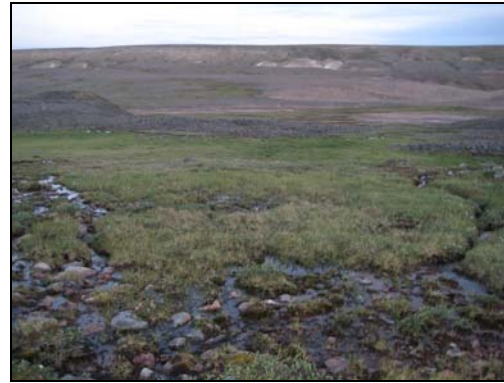
Photographs



A



B



C

Figure 1. (A) View upstream of crossing, (B) View across crossing from left bank, (C) View downstream of crossing.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-014-1
UTM Coordinates: 17W 575496 7903837

Date/Time Surveyed: 8-Aug-07 / 23:39

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	Sinuous	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	4°	Flow Regime:	INT
Bank Height (range in m):	0.15/ 0.20	Bank Shape:	UC	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

At the crossing the wetted and high water channel width were 0.8 m and 1.8 m, the maximum water depth was 0.19 m. The stream morphology was 75% pool (< 0.2 m) and 25% cascade. The substrate was 45% small cobble, 30% fines, 20% gravel and 5% boulders. The stream cover was 5% boulder, 5% UC banks, and 5% large cobble. Bank stability was moderate.

Habitat is suitable for ARCH and NNST, but is inaccessible to fish due to steep cascades downstream. Lake present downstream.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-014-1
UTM Coordinates: 17W 575496 7903837

Date/Time Surveyed: 8-Aug-07 / 23:39

Photographs



A



B



C

Figure 1. (A) View upstream of crossing, (B) View across crossing from left bank, (C) View downstream of crossing.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-014-2
UTM Coordinates: 17W 575630 7903773

Date/Time Surveyed: 8-Aug-07 / 23:52

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	Sinuuous	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	2°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

Crossing dry, no fish habitat present. Lake present downstream.

High water channel width was 0.50 m.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-014-2
UTM Coordinates: 17W 575630 7903773

Date/Time Surveyed: 8-Aug-07 / 23:52

Photographs



A



B



C

Figure 1. (A) View upstream of crossing, (B) View across crossing from left bank, (C) View downstream of crossing.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-014-3
UTM Coordinates: 17W 575881 7903652

Date/Time Surveyed: 9-Aug-07 / 00:06

General Physical Characteristics

Floodplain Width (m):	51.2	Channel Pattern:	Sinuuous	Stage:	N/A
Channel Confinement:	PC	Channel Gradient (range):	3°	Flow Regime:	PER
Bank Height (range in m):	0.30 / 0.25	Bank Shape:	UC	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 14:45 **Electrofisher Settings:** 700 V, 60 Hz, 12%

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	18	1.2	99-204	-
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	Low	No
NNST	No	No	No	No

Comments & Summary

At the crossing the wetted and high water channel width were 3.5 m and 4.0 m, the maximum water depth was 0.30 m. The stream morphology was 60% pool (< 0.2 m) and 40% cascade. The substrate was 45% small cobble, 5% fines, 5% gravel and 45% boulders. Bank stability was moderate. Stream cover was 45% boulder, 10% deep pool and 35% UC banks. Barrier present-dry downstream. Lake present downstream.

Site has turbid water but it is suitable for ARCH and NNST. Access to the crossing will be difficult for all but larger juvenile ARCH due to boulder substrate and low water. Downstream of the boulder barrier, good fish habitat exists.

In 2007, electrofishing was not conducted at this site. The site was revisited on 14-Aug-2011 and electrofishing was conducted to confirm fish presence/absence. Arctic char were captured (2011 results listed in the Fisheries Information section above).

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – MARGINAL

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-014-3
UTM Coordinates: 17W 575881 7903652

Date/Time Surveyed: 9-Aug-07 / 00:06

Photographs



A



B



C

Figure 1. (A) View upstream of crossing, (B) View across crossing from left bank, (C) View downstream of crossing.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-015-1
UTM Coordinates: 17W 576932 7903240

Date/Time Surveyed: 9-Aug 07 / 00:57

General Physical Characteristics

Floodplain Width (m):	94.2	Channel Pattern:	UD-Flooded	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	2°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

At the crossing the wetted and high water channel width were 50.3 m and 54.9 m, the maximum water depth was 0.05 m. The stream morphology was 100% pool (< 0.2 m). The substrate was 100% fines. Bank stability was low.

Low water over terrestrial vegetation substrate is unsuitable habitat for fish. Lake present downstream.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-015-1
UTM Coordinates: 17W 576932 7903240

Date/Time Surveyed: 9-Aug 07 / 00:57

Photographs



A



B



C

Figure 1. (A) View upstream of crossing, (B) View across crossing from left bank, (C) View downstream of crossing.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-016-1
UTM Coordinates: 17 W 577142 7903135

Date/Time Surveyed: 20-Jul-08 / 4:11

General Physical Characteristics

Floodplain Width (m):	>183	Channel Pattern:	Sinuuous	Stage:	Normal
Channel Confinement:	UD	Channel Gradient (range):	0-2°	Flow Regime:	PER
Bank Height (range in m):	0.01 - 0.15	Bank Shape:	70% UC/30% S	T_w (°C):	2.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
100D	1.20	1.20	0.14	0.16	0.20	0.20	0.04	0.12	0.61	0.61
80D	1.10	1.10	0.20	0.21	0.21	0.21	0.41	0.50	0.75	0.75
60D (2 ch)	2.00	3.50	0.29	0.23	0.25	0.34	0.12	0.49	0.10	0.49
40D (2 ch)	10.60	17.10	0.08	0.16	0.05	0.27	0.42	0.52	0.17	0.52
20D	3.20	3.20	0.18	0.14	0.12	0.18	0.21	0.19	0.13	0.21
0	1.00	1.00	0.24	0.18	0.12	0.24	0.69	0.59	0.34	0.69
20U	2.70	2.70	0.60	0.58	0.33	0.60	0.10	0.02	0.02	0.10
40U	0.80	0.80	0.26	0.20	0.16	0.26	0.69	0.86	0.48	0.98
60U	0.60	0.60	0.08	0.08	0.03	0.40	0.27	0.36	0.69	0.69
80U	1.40	1.40	0.35	0.30	0.12	0.35	0.60	0.22	0.40	0.60
100U	6.40	11.40	0.11	0.20	0.18	0.50	0.10	0.12	0.09	0.12

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
100D	60	40					20FT, 20sand	25	30	5	
80D	100								40	60	
60D	30	20	50				30Ft, 30sand		15	25	
40D	85	15					30 sand	15	35	20	
20D	75	20	5				30 sand	10	30	25	5
0	50		50				10 sand 10FT		55	15	10
20U	10		90				15 FT, 70sand	5	5		5
40U		75	10		15		10 FT		5	20	65
60U	50	50					40FT, 10sand			50	
80U	100						35FT			25	40
100U	15	65	20				25 FT, 45sand		5		25

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-016-1
UTM Coordinates: 17 W 577142 7903135

Date/Time Surveyed: 20-Jul-08 / 4:11

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 5:56 **Electrofisher Settings:** 400V, 70Hz, 40%DC

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	19	3.20	75 - 154	4 - 35
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	High	Moderate
NNST	No	No	Low	No

Comments & Summary

A barrier to further fish movement exists approximately 450 m upstream of the crossing area (UTM – 17 W 569683 7907631). Juvenile Arctic char were captured both up and downstream of the crossing area. In general, this area provides abundant, important juvenile fish habitat up until the fish barrier.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Crossing ID: CV-016-1
UTM Coordinates: 17 W 577142 7903135

Date/Time Surveyed: 20-Jul-08 / 4:11

Photographs



A



B



C



D



E



F



G



H



I



J



K

Figure 1. View of habitat 100 (A), 80 (B), 60 – left channel (C), 40 – left channel (D), and 20 m (E) downstream of crossing, at the crossing (F), and 20 (G), 40 (H), 60 (I), 80 (J), and 100 m (K) upstream of the crossing.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-016-2
UTM Coordinates: 17W 577416 7902996

Date/Time Surveyed: 9-Aug-07 / 01:29

General Physical Characteristics

Floodplain Width (m):	27.4	Channel Pattern:	UD-Flooded	Stage:	N/A
Channel Confinement:	PC	Channel Gradient (range):	1°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

Crossing dry, no fish habitat present. Lake present downstream.

High water channel width was 27.4 m.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-016-2
UTM Coordinates: 17W 577416 7902996

Date/Time Surveyed: 9-Aug-07 / 01:29

Photographs



A



B



C

Figure 1. (A) View upstream of crossing, (B) View across crossing from left bank, (C) View downstream of crossing.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-017-1
UTM Coordinates: 17 W 578074 7902639

Date/Time Surveyed: 20-Jul-08 / 3:20

General Physical Characteristics

Floodplain Width (m):	59.44	Channel Pattern:	Meandering, braided	Stage:	Low
Channel Confinement:	UD	Channel Gradient (range):	0-1°	Flow Regime:	INT
Bank Height (range in m):	UD - 0.25	Bank Shape:	75% UD/25% V	T_w (°C):	3.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
100D	POND									
0 (2 chnls)	4.80	59.44	0.08	0.11	0.07	0.11	0.05	0.05	0.14	0.14
10U (2 chnls)	10.52	53.04	0.09	0.07	0.10	0.32	0.07	0.19	0.10	0.19
20U (2 chnls)	9.60	51.21	0.10	0.15	0.09	0.15	0.18	0.04	0.29	0.43
30U (4 chnls)	10.06	54.86	0.48	0.14	0.12	0.48	0.00	0.15	0.01	0.15
40U	16.46	85.04	NM	NM	NM	0.35	NM	NM	NM	0.00
50U	BARRIER									

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
100D	POND										
0 (2 ch)	15	85					75			25	
10U (2 ch)	25	65	10				50			35	15
20U (2 ch)	60	40					35	5	15	30	15
30U (4 ch)	15	85					15FT, 35sand		10	30	10
40U		100					20FT, 10sand			55	15
50U	BARRIER										

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-017-1
UTM Coordinates: 17 W 578074 7902639

Date/Time Surveyed: 20-Jul-08 / 3:20

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 6:57 **Electrofisher Settings:** 700V, 70Hz, 30%DC

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	16	2.30	65 - 145	4 - 33
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	High	No
NNST	No	No	Low	No

Comments & Summary

The pond (LE-017-1) immediately downstream of this crossing does not provide suitable fish habitat for rearing or spawning and acts only as a migration corridor between downstream wintering areas and CV-017-1. A boulder barrier to further fish movement exists approximately 50 m upstream of the crossing area (UTM – 17 W 569683 7907631). Juvenile Arctic char use the crossing area, but are limited to only about 50 m of suitable habitat.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-017-1
UTM Coordinates: 17 W 578074 7902639

Date/Time Surveyed: 20-Jul-08 / 3:20

Photographs



A



B



C



D



E



F



G



H



I



J

Figure 1. View of habitat at the crossing in the left (A) and right (B) channels, 10 m upstream in the left (C) and right (D) channels, 20 m US in the left (E) and right (F) channels, 30 m US in the left (G) and right (H) channels, 40 m US (I), and of the fish barrier (J) upstream of the crossing.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-017-2
UTM Coordinates: 17W 578733 7902277

Date/Time Surveyed: 9-Aug-07 / 01:48

General Physical Characteristics

Floodplain Width (m):	> 200	Channel Pattern:	Sinuuous	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	1°	Flow Regime:	EPH
Bank Height (range in m):	0.20	Bank Shape:	UC	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

At the crossing the wetted and high water channel width were 0.7 m each, the maximum water depth was 0.10 m. The stream morphology was 100% pool (< 0.2 m). The substrate was 95% large cobble and 5% boulders. The bank stability was moderate. The stream cover was 5% boulder and 15% UC banks.

Only stagnant pools are present at the crossing site. The habitat is unsuitable for fish. Barriers present downstream.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-017-2
UTM Coordinates: 17W 578733 7902277

Date/Time Surveyed: 9-Aug-07 / 01:48

Photographs



A



B



C

Figure 1. (A) View upstream of crossing, (B) View across crossing from left bank, (C) View downstream of crossing.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-018-1
UTM Coordinates: 17W 578855 / 7902210

Date/Time Surveyed: 9-Aug-07 / 01:55

General Physical Characteristics

Floodplain Width (m):	> 200	Channel Pattern:	Slightly meandering	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	1°	Flow Regime:	PER
Bank Height (range in m):	0.35	Bank Shape:	UC	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 10:00 **Electrofisher Settings:** 500V,60Hz

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	1	-	-	-
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	Low	Low
NNST	Low	No	Moderate	Low

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality –IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-018-1
UTM Coordinates: 17W 578855 / 7902210

Date/Time Surveyed: 9-Aug-07 / 01:55

Comments & Summary

At the crossing the wetted and high water channel width were 0.95 m each, the maximum water depth was 0.28 m. The stream morphology was 90% pool (< 0.2 m) and 10% riffle. The substrate was 80% fines and 20% gravel. Bank stability was moderate. Stream cover was 25% deep pool and 50% UC banks.

Water at the site is turbid, and the substrate is not ideal for fish. Juvenile ARCH are present at the crossing, but may not use this habitat preferentially. As long as there are no barriers preventing their upstream migration, NNST may also be present (habitat is more suitable for this species).

Photographs



A



B



C

Figure 1. (A) View upstream of crossing, (B) View across crossing from left bank, (C) View downstream of crossing.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-018-2
UTM Coordinates: 17W 579065 7902100

Date/Time Surveyed: 9-Aug-07 / 02:17

General Physical Characteristics

Floodplain Width (m):	24.7	Channel Pattern:	Sinuuous	Stage:	N/A
Channel Confinement:	PC	Channel Gradient (range):	4°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

Water flows under boulders at crossing site; no fish habitat present. Barriers present downstream.

The wetted width of the channel and the high water channel width at the crossing was 1.0 m each. The substrate was 50% boulders and 50% small cobble. Stream cover was 50% boulder and 25% large cobble.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

ail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-018-2
UTM Coordinates: 17W 579065 7902100

Date/Time Surveyed: 9-Aug-07 / 02:17

Photographs



A



B



C

Figure 1. (A) View upstream of crossing, (B) View across crossing from left bank, (C) View downstream of crossing.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-018-3
UTM Coordinates: 17W 579361 7901995

Date/Time Surveyed: 9-Aug-07 / 02:30

General Physical Characteristics

Floodplain Width (m):	27.4	Channel Pattern:	UD	Stage:	N/A
Channel Confinement:	PC	Channel Gradient (range):	5°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

Crossing dry, no fish habitat present. Barriers and lake present downstream.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-018-3
UTM Coordinates: 17W 579361 7901995

Date/Time Surveyed: 9-Aug-07 / 02:30

Photographs



A



B



C

Figure 1. (A) View upstream of crossing, (B) View across crossing from right bank, (C) View downstream of crossing.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-019-1
UTM Coordinates: 17 W 579874 7901941

Date/Time Surveyed: 23-Jul-08 / 23:20

General Physical Characteristics

Floodplain Width (m):	33.83	Channel Pattern:	Sinuous	Stage:	High
Channel Confinement:	PC	Channel Gradient (range):	1-15°	Flow Regime:	PER
Bank Height (range in m):	FL	Bank Shape:	UD-flooded	T_w (°C):	5.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
100D	18.10	18.10	0.35	0.23	0.50	0.60	0.75	0.15	0.31	0.75
80D	14.40	14.40	0.85	0.70	0.52	0.85	0.44	0.53	0.95	0.95
60D	15.30	15.30	0.80	0.25	0.05	0.80	0.76	1.33	1.44	1.44
40D	15.40	15.40	0.15	0.45	0.78	0.78	0.48	1.01	0.98	1.01
20D	19.70	19.70	0.45	0.85	0.85	0.85	0.83	0.65	0.12	0.83
0	11.00	11.00	0.25	0.70	0.18	0.70	0.16	1.04	0.94	1.04
20U	21.10	21.10	0.65	0.75	0.95	0.95	0.03	0.33	0.28	0.33
40U	18.20	18.20	0.65	0.65	0.46	0.65	0.47	0.04	0.80	0.80
60U	8.70	8.70	0.17	0.25	0.10	0.60	0.39	0.24	0.46	1.30
80U	8.60	8.60	0.22	0.18	0.10	0.22	0.89	0.78	0.18	1.43
100U	17.30	17.30	0.10	0.20	0.15	0.25	0.50	0.77	0.40	0.77

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
100D	30		30	40					10	40	50
80D	30		10	60			5		10	55	30
60D	45		10	45			5		10	35	50
40D	25		25	50			5		10	45	40
20D	5		5	90			5		10	45	40
0	10		10	80			10		30	40	20
20U			30	70			15		45	30	10
40U	30	15	15	10	30					20	80
60U		20			80					20	80
80U		20	5		75					20	80
100U	30	40		30			10		10	20	60

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-019-1
UTM Coordinates: 17 W 579874 7901941

Date/Time Surveyed: 23-Jul-08 / 23:20

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 5:15 **Electrofisher Settings:** 600V, 40Hz, 30%DC

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	13	2.48	81 - 150	5 – 35
NNSt	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	High	No
NNST	Low	No	Low	No

Comments & Summary

A possible barrier to further fish movement exists approximately 60 m upstream of the crossing and a definite fish barrier exists approximately 400 m upstream (UTM – 17 W 580202 7902106). Juvenile Arctic char were captured both up and downstream of the crossing area, but did not appear to be present further than 60 m upstream. In general, this area provides abundant, important juvenile fish habitat, but has natural barriers to extensive movements.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-019-1
UTM Coordinates: 17 W 579874 7901941

Date/Time Surveyed: 23-Jul-08 / 23:20

Photographs



A



B



C



D



E



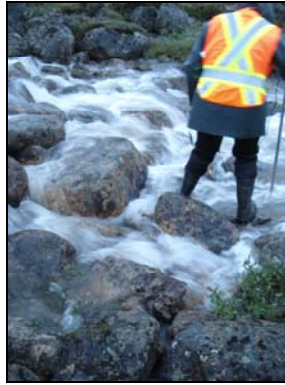
F



G



H



I



J



K

Figure 1. View of habitat 100 (A), 80 (B), 60 (C), 40 (D), and 20 m (E) downstream of crossing, at the crossing (F), and 20 (G), 40 (H), 60 (I), 80 (J), and 100 m (K) upstream of the crossing.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-019-2
UTM Coordinates: 17W 580423 / 7901736

Date/Time Surveyed: 9-Aug-07 / 03:30

General Physical Characteristics

Floodplain Width (m):	23.6	Channel Pattern:	Straight	Stage:	N/A
Channel Confinement:	PC	Channel Gradient (range):	2°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

At the crossing site there is only low water flowing under boulders, so there is no fish habitat. At the crossing the substrate is 50% cobble and 50% boulders. The high water channel width was 23.6 m. Stream cover was 50% boulders and 50% large cobble. Barriers and lakes present downstream.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-019-2
UTM Coordinates: 17W 580423 / 7901736

Date/Time Surveyed: 9-Aug-07 / 03:30

Photographs



A



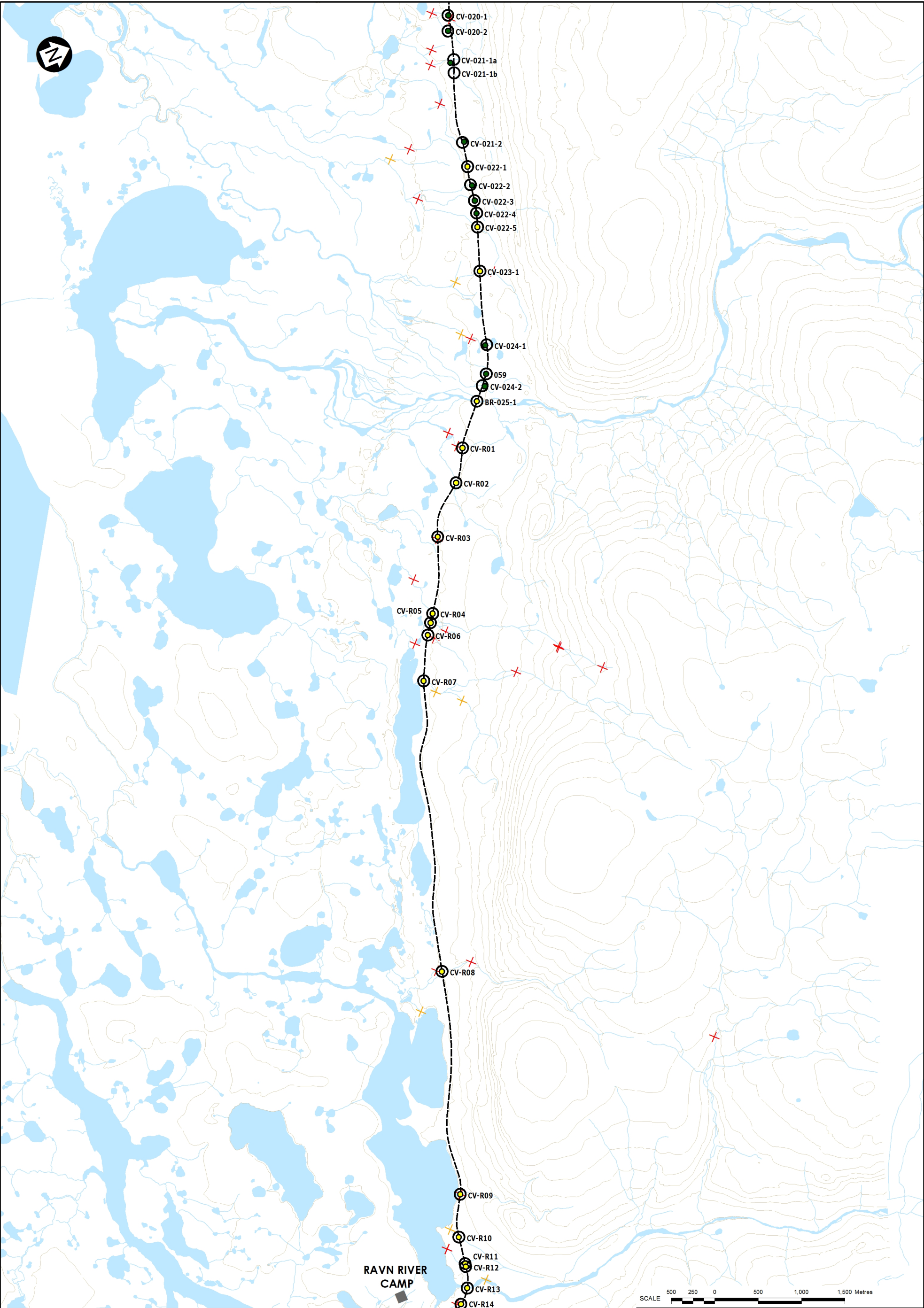
B



C

Figure 1. (A) View upstream of crossing, (B) View across crossing from right bank, (C) View downstream of crossing.

Path: G:\MARYRIV_GDB\IEIS_Figures\MXD\Synthesis_RailLine_AccessRoad\Rev2\Apdx\20101119_ApdxRW_sg.mxd



LEGEND:

- | | |
|---------------------------------------|---|
| RAILWAY CROSSING SURVEY YEAR | CONTOUR |
| ● 2007 | — MILNE INLET TOTE ROAD (EXISTING) |
| ● 2008 | --- RAILWAY ALIGNMENT (PROPOSED) |
| ● 2010 | - - - CONSTRUCTION ACCESS ROAD (PROPOSED) |
| ○ STREAM CROSSING | ■ WATER |
| ○ STREAM CROSSING (APPROX.) | ■ INFRASTRUCTURE |
| ✕ FISH BARRIER (CONFIRMED) | |
| ✕ FISH BARRIER (AREAL INTERPRETATION) | |

NOTES:

1. BASE MAP 1:50,000 © HER MAJESTY THE QUEEN IN RIGHTS OF CANADA DEPARTMENT OF NATURAL RESOURCES (2009.) ALL RIGHTS RESERVED.
2. TOPOGRAPHY PROVIDED BY EAGLE MAPPING (2005).
3. PROPOSED RAILWAY ALIGNMENT PROVIDED BY CANRAIL CONSULTANTS INC.
4. PROPOSED RAILWAY CONSTRUCTION ACCESS ROAD ALIGNMENT PROVIDED BY CANRAIL CONSULTANTS INC. DRAWING NO. RAILWAY ALIGNMENT AND CONST ACCESS RD - MARY RIVER STEENSBY 2010 -12AUG2010 DWG
5. LOCATION OF PROPOSED INFRASTRUCTURE IS APPROXIMATE AND SUBJECT TO FIELD ADJUSTMENTS
6. CONTOUR INTERVAL IS 25 AND IS IN METRES.

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

Railway Stream Crossing Sites (Map C)

North/South Consultants Inc.
Aquatic Environment Specialists

P/A NO.	REF NO.
-	-
DATE: 19/11/2010	REV 2

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-020-1
UTM Coordinates: 17W 581148 / 7901425

Date/Time Surveyed: 9-Aug-07 / 03:05

General Physical Characteristics

Floodplain Width (m):	21.9	Channel Pattern:	Sinuuous	Stage:	N/A
Channel Confinement:	PC	Channel Gradient (range):	4°	Flow Regime:	PER
Bank Height (range in m):	0.15 / 0.20	Bank Shape:	UC	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	Low	No
NNST	No	No	No	No

Comments & Summary

At the crossing the wetted and high water channel width were 2.2 m and 3.0 m, the maximum water depth was 0.15 m. The stream morphology was 10% pool (> 0.2 m) and 90% riffle. The substrate was 10% fines, 10% gravel and 80% large cobble. Bank stability was moderate. Stream cover was 25% large cobble.

The crossing site is good fish habitat, but a series of downstream cascades with shallow water at the stream's base may prevent fish from reaching the site. There is also no suitable fish habitat upstream of the crossing site because the water all flows beneath cobble/boulders. Lake present downstream.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – MARGINAL

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-020-1
UTM Coordinates: 17W 581148 / 7901425

Date/Time Surveyed: 9-Aug-07 / 03:05

Photographs



A



B



C

Figure 1. (A) View upstream of crossing, (B) View across crossing from right bank, (C) View downstream of crossing.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-020-2
UTM Coordinates: 17W 581313 7901354

Date/Time Surveyed: 9-Aug-07 / 03:24

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	Straight	Stage:	N/A
Channel Confinement:	PC	Channel Gradient (range):	5°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

Crossing dry, no fish habitat present. The high water channel was 2.0 m. Barriers present and lake present downstream.

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality –NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-020-2
UTM Coordinates: 17W 581313 7901354

Date/Time Surveyed: 9-Aug-07 / 03:24

Photographs



A



B



C

Figure 1. (A) View upstream of crossing, (B) View across crossing from right bank, (C) View downstream of crossing.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-021-1a and CV-021-1b
UTM Coordinates: 17W 581664 7901241

Date/Time Surveyed: 9-Aug-07 / 03:37

General Physical Characteristics

Floodplain Width (m):	54.9	Channel Pattern:	Sinuuous	Stage:	N/A
Channel Confinement:	PC	Channel Gradient (range):	3°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

No fish habitat at crossing site, only water flowing under boulders. Lake present downstream.

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-021-1a and CV-021-1b
UTM Coordinates: 17W 581664 7901241

Date/Time Surveyed: 9-Aug-07 / 03:37

Photographs



A



B



C

Figure 1. (A) View upstream of crossing, (B) View across crossing from left bank, (C) View downstream of crossing.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-021-2
UTM Coordinates: 17W 582566 7901042

Date/Time Surveyed: 9-Aug 07 / 04:16

General Physical Characteristics

Floodplain Width (m):	> 200	Channel Pattern:	Flooded terrestrial	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	3°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

Not enough water or flow present to be fish habitat. More suitable fish habitat exists ~200m downstream. The wetted channel width at the crossing was 25.6 m and the high water channel width was undefined.

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-021-2
UTM Coordinates: 17W 582566 7901042

Date/Time Surveyed: 9-Aug 07 / 04:16

Photographs



A



B



C

Figure 1. (A) View upstream of crossing, (B) View across crossing from right bank, (C) View downstream of crossing.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-022-1
UTM Coordinates: 17 W 582846 7900965

Date/Time Surveyed: 24-Jul-08 / 01:20

General Physical Characteristics

Floodplain Width (m):	50.0	Channel Pattern:	Sinuuous, braided	Stage:	N/M
Channel Confinement:	PC	Channel Gradient (range):	1-15°	Flow Regime:	PER
Bank Height (range in m):	0.05-0.20	Bank Shape:	S	T_w (°C):	5

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
0	N/M	N/M	0.15	0.12	0.14	0.18	0.26	0.73	1.43	1.43

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
0		30			70				5	75	20

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 7:50 **Electrofisher Settings:** 900V, 70Hz, 40%DC

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	0	-	-	-
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

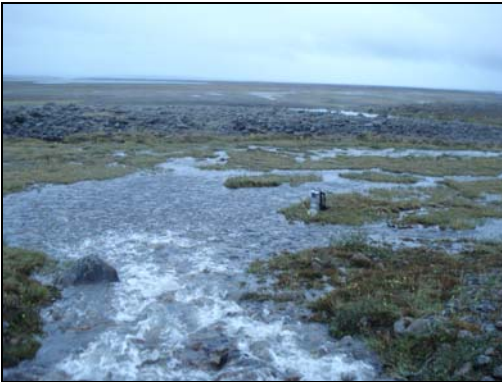
Crossing ID: CV-022-1
UTM Coordinates: 17 W 582846 7900965

Date/Time Surveyed: 24-Jul-08 / 01:20

Comments & Summary

No fish captured for at least 300m D/S. Barrier of high gradient and little surface water exists further downstream.

Photographs



A



B



C

Figure 1. View of habitat downstream of crossing (A), at the crossing (B), and upstream of the crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-022-2
UTM Coordinates: 17W 583070 / 7900930

Date/Time Surveyed: 9-Aug-07 / 04:04

General Physical Characteristics

Floodplain Width (m):	> 200	Channel Pattern:	Braided, sinuous	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	3°	Flow Regime:	PER
Bank Height (range in m):	0.01 / 0.03	Bank Shape:	S	T_w (°C):	N/M

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
0	2.0	N/M (many little channels)	0.07	0.02	0.03	0.07				

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
0					100		50	10	40		

Fisheries Information

Electrofishing Conducted: N **Effort (min):** N/A **Electrofisher Settings:** N/A

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

Low water levels at the crossing site make it unlikely fish habitat. Fish would be unable to reach crossing due to the marshy area and the steep cascade separating it from the lake. Bank stability was moderate.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-022-2
UTM Coordinates: 17W 583070 / 7900930

Date/Time Surveyed: 9-Aug-07 / 04:04

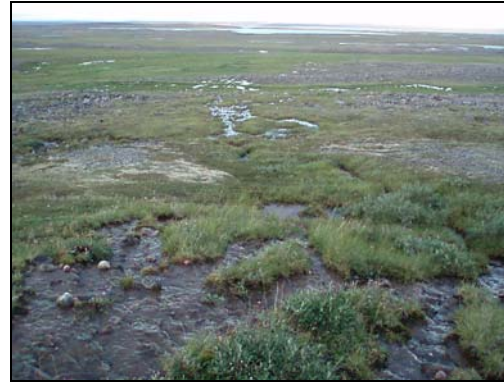
Photographs



A



B



C

Figure 1. (A) View upstream of crossing, (B) View across crossing from right bank, (C) View downstream of crossing.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-022-3
UTM Coordinates: 17W 583242 7900892

Date/Time Surveyed: 9-Aug-07 / 04:55

General Physical Characteristics

Floodplain Width (m):	> 200	Channel Pattern:	Braided, sinuous	Stage:	Normal
Channel Confinement:	NC	Channel Gradient (range):	10°	Flow Regime:	PER
Bank Height (range in m):	0.17 / 0.22	Bank Shape:	V	T_w (°C):	N/M

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
0	2.5	N/M	0.11	0.08	0.05	0.11	N/M	N/M	N/M	N/M

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
0			10		90		40	10	30	15	5

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 5:00 **Electrofisher Settings:** 500V, 60 Hz

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	1	0.20	N/M	N/M

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	Low	No
NNST	No	No	No	No

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – MARGINAL

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-022-3
UTM Coordinates: 17W 583242 7900892

Date/Time Surveyed: 9-Aug-07 / 04:55

Comments & Summary

Habitat at the crossing and downstream are suitable for ARCH, although the water is a little turbid. It is not ideal NNST habitat. One ARCH was observed below some cascades. Steep cascades at the crossing and low water levels prevent further upstream movement. Bank stability was high. Stream cover was 5% boulder and 5% deep pool.

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), crossing from left bank (B), and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-022-4
UTM Coordinates: 17W 583387 / 7900856

Date/Time Surveyed: 9-Aug-07 / 05:15

General Physical Characteristics

Floodplain Width (m):	27.4	Channel Pattern:	Flooded terrestrial	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	2°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

The site has no fish habitat due to very low water levels and substrate that is mainly flooded terrestrial vegetation. The channel width and high water channel water width are undefined.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-022-4
UTM Coordinates: 17W 583387 / 7900856

Date/Time Surveyed: 9-Aug-07 / 05:15

Photographs



A



B



C

Figure 1. (A) View upstream of crossing, (B) View across crossing from the left bank, (C) View downstream of crossing.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-022-5
UTM Coordinates: 17 W 583535 7900806

Date/Time Surveyed: 24-Jul-08 / 02:00

General Physical Characteristics

Floodplain Width (m):	55.0	Channel Pattern:	Sinuuous	Stage:	High
Channel Confinement:	PC	Channel Gradient (range):	1-3°	Flow Regime:	PER
Bank Height (range in m):	0.02-0.05	Bank Shape:	V	T_w (°C):	5

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
0	1.5	5.5	0.10	0.12	0.15	0.15	0.93	0.76	0.65	0.93

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
0		95	5				5	5	45	45	

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 5:25 **Electrofisher Settings:** 700V, 70Hz, 40%DC

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	0	-	-	-
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-022-5
UTM Coordinates: 17 W 583535 7900806

Date/Time Surveyed: 24-Jul-08 / 02:00

Comments & Summary

No fish, so probable barrier somewhere D/S.

Photographs



A



B



C

Figure 1. View of habitat downstream of crossing (A), at the crossing (B), and upstream of the crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-023-1
UTM Coordinates: 17 W 584019 7900636

Date/Time Surveyed: 24-Jul-08

General Physical Characteristics

Floodplain Width (m):	182.9	Channel Pattern:	Sinuuous, braided	Stage:	High
Channel Confinement:	NC-PC	Channel Gradient (range):	1-3°	Flow Regime:	PER
Bank Height (range in m):	None	Bank Shape:	None	T _w (°C):	4.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
100D	40.0	40.0	0.28	0.50	0.25	0.50	0.11	0.36	0.63	0.63
80D	30.0	30.0	0.07	0.35	0.22	0.35	0.83	0.36	0.75	0.83
60D	25.0	25.0	0.19	0.22	0.10	0.25	0.68	0.65	0.94	0.94
40D	25.0	25.0	0.48	0.22	0.35	0.45	0.05	0.69	0.74	1.55
20D	16.3	16.3	0.20	0.21	0.36	0.40	0.72	0.29	1.06	1.06
0	30.6	30.6	0.15	0.24	0.22	0.25	0.17	0.48	0.83	0.90
20U	30.8	30.8	0.17	0.11	0.15	0.20	0.28	0.48	1.13	1.13
40U	40.5	40.5	0.10	0.15	0.12	0.15	0.42	0.13	0.31	0.50
60U	41.5	41.5	0.17	0.12	0.22	0.28	0.18	0.19	0.46	0.46
80U	13.4	13.4	0.30	0.32	0.32	0.32	0.21	0.17	0.01	0.21
100U	14.0	14.0	0.31	0.69	0.58	0.69	0.40	0.31	0.32	1.09

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
100D (3 ch)	75		25				70	10	10	5	5
80D (3 ch)	75	5	20				30			35	35
60D (3 ch)	85	10	5				10			40	50
40D (2 ch)	70	10	15		5		15		10	35	40
20D (3 ch)	75	5	20				10		10	60	20
0 (3 ch)	60	20	10		10		10		10	50	30
20U (6 ch)	75	25					10		55	30	5
40U (5 ch)	75	25					10	10	60	20	
60U (3 ch)	80	20					10	10	65	10	5
80U (1 ch)			70	30			70				30
100U (3 ch)			20	60	20		40		15	40	5

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-023-1
UTM Coordinates: 17 W 584019 7900636

Date/Time Surveyed: 24-Jul-08

Fisheries Information

Electrofishing Conducted: Y Effort (min): 6:35 Electrofisher Settings:

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	6	0.911	95-140	9-28
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	High	No
NNST	No	No	Low	No

Comments & Summary

High quality habitat for juvenile char and possibly also ninespine stickleback.

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-023-1
UTM Coordinates: 17 W 584019 7900636

Date/Time Surveyed: 24-Jul-08

Photographs



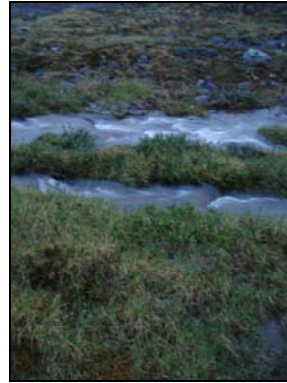
A



B



C



D



E



F



G



H



I



J

Figure 1: View of habitat 100 (A), 80 (B), 60 (C), 40 (D), and 20 m (E) downstream of crossing, at the crossing (F), and 20 (G), 40 (H), 80 (I), and 100 m (J), upstream of the crossing.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-024-1
UTM Coordinates: 17W 584838 7900369

Date/Time Surveyed: 9-Aug-07 / 23:15

General Physical Characteristics

Floodplain Width (m):	17.0	Channel Pattern:	UD	Stage:	N/A
Channel Confinement:	PC	Channel Gradient (range):	1°	Flow Regime:	INT
Bank Height (range in m):	0.1	Bank Shape:	V	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted: N **Effort (min):** N/A **Electrofisher Settings:** N/A

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	Low	Low
NNST	No	No	No	No

Comments & Summary

At the crossing the wetted width was 2.3 m, the high water width was 17.0 m and the maximum water depth was 0.11 m. The water body at the crossing was 15% riffle and 85% pool (<0.2 m). The substrate was 15% gravel, 15% fines, 55% small cobble and 15% boulders. Bank stability is moderate.

The crossing site is not ideal fish habitat because of shallow water and low flow. Larger juvenile ARCH might make it past the downstream barrier at higher water levels. Upstream of the crossing there is a large pool that is good fish habitat, so the crossing may also be used as a migration corridor.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality –MARGINAL

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-024-1
UTM Coordinates: 17W 584838 7900369

Date/Time Surveyed: 9-Aug-07 / 23:15

Photographs



A



B



C

Figure 1. (A) View upstream of crossing, (B) View across crossing from right bank, (C) View downstream of crossing.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: 59
UTM Coordinates: 17 W 585145 7900251

Date/Time Surveyed: 9-Aug-07 / 23:25

General Physical Characteristics

Floodplain Width (m):	57.6	Channel Pattern:	Flooded terrestrial	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	2°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	Low	No

Comments & Summary

The wetted width at the crossing was 0.5 m and high water channel width was 57.6 m. Maximum water depth at the crossing was 0.05 m. Channel morphology was 75% riffle and 25% pool and substrate was 60% fines, 20% gravel and 20% cobble. Barriers present (partial) – low water downstream.

No ARCH habitat present at crossing site. While the habitat is more suitable for NNST, the crossing is likely too far from an overwintering site for NNST.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – MARGINAL

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: 59
UTM Coordinates: 17 W 585145 7900251

Date/Time Surveyed: 9-Aug-07 / 23:25

Photographs



A

B

C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-024-2
UTM Coordinates: 17W 585271 7900183

Date/Time Surveyed: 9-Aug-07 / 23:50

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	Sinuuous	Stage:	N/A
Channel Confinement:	PC	Channel Gradient (range):	2°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

Crossing dry, no fish habitat present. The high water channel width was 5.0 m.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-024-2
UTM Coordinates: 17W 585271 7900183

Date/Time Surveyed: 9-Aug-07 / 23:50

Photographs



A



B



C

Figure 1. (A) View upstream of crossing, (B) View across crossing from left bank, (C) View downstream of crossing.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: BR-025-1
UTM Coordinates: 17 W 585397 7900034

Date/Time Surveyed: 1-Sept-08 /15:22

General Physical Characteristics

Floodplain Width (m): 77.72	Channel Pattern: Braided, meandering	Stage: High
Channel Confinement: C	Channel Gradient (range): 0.25-0.5°	Flow Regime: PER
Bank Height (range in m): UD-1.0	Bank Shape: UD-Rocks, S	T_w (°C): 2

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
40D (ch-2)	35	64	1.50	0.90	0.42	>1.0	0.52	0.46	1.11	>2.0
20D (ch-2)	40	56	0.65	0.70	0.72	>1.0	1.00	0.32	0.33	>2.0
0 Crossing	24	49.38	0.35	0.47	0.49	>1.0	1.44	0.33	1.01	>2.0
20U (ch-2)	Slightly	44	0.37	0.11	0.62	>1.0	0.90	0.28	1.05	>2.0
40U (ch-1)	65	65	0.97	0.6	Too deep	>1.0	0.23	0.52	Too deep	>1.5

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
40D (ch-2)				50		50 rapids	25	10	15	50	
20D (ch-2)		20	20			60 rapids			15	15	70
0 Crossing		15	10			75 rapids	5	5	30	40	20
20U (ch-2)		25	25	50			10	10	40	30	10
40U (ch-1)				100			25	10		40	25

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 7:00 **Electrofisher Settings:** 400V, 40 Hz, 30%

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	1	0.14	97	-
NNST	0	-	-	-

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: BR-025-1
UTM Coordinates: 17 W 585397 7900034

Date/Time Surveyed: 1-Sept-08 /15:22

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	High	Moderate
NNST	Low	No	Moderate	Low

Comments & Summary

All habitat substrate was judged from 25% of the location. No downstream barrier, extremely braided downstream. Many serve as rapids meandering upstream but all likely passable by large fish under lower water conditions. UTM 17 W 586881 7913688 is where the stream starts.

Photographs



A



B



C



D

Figure 1. View at 40m downstream across (A), 20m (B), 20m upstream across (C), and 40m (D).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R01
UTM Coordinates: 17 W 585831 7899673

Date/Time Surveyed: 1-Sept-08 / 15:30

General Physical Characteristics

Floodplain Width (m):	>200	Channel Pattern:	Meandering	Stage:	Normal-high
Channel Confinement:	NC	Channel Gradient (range):	1°	Flow Regime:	INT
Bank Height (range in m):	0.0-0.3	Bank Shape:	R	T_w (°C):	N/A

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
0	8.2	10.6	0.07	0.15	0.04		0.51	0.15	0.24	0.59

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
0	30	60	5		5		10 FT		15	50	25

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 3:30 **Electrofisher Settings:** 400V, 40HZ, 30%

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	0	-	-	-
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R01
UTM Coordinates: 17 W 585831 7899673

Date/Time Surveyed: 1-Sept-08 / 15:30

Comments & Summary

Water flows under boulders for ~ 10m at UTM 17 W 585787 7899615 (probably a barrier). This stream eventually joins with BR-025-1 downstream. Stream begins at UTM 17 W 585943 7900136 in small shallow upstream pond.

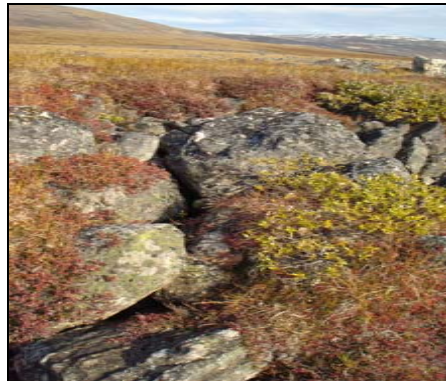
Photographs



A



B



C



D



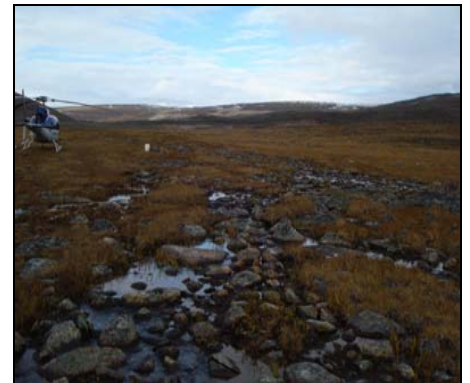
E



F



G



H

Figure 1. View of barrier downstream (A), downstream barrier 2 (B), downstream barrier 3 (C), downstream barrier 4 (D), downstream barrier 5 (E), crossing downstream (F), crossing across (G), and crossing upstream (H).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R02
UTM Coordinates: 17 W 586176 7899452

Date/Time Surveyed: 1-Sept-08 / 15:59

General Physical Characteristics

Floodplain Width (m):	66.75	Channel Pattern:	Sinuuous, braided	Stage:	Normal-high
Channel Confinement:	NC	Channel Gradient (range):	0.5-1.0°	Flow Regime:	PER
Bank Height (range in m):	0.0-0.3	Bank Shape:	UD-flooded	T_w (°C):	5.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
0	2.1	2.3	0.05	0.07	0.11	0.26			~0.3	

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
0	60	35	5				FT 10		40	40	10

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 4:00 **Electrofisher Settings:** 400V, 40HZ, 30%

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	0	-	-	-
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R02
UTM Coordinates: 17 W 586176 7899452

Date/Time Surveyed: 1-Sept-08 / 15:59

Comments & Summary

Starts on a grassy plateau, UTM 17 W 586410 7899551. UTM 17 W 565849 7904565 = barrier of rocks in stream. Downstream of both CV-R01 and CV-R02 as well as the barrier at UTM 17 W 585787 7899615.

Photographs



A



B



C



D

Figure 1. Aerial view of downstream barrier (A), crossing downstream (B), crossing across (C), and crossing upstream (D).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R03
UTM Coordinates: 17 W 586674 7899016

Date/Time Surveyed: 1-Sept-08 / 16:38

General Physical Characteristics

Floodplain Width (m):	>200	Channel Pattern:	Sinuuous	Stage:	Normal
Channel Confinement:	NC	Channel Gradient (range):	0.5-1.5	Flow Regime:	INT
Bank Height (range in m):	0.0-0.5	Bank Shape:	50% UC, 50% S	T_w (°C):	5.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
0	0.9	3.4	0.08	0.03	0.03	0.09				0.3

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
0	30	30			30		20	35	30	10	5

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 2:20 **Electrofisher Settings:** 400V, 40HZ, 30%

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	0	-	-	-
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R03
UTM Coordinates: 17 W 586674 7899016

Date/Time Surveyed: 1-Sept-08 / 16:38

Comments & Summary

Flows underground at UTM 17 W 586698 7899003 and branches off over flooded terrestrial. Fish cannot reach crossing site because there is no channel leading up to it. Did not look for upstream most reach since this habitat is inaccessible.

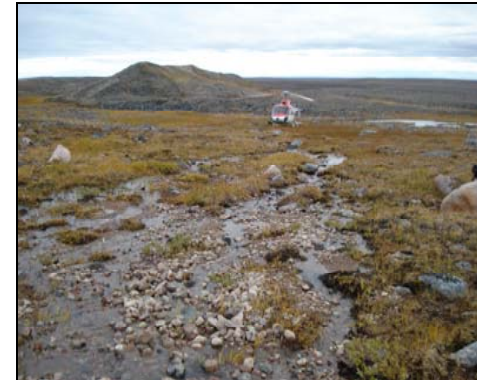
Photographs



A



B



C



D



E

Figure 1. View at crossing upstream (A), crossing across (B), crossing downstream (C), and water flows underground downstream of crossing (D-E).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R04
UTM Coordinates: 17 W 587469 7898625

Date/Time Surveyed: 1-Sept-08 / 17:01 & 2-Sept-08 / 08:17

General Physical Characteristics

Floodplain Width (m): 122.53	Channel Pattern: Sinuous	Stage: Normal-high
Channel Confinement: NC-PC	Channel Gradient (range): 0.75	Flow Regime: PER
Bank Height (range in m): 0.0-0.4	Bank Shape: 80% UC, 20% STR	T_w (°C): 5.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
100D	6.70	17.67	0.16	0.10	0.14	0.16	0.32	0.27	0.03	0.32
80D	0.91	16.92	0.30	0.36	0.27	0.36	0.06	0.44	0.34	0.44
60D	5.35	9.97	0.16	0.22	0.28	0.35	0.16	0.21	0.44	0.44
40D	2.41	6.96	0.02	0.30	0.25	0.30	0.05	0.40	0.05	0.40
20D	2.49	9.40	0.13	0.09	0.15	0.15	0.25	0.15	0.34	0.34
0	3.85	10.06	0.15	0.24	0.12	0.24	0.39	0.46	0.01	0.46
20U	1.65	4.85	0.26	0.20	0.17	0.26	0.51	0.00	0.18	0.51
40U	2.30	17.38	0.30	0.18	0.15	0.30	0.13	0.70	0.38	0.70
60U	0.65	6.12	0.34	0.37	0.35	0.50	0.56	0.47	0.20	0.56
80U	2.15	4.86	0.21	0.08	0.12	0.21	0.02	0.67	0.35	0.67
100U	0.62	6.40	0.17	0.20	0.20	0.28	0.53	0.63	0.57	0.63

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
100D	75	20	5	-	-	-	-	20	-	40	40
80D	-	-	-	80	20	-	20	30	30	20	-
60D	35	-	65	-	-	-	20FT	20	10	-	50
40D	50	10	20	-	20	-	-	20	10	40	30
20D	70	20	10	-	-	-	-	10	60	20	10
0	30	30	20	-	20	-	-	10	20	30	40
20U	30	-	40	-	30	-	-	5	15	30	50
40U	-	-	75	-	25	-	-	5	20	-	75
60U	-	-	-	100	-	-	-	10	80	-	10
80U	10	-	70	-	20	-	-	20	30	20	30
100U	50	-	50	-	-	-	10	30	60	-	-

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R04
UTM Coordinates: 17 W 587469 7898625

Date/Time Surveyed: 1-Sept-08 / 17:01 & 2-Sept-08 / 08:17

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 4:40 **Electrofisher Settings:** 400V, 40 Hz, 30%

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	0	-	-	-
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	Moderate	Moderate
NNST	Low	No	Moderate	Low

Comments & Summary

No fish. Looks like excellent fish habitat. First pass down the stream did not reveal any obvious barriers. Upstream there are some cascades that are unlikely passable at high water (UTM 17 W 588375 7899819, and UTM 17 W 588391 7899826). Definite limit of US passage = UTM 17 W 588795 7900199.

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R04
UTM Coordinates: 17 W 587469 7898625

Date/Time Surveyed: 1-Sept-08 / 17:01 & 2-Sept-08 / 08:17

Photographs

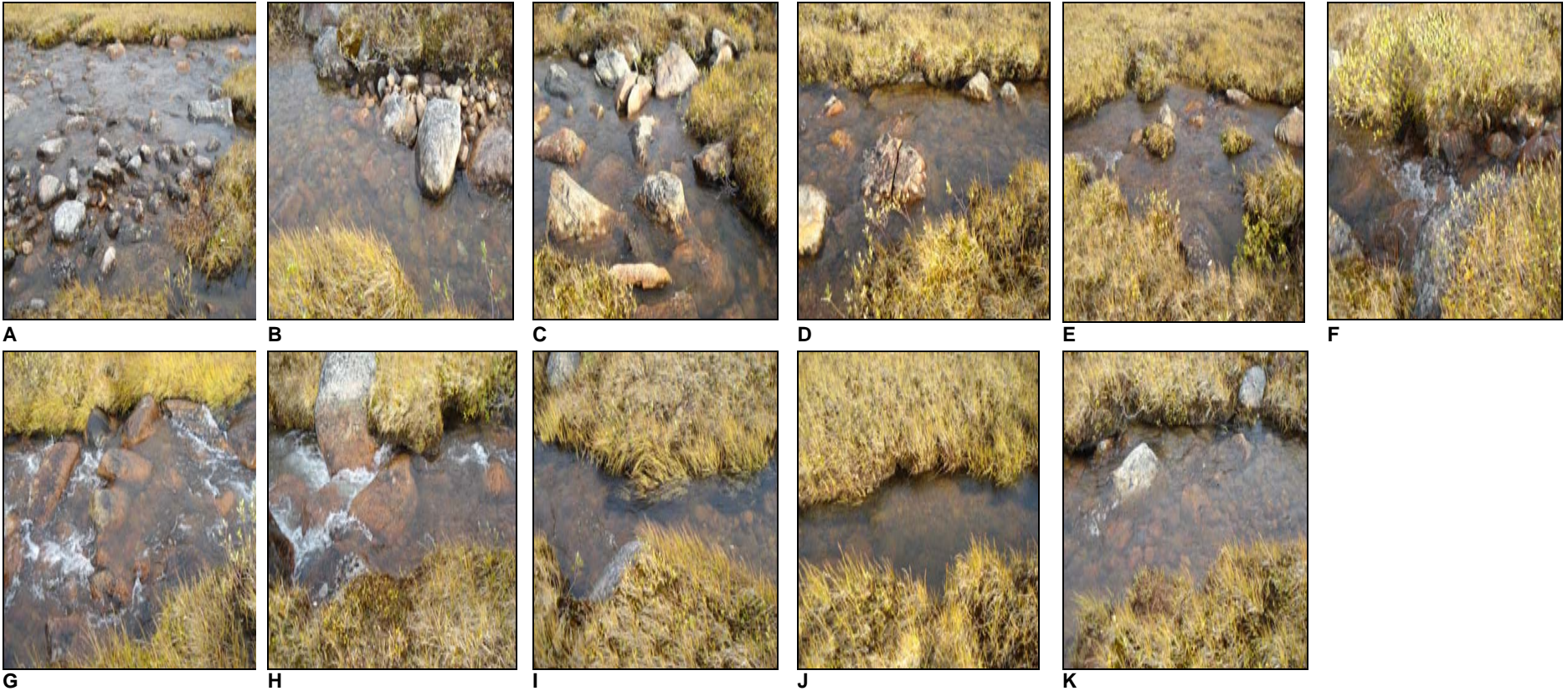


Figure 1. View at 100m downstream across (A), 80m (B), 60m (C), 40m (D), 20m (E), crossing across (F), 20m upstream across (G), 40m (H), 60m (I), 80m (J), and 100m (K).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R05
UTM Coordinates: 17 W 587559 7898562

Date/Time Surveyed: 1-Sept-08 / 17:47

General Physical Characteristics

Floodplain Width (m):	>183	Channel Pattern:	Meandering	Stage:	Normal
Channel Confinement:	NC	Channel Gradient (range):	0.25-0.5°	Flow Regime:	INT
Bank Height (range in m):	0.0-0.1	Bank Shape:	30% UC, 50% UD-flooded, 20% V	T_w (°C):	4.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
0	0.28	3.5	0.11	0.07	0.03	0.15				0.2

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
0	20	60			20		10FT	15	50	20	5

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 2:00 **Electrofisher Settings:** 400V, 40HZ, 30%

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	0	-	-	-
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R05
UTM Coordinates: 17 W 587559 7898562

Date/Time Surveyed: 1-Sept-08 / 17:47

Comments & Summary

The downstream end of this stream flows into an isolated pool. Disappears underground upstream at UTM 17 W 587723 7898682.

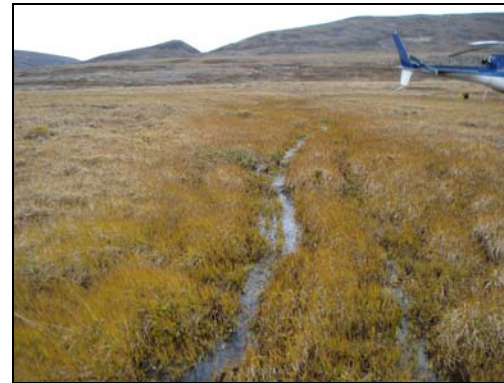
Photographs



A



B



C

Figure 1. View at crossing downstream (A), crossing across (B), and crossing upstream (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R06
UTM Coordinates: 17 W 587680 7898478

Date/Time Surveyed: 1-Sept-08 / 16:08

General Physical Characteristics

Floodplain Width (m):	91.44	Channel Pattern:	Sinuuous, meandering	Stage:	Normal
Channel Confinement:	PC	Channel Gradient (range):	1-1.25°	Flow Regime:	INT
Bank Height (range in m):	0.1-0.3	Bank Shape:	20% UC, 50%UD-flooded, 30% V	T_w (°C):	4.5

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
0	1.90	13.72	0.15	0.16	0.14	0.27				0.4

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
0	25	65	10					10	30	30	30

Electrofishing Conducted: Y **Effort (min):** 4:00 **Electrofisher Settings:** 400V, 40HZ, 30%

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	0	-	-	-
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R06
UTM Coordinates: 17 W 587680 7898478

Date/Time Surveyed: 1-Sept-08 / 16:08

Comments & Summary

Barrier upstream at UTM 17 W 587744 7898530. Water is under boulders downstream at UTM 17 W 587714 7898301, swampy area separates it from a very large (probably overwintering lake). Upstream of barrier, simply drains a plateau.

Photographs



A



B



C



D



E



F

Figure 1. View at crossing across (A), downstream barrier in marshy area (B), upstream barrier (C), downstream of marshy barrier (D), downstream lake (E), source of runoff (F).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R07
UTM Coordinates: 17W 588151 7898234

Date/Time Surveyed: 2-Sept-08 / 09:32

General Physical Characteristics

Floodplain Width (m):	>200	Channel Pattern:	Sinuous	Stage:	Normal
Channel Confinement:	PC-NC	Channel Gradient (range):	0.5-1.0	Flow Regime:	PER
Bank Height (range in m):	0.3-1.0	Bank Shape:	100% UC	T_w (°C):	2.5

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
100D	5.08	flooded	0.61	0.68	0.67	0.68	0.09	0.04	0.04	0.09
80D	7.07	10.34	0.47	0.38	0.14	0.53	0.11	0.00	0.03	0.20
60D	2.34	4.30	0.11	0.31	0.20	0.43	0.20	0.57	0.74	0.74
40D	5.25	10.01	0.23	0.17	0.40	0.40	0.12	0.53	0.50	0.53
20D	4.29	flooded	0.15	0.28	0.39	0.39	0.45	0.18	0.09	0.71
0	3.65	flooded	0.25	0.25	0.20	0.35	0.54	0.12	0.22	0.55
20U	2.5	17.44	0.31	0.25	0.13	0.31	0.55	0.85	0.44	0.85
40U	9.12	14.47	0.18	0.37	0.19	0.37	0.37	0.43	0.22	0.55
60U	3.30	10.62	0.63	0.48	0.25	0.63	0.23	0.12	0.00	0.60
80U	3.14	14.10	0.16	0.11	0.10	0.26	0.30	1.28	0.95	1.28
100U	4.06	12.00	0.16	0.06	0.19	0.97	0.23	0.61	0.06	0.72

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
100D			100				50FT	30	10		
80D			100				35	20	40		5
60D				30 (flat)	40		5	15		30	50
40D	25	10	25		40		10	10	10	40	30
20D			50		50		5	10	5	60	20
0	20	30			50		10	5	5	40	40
20U	40			20 (flat)	40		5	15	30	30	20
40U	70	10			20		15	15	10	50	10
60U		30	10	50	40		10	5	5	40	40
80U	20		25		20	35 rapid	5	5	10	60	20
100U	30		30		40			10	20	40	30

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R07
UTM Coordinates: 17W 588151 7898234

Date/Time Surveyed: 2-Sept-08 / 09:32

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 9:00 **Electrofisher Settings:** 400V, 40HZ, 30%

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	12	1.33	64-109	4-2
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	High	Moderate
NNST	No	No	Low	Low

Comments & Summary

Large lake ~ 120m downstream of crossing, UTM 17 W 588450 7899185 and UTM 17 W 588460 7899255 =upstream barrier.

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R07
UTM Coordinates: 17W 588151 7898234

Date/Time Surveyed: 2-Sept-08 / 09:32

Photographs

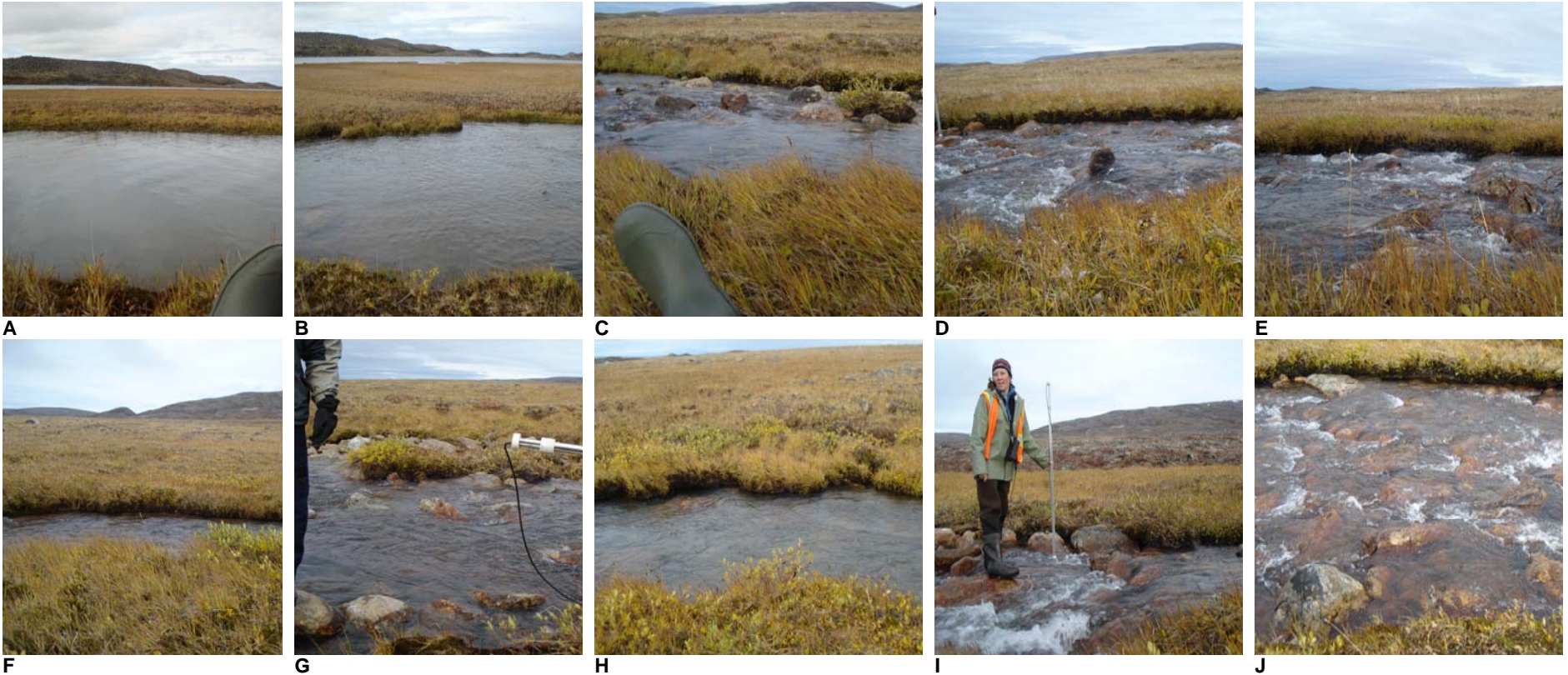


Figure 1. View at 100m downstream across (A), 80m (B), 60m (C), 20m (D), crossing across (E), 20m upstream across (F), 40m (G), 60m (H), 80m (I), and 100m (J).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R08
UTM Coordinates: 17 W 591337 7897150

Date/Time Surveyed: 2-Sept-08

General Physical Characteristics

Floodplain Width (m):	9.14	Channel Pattern:	Braided, meandering	Stage:	Normal-high
Channel Confinement:	PC-NC	Channel Gradient (range):	2-7°	Flow Regime:	PER
Bank Height (range in m):	0.5-1.0	Bank Shape:	UC with rocks 100%	T_w (°C):	4

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
0	4.46	5.29	0.20	0.35	0.30	0.35	0.39	0.25	0.01	0.39

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
0	20	10	30	-	40	-	10	5	10	35	40

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 7:00 **Electrofisher Settings:** 400V, 40Hz, 30%

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	0	-	-	-
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R08
UTM Coordinates: 17 W 591337 7897150

Date/Time Surveyed: 2-Sept-08

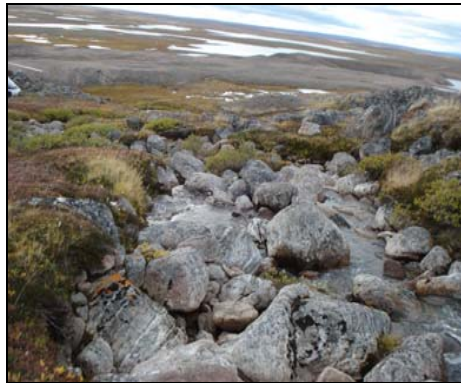
Comments & Summary

There are two channels downstream of the crossing; right has very low water and the left has barrier at UTM 17 W 591306 7897090. UTM 17 W 591306 7897090 is ~60m downstream of crossing and very likely acts as a barrier. At UTM 17 W 591364 7897500 two sets of falls that act as an upstream barrier.

Photographs



A



B



C



D



E



F

Figure 1. View of upstream barrier falls (A), crossing upstream (B), crossing across (C), crossing downstream (D), downstream barrier –left channel (E), downstream barrier – right channel (F).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R09
UTM Coordinates: 17 W 593797 7896363

Date/Time Surveyed: 2-Sept-2008

General Physical Characteristics

N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted: N **Effort (min):** N/A **Electrofisher Settings:** N/A

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

Water is all flowing beneath boulders at crossing site. Even if water levels were high enough for fish to swim upstream, the gradient is too steep over too long a distance for the fish to reach the crossing (6° over 65m). US limit of stream is UTM 17 W 594080 7896774.

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R09
UTM Coordinates: 17 W 593797 7896363

Date/Time Surveyed: 2-Sept-2008

Photographs



A



B



C



D

Figure 1. Aerial view of crossing site (A), crossing downstream (B), crossing across (C), and crossing upstream (D).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R10
UTM Coordinates: 17 W 594249 7896161

Date/Time Surveyed: 2-Sept-2008

General Physical Characteristics

N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted: N

Effort (min): N/A

Electrofisher Settings: N/A

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

Not fish habitat. Currently dry, probably only has water during the spring. Due to steep downstream drop-off, inaccessible to fish from downstream. No persistent source of headwater. Downstream barrier at UTM 17 W 594330 7895960. The water temperature was 6 °C.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R10
UTM Coordinates: 17 W 594249 7896161

Date/Time Surveyed: 2-Sept-2008

Photographs



A



B



C



D

Figure 1. View at crossing upstream (A), crossing across (B) crossing downstream (C), and downstream barrier (dry, steep) (D).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R11
UTM Coordinates: 17 W 594561 7896111

Date/Time Surveyed: 2-Sept-2008

General Physical Characteristics

N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted: N **Effort (min):** N/A **Electrofisher Settings:** N/A

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

Crossing is dry. No persistent source of water. When water is present, would flow into downstream lake at same point as R10 and R12.

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R11
UTM Coordinates: 17 W 594561 7896111

Date/Time Surveyed: 2-Sept-2008

Photographs



A



B



C

Figure 1. View at crossing downstream (A), crossing across (B), and crossing upstream (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R12
UTM Coordinates: 17 W 594594 7896105

Date/Time Surveyed: 2-Sept-2008

General Physical Characteristics

N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted: N **Effort (min):** N/A **Electrofisher Settings:** N/A

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

All the same information as R11. No fish habitat, totally dry.

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R12
UTM Coordinates: 17 W 594594 7896105

Date/Time Surveyed: 2-Sept-2008

Photographs



A



B



C

Figure 1. View at crossing downstream (A), crossing across (B), and crossing upstream (C).

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LEGEND:

- | | |
|---------------------------------------|---|
| RAILWAY CROSSING SURVEY YEAR | CONTOUR |
| ● 2007 | — MILNE INLET TOTE ROAD (EXISTING) |
| ● 2008 | ----- RAILWAY ALIGNMENT (PROPOSED) |
| ● 2010 | ----- CONSTRUCTION ACCESS ROAD (PROPOSED) |
| ○ STREAM CROSSING | ■ WATER |
| ○ STREAM CROSSING (APPROX.) | ■ INFRASTRUCTURE |
| ✕ FISH BARRIER (CONFIRMED) | |
| ✕ FISH BARRIER (AREAL INTERPRETATION) | |

NOTES:

1. BASE MAP 1:50,000 © HER MAJESTY THE QUEEN IN RIGHTS OF CANADA DEPARTMENT OF NATURAL RESOURCES (2009.) ALL RIGHTS RESERVED.
2. TOPOGRAPHY PROVIDED BY EAGLE MAPPING (2005).
3. PROPOSED RAILWAY ALIGNMENT PROVIDED BY CANRAIL CONSULTANTS INC.
4. PROPOSED RAILWAY CONSTRUCTION ACCESS ROAD ALIGNMENT PROVIDED BY CANRAIL CONSULTANTS INC. DRAWING NO. RAILWAY ALIGNMENT AND CONST ACCESS RD - MARY RIVER STEENSBY 2010 -12AUG2010 DWG
5. LOCATION OF PROPOSED INFRASTRUCTURE IS APPROXIMATE AND SUBJECT TO FIELD ADJUSTMENTS
6. CONTOUR INTERVAL IS 25 AND IS IN METRES.

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

Railway Stream Crossing Sites (Map D)

North/South Consultants Inc.
Aquatic Environment Specialists

P/A NO.
-
DATE: 19/11/2010

REF NO.
-
REV
2

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R13
UTM Coordinates: 17 W 594831 7896026

Date/Time Surveyed: 2-Sept-08 / 15:28

General Physical Characteristics

Floodplain Width (m): >200	Channel Pattern: Sinuous	Stage: Normal
Channel Confinement: C-PC	Channel Gradient (range): 0.75°	Flow Regime: PER
Bank Height (range in m): 0-4	Bank Shape: UD	T_w (°C): 4.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
40D	16.46	16.46	0.70	Too deep	Too deep	0.70	0.44	Too deep	Too deep	0.44
20D	13.72	29.26	0.65	0.63	Too deep	0.65	0.19	0.61	Too deep	0.61
0	13.72	34.75	0.45	0.15	Too rapid	0.45	1.15	2.35	Too rapid	2.35
20U	16.46	45.72	0.58	0.30	Too rapid	0.80	0.57	1.45	Too rapid	1.45
40U	21.95	35.66	0.35	0.46	0.55	0.55	0.75	0.36	0.78	0.78

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
40D	-	25	-	65	-	10 rapid	10	10	10+20 bedrock	20	30
20D	10	-	30	60	-	-	10	-	30 bedrock	20	40
0	-	-	25	-	20	55 rapid	-	-	40 bedrock	30	30
20U	-	10	30	-	20	40 rapid	5	5	-	30	60
40U	30	-	20	-	-	50 rapid	-	-	-	40	60

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 10:37 **Electrofisher Settings:** 300V, 40HZ, 30%

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	7(2 observed)	0.66	67-126	4-2
NNST	0	-	-	-

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R13
UTM Coordinates: 17 W 594831 7896026

Date/Time Surveyed: 2-Sept-08 / 15:28

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	High	High
NNST	No	No	Low	Low

Comments & Summary

Fished along the right shore only. Upstream limit at UTM 17 W 597007 7904134, and UTM 17 W 597520 7904346. Up left arm, all steep cascades that only large fish could get up.

Photographs



A



B



C



D



E



F



G

Figure 1. View at 40m downstream across (A), crossing across (B), 20m upstream across (C), 40m upstream across (D), large cascades upstream on left arm (E), upstream barrier on right arm downstream (F), and upstream barrier on right arm upstream (G).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R14
UTM Coordinates: 17 W 594975 7895888

Date/Time Surveyed: 2-Sept-2008

General Physical Characteristics

N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted: N **Effort (min):** N/A **Electrofisher Settings:** N/A

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

Dry at the crossing. Probably has a very small amount of water during the spring. Very small channel (~0.25m across) that would be flooded terrestrial vegetation when water is present. Barrier 50m downstream at UTM 17 W 594958 7895836 - vertical drop ~1.5m.

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R14
UTM Coordinates: 17 W 594975 7895888

Date/Time Surveyed: 2-Sept-2008

Photographs



A



B



C



D



E



F

Figure 1. View at crossing upstream (A), crossing across (B), crossing downstream (C), downstream barrier across (D), downstream barrier facing downstream (E), and downstream barrier facing upstream (F).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R15
UTM Coordinates: 17 W 595065 7895608

Date/Time Surveyed: 2-Sept-2008

General Physical Characteristics

N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted: N **Effort (min):** N/A **Electrofisher Settings:** N/A

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

Very dry. Too rocky and variable in height and depth to be good fish habitat (the channel is most likely under the rocks or at least blocked by the rocks). Rock barrier approximately 30m upstream, and the mouth is at UTM 17 W 595129 7895411. Just upstream of mouth is flooded terrestrial habitat.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

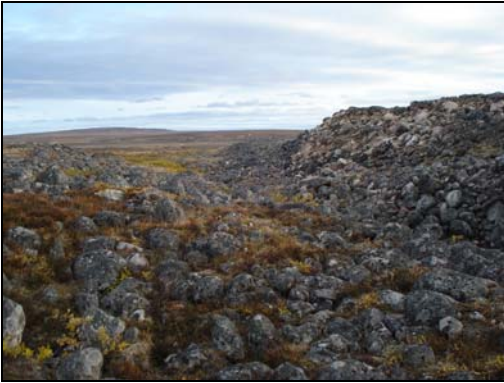
Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R15
UTM Coordinates: 17 W 595065 7895608

Date/Time Surveyed: 2-Sept-2008

Photographs



A



B



C

Figure 1. View at crossing downstream (A), crossing across (B), and crossing upstream (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R16
UTM Coordinates: 17 W 595076 7895399

Date/Time Surveyed: 3-Sept-08 / 08:41

General Physical Characteristics

Floodplain Width (m):	>183	Channel Pattern:	Meandering	Stage:	Normal
Channel Confinement:	PC	Channel Gradient (range):	0.25-1.0°	Flow Regime:	PER
Bank Height (range in m):	0->1.0	Bank Shape:	10%UC, 90% S	T_w (°C):	N/M

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
100D	32.9	34	0.35	0.10	0.05		0.60	0.15	0.00	
80D	27.9	29.9	0.17	0.24	0.15		0.44	0.29	0.53	
60D	30.5	32.5	0.19	0.24	0.24		0.21	0.64	0.45	
40D	34	37	0.28	0.13	0.26		0.20	0.21	0.07	
20D	46.7	50	0.37	0.08	0.75		0.23	0.24	1.00	
0	42	48	0.32	0.18	0.02		1.12	0.27	Under rocks	
20U	42.5	47	2.0	0.32	0.25		pool	0.43	0.00	
40U	14.63	73.15	0.46	0.41	0.10		0.36	0.45	0.07	
60U	11.89	73.15	0.51	0.30	0.08		0.60	0.38	0.04	
80U	29.26	68.58	0.70	0.53	0.06		0.53	0.01	0.12	
100U	29.26	43.89	0.21	0.37	0.07		0.46	0.96	0.13	

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
100D	50	20				Flat 30			30	50	20
80D	80	20							40	45	15
60D	70	30							20	60	20
40D	60	30	10				20FT		10	50	20
20D	40	55	5						40	50	10
0	20	50				30rapid			20	60	20
20U	40	20	40						10	60	30
40U	70	20	10				10		10	50	30
60U	90	10					10	10	20	50	10
80U	60	10	20		10			10	10	60	20
100U	100									80	20

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R16
UTM Coordinates: 17 W 595076 7895399

Date/Time Surveyed: 3-Sept-08 / 08:41

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 9:00 **Electrofisher Settings:** 400V, 30HZ, 30%

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	21	2.33	42-104	<1-12
NNST	1	0.11	50	1

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	High	High
NNST	No	No	Moderate	Moderate

Comments & Summary

Fished along the left bank. Left side of max channel is fast flowing and deeper and right side is shallow with exposed rocks. This stream flows into the Raven River.

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R16
UTM Coordinates: 17 W 595076 7895399

Date/Time Surveyed: 3-Sept-08 / 08:41

Photographs



A



B



C



D



E



F



G



H

Figure 1. View at 100m downstream across (A), 20m (B), crossing across (C), 20m upstream across (D), 20m upstream right channel (E), 40m upstream across (F), 80m (G), and 100m (H).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R17
UTM Coordinates: 17 W 595083 7895225

Date/Time Surveyed: 2-Sept-2008

General Physical Characteristics

N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted: N **Effort (min):** N/A **Electrofisher Settings:** N/A

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

Water flows from a slightly higher position along a plateau and then pools downstream ~100m on top of the same plateau. The crossing is dry.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

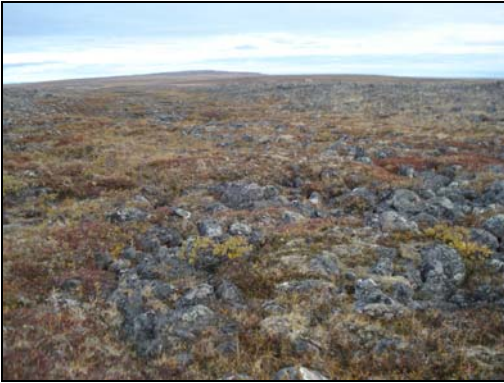
Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R17
UTM Coordinates: 17 W 595083 7895225

Date/Time Surveyed: 2-Sept-2008

Photographs



A



B



C

Figure 1. View at crossing downstream (A), crossing across (B), and crossing upstream (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R18
UTM Coordinates: 17 W 595111 7894902

Date/Time Surveyed: 3-Sept-2008

General Physical Characteristics

N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted: N **Effort (min):** N/A **Electrofisher Settings:** N/A

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

Channels run-off starting from UTM 17 W 594786 7895317. Water is pooled downstream of the site (within 50m) but not deep enough and there are dry patches. Eventually if enough water was present it would connect to a deep enough lake but there are dry patches in between. Currently cut off due to the dry spots and probably is for most of the open water season.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R18
UTM Coordinates: 17 W 595111 7894902

Date/Time Surveyed: 3-Sept-2008

Photographs



A



B



C



D

Figure 1. View at crossing upstream (A), crossing across (B), crossing downstream (C), and dry downstream barrier (D).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R19
UTM Coordinates: 17 W 595301 7894402

Date/Time Surveyed: 3-Sept-2008

General Physical Characteristics

N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted: N **Effort (min):** N/A **Electrofisher Settings:** N/A

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

Site contains a small puddle of water, maximum water depth was 0.05 m and the substrate was 100% large cobble. Is currently inaccessible to fish. Many dry patches exist between it and downstream water.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R19
UTM Coordinates: 17 W 595301 7894402

Date/Time Surveyed: 3-Sept-2008

Photographs



A



B



C

Figure 1. View at crossing downstream (A), crossing across (B), and crossing upstream (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R20
UTM Coordinates: 17 W 595338 7894313

Date/Time Surveyed: 3-Sept-2008

General Physical Characteristics

N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted: N **Effort (min):** N/A **Electrofisher Settings:** N/A

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

A very small amount of water is present. The water temperature was 6.0 °C. Flooded terrestrial connects to a downstream pond that is too shallow for overwintering. Upstream source of CV-R19 and R20 is just snow and rain runoff at UTM 17 W 594849 7894877. This pond is separated from the Ravn by a barrier (dry land, no visible channel and slight drop at UTM 17 W 595354 7894151). At high water, fish may be able to make it up the slope but the habitat between the ponds is very poor.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R20
UTM Coordinates: 17 W 595338 7894313

Date/Time Surveyed: 3-Sept-2008

Photographs



A



B



C

Figure 1. View at crossing downstream (A), crossing across (B), and crossing upstream (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R21
UTM Coordinates: 17 W 595417 7894126

Date/Time Surveyed: 3-Sept-2008

General Physical Characteristics

N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted: N **Effort (min):** N/A **Electrofisher Settings:** N/A

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	High	No
NNST	No	No	Low	No

Comments & Summary

This site is actually the bank of the Ravn river and during high water in the spring, it would be excellent fish habitat. It is ~25m from the edge of the main river flow. The crossing was dry and the substrate was 10% fines, 10% gravel, 40% small cobble, 30% large cobble, and 10% boulders.

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R21
UTM Coordinates: 17 W 595417 7894126

Date/Time Surveyed: 3-Sept-2008

Photographs



A



B



C



D

Figure 1. View at crossing downstream (A), crossing towards bank (B), crossing towards river (C), and crossing upstream (D).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R22
UTM Coordinates: 17 W 595468 7894001

Date/Time Surveyed: 4-Sept-08 / 08:00

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	Single channel, meandering	Stage:	Normal-High
Channel Confinement:	PC	Channel Gradient (range):	< 0.5°	Flow Regime:	PER
Bank Height (range in m):	0.00-3.00	Bank Shape:	20% UC, 80% S	T_w (°C):	4.5

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
40D	113.39	139.90	0.32	0.56	0.73	> 1.0	0.00	0.07	0.20	> 1.00
20D	113.39	140.82	0.23	0.46	0.57	> 1.0	0.00	0.27	0.46	> 1.00
0	114.30	146.30	0.20	0.36	0.52	> 1.0	0.08	0.54	0.69	> 1.00
20U	112.47	135.33	0.22	0.34	0.40	> 1.0	0.00	0.69	0.90	> 1.00
40U	124.36	-	0.09	0.34	0.57	> 1.0	0.00	0.54	0.86	> 1.00

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
40D	50		20	10		Rapid 20	5	10	60	20	5
20D	50	5	15	10		Rapid 20	5	15	65	10	5
0	50	10	10			Rapid 30	5	15	50	20	10
20U	30	5	5			Rapid 60	20	10	30	20	20
40U	40	20				Rapid 40	20	10	15	40	15

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 6:30 **Electrofisher Settings:** 400V, 30Hz, 30%

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	6	0.92	59-105	2-11
NNST	2	0.31	32-82	2-4

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R22
UTM Coordinates: 17 W 595468 7894001

Date/Time Surveyed: 4-Sept-08 / 08:00

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	High	High
NNST	Low	No	High	High

Comments & Summary

Abundant, suitable habitat for both species.

Photographs



A



B



C



D



E



F

Figure 1. View at 40m downstream across (A), 20m (B-C), crossing across (D), 20m upstream across (E), and 40m (F).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R23
UTM Coordinates: 17 W 595665 7893529

Date/Time Surveyed: 3-Sept-2008

General Physical Characteristics

N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted: N **Effort (min):** N/A **Electrofisher Settings:** N/A

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

Flooded terrestrial surrounded by a few ponds. Not fish habitat, water feeds into pond at UTM 17 W 595650 7893515. No obvious run-off point. The maximum water depth at the crossing was < 1 m and the substrate composition was 97% small fines and 3% boulders.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R23
UTM Coordinates: 17 W 595665 7893529

Date/Time Surveyed: 3-Sept-2008

Photographs



A



B



C

Figure 1. View at crossing downstream (A), crossing across (B), and crossing upstream (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R24
UTM Coordinates: 17 W 596479 7891599

Date/Time Surveyed: 11-Aug-08 / 11:25

General Physical Characteristics

N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted: N **Effort (min):** N/A **Electrofisher Settings:** N/A

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

Marshy ground; no visible flow/stream/creek.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R24
UTM Coordinates: 17 W 596479 7891599

Date/Time Surveyed: 11-Aug-08 / 11:25

Photographs



A



B



C



D

Figure 1. View of habitat facing, north (A), south (B) east (C), west (D) at the crossing.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R25
UTM Coordinates: 17 W 596704 7891450

Date/Time Surveyed: 11-Aug-2008/12:15

General Physical Characteristics

N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted: N

Effort (min): N/A

Electrofisher Settings: N/A

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

There is no waterbody within sight of the crossing; at the time of assessment, there wasn't even standing water, the high water channel width was undefined.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R25
UTM Coordinates: 17 W 596704 7891450

Date/Time Surveyed: 11-Aug-2008/12:15

Photographs



A



B



C



D

Figure 1. View of the crossing facing north (A), east (B), south (C), and west (D).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R26
UTM Coordinates: 17 W 596749 7891407

Date/Time Surveyed: 11-Aug-2008/12:21

General Physical Characteristics

N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted: N

Effort (min): N/A

Electrofisher Settings: N/A

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

There were only a number of isolated puddles at the crossing site and the high water channel width was undefined.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

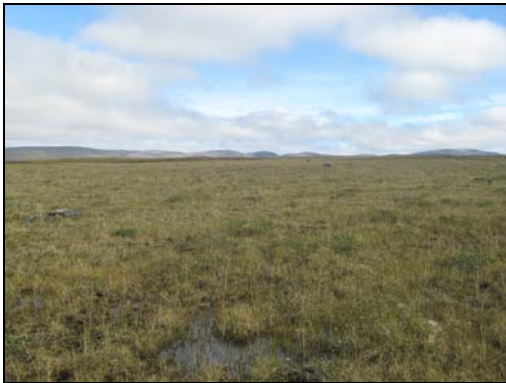
Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R26
UTM Coordinates: 17 W 596749 7891407

Date/Time Surveyed: 11-Aug-2008/12:21

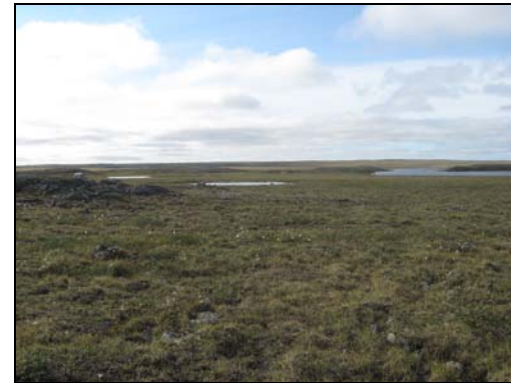
Photographs



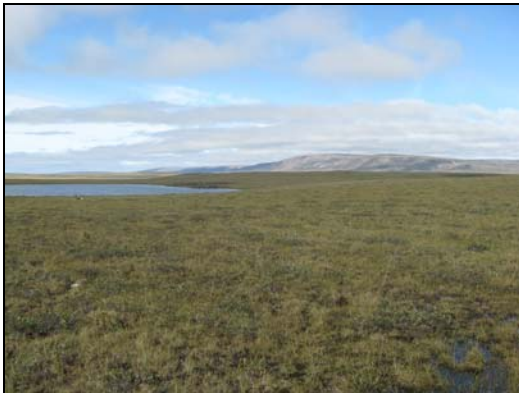
A



B



C



D

Figure 1. View of crossing facing north (A), east (B), south (C), and west (D).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R27
UTM Coordinates: 17 W 596886 7891237

Date/Time Surveyed: 11-Aug-08 / 12:40

General Physical Characteristics

N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 3:02 **Electrofisher Settings:** 400V, 40Hz, 30%DC

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	0	-	-	-
NNST	9	2.97	22-36	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	High	No	High	No

Comments & Summary

No stream crossing site nearby. Waypoint was close to small lake (<10m) and therefore this site was assessed as an LE (see photos below). The water temperature was 12.0 °C. The substrate of the water body (146 X 55 m) at the crossing was 30% fines, 10% gravel, 20% small cobble and 40% large cobble.

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

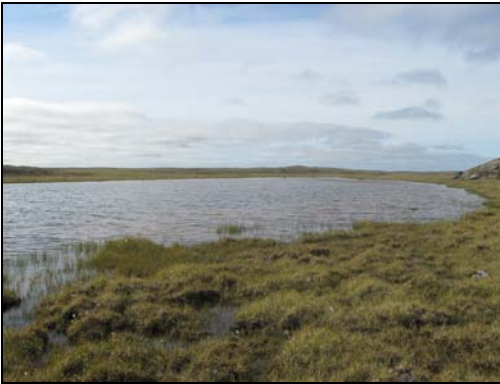
Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R27
UTM Coordinates: 17 W 596886 7891237

Date/Time Surveyed: 11-Aug-08 / 12:40

Photographs



A



B



C



D

Figure 1. View of habitat facing south (A), and southeast of crossing (B), and of substrate (C-D).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R28
UTM Coordinates: 17 W 597243 7890426

Date/Time Surveyed: 11-Aug-2008/14:10

General Physical Characteristics

N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted: N

Effort (min): N/A

Electrofisher Settings: N/A

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

There were only a number of isolated puddles at the crossing site, the high water channel width was undefined. The closest waterbody is at least 300m away.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

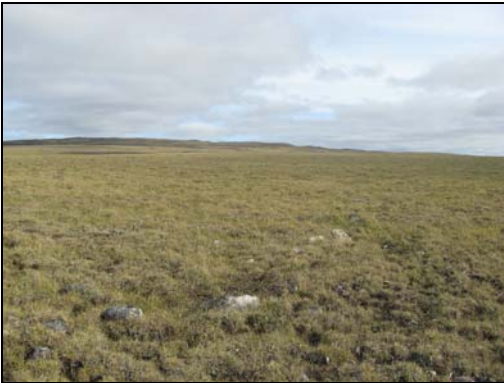
Rail Alignment Watercourse Crossing Assessment

Location

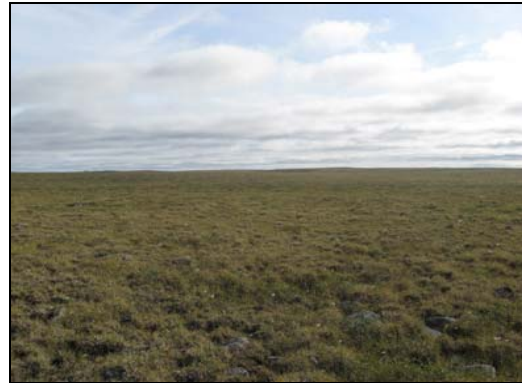
Crossing ID: CV-R28
UTM Coordinates: 17 W 597243 7890426

Date/Time Surveyed: 11-Aug-2008/14:10

Photographs



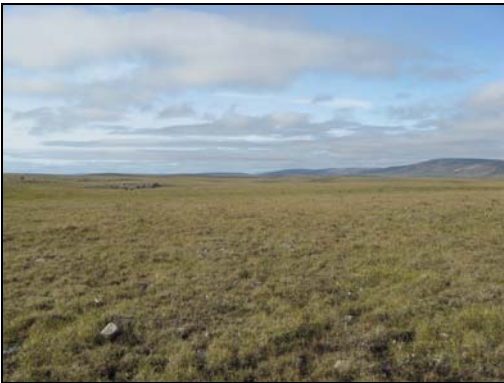
A



B



C



D

Figure 1. View of crossing facing north (A), east (B), south (C), and west (D).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R29
UTM Coordinates: 17 W 597433 7889759

Date/Time Surveyed: 3-Sept-08 /15:18

General Physical Characteristics

Floodplain Width (m):	>200	Channel Pattern:	Braided, meandering	Stage:	Normal
Channel Confinement:	NC	Channel Gradient (range):	0.25°	Flow Regime:	INT
Bank Height (range in m):	0-0.25	Bank Shape:	25% UC, 75% V	T_w (°C):	7.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
40D	Lake									
20D	8.41/25	~50	0.10	0.11	0.03		0.24	0.00	0.06	
0	29.84	24.6	0.11	0.07	0.08		0.19	0.00	0.10	
20U	1.35	10.2	0.36	0.45	0.43		0.00	0.00	0.04	
40U	1.34	4.3	0.18	0.26	0.23		0.12	0.05	0.08	
60U	10.3	26.4	0.06	0.05	0.08		0.00	0.06	0.10	

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
40D	Lake										
20D	40		60				10	40	30	20	
0	30		70				100 FT				
20U			100				40 sand	20	30	5	5
40U	30		70				30 sand/clay	30	40		
60U	10	90					70 clay	15	10	5	

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 4:41 **Electrofisher Settings:** 200V, 30Hz, 30%

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	0	-	-	-
NNST	8	1.71	25-39	-

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R29
UTM Coordinates: 17 W 597433 7889759

Date/Time Surveyed: 3-Sept-08 /15:18

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	Low	No
NNST	High	No	High	Moderate

Comments & Summary

Stream between two lakes. North lake (D/S lake) has a deep hole in it (>3-4 m) Lake to the South (U/S lake) is not deep enough to overwinter fish.

Photographs



A



B



C



D



E



F



G



H

Figure 1. View of downstream lake (A), 20m downstream across (B), crossing across (C), substrate at crossing (D), 20m upstream across (E), 40m (F), 60m (G), and upstream lake (H).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R30
UTM Coordinates: 17 W 597272 7888578

Date/Time Surveyed: 4-Sept-2008

General Physical Characteristics

N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted: N

Effort (min): N/A

Electrofisher Settings: N/A

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	Low	Low

Comments & Summary

Nearly dry. During high water it may connect to other ponds that are too shallow for overwintering. There is a pond upstream that may be connected to this point and might be deep enough for overwintering, but only during high water.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – MARGINAL

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R30
UTM Coordinates: 17 W 597272 7888578

Date/Time Surveyed: 4-Sept-2008

Photographs



A



B



C

Figure 1. View at crossing downstream (A), crossing across (B), and crossing upstream.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R31
UTM Coordinates: 17 W 597364 7888229

Date/Time Surveyed: 4-Sept-2008

General Physical Characteristics

N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted: N **Effort (min):** N/A **Electrofisher Settings:** N/A

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

A few isolated marshy puddles. There are a couple of nearby shallow ponds (maximum water depth = 0.5 m), but none are attached overwintering habitat.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

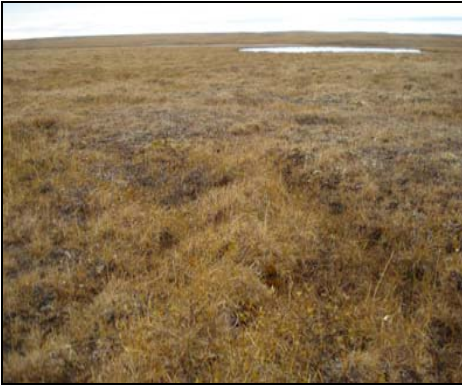
Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R31
UTM Coordinates: 17 W 597364 7888229

Date/Time Surveyed: 4-Sept-2008

Photographs



A



B



C

Figure 1. View at crossing downstream (A), crossing across (B), and crossing upstream (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R32
UTM Coordinates: 17 W 597515 7887484

Date/Time Surveyed: 4-Sept-2008

General Physical Characteristics

N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted: N **Effort (min):** NA **Electrofisher Settings:** NA

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

Marsh with no defined channels. There is a nearby pond, but it does not provide overwintering habitat.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NONE

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R32
UTM Coordinates: 17 W 597515 7887484

Date/Time Surveyed: 4-Sept-2008

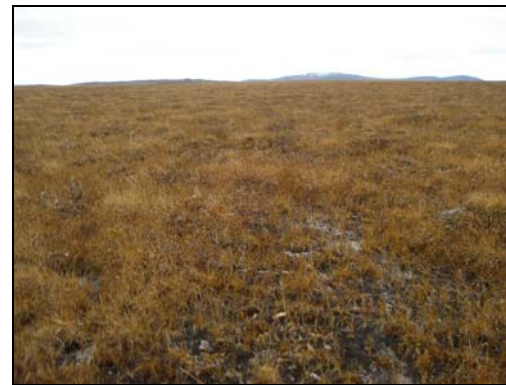
Photographs



A



B



C

Figure 1. View at crossing downstream (A), crossing across (B), and crossing upstream.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R33
UTM Coordinates: 17 W 597481 7887335

Date/Time Surveyed: 4-Sept-08 / 09:32

General Physical Characteristics

Floodplain Width (m):	>183	Channel Pattern:	Sinuous	Stage:	Normal
Channel Confinement:	NC	Channel Gradient (range):	0.25-0.5°	Flow Regime:	PER
Bank Height (range in m):	0-4.0	Bank Shape:	80% UC, 20% UD-Flooded	T_w (°C):	4.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
100D	5.55	flooded	0.33	0.24	0.26	0.33	0.26	0.04	0.19	0.26
80D	8.9	flooded	0.18	0.15	0.08	0.25	0.84	0.44	0.29	0.84
60D	8.2	flooded	0.17	0.12	0.17	0.40	0.00	0.14	0.18	0.56
40D	6.65	36.58	0.17	0.12	0.13	0.17	0.14	0.09	0.11	0.53
20D	15.9	42.98	0.12	0.09	0.16	0.30	0.07	0.03	0.17	0.35
0	19.5	41.15	0.14	0.11	0.22	0.27	0.23	0.45	0.01	0.45
20U	14.9	38.40	0.11	0.2	0.07	0.39	0.00	0.10	0.29	0.29
40U	12.15	32.00	0.22	0.26	0.22	0.26	0.14	0.02	0.02	0.14
60U	8.4	18.5	0.25	0.18	0.34	0.34	0.00	0.72	0.03	0.72
80U	4.4	5.7	0.38	0.45	0.41	0.60	0.13	0.06	0.00	0.13
100U	2.5	15.54	0.10	0.26	0.20	0.26	0.49	0.21	0.00	0.49

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
100D	60	10	30				30Ft	10	40	15	5
80D		40				60		10	50	10	30
60D	30	40	10		20				10	10	70bedrock
40D	30		70						20	40	40
20D	70	15	15						10	50	40
0	70	20	10						10	60	30
20U	60	30	10						50	40	10
40U	70	30					15FT	10	50	20	5
60U	60	20	20				10FT	10	35	25	10
80U	70	10	20				10FT		30	40	10
100U	50	10	40					10	50	30	10

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R33
UTM Coordinates: 17 W 597481 7887335

Date/Time Surveyed: 4-Sept-08 / 09:32

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 13:10 **Electrofisher Settings:** 300V, 50HZ, 30%

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	5	0.38	106-167	11-58
NNST	16	1.22	29-41	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	High	Moderate
NNST	High	No	High	High

Comments & Summary

Connects to a large river at downstream at UTM 17 W 597216 7887372, ends in a series of pools at UTM 17 W 598910 7887219.

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R33
UTM Coordinates: 17 W 597481 7887335

Date/Time Surveyed: 4-Sept-08 / 09:32

Photographs



Figure 1. Aerial view of confluence with river (A), 100m downstream across (B), 80m (C), 60m (D), 40m (E), 20m (F), crossing across (G), 20m upstream across (H), 40m (I), 60m (J), 80m (K), and 100m (L).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R34
UTM Coordinates: 17 W 596723 7886534

Date/Time Surveyed: 5-Sept-08 /09:45

General Physical Characteristics

Floodplain Width (m): ~80	Channel Pattern: Straight	Stage: Normal
Channel Confinement: NC-PC	Channel Gradient (range): 0-0.25°	Flow Regime: PER
Bank Height (range in m): 0.1-0.75	Bank Shape: 100% UC(with rocks)	T_w (°C): 4.5

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
40D	54	74	0.60	Too	dangerous	>1	0.02	Too	dangerous	1.0
20D	42	72	0.36	0.43	0.49	~1.0	0.05	0.16	0.14	~1.0
0	46	78	0.37	0.35	0.27	>1.0	0.24	0.23	0.12	>1.0
20U	49	64	0.24	0.57	0.61	>1.0	0.08	0.21	0.24	>1.0
40U	48	59	0.49	0.45	Too rapid	>1.0	0.35	0.20	Too rapid	>1.0

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
40D	10	10	50	30						10	90
20D	20	30		50						40	60
0	50		30	10	10				10	10	80
20U	40		20		20	Rapid 20	60Bedrock			10	30
40U	10		20		20	Rapid 50	80Bedrock			10	10

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 11:28 **Electrofisher Settings:** 700V, 50Hz, 30%

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	3 (3observed)	0.26	112-129	17-19
NNST	1(1observed)	0.09	22	<1

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R34
UTM Coordinates: 17 W 596723 7886534

Date/Time Surveyed: 5-Sept-08 /09:45

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	High	High
NNST	Low	No	Moderate	Moderate

Comments & Summary

Abundant, high quality habitat for both species.

Photographs



A



B



C



D



E

Figure 1. View at 40m upstream across (A), 20m (B), crossing across (C), 20m downstream across (D), and 40m (E).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R35
UTM Coordinates: 17 W 596577 7886207

Date/Time Surveyed: 4-Sept-2008

General Physical Characteristics

N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted: N **Effort (min):** N/A **Electrofisher Settings:** N/A

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

Marshy and almost dry. Never fish habitat. Small pond very shallow approximately 50m upstream. Runoff from rain feeds this area but water will usually be too low. The water temperature was 6 °C.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-R35
UTM Coordinates: 17 W 596577 7886207

Date/Time Surveyed: 4-Sept-2008

Photographs



A



B



C

Figure 1. View at crossing downstream (A), crossing across (B), and crossing upstream (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-044-1
UTM Coordinates: 17 W 596561 7885802

Date/Time Surveyed: 4-Sept-08 / 12:00

General Physical Characteristics

Floodplain Width (m):	>183	Channel Pattern:	Single channel, sinuous	Stage:	Normal
Channel Confinement:	NC	Channel Gradient (range):	0-0.25°	Flow Regime:	PER
Bank Height (range in m):	0.00-0.10	Bank Shape:	50% UC, 50% UD-flooded	T_w (°C):	6.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
80D	Large river									
60D	0.8	flooded	0.14	0.12	-	0.14	0.02	0.31	-	0.31
40D	2.4	33	0.11	0.31	0.60	0.67	0.00	0.02	0.00	0.02
20D	1.7	29.3	0.09	0.74	0.37	0.74	0.00	0.00	0.06	0.06
0	3.2	17.4	0.10	0.26	0.11	0.26	0.00	0.00	0.00	-
20U	1.3	13.5	0.15	0.07	0.03	0.25	0.00	0.34	0.00	0.34
40U	0.95	13.3	0.28	0.26	0.06	0.28	0.02	0.11	0.00	0.11
60U	2.49	13.75	0.08	0.07	0.09	0.09	0.00	0.23	0.17	0.17
80U	Large pond									

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
60D	50	50					90			10	
40D	20	10	70				90	10			
20D	30	10	60				80		20		
0	40	40	20				80		15	5	
20U	40	55	5				100				
40U	70	10	20				75		10	15	
60U	20	20	60				97		2	1	

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-044-1
UTM Coordinates: 17 W 596561 7885802

Date/Time Surveyed: 4-Sept-08 / 12:00

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 2:33 **Electrofisher Settings:** 200V, 40HZ, 30%

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	0	-	-	-
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	Low	High
NNST	Moderate	No	High	High

Comments & Summary

The lake upstream at UTM 17 W 598610 7873885 is probably deep enough for overwintering fish. This stream is likely a migration corridor even at present water depths (for small fish) and especially in the spring. Upstream limit of passage was UTM 17 W 598644 7873945. Large river at UTM 17 W 598588 7873846. No catch within 50 m stretch. Many NNST seen just upstream of fishing stretch (near upstream pond).

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-044-1
UTM Coordinates: 17 W 596561 7885802

Date/Time Surveyed: 4-Sept-08 / 12:00

Photographs

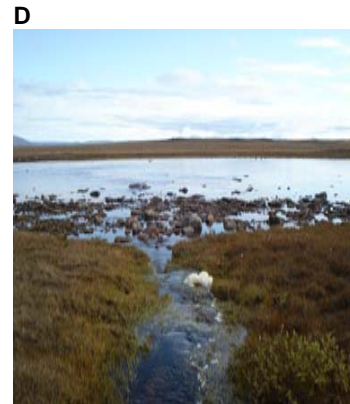


Figure 1. View at 60m downstream across (A), 40m (B), 20m (C), crossing (D), 20m upstream across (E), 40m (F), 60m (G), deep lake further upstream (H), large river downstream (I), and pond upstream (J).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-044-2
UTM Coordinates: 17 W 596551 7885501

Date/Time Surveyed: 11-Aug-07 / 04:42

General Physical Characteristics

Floodplain Width (m):	> 200	Channel Pattern:	UD	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	N/M	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

There was no water at this crossing and the high water channel width was undefined. Barriers present – dry downstream and at crossing.

Crossing dry, no fish habitat present.

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-044-2
UTM Coordinates: 17 W 596551 7885501

Date/Time Surveyed: 11-Aug-07 / 04:42

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-044-3
UTM Coordinates: 17 W 596551 7884976

Date/Time Surveyed: 4-Sept-08 / 13:50

General Physical Characteristics

Floodplain Width (m):	>183	Channel Pattern:	Meandering	Stage:	Normal
Channel Confinement:	NC	Channel Gradient (range):	0.25°	Flow Regime:	PER
Bank Height (range in m):	0-0.1	Bank Shape:	100% UC/UD-Flooded	T_w (°C):	6.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
100D	1.7	9.8	0.14	0.49	0.31	0.49	0.00	0.04	0.01	0.04
80D	2.9	15	0.15	1.3	1.3	1.3	0.00	0.00	0.00	0.00
60D	2.7	60/flooded	0.07	0.16	0.10	0.16	0.00	0.32	0.00	0.32
40D	3	50/flooded	0.00	0.17	0.14	0.17	0.00	0.44	0.00	0.44
20D	14.9	50/flooded	0.05-0.10	0.59	0.05-0.1	0.59	0.00	0.02	0.00	0.02
0	2.9	80/flooded	0.05	0.16	0.06	0.24	0.33	0.09	0.02	0.33
20U	2.6	47/flooded	0.13	0.20	0.06	.20	0.00	0.08	0.43	0.43

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
100D	30	10	60				10clay, 65algae	5		10	10
80D	30		70				30FT, 70 algae/silt				
60D	50	20	30				15sand, 85FT				
40D	30	70					100FT				
20D	20	50	30				60FT			10	30
0	40	60					10sand, 85FT	5	10	20	
20U	60	40					20clay, 60FT		10	10	

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – MARGINAL

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-044-3
UTM Coordinates: 17 W 596551 7884976

Date/Time Surveyed: 4-Sept-08 / 13:50

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 5:20 **Electrofisher Settings:** 200V, 50Hz, 30%DC

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	1	0.19	62	2
NNST	1	0.19	127	19

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	Low	Low
NNST	Low	No	Moderate	Low

Comments & Summary

Confluence with large river at UTM 17 W 596621 7885138. No barriers between river and site. Upstream there is also a lake that might barely be capable of supporting an overwintering population at UTM 17 W 596154 7884949. There is an additional pond upstream at UTM 17 W 596522 7884973

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – MARGINAL

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-044-3
UTM Coordinates: 17 W 596551 7884976

Date/Time Surveyed: 4-Sept-08 / 13:50

Photographs



A



B



C



D



E



F



G



H

Figure 1. View at 100m downstream across (A), 80m (B), 60m (C), 40m (D), 20m (E), crossing across (F), 20m upstream across (G), and large river confluence (H).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-045-1
UTM Coordinates: 17 W 597159 7884187

Date/Time Surveyed: 11-Aug-07 / 3:45

General Physical Characteristics

Floodplain Width (m):	> 200	Channel Pattern:	Isolated pools	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	0.5°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
----------------------------------	---	----------------------	-----	--------------------------------	-----

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

The maximum water depth at the crossing was 0.15 m. Channel was undefined with isolated pools and had a wetted width of ~ 0.5 m. The substrate was 90% flooded terrestrial, 9% cobble and 1% boulder. Stream cover was 1% boulder. Barriers present – isolated pools downstream.

Crossing is almost dry and is unlikely to ever be connected to a large DS river.

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-045-1
UTM Coordinates: 17 W 597159 7884187

Date/Time Surveyed: 11-Aug-07 / 3:45

Photographs



A



B



C

Figure 1. View of habitat upstream of the crossing (A), at the crossing (B) and downstream of the crossing (C)

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-047-1
UTM Coordinates: 17 W 598223 7882688

Date/Time Surveyed: 11-Aug-07 / 05:05

General Physical Characteristics

Floodplain Width (m):	> 200	Channel Pattern:	Flooded terrestrial	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	N/M	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
----------------------------------	---	----------------------	-----	--------------------------------	-----

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

The maximum water depth at the crossing was 0.04 m. Channel was characterized by flooded terrestrial with an undefined wetted and high water width. The substrate composition was 100% flooded terrestrial and stream morphology composition was 100% pool. Barriers present – low water levels downstream. Lake(s) present - downstream

Water levels at crossing are too low to provide fish habitat. Although there are likely fish in the downstream lake, they would not move upstream to the crossing site.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-047-1
UTM Coordinates: 17 W 598223 7882688

Date/Time Surveyed: 11-Aug-07 / 05:05

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Path: G:\MARYRIV_GDB\IEIS_Figures\MXD\Synthesis_RailLine_AccessRoad\Rev2\Apdx\20101119_ApdxRW_sg.mxd



LEGEND:

- RAILWAY CROSSING SURVEY YEAR
- 2007
 - 2008
 - 2010
- STREAM CROSSING
- STREAM CROSSING (APPROX.)
 - FISH BARRIER (CONFIRMED)
 - FISH BARRIER (AREAL INTERPRETATION)

- CONTOUR
- MILNE INLET TOTE ROAD (EXISTING)
- RAILWAY ALIGNMENT (PROPOSED)
- CONSTRUCTION ACCESS ROAD (PROPOSED)
- WATER
- INFRASTRUCTURE

NOTES:

1. BASE MAP 1:50,000 © HER MAJESTY THE QUEEN IN RIGHTS OF CANADA DEPARTMENT OF NATURAL RESOURCES (2009.) ALL RIGHTS RESERVED.
2. TOPOGRAPHY PROVIDED BY EAGLE MAPPING (2005).
3. PROPOSED RAILWAY ALIGNMENT PROVIDED BY CANRAIL CONSULTANTS INC.
4. PROPOSED RAILWAY CONSTRUCTION ACCESS ROAD ALIGNMENT PROVIDED BY CANRAIL CONSULTANTS INC. DRAWING NO. RAILWAY ALIGNMENT AND CONST ACCESS RD - MARY RIVER STEENSBY 2010 -12AUG2010 DWG
5. LOCATION OF PROPOSED INFRASTRUCTURE IS APPROXIMATE AND SUBJECT TO FIELD ADJUSTMENTS
6. CONTOUR INTERVAL IS 25 AND IS IN METRES.

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

Railway Stream Crossing Sites (Map E)

North/South Consultants Inc.
Aquatic Environment Specialists

P/A NO.
-
DATE: 19/11/2010

REF NO.
-
REV
2

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-049-1
UTM Coordinates: 17 W 597961 7881471

Date/Time Surveyed: 11-Aug-07 / 05:15

General Physical Characteristics

Floodplain Width (m):	45.7	Channel Pattern:	UD	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	1°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

Crossing dry, no fish habitat present. Barriers present - no water downstream or at crossing.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

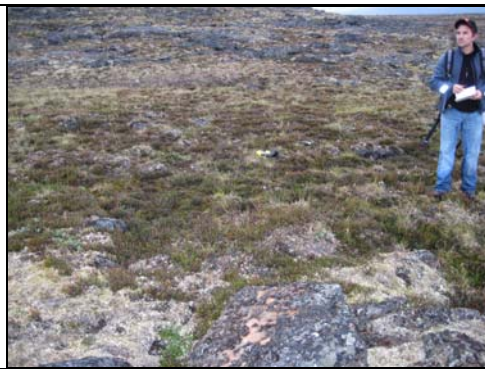
Crossing ID: CV-049-1
UTM Coordinates: 17 W 597961 7881471

Date/Time Surveyed: 11-Aug-07 / 05:15

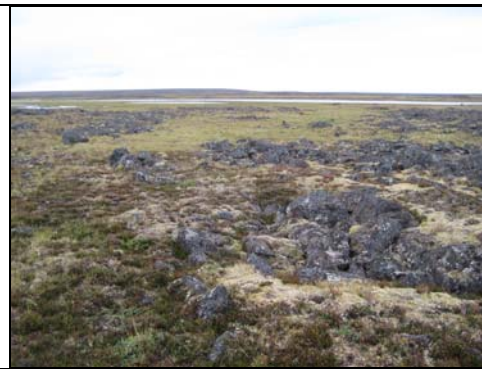
Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-049-2
UTM Coordinates: 17 W 597790 7881239

Date/Time Surveyed: 11-Aug-07 / 05:20

General Physical Characteristics

Floodplain Width (m):	> 200	Channel Pattern:	Flooded terrestrial	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	1°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

The maximum water depth at the crossing was 0.05 m and the channel wetted width was 20.5 m (high water width was undefined). The substrate composition was 100% flooded terrestrial and stream morphology composition was 100% pool. Barriers present – low water levels downstream.

Low water at crossing makes habitat unsuitable for fish. Downstream of the crossing there is potential NNST habitat, close to the confluence with the large downstream river.

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

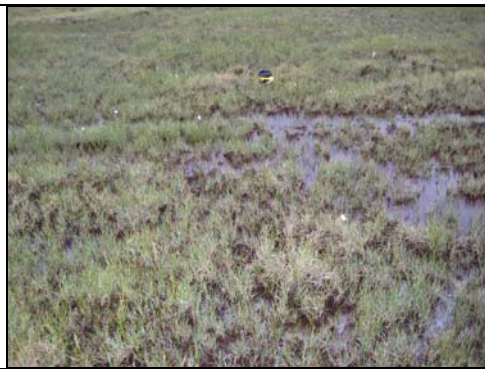
Crossing ID: CV-049-2
UTM Coordinates: 17 W 597790 7881239

Date/Time Surveyed: 11-Aug-07 / 05:20

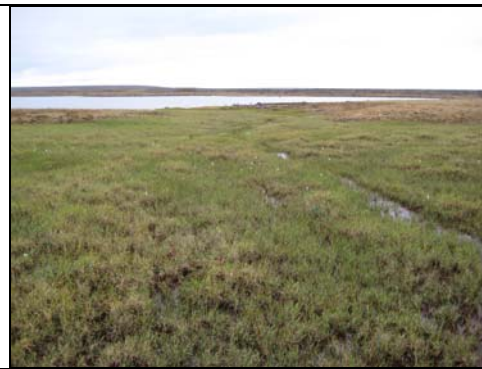
Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-049-3
UTM Coordinates: 17 W 597451 7880777

Date/Time Surveyed: 11-Aug-07 / 05:30

General Physical Characteristics

Floodplain Width (m):	> 200	Channel Pattern:	Flooded terrestrial	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	1°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	Low	No
NNST	Moderate	No	Moderate	Low

Comments & Summary

The channel wetted width at the crossing was 1.5 m (and high water width was undefined). The substrate composition was 100% flooded terrestrial and stream morphology composition was 100% pool. Barriers present – low water upstream

Seasonal NNST habitat likely exists at the crossing, and ARCH may also inhabit the crossing during periods of high water.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – MARGINAL

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-049-3
UTM Coordinates: 17 W 597451 7880777

Date/Time Surveyed: 11-Aug-07 / 05:30

Photographs



Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-050-1
UTM Coordinates: 17 W 597346 7880635

Date/Time Surveyed: 11-Aug-07 / 05:40

General Physical Characteristics

Floodplain Width (m):	> 200	Channel Pattern:	Sinuuous	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	1°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

Although the crossing was dry, the high water channel width was 0.45 m. Barriers present – no water at crossing or downstream.

Crossing dry, no fish habitat present.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-050-1
UTM Coordinates: 17 W 597346 7880635

Date/Time Surveyed: 11-Aug-07 / 05:40

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-050-2
UTM Coordinates: 17 W 596938 7880079

Date/Time Surveyed: 11-Aug-07 / 05:30

General Physical Characteristics

Floodplain Width (m):	> 200	Channel Pattern:	Flooded terrestrial	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	N/M	Flow Regime:	INT
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

The maximum water depth at the crossing was 0.15 m. The channel was characterized by flooded terrestrial with an undefined wetted and high water width. The substrate composition was 100% flooded terrestrial and stream morphology composition was 100% pool. Barriers present – no water upstream.

The crossing site is more of an isolated, shallow pond than a stream or river. It is not connected to another, larger water body, and is most likely inaccessible to fish.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-050-2
UTM Coordinates: 17 W 596938 7880079

Date/Time Surveyed: 11-Aug-07 / 05:30

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-051-1
UTM Coordinates: 17 W 596688 7879658

Date/Time Surveyed: 11-Aug-07 / 22:01

General Physical Characteristics

Floodplain Width (m):	93.3	Channel Pattern:	UD	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	N/M	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

There was no water at this crossing and high water channel width was undefined. Barriers present – no water downstream or at crossing

Crossing dry, no fish habitat present.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

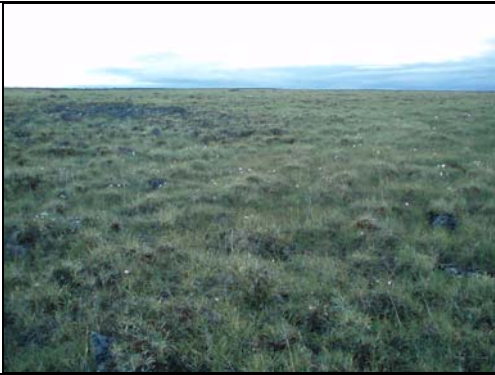
Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-051-1
UTM Coordinates: 17 W 596688 7879658

Date/Time Surveyed: 11-Aug-07 / 22:01

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-051-2
UTM Coordinates: 17 W 596622 7879337

Date/Time Surveyed: 4-Sept-08

General Physical Characteristics

Floodplain Width (m):	>183	Channel Pattern:	Meandering, forked	Stage:	Normal
Channel Confinement:	NC	Channel Gradient (range):	almost 0°	Flow Regime:	PER
Bank Height (range in m):	0-0.1	Bank Shape:	10% UC, 90% UD-Flooded	T_w (°C):	7.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
60D	6.3	flooded	0.08	0.28	0.41	0.41	0.00	0.04	0.08	0.08
40D	5.3	flooded	0.10	0.27	0.12	0.27	0.00	0.14	0.00	0.14
20D	5.5	flooded	0.23	0.49	0.09	0.49	0.09	0.04	0.00	0.09

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
60D	50	50					95			5	
40D	75	25					100				
20D	50	50					90		10		

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 4:51 **Electrofisher Settings:** 400V, 50HZ, 30%

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	1	0.21	-	-
NNST	0	-	-	-

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – MARGINAL

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-051-2
UTM Coordinates: 17 W 596622 7879337

Date/Time Surveyed: 4-Sept-08

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	Low	No
NNST	Moderate	No	Moderate	No

Comments & Summary

The crossing UTM is actually located within the same lake as LE-051-1, and the lake flows into a stream that starts 10m downstream of the crossing. The upper limit of fish passage is located at UTM 17 W 594158 7879582. Many adult and YOY NNST were observed during a 2007 assessment of this site, suggesting at least occasional use by both species.

Photographs



A



B



C



D

Figure 1. View of habitat, 60 (A), 40 (B), and 20 m (C) downstream of crossing, and at a pond 70 m D/S from crossing (D).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-052-1
UTM Coordinates: 17 W 596985 7878575

Date/Time Surveyed: 11-Aug-07 / 22:03

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	Flooded terrestrial	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	1°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

There was no water at this crossing and high water channel width was undefined. Barriers present – no water downstream or at crossing. Lake(s) present – downstream.
 Crossing dry, no fish habitat present.

**Baffinland Iron Mines
 Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

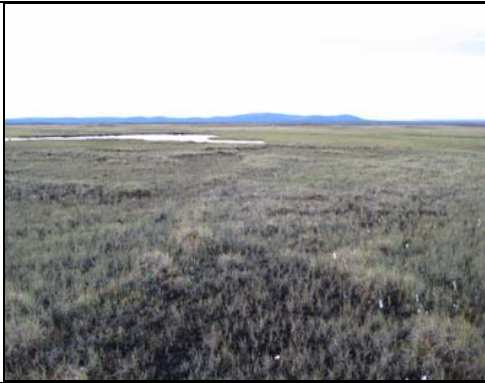
Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-052-1
UTM Coordinates: 17 W 596985 7878575

Date/Time Surveyed: 11-Aug-07 / 22:03

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-052-2
UTM Coordinates: 17 W 597276 7878344

Date/Time Surveyed: 5-Sept-08 / 11:07

General Physical Characteristics

Floodplain Width (m):	>183	Channel Pattern:	Meandering	Stage:	Normal
Channel Confinement:	NC	Channel Gradient (range):	<0.25°	Flow Regime:	PER
Bank Height (range in m):	0-0.15	Bank Shape:	5% UC, 25% UD-Flooded	T_w (°C):	5.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
100D	Pond									
80D	14.4	19.4 flooded	0.24	0.05	0.14	0.24	0.22	0.05	0.00	0.22
60D	5.3	flooded	0.07	0.35	0.25	0.40	0.00	0.05	0.03	0.05
40D	6.45	flooded	0.66	0.54	0.05	0.66	0.13	0.03	0.00	0.13
20D	2.6	flooded	0.32	0.34	0.26	0.34	0.23	0.26	0.09	0.26
0	3.1	flooded	0.54	0.60	0.54	0.6	0.01	0.00	0.13	0.13
20U	3.7	flooded	0.24	0.48	0.26	0.48	0.00	0.06	0.09	0.09
40U	3.9	4.4	0.14	0.18	0.15	0.28	0.00	0.19	0.17	0.19
60U	2.4	6.1	0.2	0.28	0.14	0.39	0.17	0.27	0.2	0.27
80U	3.5	22.1	0.2	0.19	0.16	0.24	0.42	0.25	0.17	0.42
100U	4.8	13.4	0.12	0.13	0.04	0.13	0.34	0.31	0.00	0.34

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
100D	Pond										
80D	10	70	20				20silt, 60sand		20 macrophyte		
60D		30	70				40Ft, 60sand				
40D		60	40				70Ft, 30sand				
20D	20		80				10FT, 40 sand		50 macrophyte		
0	20		80				70 sand		30 macrophyte		
20U	10		90				50sand, 50FT				
40U	20	60	20				60sand, 40FT				
60U	10	50	40				20FT,80sand				
80U	20	60	20				100sand				
100U	20	80									

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – MARGINAL

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-052-2
UTM Coordinates: 17 W 597276 7878344

Date/Time Surveyed: 5-Sept-08 / 11:07

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 14:05 **Electrofisher Settings:** 700 V, 60 Hz, 12%

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	0	-	-	-
NNST	18	1.28	26-57	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	Moderate	No	High	Moderate

Comments & Summary

Large river is downstream at UTM 17 W 597987 7878699. Upper limit of movement at UTM 17 W 597124 7878086. Probably migration path for ARCH. Good habitat for NNST along banks. Downstream pond at UTM 17 W 597303 7878431.

In 2008, electrofishing (700V, 50 Hz, 30%) was conducted for 6:39 and only five NNST (CPUE = 0.75; length range = 21-58 mm) were captured. The site was revisited on 14-Aug-2011 and an additional round of electrofishing was conducted to confirm ARCH presence/absence. Once again, only NNST were captured (2011 results listed in the Fisheries Information section above). As a result, the Fish Habitat Quality for the site was adjusted from Important to Marginal.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – MARGINAL

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-052-2
UTM Coordinates: 17 W 597276 7878344

Date/Time Surveyed: 5-Sept-08 / 11:07

Photographs



A



B



C



D



E



F



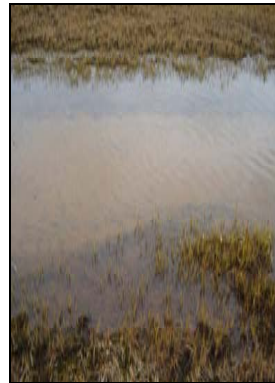
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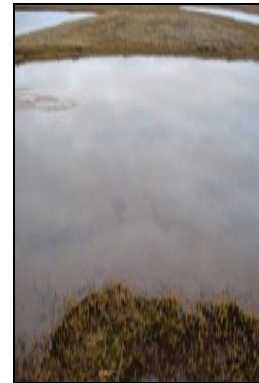
H



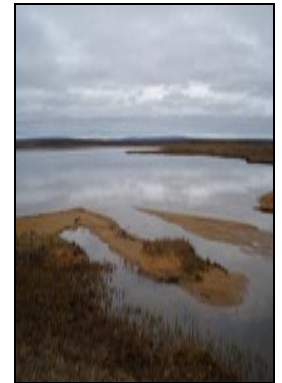
I



J



K



L

Figure 1. View of upstream pond (A), 100m upstream across (B), 80m (C), 60m (D), 40m (E), 20m (F), crossing across (G), 20m downstream across (H), 40m (I), 60m (J), 80m (K), and downstream pond (L).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-053-1
UTM Coordinates: 17 W 597522 7877988

Date/Time Surveyed: 11-Aug-07 / 22:23

General Physical Characteristics

Floodplain Width (m):	> 200	Channel Pattern:	Flooded terrestrial	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	1°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

Channel was characterized by 100% flooded terrestrial with an undefined wetted and high water width. The stream morphology was 100% pool. Barriers present – low water downstream and at crossing. Lake(s) present – downstream and upstream.

Low water levels and flooded terrestrial vegetation substrate at the crossing site make it unsuitable fish habitat.

Crossings CV-53-1 and CV-52-2 share a large downstream pond which is good fish habitat and may contain fish.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-053-1
UTM Coordinates: 17 W 597522 7877988

Date/Time Surveyed: 11-Aug-07 / 22:23

Photographs



Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-056-1
UTM Coordinates: 17 W 598812 7875711

Date/Time Surveyed: 4-Sept-2008

General Physical Characteristics

N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted: N **Effort (min):** N/A **Electrofisher Settings:** N/A

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

Not currently flowing; only isolated pools in a slightly marshy but mostly dry area between ponds. No obvious channels so not ideal habitat. May be wet during high water, but still not ideal habitat. It is quite far from any overwintering water bodies. Very slim chance fish could reach here during spring.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-056-1
UTM Coordinates: 17 W 598812 7875711

Date/Time Surveyed: 4-Sept-2008

Photographs



A



B



C

Figure 1. View at crossing downstream (A), crossing across (B), and crossing upstream (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-057-1
UTM Coordinates: 17 W 599410 7874632

Date/Time Surveyed: 11-Aug-07 / 23:25

General Physical Characteristics

Floodplain Width (m):	82.3	Channel Pattern:	UD	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	N/M	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

There was no water at this crossing, but high water channel width was measured at 36.6 m. Barriers present – no water at crossing or downstream. Lake(s) present - downstream

Crossing dry, no fish habitat present.

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-057-1
UTM Coordinates: 17 W 599410 7874632

Date/Time Surveyed: 11-Aug-07 / 23:25

Photographs



Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: BR-057-1
UTM Coordinates: 17 W 599447 7874417

Date/Time Surveyed: 5-Sept-08 /13:34

General Physical Characteristics

Floodplain Width (m):	>183	Channel Pattern:	Sinuuous	Stage:	Normal-high
Channel Confinement:	NC	Channel Gradient (range):	<0.25°	Flow Regime:	PER
Bank Height (range in m):	0.0-0.3	Bank Shape:	25% V, 75% UD	T_w (°C):	5

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
40D	21	Flooded 120	0.21	0.17	0.24	0.33	0.15	0.13	0.00	0.18
20D	22	Flooded 183	0.1	0.2	0.15	0.22	0.00	0.17	0.04	0.33
0	23	Flooded 183	0.15	0.24	0.1	0.24	0.00	0.05	0.41	0.41
20U	24	Flooded 183	0.19	0.2	0.14	0.25	0.10	0.12	0.01	0.12
40U	25	Flooded 183	0.28	0.24	0.14	0.24	0.09	0.12	0.00	0.12

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
40D	25	65	10				5 sand,10FT	5	20	40	20
20D	80	20					10 sand, 30FT	5	(20 algae)	25	10
0	75	20	5				5 sand,30FT	10	5	20	30
20U	15	85					10FT	10	20	60	10
40U	20	75	5				10FT	10	20	40	20

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: BR-057-1
UTM Coordinates: 17 W 599447 7874417

Date/Time Surveyed: 5-Sept-08 /13:34

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 12:20 **Electrofisher Settings:** 700V, 50 Hz, 30%

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	0	-	-	-
NNST	45	3.65	23-53	<1-1

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	Low	No
NNST	High	No	High	Low

Comments & Summary

There is a lake downstream of the crossing (LE-057-01) with fish and it appears to be deep enough for overwintering. Upstream limit of passage UTM 17 W 602100 7875244 - series of ponds and streams that are deep enough for overwintering. Many lakes and ponds downstream, some of which appear deep enough for overwintering. Barrier currently exists at UTM 17 W 602100 7875244 between the many downstream lakes and Nivek Lake (a channel with dry boulders). Two juvenile ARCH observed at this site during a 2007 assessment, suggesting occasional use by this species.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: BR-057-1
UTM Coordinates: 17 W 599447 7874417

Date/Time Surveyed: 5-Sept-08 /13:34

Photographs



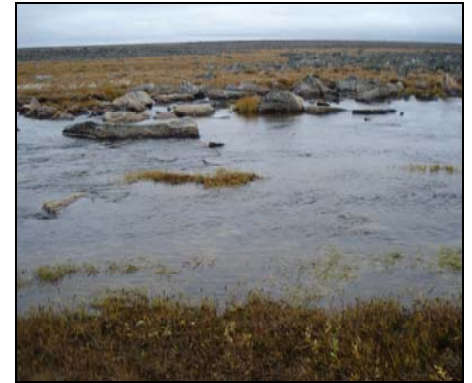
A



B



C



D



E



F



G



H

Figure 1. View 40m downstream across (A), 40m downstream facing downstream (B), 20m downstream across (C), crossing across (D), 20m upstream across (E), 40m upstream downstream (F), 40m upstream across (G), and 40m upstream facing upstream (H).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: BR-059-1
UTM Coordinates: 17 W 598858 7872547

Date/Time Surveyed: 5-Sept-08 /15:22

General Physical Characteristics

Floodplain Width (m): >200 **Channel Pattern:** Sinuous **Stage:** Normal-high
Channel Confinement: NC **Channel Gradient (range):** 0.0-0.25° **Flow Regime:** PER
Bank Height (range in m): 0.0-0.2 **Bank Shape:** V, UD-Flooded **T_w (°C):** 4

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
100D	12.9	15.9	0.18	0.09	0.06	0.21	0.04	0.08	0.07	0.08
80D	9.7	21.6	0.14	0.23	0.16	0.33	0.00	0.03	0.00	0.03
60D	8.3	14.2	0.06	0.03	0.05	0.06	0.02	0.10	0.00	0.1
40D	5.2	16.3	0.16	0.1	0.04	0.16	0.21	0.00	0.00	0.21
20D	5.9	20.2	0.07	0.08	0.08	0.08	0.06	0.00	0.08	0.08
0	6.0	11.0	0.2	0.19	0.02	0.2	0.02	0.00	0.04	0.04
20U	4.0	9.4	0.17	0.15	0.23	0.24	0.00	0.04	0.00	0.04
40U	3.75	7.8	0.1	0.08	0.1	0.17	0.00	0.01	0.04	0.04
60U	4.1	9.4	0.12	0.09	0.15	0.21	0.07	0.00	0.00	0.07
80U	3.8	20.5	0.34	0.22	0.09	0.34	0.00	0.00	0.00	-

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
100D	20	80					10moss	10	30	40	10
80D		80	20				20FT,10sand	10	20	30	10
60D	50	50					10FT	25	40	20	5
40D	40	60					10FT	40	30	20	
20D	5	95					5moss	50	40	5	
0		100					10FT	10	35	40	5
20U		95	5				5	10	15	40	30
40U	20	80					5moss	15	30	40	10
60U	50	50					10sand,5moss		15	50	20
80U		95	5						30	30	40

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – MARGINAL

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: BR-059-1
UTM Coordinates: 17 W 598858 7872547

Date/Time Surveyed: 5-Sept-08 /15:22

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 6:29 **Electrofisher Settings:** 700V, 50 Hz, 30%

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	0	-	-	-
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	Moderate	No
NNST	No	No	Moderate	No

Comments & Summary

Nice fish habitat, but no fish present. Must be a downstream barrier. Upstream barrier at UTM 17 W 598939 7872524. Exposed boulder barrier at UTM 17 W 598947 7872537

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – MARGINAL

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: BR-059-1
UTM Coordinates: 17 W 598858 7872547

Date/Time Surveyed: 5-Sept-08 /15:22

Photographs



Figure 1. View at 100m downstream across (A), 80m (B), 40m (C), 20m (D), crossing across (E), 20m upstream across (F), 40m (G), 60m (H), 80m (I), and 80m upstream facing upstream towards barrier (J).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-060-1
UTM Coordinates: 17 W 598802 7871473

Date/Time Surveyed: 11-Aug-07 / 23:54

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	UD	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	1°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

There was no water at this crossing and high water channel width was undefined. Barriers present – no water at crossing or downstream.

Crossing dry, no fish habitat present.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-060-1
UTM Coordinates: 17 W 598802 7871473

Date/Time Surveyed: 11-Aug-07 / 23:54

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-062-1
UTM Coordinates: 17 W 598242 7869614

Date/Time Surveyed: 5-Sept-08 / 16:06

General Physical Characteristics

Floodplain Width (m):	>183	Channel Pattern:	Sinuous	Stage:	Normal-high
Channel Confinement:	NC	Channel Gradient (range):	0.25°	low Regime:	PER
Bank Height (range in m):	FL	Bank Shape:	100% UD-flooded	T_w (°C):	5.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
100D	flooded	6.3	0.2	0.42	0.36	0.65	0.00	0.06	0.05	0.2
80D	6.8	12.2	0.14	0.33	0.15	0.33	0.00	0.32	0.00	0.32
60D	9.0	26	0.11	0.12	0.11	0.12	0.00	0.12	0.00	0.12
40D	4.2	8.4	0.18	0.48	0.22	0.48	0.00	0.29	0.00	0.29
20D	5.5	15.3	0.08	0.17	0.29	0.29	0.00	0.16	0.21	0.21

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
100D	10	30	60				60Ft,30sand	5	2	3	
80D	20	20	60				50Ft,40sand	3	2	5	
60D	70	30					100Ft				
40D		60	40				75Ft,20sand	2	2	1	
20D	5	75	20				64Ft,25sand	10		1	

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 13:30 **Electrofisher Settings:** 700 V, 60 Hz, 12%

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	3	0.22	-	-
NNST	19	1.41	35-65	-

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-062-1
UTM Coordinates: 17 W 598242 7869614

Date/Time Surveyed: 5-Sept-08 / 16:06

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	Low	No
NNST	Moderate	No	High	High

Comments & Summary

Upstream pond at UTM 17 W 598237 7869615. Upstream extent = UTM 17 W 601321 7868524. No visible barrier between this site and large DS lake at UTM 17 W 595878 7868725, which looks like it might be deep enough to overwinter.

In 2008, electrofishing (700V, 40HZ, 30%) was conducted for 10:56 and 33 NNST were captured (CPUE = 3.02; length range = 21-71 mm). The site was revisited on 14-Aug-2011 and an additional round of electrofishing was conducted to confirm ARCH presence/absence. Both NNST and ARCH were captured in 2011 (2011 results listed in the Fisheries Information section above). As a result, the site's Fish Habitat Quality rating remained Important.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-062-1
UTM Coordinates: 17 W 598242 7869614

Date/Time Surveyed: 5-Sept-08 / 16:06

Photographs



A



B



C



D



E



F

Figure 1. View of upstream pond (A), 20m downstream across (B), 40m (C), 60m (D), 80m (E), and 100m (F).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-063-1
UTM Coordinates: 17 W 598881 7868768

Date/Time Surveyed: 12-Aug-07 / 00:20

General Physical Characteristics

Floodplain Width (m):	> 200	Channel Pattern:	Flooded terrestrial	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	0.5°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

Channel was characterized by flooded terrestrial with an undefined wetted or high water width. The stream morphology composition was 100% pool. Barriers present – low water at crossing and downstream.

Water levels at crossing are far too low to act as fish habitat. Even at high water during the spring, there would be no habitat here.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-063-1
UTM Coordinates: 17 W 598881 7868768

Date/Time Surveyed: 12-Aug-07 / 00:20

Photographs



A



B



C

Figure 1. View of habitat north of crossing (A), east of the crossing (B) and south of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-064-1
UTM Coordinates: 17 W 599006 7867836

Date/Time Surveyed: 5-Sept-2008/17:50

General Physical Characteristics

N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted: N **Effort (min):** N/A **Electrofisher Settings:** N/A

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

Marshy terrestrial vegetation ~40m downstream of a pond similar to LE-62-1. This currently is not fish habitat and there is no defined channel. Limited flow (~0.05m/s) at certain locations. Downstream of the crossing there are many similar stretches between ponds before coming to a large lake at UTM 17 W 595995 7868729. Fish use of this poor habitat is very unlikely. Upstream there are more marshy areas that act as further barriers at UTM 17 W 599563 7867701. The maximum water depth was 0.05 m.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-064-1
UTM Coordinates: 17 W 599006 7867836

Date/Time Surveyed: 5-Sept-2008/17:50

Photographs



A



B



C

Figure 1. View at crossing downstream (A), crossing across (B), and crossing upstream (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-065-1
UTM Coordinates: 17 W 599391 7867415

Date/Time Surveyed: 12-Aug-07 / 00:45

General Physical Characteristics

Floodplain Width (m):	> 200	Channel Pattern:	Flooded terrestrial	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	1°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

Channel was characterized by flooded terrestrial with an undefined wetted or high water width. The stream morphology composition was 100% pool. Barriers present – low water at crossing and downstream.

Low water levels at crossing make it unsuitable habitat for fish.

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-065-1
UTM Coordinates: 17 W 599391 7867415

Date/Time Surveyed: 12-Aug-07 / 00:45

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Path: G:\MARYRIV_GDB\EIFS\UpdatedMapping\Baseline appendices\7C4-19_to_7C7-19_App4_4-3_Maps\AtoJ.mxd



LEGEND:

2007

2008

2010

STREAM CROSSING

STREAM CROSSING (APPROX.)

FISH BARRIER (CONFIRMED)

FISH BARRIER (AREAL INTERPRETATION)

CONTOUR

MILNE INLET TOTE ROAD (EXISTING)

RAILWAY ALIGNMENT (PROPOSED)

CONSTRUCTION ACCESS ROAD (PROPOSED)

WATER

INFRASTRUCTURE

NOTES:

1. BASE MAP 1:50,000 © HER MAJESTY THE QUEEN IN RIGHTS OF CANADA DEPARTMENT OF NATURAL RESOURCES (2009) ALL RIGHTS RESERVED.

2. TOPOGRAPHY PROVIDED BY EAGLE MAPPING (2005).

3. PROPOSED RAILWAY ALIGNMENT PROVIDED BY CANRAIL CONSULTANTS INC.

4. PROPOSED RAILWAY CONSTRUCTION ACCESS ROAD ALIGNMENT PROVIDED BY CANRAIL CONSULTANTS INC. DRAWING NO. RAILWAY ALIGNMENT AND CONST ACCESS RD - MARY RIVER STEENSBY 2010 -12AUG2010.DWG


5. LOCATION OF PROPOSED INFRASTRUCTURE IS APPROXIMATE AND SUBJECT TO FIELD ADJUSTMENTS

6. CONTOUR INTERVAL IS 25 AND IS IN METRES.

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

Railway Stream Crossing Sites (Map F)

North/South Consultants Inc.

Aquatic Environment Specialists

P/A NO.

-

REF NO.

-

DATE: 14/12/2011

REV

2

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-065-2
UTM Coordinates: 17 W 599465 7867227

Date/Time Surveyed: 12-Aug-07 / 00:50

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	UD	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	1°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

The high water channel width was undefined. Barriers present – no water at crossing and downstream.

Crossing dry, no fish habitat present.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-065-2
UTM Coordinates: 17 W 599465 7867227

Date/Time Surveyed: 12-Aug-07 / 00:50

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-067-1
UTM Coordinates: 17 W 600353 7866153

Date/Time Surveyed: 12-Aug-07 / 00:35

General Physical Characteristics

Floodplain Width (m):	> 200	Channel Pattern:	Flooded terrestrial	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	<1°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

Channel was characterized by flooded terrestrial with an undefined wetted and high water width. The stream morphology composition was 100% pool. Barriers present – low water at crossing and downstream. Lake(s) present – downstream.

Low water levels at crossing make it unsuitable habitat for fish.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-067-1
UTM Coordinates: 17 W 600353 7866153

Date/Time Surveyed: 12-Aug-07 / 00:35

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-068-1
UTM Coordinates: 17 W 601078 7865463

Date/Time Surveyed: 4-Aug-08 / 4:15

General Physical Characteristics

Floodplain Width (m):	> 200	Channel Pattern:	Straight	Stage:	Low
Channel Confinement:	NC	Channel Gradient (range):	N/M	Flow Regime:	EPH
Bank Height (range in m):	N/M	Bank Shape:	N/M	T_w (°C):	14.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
0	20			0.05		0.1				

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
0		100					100				

Fisheries Information

Electrofishing Conducted: N **Effort (min):** N/A **Electrofisher Settings:** N/A

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

Wetland area.

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-068-1
UTM Coordinates: 17 W 601078 7865463

Date/Time Surveyed: 4-Aug-08 / 4:15

Photographs



A



B

Figure 1. View of habitat at crossing (A-B)

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-069-1
UTM Coordinates: 17 W 601567 7864757

Date/Time Surveyed: 12-Aug-07 / 01:10

General Physical Characteristics

Floodplain Width (m):	> 200	Channel Pattern:	UD	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	1°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

High water channel width was undefined. Barriers present – no water at crossing and downstream.

Crossing dry, no fish habitat present.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-069-1
UTM Coordinates: 17 W 601567 7864757

Date/Time Surveyed: 12-Aug-07 / 01:10

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-069-2
UTM Coordinates: 17 W 601901 7864318

Date/Time Surveyed: 12-Aug-07 / 01:20

General Physical Characteristics

Floodplain Width (m):	> 200	Channel Pattern:	Sinuuous	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	1°	Flow Regime:	INT
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

The maximum water depth at the crossing was 0.09 m and wetted width and high water width were 1.5 m and 5.0 m respectively. The substrate was 100% flooded terrestrial and the stream morphology was 95% pool and 5% riffle. Barriers present – low water downstream.

The crossing could potentially provide NNST habitat when water levels are higher, but as there are no large water bodies within 500 m upstream or downstream of the crossing, the distance from overwintering habitat may be too great.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-069-2
UTM Coordinates: 17 W 601901 7864318

Date/Time Surveyed: 12-Aug-07 / 01:20

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-071-1
UTM Coordinates: 17 W 602535 7862393

Date/Time Surveyed: 12-Aug-07 / 01:55

General Physical Characteristics

Floodplain Width (m):	> 200	Channel Pattern:	Flooded terrestrial	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	1°	Flow Regime:	INT
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

Channel was characterized by flooded terrestrial with an undefined wetted and high water width. The substrate composition was 99% flooded terrestrial and 1% boulder and stream morphology composition was 90% pool and 10% riffle.

Water levels and substrate at crossing itself make it unsuitable fish habitat. Even at high water levels, when it would be more favourable NNST habitat, it is unlikely that fish inhabit the crossing since there are no large bodies of water nearby. Habitat upstream and downstream of the crossing is more suitable for fish, but is still only marginal.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-071-1
UTM Coordinates: 17 W 602535 7862393

Date/Time Surveyed: 12-Aug-07 / 01:55

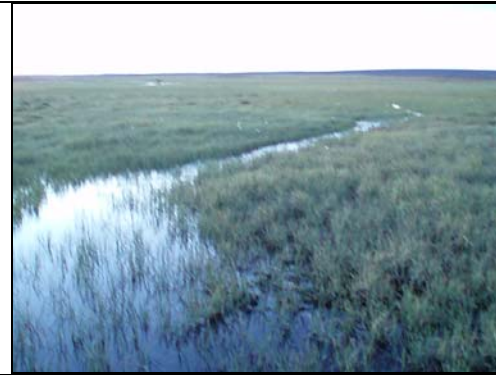
Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-073-1
UTM Coordinates: 17 W 603047 7861074

Date/Time Surveyed: 12-Aug-07 / 01:54

General Physical Characteristics

Floodplain Width (m):	> 200	Channel Pattern:	UD	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	N/M	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

Both the wetted and high water channel widths were undefined. Barriers present – water flows under boulders.

The crossing site itself is not suitable habitat for fish because the small amount of water flowing through the site is under boulders. Downstream of the crossing site, the stream emerges from the boulders and becomes more suitable fish habitat. The DS reaches of the stream are likely inhabited by fish, as is connects to a large river.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-073-1
UTM Coordinates: 17 W 603047 7861074

Date/Time Surveyed: 12-Aug-07 / 01:54

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-074-1
UTM Coordinates: 17 W 603631 7859970

Date/Time Surveyed: 12-Aug-07 / 02:10

General Physical Characteristics

Floodplain Width (m):	> 200	Channel Pattern:	Flooded terrestrial	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	1°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

Channel was characterized by flooded terrestrial with an undefined wetted and high water width. The stream morphology composition was 100% pool. Barriers present – low water level downstream and at crossing.

Low water levels and flooded terrestrial substrate make the crossing unsuitable fish habitat. Even at high water levels, fish would not live here.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-074-1
UTM Coordinates: 17 W 603631 7859970

Date/Time Surveyed: 12-Aug-07 / 02:10

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-075-1
UTM Coordinates: 17 W 603763 7859336

Date/Time Surveyed: 26-Jul-08 / 23:00

General Physical Characteristics

Floodplain Width (m):	> 200	Channel Pattern:	Sinuous	Stage:	Moderate-high
Channel Confinement:	NC	Channel Gradient (range):	0-1°	Flow Regime:	INT
Bank Height (range in m):	FL	Bank Shape:	UD-Flooded	T_w (°C):	12.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
0	2.0	10.0	-	-	-	0.3	-	-	-	-

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
0	5	94	1				20		40	40	

Fisheries Information

Electrofishing Conducted: N **Effort (min):** N/A **Electrofisher Settings:** N/A

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

Downstream river does not have Arctic char, and ninespine stickleback appear not to move this far upstream from the nearest overwintering lake on the large river.

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

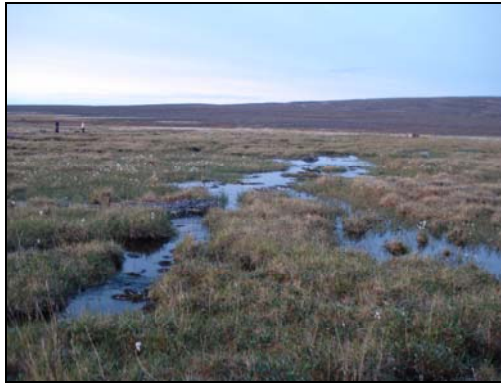
Crossing ID: CV-075-1
UTM Coordinates: 17 W 603763 7859336

Date/Time Surveyed: 26-Jul-08 / 23:00

Photographs



A



B



C

Figure 1. View of habitat, at crossing (A), downstream of crossing (B), and upstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-075-2
UTM Coordinates: 17 W 603944 7858901

Date/Time Surveyed: 26-Jul-08 / 22:40

General Physical Characteristics

Floodplain Width (m):	> 200	Channel Pattern:	Sinuuous, some braiding	Stage:	High
Channel Confinement:	NC	Channel Gradient (range):	3-5°	Flow Regime:	INT
Bank Height (range in m):	0.02-UD	Bank Shape:	V	T_w (°C):	8.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
0	4.92	4.92	0.12	0.20	0.20	0.23	0.08	0.08	0.01	0.60

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
0		40	60				3		40	55	2

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 5:00 **Electrofisher Settings:** 600V, 60Hz, 50%DC

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	0	-	-	-
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-075-2
UTM Coordinates: 17 W 603944 7858901

Date/Time Surveyed: 26-Jul-08 / 22:40

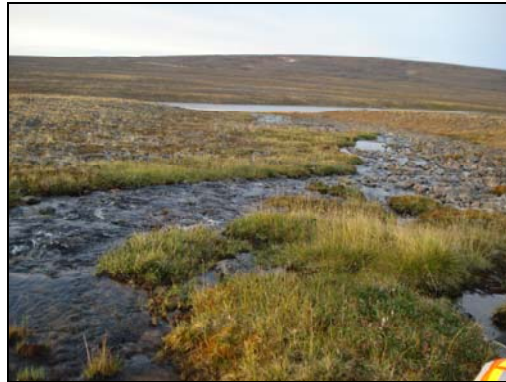
Comments & Summary

No habitat.

Photographs



A.



B.



C.

Figure 1. View of habitat, at crossing (A), downstream of crossing (B), and upstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-076-1
UTM Coordinates: 17 W 604251 7858661

Date/Time Surveyed: 26-Jul-08 / 20:15

General Physical Characteristics

Floodplain Width (m):	30.0	Channel Pattern:	Slightly sinuous	Stage:	High
Channel Confinement:	PC	Channel Gradient (range):	5°	Flow Regime:	PER
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	11.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
0	4.25	4.25	0.23	0.21	0.16	0.45	0.12	0.33	0.05	1.23

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
0	50	45	5				5		30	40	25

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 2:00 **Electrofisher Settings:** 600V, 60Hz, 50%DC

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	0	-	-	-
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-076-1
UTM Coordinates: 17 W 604251 7858661

Date/Time Surveyed: 26-Jul-08 / 20:15

Comments & Summary

Although it appears to be suitable fish habitat, Arctic char are not present in the large river downstream, so this crossing does not provide Arctic char habitat. No fish.

Photographs



A



B



C

Figure 1. View of habitat across at the crossing (A), downstream of the crossing (B), and upstream of the crossing(C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-076-2
UTM Coordinates: 17 W 604309 7858624

Date/Time Surveyed: 26-Jul-08 / 09:47

General Physical Characteristics

Floodplain Width (m): 55.0	Channel Pattern: Braided, sinuous	Stage: High
Channel Confinement: NC-PC	Channel Gradient (range): 3-7°	Flow Regime: PER
Bank Height (range in m): 0-0.17	Bank Shape: V	T_w (°C): 12.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
0	3.4	3.4	0.10	0.07	0.16	0.18	0.03	0.01	0.11	0.69

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
0	50	50					5	20	20	50	5

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 2:00 **Electrofisher Settings:** 600V, 60Hz, 50%DC

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	0	-	-	-
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-076-2
UTM Coordinates: 17 W 604309 7858624

Date/Time Surveyed: 26-Jul-08 / 09:47

Comments & Summary

Although it appears to be suitable fish habitat, Arctic char are not present in the large river downstream, so this crossing does not provide Arctic char habitat.
No fish, no habitat

Photographs



A



B



C

Figure 1. View of habitat, at crossing (A), downstream of crossing (B), and upstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-076-3
UTM Coordinates: 17 W 604396 7858569

Date/Time Surveyed: 26-Jul-08 / 21:20

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	Sinuous	Stage:	High
Channel Confinement:	NC	Channel Gradient (range):	N/M	Flow Regime:	PER
Bank Height (range in m):	0.05-0.93	Bank Shape:	S-V	T_w (°C):	11.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
0	6.8	7.2	0.16	0.10	0.10	0.22	0.69	0.53	0.14	0.85

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
0	70	30	-	-	-	-	-	8	40	50	2

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 12:00 **Electrofisher Settings:** 800V, 80Hz, 50%DC

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	0	0	-	-
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-076-3
UTM Coordinates: 17 W 604396 7858569

Date/Time Surveyed: 26-Jul-08 / 21:20

Comments & Summary

Although it appears to be suitable fish habitat, Arctic char are not present in the large river downstream, so this crossing does not provide Arctic char habitat.

Photographs



A



B



C

Figure1. View of habitat, at crossing (A), downstream of crossing (B), and upstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-077-1
UTM Coordinates: 17 W 605007 7857943

Date/Time Surveyed: 6-Sept-2008/9:42

General Physical Characteristics

N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted: N **Effort (min):** N/A **Electrofisher Settings:** N/A

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

No water at the crossing and no defined banks. Even if water were present it would likely flow underground. Downstream barrier at UTM 17 W 605102 7857956. Water flows underground. Water present 20m-90m downstream of the crossing but it is inaccessible from further downstream.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

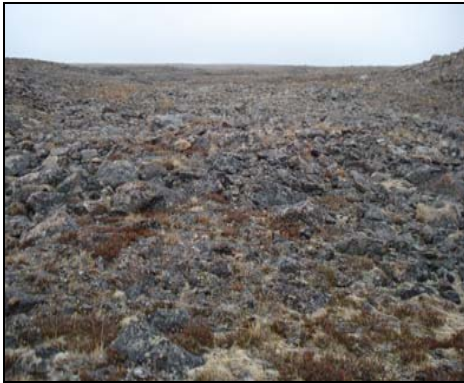
Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-077-1
UTM Coordinates: 17 W 605007 7857943

Date/Time Surveyed: 6-Sept-2008/9:42

Photographs



A



B



C



D



E

Figure 1. View at crossing upstream (A), crossing across (B), crossing downstream (C), downstream barrier (water goes underground at 90m) (D), and dry stretch between downstream river and wetted stream (E).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-077-2
UTM Coordinates: 17 W 605069 7857825

Date/Time Surveyed: 6-Sept-2008/9:51

General Physical Characteristics

N/M

Hydrology & Habitat Characteristics

N/M

Electrofishing Conducted: N **Effort (min):** N/A **Electrofisher Settings:** N/A

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

No water at site and channel difficult to define. Even if there was water at the site, it would probably be flowing under boulders. Crossing is not fish habitat. First sign of water is downstream 80 m at UTM 17 W 605147 7857846.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-077-2
UTM Coordinates: 17 W 605069 7857825

Date/Time Surveyed: 6-Sept-2008/9:51

Photographs



A



B



C



D



E



F

Figure 1. View at crossing upstream (A), crossing across (B), crossing downstream (C), closest surface water 80m of site (D), gradient and rock barriers between crossing and downstream river (E), and water downstream of crossing and barrier (F).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-078-1
UTM Coordinates: 17 W 605518 7856472

Date/Time Surveyed: 4-Aug-08 /02:50

General Physical Characteristics

Floodplain Width (m): 49.38	Channel Pattern: Braided, sinuous	Stage: N/M
Channel Confinement: PC	Channel Gradient (range): -3 to +2°	Flow Regime: PER
Bank Height (range in m): 0-0.40	Bank Shape: N/M	T_w (°C): 10.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
100D	37.49	48.46	0.10	0.10	0.14	0.17	0	0	0.17	0.25
80D	21.03	38.40	0.12	0.08	0.20	0.32	0.02	0.14	0.16	1.15
60D	10.97	40.23	0.10	0.23	0.17	0.28	0.01	0.01	0.36	1.45
40D	11.89	52.12	0.19	0.22	0.15	0.23	0.18	0.28	0.03	0.75
20D	53.04	53.04	0.15	0.17	0.21	0.22	0.34	0.35	0.17	0.63
0	13.72	14.63	0.08	0.15	0.10	0.25	0.04	0.14	0.26	0.98
20U	52.12	52.12	0.14	0.13	0.14	0.17	0.02	0.04	0.15	0.59
40U	45.72	45.72	0.09	0.13	0.14	0.17	0.11	0.63	0.05	1.03
60U	51.21	51.21	0.11	0.07	0.08	0.11	0.37	0.10	0.10	0.78
80U	45.72	45.72	0.15	0.05	0.05	0.25	0.09	0.05	0.12	0.96
100U	37.49	37.49	0.12	0.20	0.11	0.24	0.13	0.37	0.13	0.37

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
100D	80	20						20	45	30	5
80D	80	20						20	45	30	5
60D	90	10						20	45	30	5
40D	90	10						20	49	30	1
20D	90	10					10	5	40	40	5
0	50	50					15		40	40	5
20U	90	10					10	5	40	40	5
40U	80	20					15		40	40	5
60U	80	20					10	5	40	40	5
80U	80	20					10	5	40	40	5
100U	50	50					15		40	40	5

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – MARGINAL

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-078-1
UTM Coordinates: 17 W 605518 7856472

Date/Time Surveyed: 4-Aug-08 /02:50

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 21:00 **Electrofisher Settings:** 700V, 70Hz, 70%DC

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	0	0.00	-	-
NNST	1	0.05	68	3

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	Low	No

Comments & Summary

Although it appears to be suitable fish habitat, Arctic char are not present in the large river downstream, so this crossing does not provide Arctic char habitat. A single stickleback was captured in 21 minutes of electrofishing at a water temperature of 10°C. Some factor (possibly a partial fish barrier) appears to be preventing more extensive use of the habitat at this site.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – MARGINAL

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-078-1
UTM Coordinates: 17 W 605518 7856472

Date/Time Surveyed: 4-Aug-08 / 02:50

Photographs

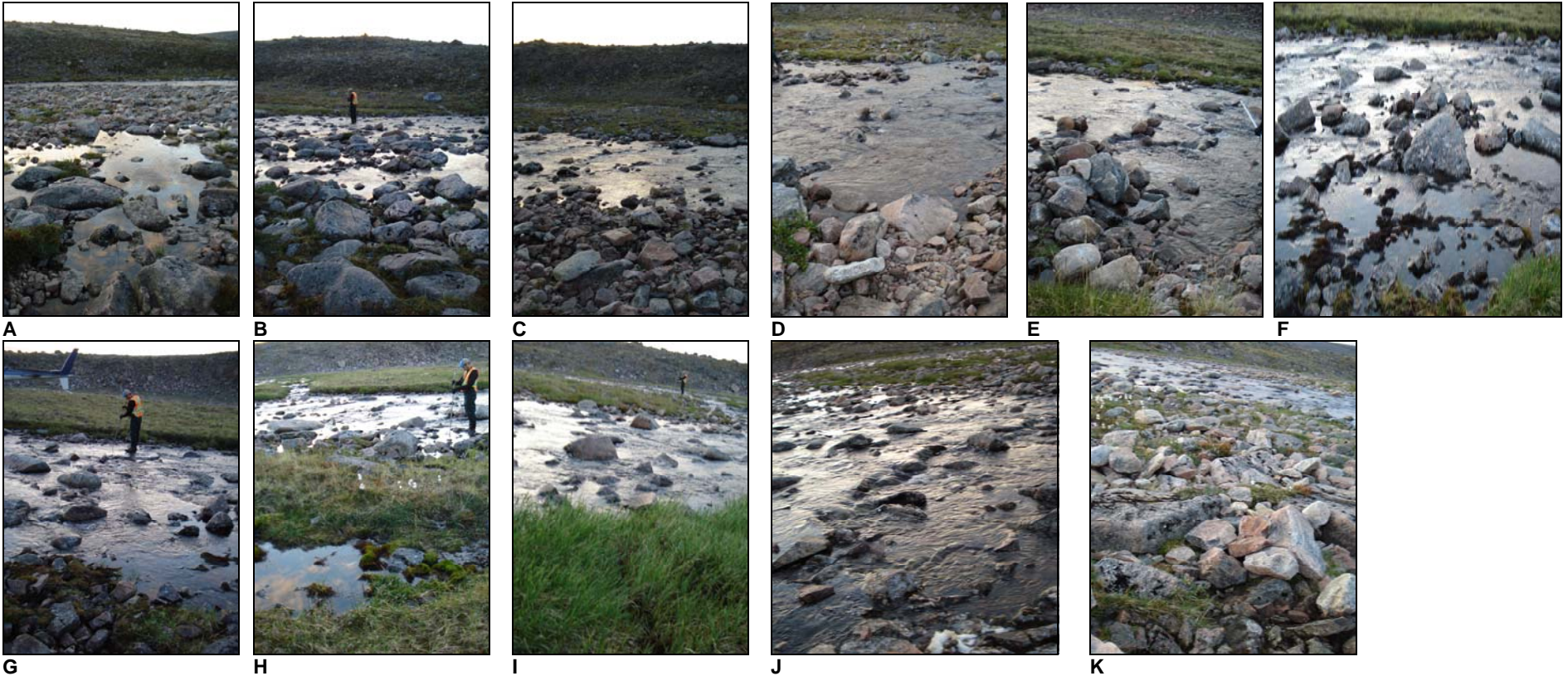


Figure 1. View of habitat 100 (A), 80 (B), 60 (C), 40 (D), and 20 m (E) downstream of crossing, at the crossing (F), and 20 (G), 40 (H), 60 (I), 80 (J), and 100 m (K) upstream of the crossing.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-078-2
UTM Coordinates: 17 W 605545 7856216

Date/Time Surveyed: 12-Aug-07 / 04:30

General Physical Characteristics

Floodplain Width (m):	23.8	Channel Pattern:	Braided, sinuous	Stage:	N/A
Channel Confinement:	PC	Channel Gradient (range):	3°	Flow Regime:	INT
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
0	1.0	N/M	0.10	0.10	0.15	0.30				

Fisheries Information

Electrofishing Conducted: N **Effort (min):** N/A **Electrofisher Settings:** N/A

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	Low	No

Comments & Summary

The stream morphology at this crossing is 40% riffle, 40% pool and 20% cascade. The substrate composition was 50% fines and 50% cobble. Partial barriers present – small cascade downstream, underground flow upstream. Many small channels therefore the high water channel width was undefined.

NNST may be present at the crossing. During the spring NNST would be able to reach the crossing from the large river downstream, but current low water levels likely prevent smaller fish from reaching the crossing site. This site does not provide habitat for Arctic char because they are not present in the large river downstream.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – MARGINAL

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-078-2
UTM Coordinates: 17 W 605545 7856216

Date/Time Surveyed: 12-Aug-07 / 04:30

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-078-3
UTM Coordinates: 17 W 605542 7856101

Date/Time Surveyed: 12-Aug-07 / 04:52

General Physical Characteristics

Floodplain Width (m):	15.5	Channel Pattern:	UD	Stage:	N/A
Channel Confinement:	PC	Channel Gradient (range):	6°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

Crossing dry, no fish habitat present. High water channel width was undefined. Barriers present – dry downstream and at crossing. There is only marginal fish habitat even further downstream of the crossing due to low water levels.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-078-3
UTM Coordinates: 17 W 605542 7856101

Date/Time Surveyed: 12-Aug-07 / 04:52

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-079-1
UTM Coordinates: 17 W 605537 7855864

Date/Time Surveyed: 12-Aug-07 / 05:21

General Physical Characteristics

Floodplain Width (m):	32.0	Channel Pattern:	Straight	Stage:	N/A
Channel Confinement:	NC-PC	Channel Gradient (range):	4°	Flow Regime:	INT
Bank Height (range in m):	0.15	Bank Shape:	V	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
----------------------------------	---	----------------------	-----	--------------------------------	-----

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	Low	No

Comments & Summary

The maximum water depth at the crossing was 0.19 m with wetted and high water channel widths of 0.5 and 0.7 m respectively. The substrate composition was 100% fines and the stream morphology composition was 95% pool and 5% riffle. Bank stability – moderate. Barriers present – low water downstream and at crossing.

Marginally good habitat for NNST, but low water downstream may prevent them from reaching the crossing site during most of the open water season. Arctic char are not present in the large downstream river, so this site does not provide arctic char habitat.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – MARGINAL

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-079-1
UTM Coordinates: 17 W 605537 7855864

Date/Time Surveyed: 12-Aug-07 / 05:21

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-079-2
UTM Coordinates: 17 W 605533 7855668

Date/Time Surveyed: 12-Aug-07 / 05:14

General Physical Characteristics

Floodplain Width (m):	38.4	Channel Pattern:	Braided, sinuous	Stage:	N/A
Channel Confinement:	PC	Channel Gradient (range):	> 15°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
----------------------------------	---	----------------------	-----	--------------------------------	-----

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

Although it appears to be suitable fish habitat, Arctic char are not present in the large river downstream, so this crossing does not provide Arctic char habitat. High water channel width was 12 m. Barriers present – no water downstream and at crossing.

Crossing dry, no fish habitat present. Even when wetted, the gradient of the stream is likely too high for fish from the large downstream river to use it as habitat.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-079-2
UTM Coordinates: 17 W 605533 7855668

Date/Time Surveyed: 12-Aug-07 / 05:14

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-079-3
UTM Coordinates: 17 W 605529 7855489

Date/Time Surveyed: 12-Aug-07/ 05:02

General Physical Characteristics

Floodplain Width (m):	40.2	Channel Pattern:	Sinuuous	Stage:	N/A
Channel Confinement:	PC	Channel Gradient (range):	7°	Flow Regime:	INT
Bank Height (range in m):	UD	Bank Shape:	UD-Rock	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
----------------------------------	---	----------------------	-----	--------------------------------	-----

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

The maximum water depth at the crossing was 0.16 m with wetted and high water channel width of 4.8 m and 5.8 m, respectively. The substrate was 80% large cobble and 20% boulders and stream morphology was 60% pool and 40% cascade. Stream cover – 20% boulder, 40% large cobble. Barrier present downstream – cascades that ninespine stickleback cannot ascend and there are no Arctic char in the downstream river.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-079-3
UTM Coordinates: 17 W 605529 7855489

Date/Time Surveyed: 12-Aug-07/ 05:02

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-079-4a
UTM Coordinates: 17 W 605521 7855138

Date/Time Surveyed: 12-Aug-07 / 04:50

General Physical Characteristics

Floodplain Width (m):	76.8	Channel Pattern:	Sinuuous to meandering	Stage:	N/A
Channel Confinement:	PC	Channel Gradient (range):	5°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
----------------------------------	---	----------------------	-----	--------------------------------	-----

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

High water channel width was 11 m. Barriers present – dry, steep cascade downstream.

Crossing dry, no fish habitat present. Even when wetted, the steep gradient of the stream would probably prevent fish from reaching the crossing site.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-079-4a
UTM Coordinates: 17 W 605521 7855138

Date/Time Surveyed: 12-Aug-07 / 04:50

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-080-1a
UTM Coordinates: 17 W 605517 7854932

Date/Time Surveyed: 12-Aug-07 / 04:45

General Physical Characteristics

Floodplain Width (m):	164.6	Channel Pattern:	Sinuuous to meandering	Stage:	N/A
Channel Confinement:	PC	Channel Gradient (range):	8°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
----------------------------------	---	----------------------	-----	--------------------------------	-----

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

There was no water at this crossing, but high water channel width was 20 m. Barriers present – dry, steep gradient downstream and upstream.

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-080-1a
UTM Coordinates: 17 W 605517 7854932

Date/Time Surveyed: 12-Aug-07 / 04:45

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-080-2
UTM Coordinates: 17 W 605511 7854689

Date/Time Surveyed: 12-Aug-07 / 04:38

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	Sinuuous	Stage:	N/A
Channel Confinement:	N/M	Channel Gradient (range):	45°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

High water channel width was 2.0 m. Barriers present – dry, steep gradient downstream and upstream.

Crossing dry, no fish habitat present.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-080-2
UTM Coordinates: 17 W 605511 7854689

Date/Time Surveyed: 12-Aug-07 / 04:38

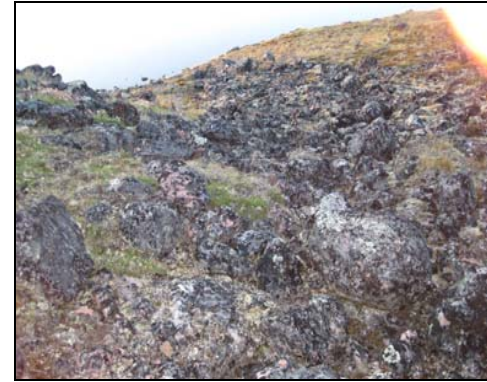
Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-080-3
UTM Coordinates: 17 W 605508 7854493

Date/Time Surveyed: 12-Aug-07/ 04:31

General Physical Characteristics

Floodplain Width (m):	45.7	Channel Pattern:	Sinuuous	Stage:	N/A
Channel Confinement:	PC	Channel Gradient (range):	> 15°	Flow Regime:	INT
Bank Height (range in m):	0.25	Bank Shape:	V	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
----------------------------------	---	----------------------	-----	--------------------------------	-----

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

The maximum water depth at the crossing was 0.08 m with both wetted and high water channel widths of 6.0 m. The substrate composition was 95% cobble and 5% boulder and the stream morphology composition was 80% pool and 20% cascade. Bank stability – moderate. Stream cover – 5% boulder, 40% large cobble. Barriers present –steep gradient downstream and upstream.

The steep gradient between the large river downstream and the crossing prevents fish from reaching the site. There may be some fish habitat present in the lowermost reaches of this stream, near the confluence with the large, downstream river, but none at the crossing.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-080-3
UTM Coordinates: 17 W 605508 7854493

Date/Time Surveyed: 12-Aug-07/ 04:31

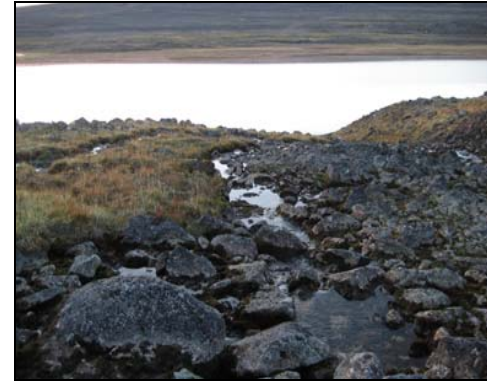
Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-080-4
UTM Coordinates: 17 W 605509 7854445

Date/Time Surveyed: 12-Aug-07 / 04:28

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	Sinuuous	Stage:	N/A
Channel Confinement:	PC	Channel Gradient (range):	10-15°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

There was no water at this crossing, but high water channel width was 1.5 m. Barriers present –dry, steep gradient downstream and upstream.

The steep gradient between the large river downstream and the crossing prevents fish from reaching the site even during high water.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-080-4
UTM Coordinates: 17 W 605509 7854445

Date/Time Surveyed: 12-Aug-07 / 04:28

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-080-5
UTM Coordinates: 17 W 605519 7854217

Date/Time Surveyed: 12-Aug-07 / 04:23

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	Sinuuous	Stage:	N/A
Channel Confinement:	PC	Channel Gradient (range):	15°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

There was no water at this crossing, but high water channel width was 2.5 m. Barriers present –dry, steep gradient downstream and upstream.

The steep gradient between the large river downstream and the crossing prevents fish from reaching the site even during high water.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-080-5
UTM Coordinates: 17 W 605519 7854217

Date/Time Surveyed: 12-Aug-07 / 04:23

Photographs



A



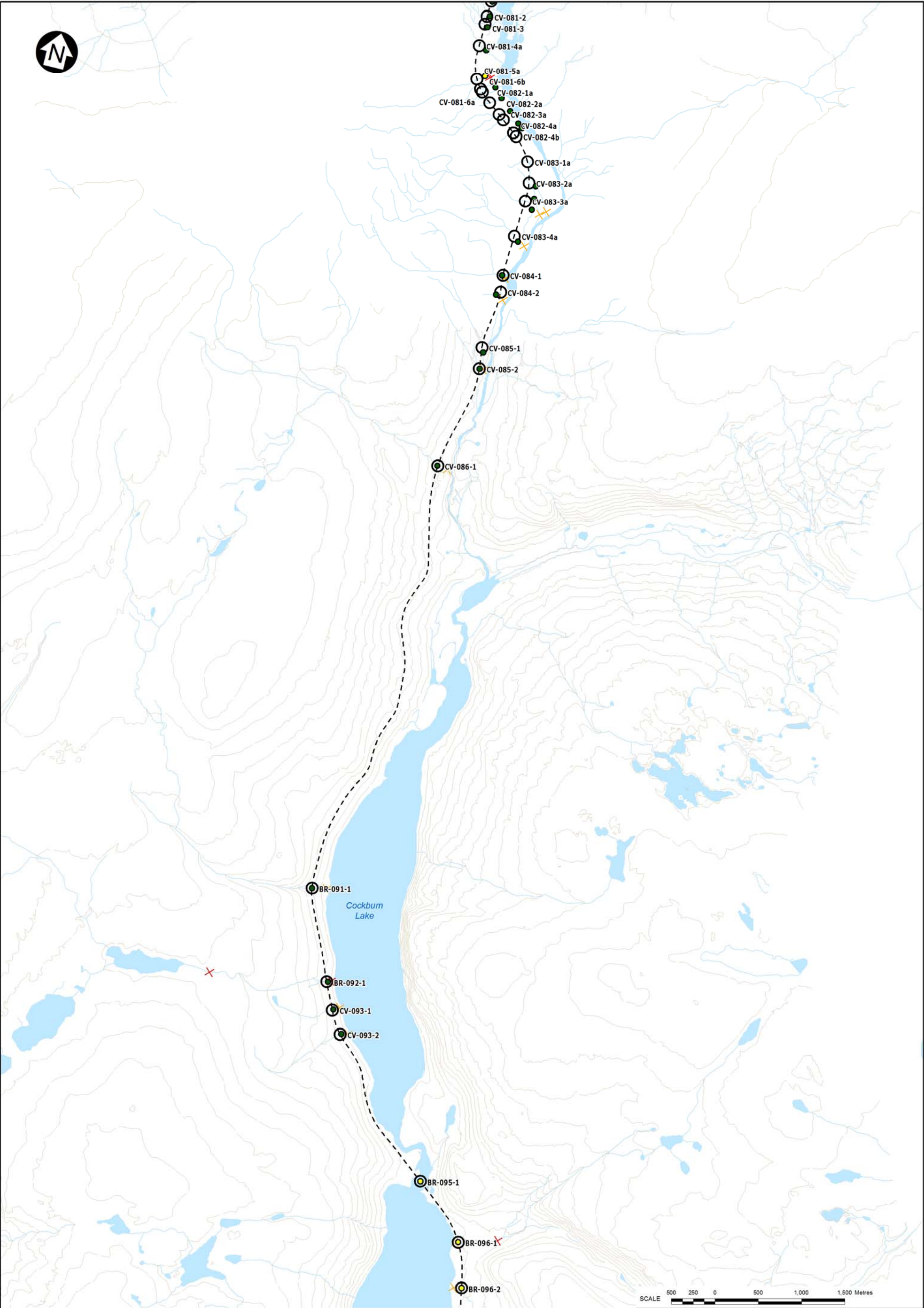
B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Path: G:\MARYRIV_GDB\GIS\UpdatedMapping\Baseline appendices\7C4-19_to_7C7-19_App4_4-3_Maps\AtoJ.mxd



LEGEND:

RAILWAY CROSSING SURVEY YEAR

- 2007
- 2008
- 2010

STREAM CROSSING

- STREAM CROSSING (APPROX.)

FISH BARRIER (CONFIRMED)

FISH BARRIER (AREAL INTERPRETATION)

CONTOUR

MILNE INLET TOTE ROAD (EXISTING)

RAILWAY ALIGNMENT (PROPOSED)

CONSTRUCTION ACCESS ROAD (PROPOSED)

WATER

INFRASTRUCTURE

NOTES:

1. BASE MAP: 1:50,000 © HER MAJESTY THE QUEEN IN RIGHTS OF CANADA DEPARTMENT OF NATURAL RESOURCES (2009). ALL RIGHTS RESERVED.
2. TOPOGRAPHY PROVIDED BY EAGLE MAPPING (2005).
3. PROPOSED RAILWAY ALIGNMENT PROVIDED BY CANRAIL CONSULTANTS INC.
4. PROPOSED RAILWAY CONSTRUCTION ACCESS ROAD ALIGNMENT PROVIDED BY CANRAIL CONSULTANTS INC. DRAWING NO. RAILWAY ALIGNMENT AND CONST ACCESS RD - MARY RIVER STEENSBY 2010 - 12AUG2010 DWG
5. LOCATION OF PROPOSED INFRASTRUCTURE IS APPROXIMATE AND SUBJECT TO FIELD ADJUSTMENTS
6. CONTOUR INTERVAL IS 25 AND IS IN METRES.

BAFFINLAND IRON MINES CORPORATION										
MARY RIVER PROJECT										
Railway Stream Crossing Sites (Map G)										
	<table><tr><td>P/A NO.</td><td>REF NO.</td></tr><tr><td>-</td><td>-</td></tr><tr><td colspan="2">DATE: 14/12/2011</td></tr></table>	P/A NO.	REF NO.	-	-	DATE: 14/12/2011		<table><tr><td>REV</td></tr><tr><td>2</td></tr></table>	REV	2
P/A NO.	REF NO.									
-	-									
DATE: 14/12/2011										
REV										
2										

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-081-2
UTM Coordinates: 17 W 605526 7854046

Date/Time Surveyed: 12-Aug-07 / 04:15

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	Sinuuous	Stage:	N/A
Channel Confinement:	PC	Channel Gradient (range):	15°	Flow Regime:	INT
Bank Height (range in m):	0.15	Bank Shape:	V	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

Both wetted and high water channel widths measured 4.0 m (no max depth measured – crossing nearly dry). Barriers present –steep gradient downstream and upstream. Bank stability – moderate.

The steep gradient between the large river downstream and the crossing prevents fish from reaching the site. More suitable fish habitat may exist further downstream, closer to the confluence with the large river.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-081-2
UTM Coordinates: 17 W 605526 7854046

Date/Time Surveyed: 12-Aug-07 / 04:15

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-081-3
UTM Coordinates: 17 W 605532 7853919

Date/Time Surveyed: 12-Aug-07 / 04:10

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	Sinuuous	Stage:	N/A
Channel Confinement:	PC	Channel Gradient (range):	12°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

High water channel width was undefined. Barriers present –dry, steep gradient downstream and upstream.

Crossing dry, no fish habitat present. Even when wetted, the steep gradient of the stream would likely prevent fish from reaching the crossing site. More suitable fish habitat may exist further downstream, closer to the large river.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-081-3
UTM Coordinates: 17 W 605532 7853919

Date/Time Surveyed: 12-Aug-07 / 04:10

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-081-4a
UTM Coordinates: 17 W 605581 7853657

Date/Time Surveyed: 12-Aug-07 / 04:05

General Physical Characteristics

Floodplain Width (m):	> 200	Channel Pattern:	Slightly meandering	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	N/M	Flow Regime:	INT
Bank Height (range in m):	None	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

The maximum water depth at the crossing was 0.06 m and wetted and high water channel widths were 0.8 m and 1.5 m respectively. The substrate was 100% flooded terrestrial and the stream morphology composition was 95% pool and 5% riffle. Potential barriers present –low water downstream.

Low water levels and flooded terrestrial substrate make the crossing unsuitable habitat for fish. Even when water levels increase in the spring, it is unlikely that ninespine stickleback will move into this habitat due to the relatively large distance from suitable overwintering habitat. Arctic char are not present in the large river downstream.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-081-4a
UTM Coordinates: 17 W 605581 7853657

Date/Time Surveyed: 12-Aug-07 / 04:05

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-081-5a
UTM Coordinates: 17 W 605638 7853361

Date/Time Surveyed: 4-Aug-08 / 2:05

General Physical Characteristics

Floodplain Width (m):	> 200	Channel Pattern:	Braided	Stage:	Low
Channel Confinement:	NC	Channel Gradient (range):	0-2°	Flow Regime:	PER
Bank Height (range in m):	0.00-0.03	Bank Shape:	UC	T_w (°C):	7.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
0	2.70		0.09	0.12	0.15	0.29	0.17	0.18	0.11	0.51

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
0	60	40						19	40	40	1

Electrofishing Conducted: Y **Effort (min):** 25:00 **Electrofisher Settings:** 600V, 60Hz, 50%DC

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	0	0	-	-
NNST	0	0	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-081-5a
UTM Coordinates: 17 W 605638 7853361

Date/Time Surveyed: 4-Aug-08 / 2:05

Comments & Summary

The site is not Arctic char habitat as they are not present in the large river downstream. Young-of-the-year ninespine stickleback were observed downstream of this site during a 2007 assessment, but barriers prevent their upstream passage to the crossing site.

Entire wetted area at crossing approximately 50 m, including braids and pools.

Photographs



A



B



C

Figure 1. View of habitat, at crossing (A), downstream of the crossing (B), and upstream of the crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-081-6a and CV-081-6b
UTM Coordinates: 17 W 605789 7853263

Date/Time Surveyed: 12-Aug-07 / 22:35

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	Braided	Stage:	N/A
Channel Confinement:	PC	Channel Gradient (range):	1°	Flow Regime:	EPH
Bank Height (range in m):	N/M	Bank Shape:	N/M	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

There was no water at this crossing, but high water channel width was 11.4 m. Barriers present –no water downstream and at crossing.

Crossing dry, no fish habitat present. Even when water levels increase during spring or periods of rain, it is unlikely that fish will move into this habitat because of the available substrate.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-081-6a and CV-081-6b
UTM Coordinates: 17 W 605789 7853263

Date/Time Surveyed: 12-Aug-07 / 22:35

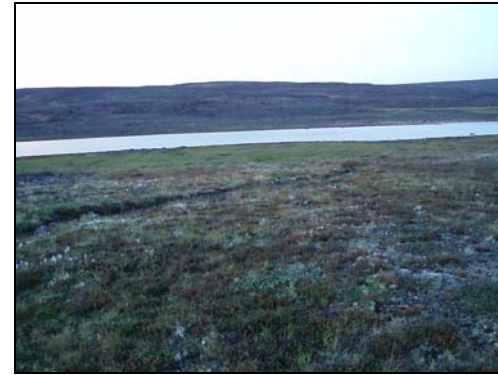
Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-082-1a
UTM Coordinates: 17 W 605884 7853158

Date/Time Surveyed: 12-Aug-07 / 22:54

General Physical Characteristics

Floodplain Width (m):	> 200	Channel Pattern:	Braided	Stage:	N/A
Channel Confinement:	PC	Channel Gradient (range):	N/M	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

High water channel width was ~4.0 m. Barriers present –no water downstream.

Crossing dry, no fish habitat present. Even when there is more water during the spring or after rains, fish will not likely use this habitat due to unsuitable substrate.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-082-1a
UTM Coordinates: 17 W 605884 7853158

Date/Time Surveyed: 12-Aug-07 / 22:54

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-082-2a
UTM Coordinates: 17 W 606017 7853036

Date/Time Surveyed: 12-Aug-07 / 23:08

General Physical Characteristics

Floodplain Width (m):	> 200	Channel Pattern:	Braided	Stage:	N/A
Channel Confinement:	PC	Channel Gradient (range):	1°	Flow Regime:	INT
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	Low	No

Comments & Summary

High water channel width was undefined (many small channels). Barriers present –low water downstream and at crossing.

Crossing almost dry; no fish habitat present. During the spring when water levels are higher, the crossing could provide suitable NNST habitat. Since there are no Arctic char in the large river downstream, this site never acts as Arctic char habitat.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – MARGINAL

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-082-2a
UTM Coordinates: 17 W 606017 7853036

Date/Time Surveyed: 12-Aug-07 / 23:08

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-082-3a
UTM Coordinates: 17 W 606144 7852920

Date/Time Surveyed: 12-Aug-07 / 23:25

General Physical Characteristics

Floodplain Width (m):	> 200	Channel Pattern:	UD	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	N/M	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

High water channel width was undefined (many small channels). Barriers present –no water downstream and at crossing.

Crossing dry, no fish habitat present.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

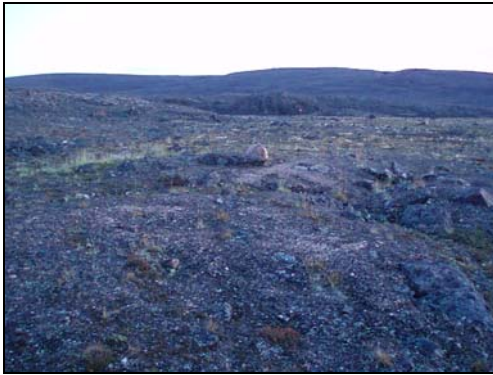
Rail Alignment Watercourse Crossing Assessment

Location

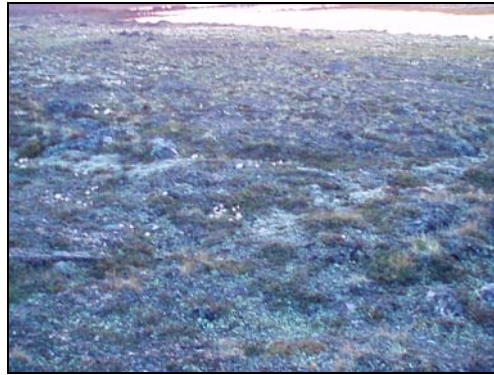
Crossing ID: CV-082-3a
UTM Coordinates: 17 W 606144 7852920

Date/Time Surveyed: 12-Aug-07 / 23:25

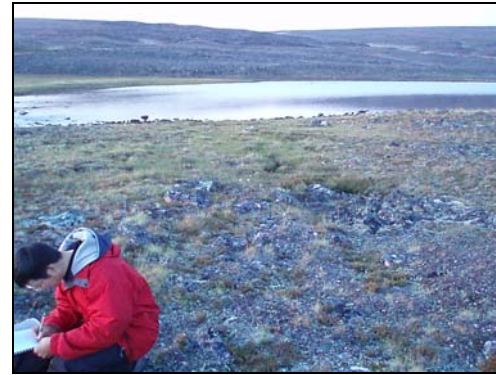
Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-082-4a and CV-082-4b
UTM Coordinates: 17 W 606194 7852876

Date/Time Surveyed: 12-Aug-07 / 23:44

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	Slightly meandering	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	5°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

High water channel width was 0.5 m. Barriers present –no water downstream or at crossing.

Crossing dry, no fish habitat present.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-082-4a and CV-082-4b
UTM Coordinates: 17 W 606194 7852876

Date/Time Surveyed: 12-Aug-07 / 23:44

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-083-1a
UTM Coordinates: 17 W 606509 7852269

Date/Time Surveyed: 12-Aug-07 / 23:31

General Physical Characteristics

Floodplain Width (m):	17.4	Channel Pattern:	Sinuuous to meandering	Stage:	N/A
Channel Confinement:	PC-C	Channel Gradient (range):	9°	Flow Regime:	EPH
Bank Height (range in m):	0.40	Bank Shape:	S	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

The wetted and high water channel widths at the crossing were 2.0 m and 2.5 m respectively. The substrate was 50% fines, 25% cobble and 25% boulder. Stream morphology was 100% pool. Barriers present –low water downstream and at crossing. Stream cover – 20% boulder, 20% large cobble. Bank stability moderate.

Low water levels and flooded terrestrial substrate make the crossing unsuitable habitat for fish. Even during periods of high water, it is unlikely that fish will move into this habitat due to the distance from overwintering habitat.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-083-1a
UTM Coordinates: 17 W 606509 7852269

Date/Time Surveyed: 12-Aug-07 / 23:31

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-083-2a
UTM Coordinates: 17 W 606528 7852123

Date/Time Surveyed: 12-Aug-07 / 23:27

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	UD	Stage:	N/A
Channel Confinement:	PC	Channel Gradient (range):	8°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

High water channel width was undefined (many small channels). Barriers present –no water downstream or at crossing.

Crossing dry, no fish habitat present. Even during periods of high water, it is unlikely that fish will move into this habitat due to the distance from overwintering habitat.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-083-2a
UTM Coordinates: 17 W 606528 7852123

Date/Time Surveyed: 12-Aug-07 / 23:27

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-083-3a
UTM Coordinates: 17 W 606531 7851992

Date/Time Surveyed: 12-Aug-07 / 23:21

General Physical Characteristics

Floodplain Width (m):	15.5	Channel Pattern:	Sinuuous to meandering	Stage:	N/A
Channel Confinement:	PC	Channel Gradient (range):	7°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

High water channel width was 2.4 m. Barriers present –no water downstream or at crossing.

Crossing dry, no fish habitat present. Even during periods of high water, it is unlikely that fish will move into this habitat due to the distance from overwintering habitat.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-083-3a
UTM Coordinates: 17 W 606531 7851992

Date/Time Surveyed: 12-Aug-07 / 23:21

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-083-4a
UTM Coordinates: 17 W 606463 7851596

Date/Time Surveyed: 12-Aug-07 / 23:13

General Physical Characteristics

Floodplain Width (m):	40.2	Channel Pattern:	Sinuuous to meandering	Stage:	N/A
Channel Confinement:	PC	Channel Gradient (range):	10°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

High water channel width was 2.8 m. Barriers present –no water downstream.

Crossing dry, no fish habitat present. Even during periods of high water, it is unlikely that fish will move into this habitat due to the distance from overwintering habitat and steep gradient.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-083-4a
UTM Coordinates: 17 W 606463 7851596

Date/Time Surveyed: 12-Aug-07 / 23:13

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-084-1
UTM Coordinates: 17 W 606378 7851181

Date/Time Surveyed: 12-Aug-07 / 23:04

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	Linear	Stage:	N/A
Channel Confinement:	PC-C	Channel Gradient (range):	30-40°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

High water channel width was 0.8 m. Barriers present –steep, no water downstream or at crossing.

Crossing dry, no fish habitat present. Even during periods of high water, it is unlikely that fish will move into this habitat due to the very steep gradient.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

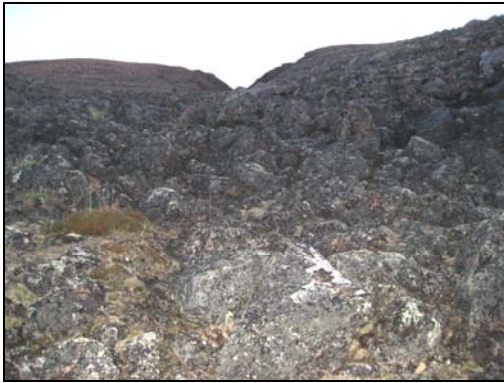
Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-084-1
UTM Coordinates: 17 W 606378 7851181

Date/Time Surveyed: 12-Aug-07 / 23:04

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-084-2
UTM Coordinates: 17 W 606363 7850947

Date/Time Surveyed: 12-Aug-07 / 22:57

General Physical Characteristics

Floodplain Width (m):	32.9	Channel Pattern:	Slightly meandering	Stage:	N/A
Channel Confinement:	PC-C	Channel Gradient (range):	20-30°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

High water channel width was 1.5 m. Barriers present –steep, no water downstream or at crossing.

Crossing dry, no fish habitat present. Even during periods of high water, it is unlikely that fish will move into this habitat due to the very steep gradient.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-084-2
UTM Coordinates: 17 W 606363 7850947

Date/Time Surveyed: 12-Aug-07 / 22:57

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

0Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-085-1
UTM Coordinates: 17 W 606380 7850253

Date/Time Surveyed: 12-Aug-07 / 22:45

General Physical Characteristics

Floodplain Width (m):	59.4	Channel Pattern:	UD	Stage:	N/A
Channel Confinement:	N/M	Channel Gradient (range):	12°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

High water channel width was undefined. Barriers present –steep, no water downstream or at crossing.

Crossing dry, no fish habitat present. Even during periods of high water, it is unlikely that fish will move into this habitat due to the very steep gradient.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-085-1
UTM Coordinates: 17 W 606380 7850253

Date/Time Surveyed: 12-Aug-07 / 22:45

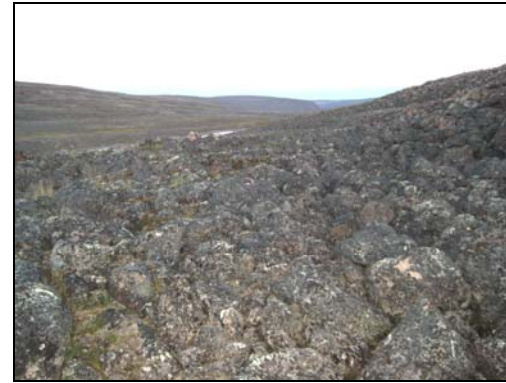
Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-085-2
UTM Coordinates: 17 W 606385 7850060

Date/Time Surveyed: 12-Aug-07 / 22:40

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	Slightly meandering	Stage:	N/A
Channel Confinement:	PC	Channel Gradient (range):	N/M	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

High water channel width was undefined. Barriers present –steep, no water downstream or at crossing.

Crossing dry, no fish habitat present. Even during periods of high water, it is unlikely that fish will move into this habitat due to the very steep gradient.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-085-2
UTM Coordinates: 17 W 606385 7850060

Date/Time Surveyed: 12-Aug-07 / 22:40

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-086-1
UTM Coordinates: 17 W 606178 7848859

Date/Time Surveyed: 12-Aug-07 / 22:15

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	Sinuuous to meandering	Stage:	N/A
Channel Confinement:	PC-C	Channel Gradient (range):	15°	Flow Regime:	PER
Bank Height (range in m):	UD	Bank Shape:	UD -boulders	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

The maximum water depth at the crossing was 0.28 m with wetted and high water channel widths of 7.5 m and 8.0 m respectively. The substrate was 70% boulder and 30% cobble and the stream morphology was 50% pool and 50% cascade. Barriers present –waterfalls downstream. Stream cover – 70% boulder, 10% large cobble. Bank stability – moderate to high.

A series of falls act as a barrier between the large river downstream and the crossing.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-086-1
UTM Coordinates: 17 W 606178 7848859

Date/Time Surveyed: 12-Aug-07 / 22:15

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: BR-091-1
UTM Coordinates: 17 W 605935 7843777

Date/Time Surveyed: 13-Aug-07 / 21:10

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	Straight	Stage:	N/A
Channel Confinement:	PC-C	Channel Gradient (range):	N/M	Flow Regime:	PER
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

The maximum water depth at the crossing was < 0.20 m and the substrate was 90% cobble and 10% boulder. Stream morphology was 90% cascade and 10% pool. Barriers present –steep, shallow cascades downstream. Lakes present – Cockburn Lake downstream. Stream cover –10% boulder, large cobble.

Habitat is likely inaccessible to fish from a suitable overwintering site (Cockburn Lake) due to steep cascades and low water levels. Only large juvenile ARCH might be capable of moving upstream past the cascades. While there might be fish in the lowermost reaches of the stream, there is most likely no fish habitat at the crossing.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: BR-091-1
UTM Coordinates: 17 W 605935 7843777

Date/Time Surveyed: 13-Aug-07 / 21:10

Photographs

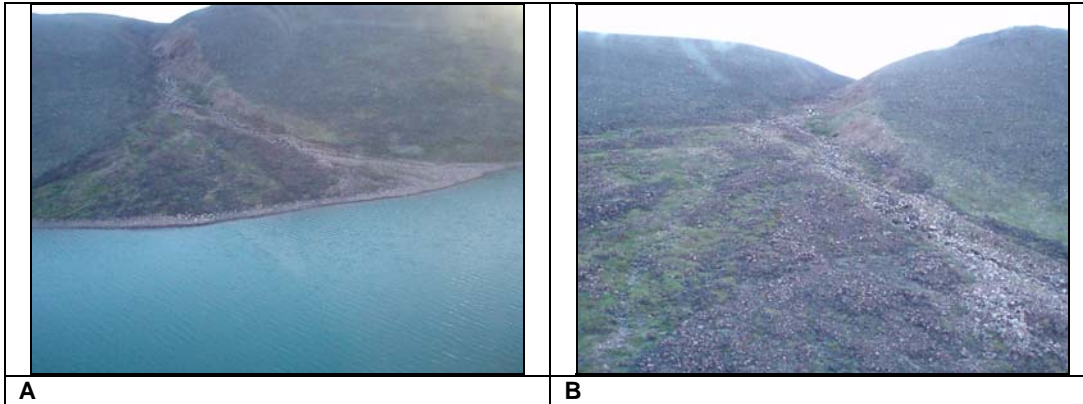


Figure 1. Aerial view of area near crossing (A) and another aerial view of area near the crossing (B).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: BR-092-1
UTM Coordinates: 17 W 606371 7842771

Date/Time Surveyed: 13-Aug-07 / 21:11

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	Straight	Stage:	N/A
Channel Confinement:	PC-C	Channel Gradient (range):	N/M	Flow Regime:	INT
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

The maximum water depth at the crossing was < 0.10 m and the substrate was 90% cobble and 10% boulder. Stream morphology was 90% cascade and 10% pool. Stream cover was 10% boulder/large cobble. Barriers present – steep shallow cascades downstream. Lakes present – Cockburn Lake downstream.

Habitat is likely inaccessible to fish from a suitable overwintering site (Cockburn Lake) due to steep cascades and low water levels. Only large juvenile ARCH might be capable of moving upstream past the cascades. While there might be fish in the lowermost reaches of the stream, there is most likely no fish habitat at the crossing.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: BR-092-1
UTM Coordinates: 17 W 606371 7842771

Date/Time Surveyed: 13-Aug-07 / 21:11

Photographs



A



B

Figure 1. Aerial view of area near crossing (A) and another aerial view of area near crossing (B).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-093-1
UTM Coordinates: 17 W 606508 7842476

Date/Time Surveyed: 13-Aug-07 / 21:12

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	Straight	Stage:	N/A
Channel Confinement:	PC	Channel Gradient (range):	N/M	Flow Regime:	INT
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

The maximum water depth at the crossing was < 0.10 m. The substrate was 80% cobble and 20% boulder and the stream morphology was 90% cascade and 10% pool. Barriers present – steep shallow cascades downstream. Lakes present – Cockburn Lake downstream. Stream cover – 20% boulder, large cobble.

Habitat is likely inaccessible to fish from a suitable overwintering site (Cockburn Lake) due to steep cascades and low water levels. Only large juvenile ARCH might be capable of moving upstream past the cascades. While there might be fish in the lowermost reaches of the stream, there is most likely no fish habitat at the crossing.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-093-1
UTM Coordinates: 17 W 606508 7842476

Date/Time Surveyed: 13-Aug-07 / 21:12

Photographs

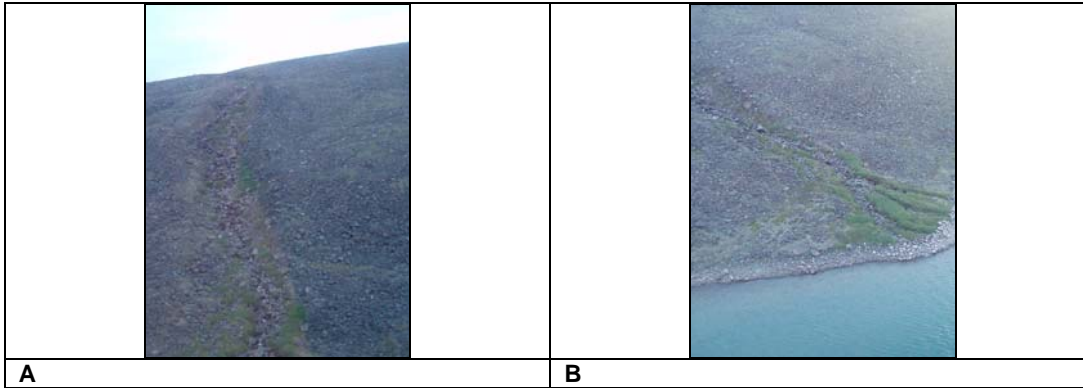


Figure 1. Aerial view of area near crossing (A-B).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-093-2
UTM Coordinates: 17 W 606663 7842226

Date/Time Surveyed: 13-Aug-07 / 21:12

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	Straight - braided	Stage:	N/A
Channel Confinement:	PC	Channel Gradient (range):	N/M	Flow Regime:	INT
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

The maximum water depth at the crossing was < 0.10 m (nearly dry). The substrate was 90% cobble and 10% boulder and the stream morphology was 90% cascade and 10% pool. Barriers present – steep shallow cascades downstream. Lakes present – Cockburn Lake downstream. Stream cover – 10% boulder, large cobble.

Habitat is likely inaccessible to fish from a suitable overwintering site (Cockburn Lake) due to steep cascades and low water levels. Only large juvenile ARCH might be capable of moving upstream past the cascades. While there might be fish in the lowermost reaches of the stream, there is most likely no fish habitat at the crossing.

Similar to site BR-91-1.

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-093-2
UTM Coordinates: 17 W 606663 7842226

Date/Time Surveyed: 13-Aug-07 / 21:12

Photographs

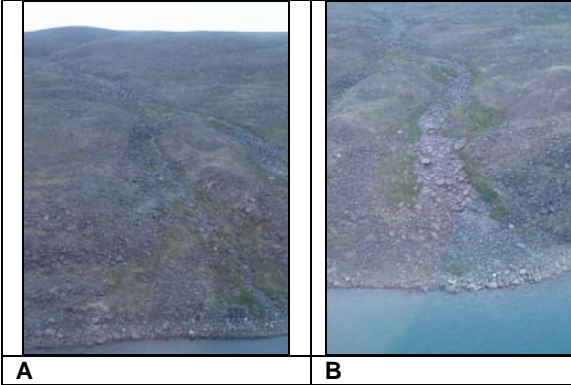
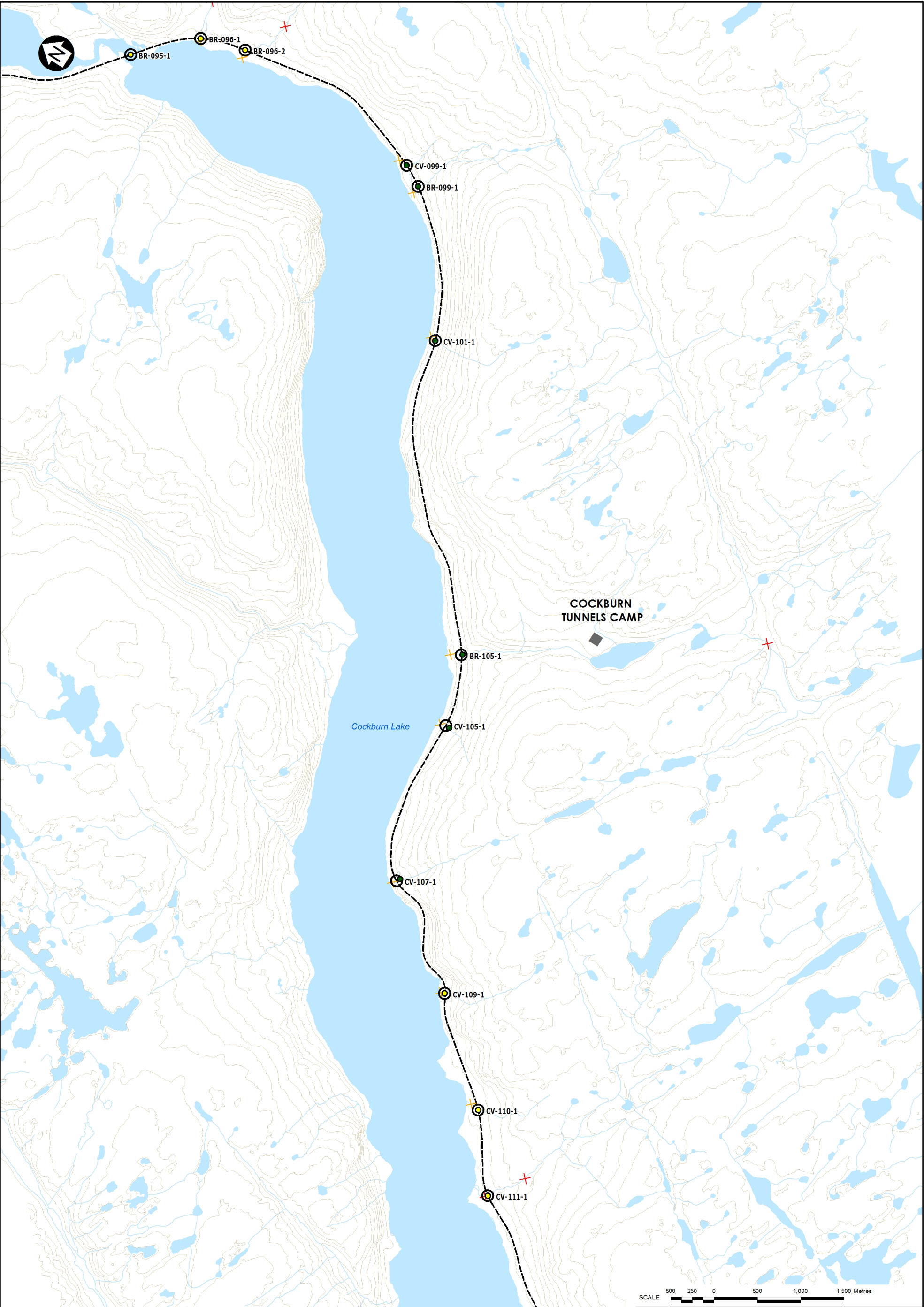


Figure 1. Aerial view of area near crossing (A-B).

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LEGEND:

- RAILWAY CROSSING SURVEY YEAR

2007

2008

2010

STREAM CROSSING

STREAM CROSSING (APPROX.)

FISH BARRIER (CONFIRMED)

FISH BARRIER (AREAL INTERPRETATION)
- CONTOUR

MILNE INLET TOTE ROAD (EXISTING)

RAILWAY ALIGNMENT (PROPOSED)

CONSTRUCTION ACCESS ROAD (PROPOSED)

WATER

INFRASTRUCTURE

NOTES:

1. BASE MAP 1:50,000 © HER MAJESTY THE QUEEN IN RIGHTS OF CANADA DEPARTMENT OF NATURAL RESOURCES (2005). ALL RIGHTS RESERVED.
2. TOPOGRAPHY PROVIDED BY EAGLE MAPPING (2005).
3. PROPOSED RAILWAY ALIGNMENT PROVIDED BY CANRAIL CONSULTANTS INC.
4. PROPOSED RAILWAY CONSTRUCTION ACCESS ROAD ALIGNMENT PROVIDED BY CANRAIL CONSULTANTS INC. DRAWING NO. RAILWAY ALIGNMENT AND CONST ACCESS RD - MARY RIVER STEENSBY 2010 - 12AUG2010 DWG
5. LOCATION OF PROPOSED INFRASTRUCTURE IS APPROXIMATE AND SUBJECT TO FIELD ADJUSTMENTS
6. CONTOUR INTERVAL IS 25 AND IS IN METRES.

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

Railway Stream Crossing Sites (Map H)



P/A NO.	REF NO.
-	-
DATE: 19/11/2010	REV
	2

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: BR-095-1
UTM Coordinates: 17 W 607951 7840793

Date/Time Surveyed: 4-Aug-08 / 01:40

General Physical Characteristics

N/M

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
0	~125 m	-	0.6	>2	0.6	>2	N/M	-	-	-

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
0 Lake	-	40	60	-	-	-	-	25	40	30	5

Fisheries Information

Electrofishing Conducted: N **Effort (min):** N/A **Electrofisher Settings:** N/A

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	High (Cockburn L.)	High (Cockburn L.)	High	High
NNST	Moderate	High (Cockburn L.)	Moderate	Moderate

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: BR-095-1
UTM Coordinates: 17 W 607951 7840793

Date/Time Surveyed: 4-Aug-08 / 01:40

Comments & Summary

Crossing occurs over a narrow section of Cockburn Lake. Obvious fish habitat.
Water temperature was 9.0 °C.

Photographs



A



B

Figure 1. Aerial view of habitat in the vicinity of the crossing (A) and a closer view of the available substrate (B).

Rail Alignment Watercourse Crossing Assessment

Location:

Crossing ID: BR-096-1
UTM Coordinates: 17 W 608545 7840211

Date/Time Surveyed: 4-Aug-08 / 24:20

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	Sinuous	Stage:	N/M
Channel Confinement:	C	Channel Gradient (range):	2-5°	Flow Regime:	PER
Bank Height (range in m):	N/M	Bank Shape:	N/M	T_w (°C):	7.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
40D	16.46	16.46	0.54	0.15	0.12	1.82	0.80	0.02	0.47	1.55
20D	8.23	8.23	0.13	0.41	0.40	0.71	0.57	0.27	0.53	1.44
0	7.32	7.32	0.23	0.20	0.20	0.50	0.52	1.34	0.52	1.34
20U	16.46	16.46	0.30	0.34	0.26	0.72	1.01	0.03	0.45	1.08
40U	13.72	13.72	0.15	0.16	0.31	0.38	0.10	0.40	0.30	1.08

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
40D		10			90					10	90
20D	10	15			75					10	90
0	10	15			75					10	90
20U	10	10			80					10	90
40U	10	15			75					20	80

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 20:00 **Electrofisher Settings:** 700 V, 70 Hz, 70%DC

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	5	0.25	82-131	1-24
NNST	0	-	-	-

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: BR-096-1
UTM Coordinates: 17 W 608545 7840211

Date/Time Surveyed: 4-Aug-08 / 24:20

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	High	No
NNST	No	No	No	No

Comments & Summary

High quality Arctic char habitat with no apparent barriers for use by multiple size classes of juveniles.

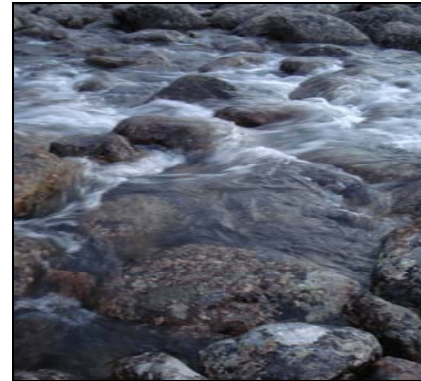
Photographs



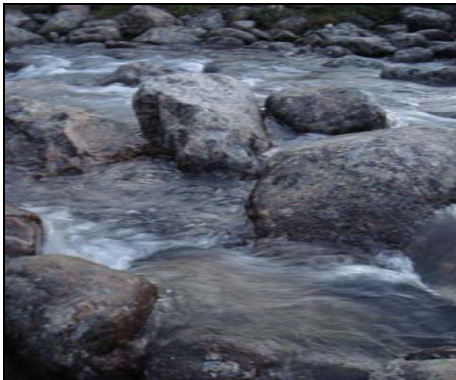
A



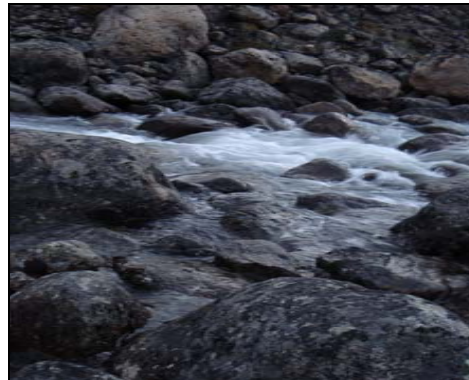
B



C



D



E

Figure 1. View of habitat 40 m (A), and 20 m downstream of crossing (B), at 40 m (C) and 20 m upstream of crossing (D), and at the crossing (E).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: BR-096-2
UTM Coordinates: 17 W 608708 7839705

Date/Time Surveyed: 17-Jul-08 / 23:49

General Physical Characteristics

Floodplain Width (m):	106.07	Channel Pattern:	Braided, meandering	Stage:	Normal
Channel Confinement:	PC	Channel Gradient (range):	3° -15°	Flow Regime:	PER
Bank Height (range in m):	UD-1.5	Bank Shape:	V-S	T_w (°C):	10.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
100D (2 chnls)	13.72	21.03	0.24	0.19	0.34	0.41	0.33	0.59	0.38	N/M
80D	10.06	10.06	0.35	0.4	0.42	N/M	0.07	0.38	0.23	N/M
60D	7.32	7.32	0.23	0.20	0.3	N/M	0.74	1.29	1.17	1.64
40D	12.80	12.80	0.50	0.05	0.27	0.65	0.89	0.73	0.88	N/M
20D	14.63	14.63	0.40	0.28	0.25	0.42	0.39	0.45	0.60	1.55
0	12.80	12.80	0.20	0.12	0.30	0.39	1.09	0.43	0.50	1.28
20U	7.32	7.32	0.70	0.52	0.28	0.82	0.07	0.55	0.39	1.71
40U	8.23	8.23	0.37	0.44	0.36	0.68	0.01	0.80	0.70	N/M
60U (1 chnl)	23.77	23.77	0.14	0.27	0.17	0.47	0.19	1.27	0.29	N/M
80U	23.77	36.58	0.31	0.22	0.2	0.42	0.25	0.05	0.92	1.57
100U (3 chnls)	13.72	19.20	0.17	0.38	0.25	0.47	0.69	0.38	0.61	N/M

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
100D	20	30			50			15	20	45	20
80D			40	60				25	10	55	10
60D	15	15			70			10	10	50	30
40D	20	10		20	50			5	10	45	40
20D	25	5	20		50			5	10	45	40
0	80	10			10			10	25	45	20
20U	20	10	35	15	20			5	5	40	50
40U	20		30	40	10			10	10	20	60
60U	20	15	15		50			5	10	20	65
80U	20	10	10		60			10	10	20	60
100U	20	15	15		50		5	5	10	20	60

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: BR-096-2
UTM Coordinates: 17 W 608708 7839705

Date/Time Surveyed: 17-Jul-08 / 23:49

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 6:48 **Electrofisher Settings:** 990V, 70Hz, 90%

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	12(7 captured, 5 seen)	1.76	80-128	6-17
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	High	No
NNST	No	No	No	No

Comments & Summary

Upstream barrier = waterfall at UTM 17 W 609169 7839588. Fish caught throughout 200 m range. At 100 m U/S there are three channels, the 3rd (right) is not fish habitat. At 100 D/S, the boulders are 20 m U/S of lake (Cockburn).

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: BR-096-2
UTM Coordinates: 17 W 608708 7839705

Date/Time Surveyed: 17-Jul-08 / 23:49

Photographs

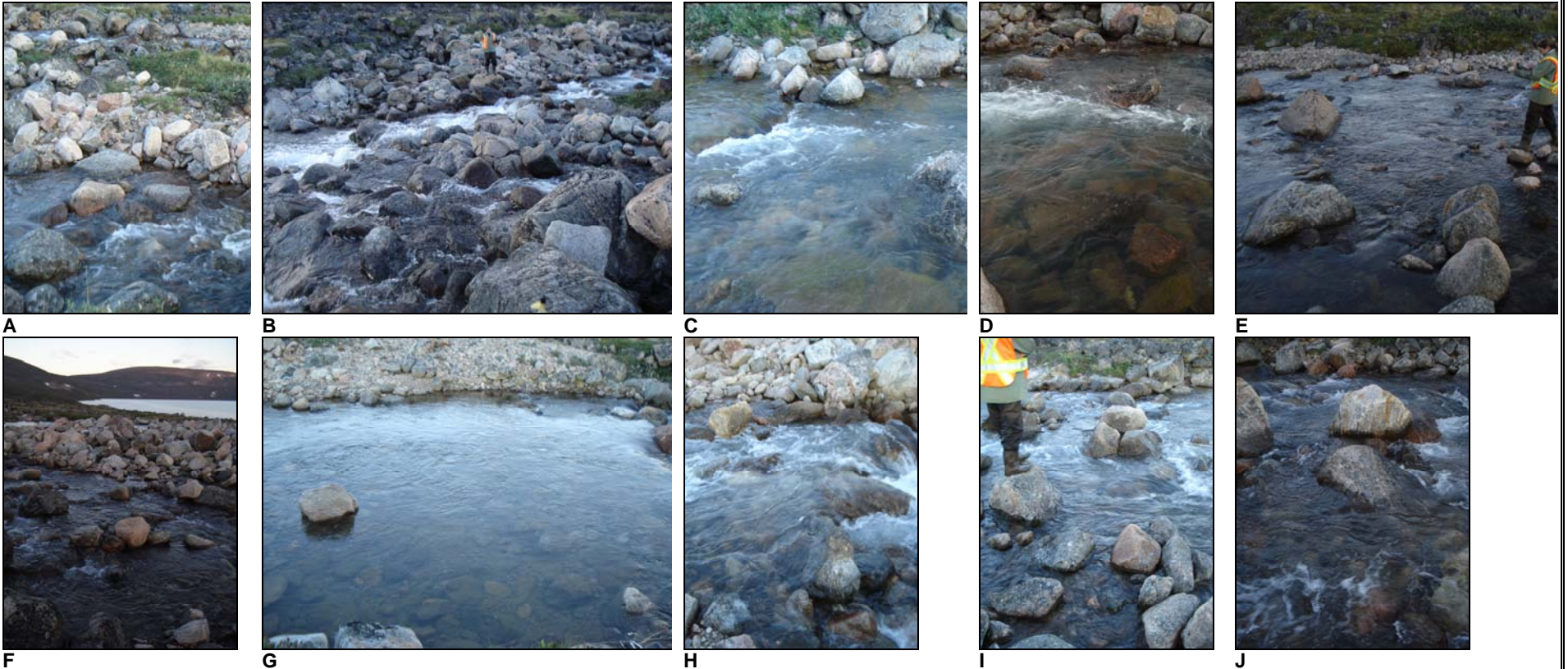


Figure 1: View of habitat from 100 (A) 80 (B) 60 (C) 40 (D) 20 m downstream of crossing (E), at the crossing (F), and 20 (G) 40 (H) 60 (I) 80 (J) and 100 m upstream of crossing (K).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-099-1
UTM Coordinates: 17 W 608594 7837414

Date/Time Surveyed: 13-Aug-07 / 21:30

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	Straight	Stage:	N/A
Channel Confinement:	PC	Channel Gradient (range):	N/M	Flow Regime:	INT
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

There was no water or nearly none at this crossing and the high water channel width was not measured. Barriers present – dry and steep downstream and upstream. Lakes present – Cockburn Lake downstream.

Habitat is dry or nearly so. It is likely inaccessible to fish from overwintering habitat in Cockburn Lake, even during high water, due to steep downstream cascades. In the spring, large juvenile ARCH might be capable of moving upstream past some of the cascades in the lowermost reaches, but there is most likely no fish habitat at the crossing.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-099-1
UTM Coordinates: 17 W 608594 7837414

Date/Time Surveyed: 13-Aug-07 / 21:30

Photographs

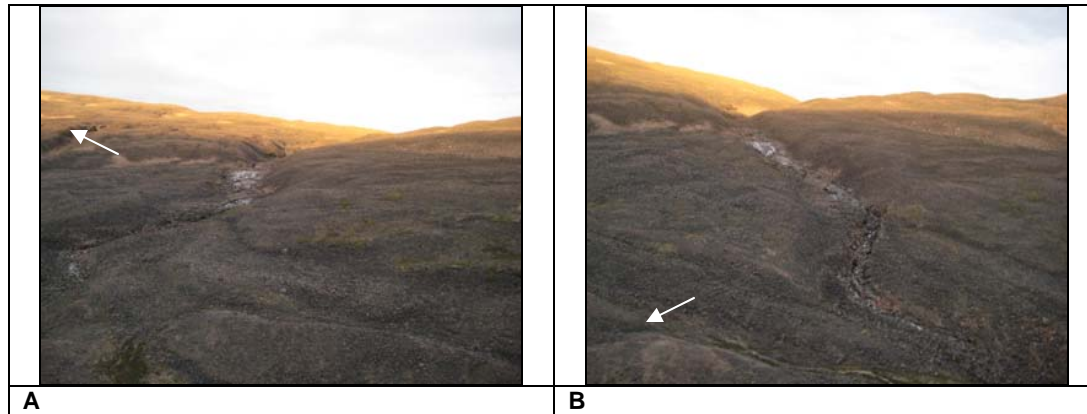


Figure 1. Aerial view of area near crossing (white arrow) (A-B).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: BR-099-1
UTM Coordinates: 17 W 608459 7837169

Date/Time Surveyed: 13-Aug-07 / 21:30

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	Straight	Stage:	N/A
Channel Confinement:	PC	Channel Gradient (range):	N/M	Flow Regime:	INT
Bank Height (range in m):	N/M	Bank Shape:	N/M	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

The maximum water depth at the crossing was < 0.20 m and the substrate was 90% cobble and 10% boulder. The channel morphology was 90% cascade and 10% pool. Stream cover is 10% boulder/large cobble. Barriers present –steep, shallow cascades downstream. Lakes present – Cockburn Lake downstream.

The habitat is likely inaccessible to fish from overwintering habitat in Cockburn Lake, even during high water, due to steep downstream cascades. Large juvenile ARCH might be capable of moving upstream past some of the cascades in the lowermost reaches, but there is most likely no fish habitat at the crossing.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: BR-099-1
UTM Coordinates: 17 W 608459 7837169

Date/Time Surveyed: 13-Aug-07 / 21:30

Photographs



A



B

Figure 1. Aerial view of area near crossing (white arrow) (A-B).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-101-1
UTM Coordinates: 17 W 607062 7836041

Date/Time Surveyed: 13-Aug-07 / 21:32

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	Straight	Stage:	N/A
Channel Confinement:	PC	Channel Gradient (range):	N/M	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

There was no water at this crossing and the high water channel width was not measured. Barriers present – dry and steep. Lakes present – Cockburn Lake downstream.

Habitat near the crossing is dry. It is likely inaccessible to fish from overwintering habitat in Cockburn Lake, even during high water, due to steep cascades. In the spring, large juvenile ARCH might be capable of moving upstream past some of the cascades in the lowermost reaches, but there is most likely no fish habitat at the crossing.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-101-1
UTM Coordinates: 17 W 607062 7836041

Date/Time Surveyed: 13-Aug-07 / 21:32

Photographs



A



B

Figure 1. Aerial view of area near crossing (A-B).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: BR-105-1
UTM Coordinates: 17 W 604171 7833818

Date/Time Surveyed: 13-Aug-07 / 21:34

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	Braided	Stage:	N/A
Channel Confinement:	PC- C	Channel Gradient (range):	N/M	Flow Regime:	INT
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

There was no water or nearly none at this crossing and the high water channel width was not measured. Barriers present – dry and steep. Lakes present – Cockburn Lake downstream.

Habitat near the crossing is basically dry. It is also likely inaccessible to fish from overwintering habitat in Cockburn Lake, even during high water, due to steep downstream cascades. Large juvenile ARCH might be capable of moving upstream past some of the cascades in the lowermost reaches, but there is most likely no fish habitat at the crossing.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: BR-105-1
UTM Coordinates: 17 W 604171 7833818

Date/Time Surveyed: 13-Aug-07 / 21:34

Photographs



A



B

Figure 1. Aerial view of area near crossing (A-B).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-105-1
UTM Coordinates: 17 W 603373 7833494

Date/Time Surveyed: 13-Aug-07 / 21:34

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	Straight	Stage:	N/A
Channel Confinement:	PC	Channel Gradient (range):	N/M	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

There was no water at this crossing and the high water channel width was not measured. Barriers present – dry and steep. Lakes present – Cockburn Lake downstream.

Habitat near the crossing is dry. It is also likely inaccessible to fish from overwintering habitat in Cockburn Lake, even during high water, due to steep downstream cascades. In the spring, large juvenile ARCH might be capable of moving upstream past some of the cascades in the lowermost reaches, but there is most likely no fish habitat at the crossing.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-105-1
UTM Coordinates: 17 W 603373 7833494

Date/Time Surveyed: 13-Aug-07 / 21:34

Photographs



A



B

Figure 1. Aerial view of area near crossing (A-B).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-107-1
UTM Coordinates: 17 W 601596 7833028

Date/Time Surveyed: 13-Aug-07 / 21:35

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	Braided	Stage:	N/A
Channel Confinement:	PC	Channel Gradient (range):	N/M	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

There was no water at this crossing and the high water channel width was not measured. Barriers present – dry and steep. Lakes present – Cockburn Lake downstream.

Habitat near the crossing is dry. It is also likely inaccessible to fish from overwintering habitat in Cockburn Lake, even during high water, due to steep downstream cascades. In the spring, large juvenile ARCH might be capable of moving upstream past some of the cascades in the lowermost reaches, but there is most likely no fish habitat at the crossing.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-107-1
UTM Coordinates: 17 W 601596 7833028

Date/Time Surveyed: 13-Aug-07 / 21:35

Photographs



A



B

Figure 1. Aerial view of area near crossing (A-B).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-109-1
UTM Coordinates: 17 W 600761 7831883

Date/Time Surveyed: 3-Aug-08 / 04:55

General Physical Characteristics

N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted: N **Effort (min):** N/A **Electrofisher Settings:** N/A

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

The floodplain width was > 200 m and the flow regime was ephemeral. At the crossing, the channel was dry and the high water channel width was 2.0 m. The substrate was 40% small cobble, 30% large cobble and 30% boulders.

Possible braids, all dry with small pools.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-109-1
UTM Coordinates: 17 W 600761 7831883

Date/Time Surveyed: 3-Aug-08 / 04:55

Photographs



A



B



C



D



E



F

Figure 1. View of habitat near crossing (A -F).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-110-1 **Date/Time Surveyed:** 3-Aug-08 / 03:30
UTM Coordinates: 17 W 599832 7830830

General Physical Characteristics

Floodplain Width (m): N/M **Channel Pattern:** Sinuous, braided **Stage:** Dry
Channel Confinement: N/M **Channel Gradient (range):** 10-20° **Flow Regime:** EPH
Bank Height (range in m): 0.0-1.0 **Bank Shape:** N/M **T_w (°C):** Dry

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted: N **Effort (min):** N/A **Electrofisher Settings:** N/A

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

Dry, some small pools that connected with the stream. The substrate was 10% fines, 20% small cobble, 20% large cobble, and 50% cobble.

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-110-1
UTM Coordinates: 17 W 599832 7830830

Date/Time Surveyed: 3-Aug-08 / 03:30

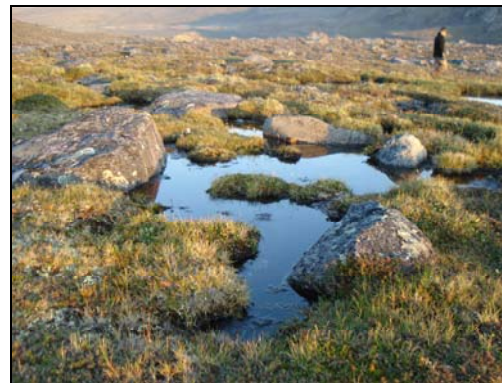
Photographs



A



B



C

Figure 1. View of habitat, at crossing (A), downstream of crossing (B), and a nearby pool (C)

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-111-1
UTM Coordinates: 17 W 599060 7830203

Date/Time Surveyed: 3-Aug-08 / 23:05

General Physical Characteristics

Floodplain Width (m):	> 200	Channel Pattern:	Straight, sinuous	Stage:	Low
Channel Confinement:	NC	Channel Gradient (range):	20-28°	Flow Regime:	PER
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	13.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
0	26.52	26.52	0.32	0.40	0.45	0.60	0.68	1.22	0.31	1.22
Upstream falls	16.46	16.46			0.85					2.44

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
0	5	10	10		75		2	3	5	10	80

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 20:00 **Electrofisher Settings:** 700V, 70Hz, 70%

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	0	-	-	-
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-111-1
UTM Coordinates: 17 W 599060 7830203

Date/Time Surveyed: 3-Aug-08 / 23:05

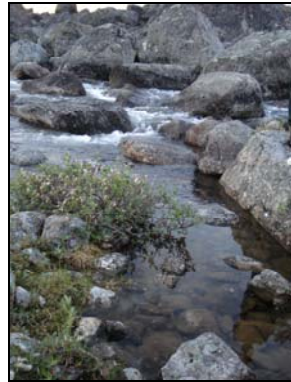
Comments & Summary

Falls at UTM 17 W 599036 7830225, U/S dry rocks at UTM 17 W 600767 7829691.

Photographs



A



B



C



D



E



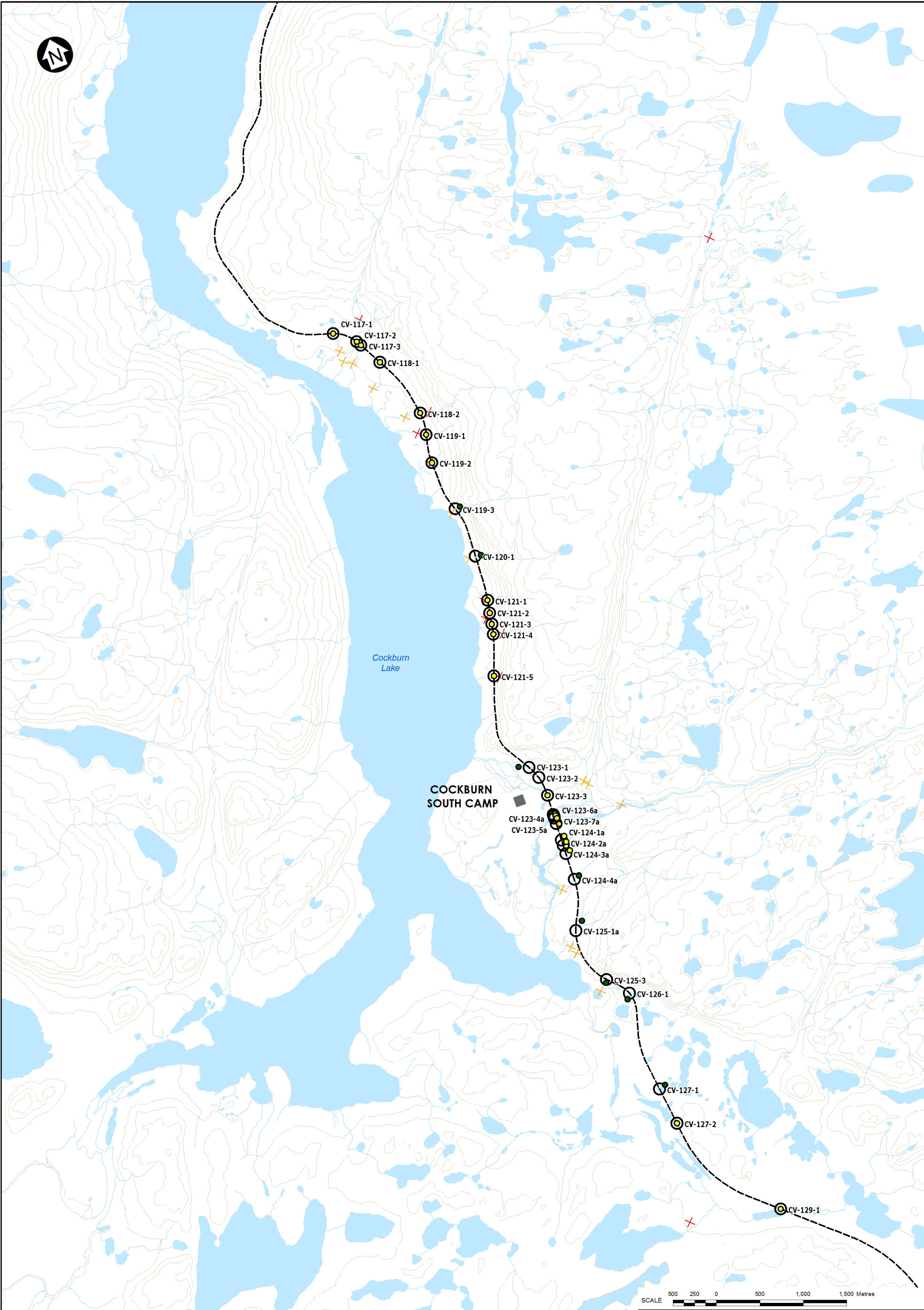
F



G

Figure 1. View of habitat, at crossing (A-B), downstream of crossing, (C-D), the downstream barrier, (E-F) and the upstream barrier (G).

Path: G:\MARYRIV_GDB\EIS_Figures\2010EIS_Figures\MXD\Synthesis_RailLine_AccessRoad\Rev2\Apdx\20101119_ApdxRW_sg.mxd



LEGEND:

- RAILWAY CROSSING SURVEY YEAR

2007

2008

2010

STREAM CROSSING

STREAM CROSSING (APPROX.)

FISH BARRIER (CONFIRMED)

FISH BARRIER (AREAL INTERPRETATION)
- CONTOUR

MILNE INLET TOTE ROAD (EXISTING)

RAILWAY ALIGNMENT (PROPOSED)

CONSTRUCTION ACCESS ROAD (PROPOSED)

WATER

INFRASTRUCTURE

NOTES:

1. BASE MAP 1:50,000 © HER MAJESTY THE QUEEN IN RIGHTS OF CANADA DEPARTMENT OF NATURAL RESOURCES (2009.) ALL RIGHTS RESERVED.
2. TOPOGRAPHY PROVIDED BY EAGLE MAPPING (2005).
3. PROPOSED RAILWAY ALIGNMENT PROVIDED BY CANRAIL CONSULTANTS INC.
4. PROPOSED RAILWAY CONSTRUCTION ACCESS ROAD ALIGNMENT PROVIDED BY CANRAIL CONSULTANTS INC. DRAWING NO. RAILWAY ALIGNMENT AND CONST ACCESS RD - MARY RIVER STEENSBY 2010 -12AUG2010 DWG
5. LOCATION OF PROPOSED INFRASTRUCTURE IS APPROXIMATE AND SUBJECT TO FIELD ADJUSTMENTS
6. CONTOUR INTERVAL IS 25 AND IS IN METRES.

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

Railway Stream Crossing Sites (Map I)



P/A NO
-
DATE: 19/11/2010

REF NO.
-
REV
2

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-117-1
UTM Coordinates: 17 W 597976 7825752

Date/Time Surveyed: 03-Aug-08 / 03:20

General Physical Characteristics

Floodplain Width (m):	> 200	Channel Pattern:	Sinuous	Stage:	Normal
Channel Confinement:	NC	Channel Gradient (range):	0-10°	Flow Regime:	PER
Bank Height (range in m):	0.40-0	Bank Shape:	N/M	T_w (°C):	9.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
0	9.14	-	0.03	0.5	0.06	0.25	0.09	0.13	0.05	0.43

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
20D	20	80					30	20	25	25	

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 5:00 **Electrofisher Settings:** 400V, 40Hz, 30%

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	0	-	-	-
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-117-1
UTM Coordinates: 17 W 597976 7825752

Date/Time Surveyed: 03-Aug-08 / 03:20

Comments & Summary

Fish were not observed or captured at this location despite the presence of suitable habitat. Although not identified, it appears there is a barrier to fish movements preventing access to the site from overwintering habitat.

Photographs



A



B



C

Figure 1. View of habitat, at crossing (A), downstream of crossing (B) and upstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-117-2
UTM Coordinates: 17 W 598198 7825571

Date/Time Surveyed: 3-Aug-08 / 02:10

General Physical Characteristics

Floodplain Width (m):	>200	Channel Pattern:	Sinuuous, braided	Stage:	N/M
Channel Confinement:	NC	Channel Gradient (range):	1-10°	Flow Regime:	PER
Bank Height (range in m):	0-0.5	Bank Shape:	Some UC	T_w (°C):	5.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
100D	27.43	27.43	0.12	0.06	0.06	0.12	0.07	0.11	0.08	0.23
80D	21.03	21.03	0.20	0.14	0.04	0.21	0.08	0.09	0.15	1.03
60D	17.37	17.37	0.07	0.06	0.03	0.16	0.09	0.17	0.08	0.22
40D	16.46	16.46	0.05	0.10	0.09	0.19	0.23	0.20	0.08	0.63
20D	2.30	2.30	0.20	0.10	0.05	0.25	0.11	0.06	0.15	0.78
0	2.40	2.40	0.16	0.11	0.13	0.25	0	0	0.18	1.03
20U	2.40	2.40	0.17	0.11	0.16	0.27	0.14	0.12	0.17	0.63
40U	4.40	4.40	0.12	0.11	0.13	0.20	0.24	0.06	0.14	0.96
60U	0.80	0.80	0.17	0.14	0.16	0.24	0.02	0.42	0.11	0.87
80U	0.99	0.99	0.16	0.20	0.15	0.89	0.34	0.11	0.06	0.34
100U	2.20	2.20	0.07	0.14	0.25	0.28	0.01	0.01	0.05	0.92

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
100D								25	25	50	
80D	90	10						25	25	50	
60D	100							25	25	50	
40D	100							35		60	5
20D	75	25						25	25	50	
0	50	50						35	35	20	10
20U	50	50						35	35	30	
40U	100							45	45	5	5
60U	50	50						50	50		
80U	50	50						50	50		
100U	50	50					5	30	30	30	5

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-117-2
UTM Coordinates: 17 W 598198 7825571

Date/Time Surveyed: 3-August-08 / 02:10

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 19:00 **Electrofisher Settings:** 700V, 70Hz, 60% DC

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	16	0.84	69-119	3-13
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	High	No
NNST	No	No	No	No

Comments & Summary

High quality, easily accessible Arctic char habitat.

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

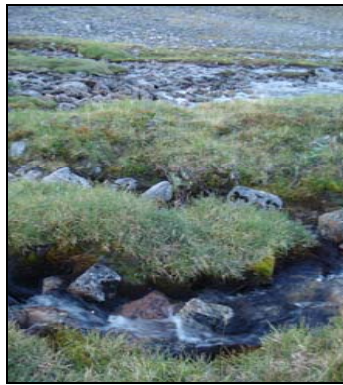
Crossing ID: CV-117-2
UTM Coordinates: 17 W 598198 7825571

Date/Time Surveyed: 3-August-08 / 02:10

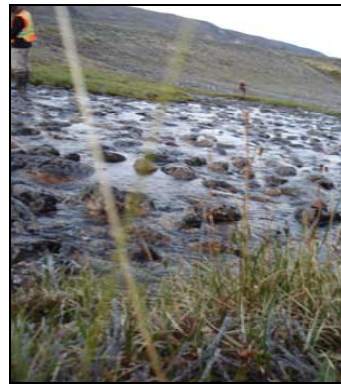
Photographs



A



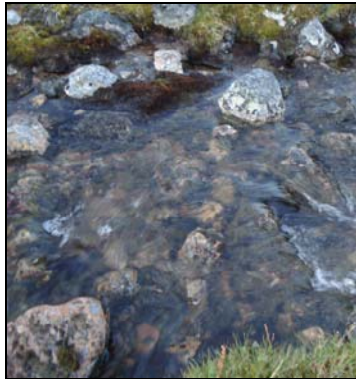
B



C



D



E



F



G



H



I



J



K

Figure 1. View of habitat 100 (A), 80 (B), 60 (C), 40 (D), and 20 m (E) downstream of crossing, at the crossing (F), and 20 (G), 40 (H), 60 (I), 80 (J), and 100 m (K) upstream of the crossing.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-117-3
UTM Coordinates: 17 W 598230 7825513

Date/Time Surveyed: 03-Aug-08 / 01:55

General Physical Characteristics

Floodplain Width (m):	> 200	Channel Pattern:	Sinuuous, braided	Stage:	N/M
Channel Confinement:	NC	Channel Gradient (range):	10-15°	Flow Regime:	EPH
Bank Height (range in m):	0.25-0	Bank Shape:	N/M	T_w (°C):	5.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
0	0.7									
Nearby Stream						0.21				0.71

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
0							10	30	40	18	2

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 5:00 **Electrofisher Settings:** 700V, 60Hz, 60%

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	0	-	-	-
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-117-3
UTM Coordinates: 17 W 598230 7825513

Date/Time Surveyed: 03-Aug-08 / 01:55

Comments & Summary

Electrofishing conducted on a nearby stream.

Photographs



A



B



C

Figure 1. View of habitat at crossing (A), downstream of crossing (B) and upstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-118-1
UTM Coordinates: 17 W 598367 7825258

Date/Time Surveyed: 3-Aug-08 / 01:30

General Physical Characteristics

Floodplain Width (m):	> 200	Channel Pattern:	Braided	Stage:	N/M
Channel Confinement:	NC	Channel Gradient (range):	3-30°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	N/M	T_w (°C):	9.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
0	1					0.03				0.04

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
0	50	50					60	10	20	10	

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 5:00 **Electrofisher Settings:** 700V, 60Hz, 60%DC

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	0	-	-	-
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-118-1
UTM Coordinates: 17 W 598367 7825258

Date/Time Surveyed: 3-Aug-08 / 01:30

Comments & Summary

Made up of several small streams.

Photographs



A



B



C

Figure 1. View of habitat, at crossing (A) downstream of crossing (B) and upstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-118-2
UTM Coordinates: 17 W 598603 7824545

Date/Time Surveyed: 2-Aug-08 / 03:20

General Physical Characteristics

Floodplain Width (m):	10.97 - >200	Channel Pattern:	Sinuuous, braided	Stage:	N/M
Channel Confinement:	C	Channel Gradient (range):	15-21°	Flow Regime:	PER
Bank Height (range in m):	0.54-UD	Bank Shape:	N/M	T_w (°C):	7.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
100D	-	-	0.20	-	0.07	0.14	0.75	-	0.37	0.75
80D	25.60	25.60	0.08	0.11	-	0.20	0.43	0.17	-	0.97
60D	7.25	7.25	0.05	0.07	0.07	0.13	0.40	0.29	0.16	0.58
40D	9.30	9.30	0.13	0.04	0.06	0.13	0.26	0.02	0.62	0.57
20D	10.65	12.00	0.01	0.02	0.10	0.16	0.15	0.01	0.18	1.01
0	2.70	5.72	0.10	0.05	0.07	0.32	0.41	0.03	0.28	0.63
20U	3.00	5.00	0.16	0.13	0.05	0.19	0.13	0.32	0.14	0.64
40U	5.50	6.50	0.09	0.06	0.06	0.10	0.26	0.36	0.24	0.82
60U	3.10	6.10	0.09	0.12	0.03	0.15	0.38	0.27	0.69	1.08
80U	4.10	5.10	0.12	0.04	0.05	0.12	0.15	0.29	0.03	1.05
100U	3.35	5.30	0.05	0.01	0.40	0.40	0.06	0.00	0.03	2.09

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
100D							10	60	20	10	
80D							20	30	40	8	2
60D	90	10					10	60	10	19	1
40D	90	10					10	30	40	19	1
20D	100						10	20	19	50	1
0	80	20						15	15	60	10
20U	100							20	10	60	10
40U	100							10	40	30	20
60U	75	5			20				10	50	40
80U	90	10							10	50	40
100U	80	20							10	50	40

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-118-2
UTM Coordinates: 17 W 598603 7824545

Date/Time Surveyed: 2-Aug-08 / 03:20

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 24:00 **Electrofisher Settings:** 600V, 60Hz, 50%DC
 700V, 70Hz, 60%DC

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	15	0.62	71-155	4-36
NNST	0	-	-	-

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	High	No
NNST	No	No	No	No

Comments & Summary

At 60 D/S, there are undercut banks in spring/high water. At 80 and 100 D/S the water is branched into two streams.

Baffinland Iron Mines
 Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-118-2
UTM Coordinates: 17 W 598603 7824545

Date/Time Surveyed: 2-Aug-08 / 03:20

Photographs

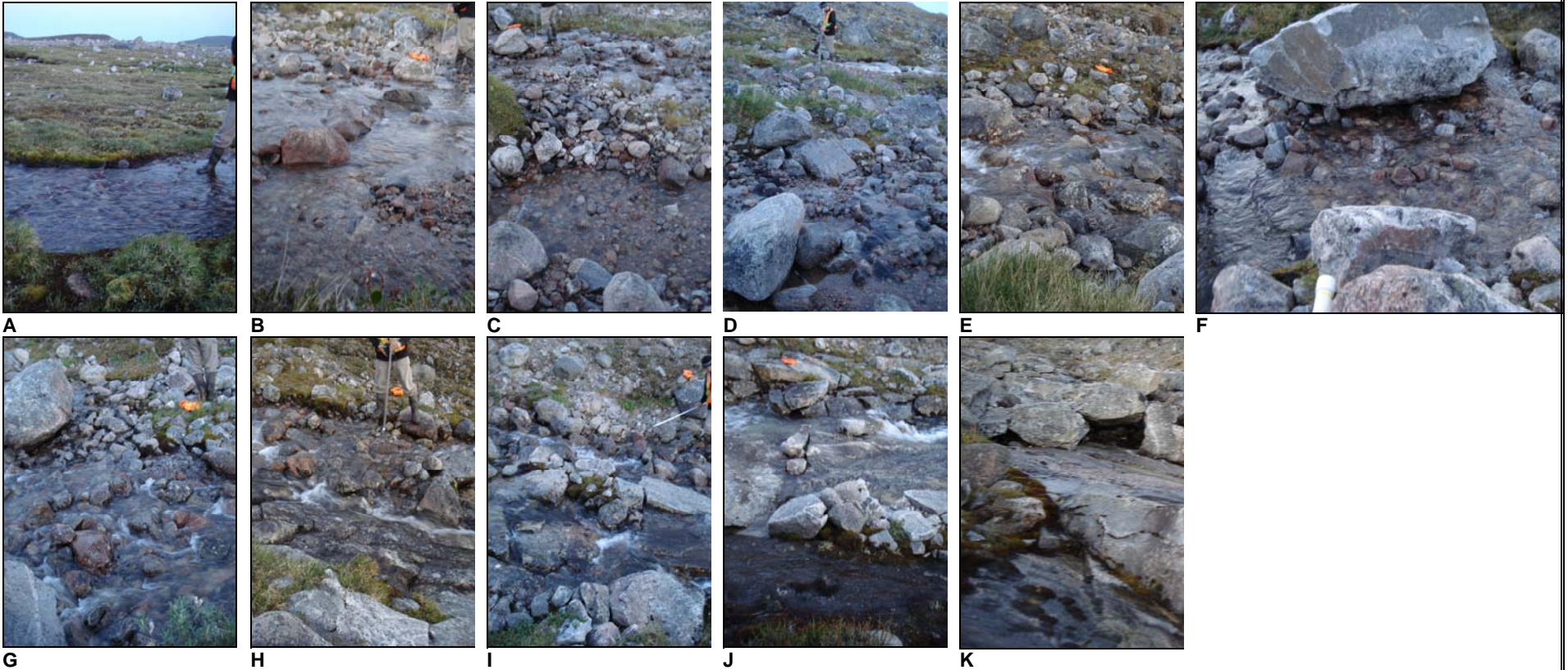


Figure 1. View of habitat 100 (A), 80 (B), 60 (C), 40 (D), and 20 m (E) downstream of crossing, at the crossing (F), and 20 (G), 40 (H), 60 (I), 80 (J), and 100 m (K) upstream of the crossing.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-119-1
UTM Coordinates: 17 W 598585 7824286

Date/Time Surveyed: 2-Aug-08 / 04:43

General Physical Characteristics

Floodplain Width (m):	> 200	Channel Pattern:	Sinuuous, braided-broken	Stage:	N/M
Channel Confinement:	NC	Channel Gradient (range):	5-10°	Flow Regime:	INT
Bank Height (range in m):	0.30-0	Bank Shape:	UD	T_w (°C):	1.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
0	3.10	3.10	0.16	0.09	0.06	0.16	0.02	0	0.03	0.78

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
0	70	20			10		0	70	18	10	2

Fisheries Information

Electrofishing Conducted: N **Effort (min):** N/A **Electrofisher Settings:** N/A

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

Obvious barriers, therefore no fish. Lots of steep drops and dry patches.

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-119-1
UTM Coordinates: 17 W 598585 7824286

Date/Time Surveyed: 2-Aug-08 / 04:43

Photographs



A



B



C

Figure 1. View of habitat (A-C)

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-119-2
UTM Coordinates: 17 W 598535 7823963

Date/Time Surveyed: 2-Aug-08 / 04:10

General Physical Characteristics

Floodplain Width (m):	> 200	Channel Pattern:	Sinuuous, braided	Stage:	N/M
Channel Confinement:	NC	Channel Gradient (range):	2-10°	Flow Regime:	PER
Bank Height (range in m):	0.06	Bank Shape:	N/M	T_w (°C):	5.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
0	0.8	1.05	0.13	0.07	0.11	0.37	0.40	0.37	0.31	1.11

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
0	80	20					10		20	70	

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 5:00 **Electrofisher Settings:** 600V, 60Hz, 50%DC

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	0	-	-	-
NST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-119-2
UTM Coordinates: 17 W 598535 7823963

Date/Time Surveyed: 2-Aug-08 / 04:10

Comments & Summary

15 meters DS crossing steep gradient.

Photographs



A



B



C



D

Figure 1. View of habitat (A-D).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-119-3
UTM Coordinates: 17 W 598665 7823373

Date/Time Surveyed: 13-Aug-07 / 21:42

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	Straight	Stage:	N/A
Channel Confinement:	PC-C	Channel Gradient (range):	N/M	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

There was no water at this crossing or nearly none. Barriers present – dry and steep. Lakes present – Cockburn Lake downstream.

Habitat near the crossing is dry or nearly so. It is likely inaccessible to fish from overwintering habitat in Cockburn Lake, even during high water, due to steep downstream cascades. Large juvenile ARCH might be capable of moving upstream past some of the cascades in the lower-most reaches, but there is most likely no fish habitat at the crossing.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

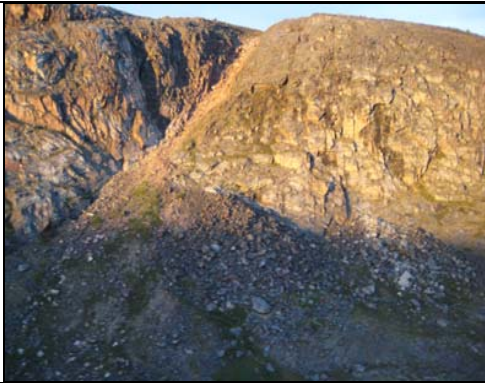
Rail Alignment Watercourse Crossing Assessment

Location

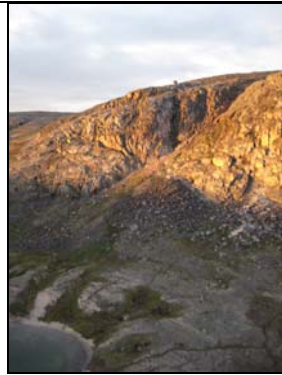
Crossing ID: CV-119-3
UTM Coordinates: 17 W 598665 7823373

Date/Time Surveyed: 13-Aug-07 / 21:42

Photographs



A



B

Figure 1. Aerial view of area near crossing (A-B).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-120-1
UTM Coordinates: 17 W 598703 7822764

Date/Time Surveyed: 13-Aug-07 / 21:43

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	Braided	Stage:	N/A
Channel Confinement:	PC	Channel Gradient (range):	N/M	Flow Regime:	INT
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

The maximum depth of this water crossing was < 0.10 m. The channel morphology was 90% cascades and 10% pool and substrate was 90% cobble and 10% boulder. Stream cover was 10% boulder, large cobble. Barriers present – dry and steep. Lakes present – Cockburn Lake downstream.

Habitat near the crossing has low water. It is likely inaccessible to fish from overwintering habitat in Cockburn Lake, even during high water, due to steep downstream cascades. Large juvenile ARCH might be capable of moving upstream past some of the cascades in the lower-most reaches, but there is most likely no fish habitat at the crossing.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-120-1
UTM Coordinates: 17 W 598703 7822764

Date/Time Surveyed: 13-Aug-07 / 21:43

Photographs



A



B

Figure 1. Aerial view of area near crossing (A-B).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-121-1
UTM Coordinates: 17 W 598596 7822248

Date/Time Surveyed: 2-Aug-08 /23:00

General Physical Characteristics

Floodplain Width (m):	>200	Channel Pattern:	Braided, broken	Stage:	N/M
Channel Confinement:	NC	Channel Gradient (range):	8-40°	Flow Regime:	EPH
Bank Height (range in m):	0.0-0.30	Bank Shape:	N/M	T_w (°C):	2.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
0	1.4	1.4	0.01	0.02	0.01	0.16	0	0	0	0.13

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
0	25	75						70	19	10	1

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 5:00 **Electrofisher Settings:** 600V, 60Hz, 50%DC

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	0	-	-	-
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-121-1
UTM Coordinates: 17 W 598596 7822248

Date/Time Surveyed: 2-Aug-08 /23:00

Comments & Summary

Lots of barriers, mountain, broken dry channels, very narrow. Dry at UTM 17 W 598564 7822261.

Photographs



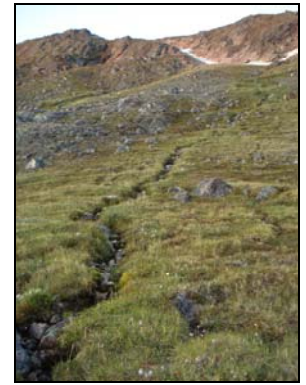
A



B



C



D

Figure 1. View of habitat, at crossing (A), the barrier (B) downstream of crossing (C) and upstream of crossing (D).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-121-2
UTM Coordinates: 17 W 598571 7822105

Date/Time Surveyed: 2-Aug-08 / 03:42

General Physical Characteristics

Floodplain Width (m):	> 200	Channel Pattern:	Braided	Stage:	N/M
Channel Confinement:	NC-C	Channel Gradient (range):	0-5°	Flow Regime:	EPH
Bank Height (range in m):	0-0.16	Bank Shape:	N/M	T_w (°C):	2.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
0	0.8	0.95	-	0.2	-	0.22	-	0.21	-	0.46

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
0						Dry	100				

Fisheries Information

Electrofishing Conducted: N **Effort (min):** N/A **Electrofisher Settings:** N/A

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

Crossing was measured in stream ~13 m west of original waypoint. At UTM 17 W 598507 7822056, there is a downstream barrier, a steep gradient cascade. Stream was dry at UTM 0598507 7822056, ~ 80 m D/S of site. U/S confinement is a valley wall.

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-121-2
UTM Coordinates: 17 W 598571 7822105

Date/Time Surveyed: 2-Aug-08 / 03:42

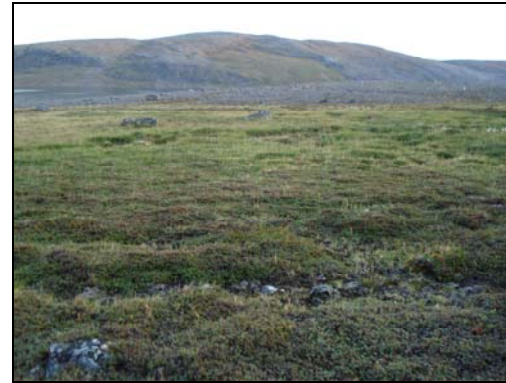
Photographs



A



B



C



D



E



F

Figure 1. View of habitat (A-D), and site at UTM 17 W 598565 7822107 (E-F).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-121-3
UTM Coordinates: 17 W 598549 7821976

Date/Time Surveyed: 2-Aug-08 / 03:20

General Physical Characteristics

Floodplain Width (m):	> 200	Channel Pattern:	Braided	Stage:	Dry
Channel Confinement:	NC	Channel Gradient (range):	3-5°	Flow Regime:	EPH
Bank Height (range in m):	N/M	Bank Shape:	N/M	Tw (°C):	Dry

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

Stream and ground is dry. Substrate composition at the site was 85% fines and 15% gravel.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

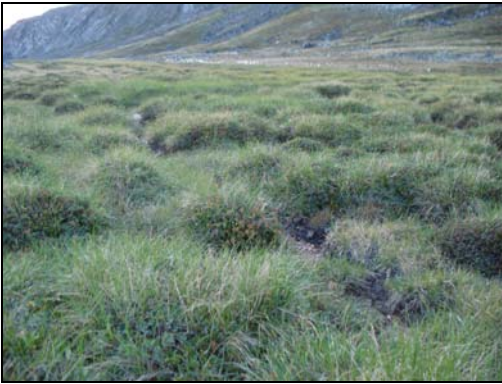
Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-121-3
UTM Coordinates: 17 W 598549 7821976

Date/Time Surveyed: 2-Aug-08 / 03:20

Photographs



A



B



C

Figure 1. View of habitat near stream bed (A-C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-121-4
UTM Coordinates: 17 W 598523 7821859

Date/Time Surveyed: 1-Aug-08 / 23:30

General Physical Characteristics

Floodplain Width (m):	>200	Channel Pattern:	Sinuuous, braided	Stage:	N/M
Channel Confinement:	NC	Channel Gradient (range):	10-20°	Flow Regime:	INT
Bank Height (range in m):	0.00-0.20	Bank Shape:	UD	T_w (°C):	4.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
0	0.51	0.51	-	0.08	-	0.15	-	0.21	-	0.57

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
0	90				10		50		10	40	

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 10:00 **Electrofisher Settings:** 600V, 60Hz, 40%DC

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	0	-	-	-
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	Low	No
NNST	No	No	Low	No

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – MARGINAL

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-121-4
UTM Coordinates: 17 W 598523 7821859

Date/Time Surveyed: 1-Aug-08 / 23:30

Comments & Summary

Although no fish were captured during a fisheries survey, there do not appear to be any significant barriers preventing access from the nearby lake. Low water temperature at the time of sampling and some potential partial barriers (small falls) may have resulted in no catches, but fish use cannot be completely ruled out.

Photographs



A



B



C



D



E



F

Figure 1. View of habitat near the crossing (A-F).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-121-5
UTM Coordinates: 17 W 598368 7821404

Date/Time Surveyed: 1-Aug-08 / 22:45

General Physical Characteristics

Floodplain Width (m):	42.06	Channel Pattern:	Sinuuous	Stage:	N/M
Channel Confinement:	NC	Channel Gradient (range):	5-15°	Flow Regime:	INT
Bank Height (range in m):	0-0.15	Bank Shape:	UD	T_w (°C):	4.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
0	10	10	0.12	0.09	0.04	0.17	0	0.09	0	0.09

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
0	70		30						7	90	3

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 4:00 **Electrofisher Settings:** 600V, 60Hz, 50%DC

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	3	0.75	N/A	N/A
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	Low	No
NNST	No	No	No	No

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – MARGINAL

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-121-5
UTM Coordinates: 17 W 598368 7821404

Date/Time Surveyed: 1-Aug-08 / 22:45

Comments & Summary

Barrier is a mountain where stream is running off snow/ice. At the crossing the water is too shallow to electrofish, therefore, started at UTM 0598345 7821402.

Photographs



A



B



C



D



E



F

Figure 1. View of habitat, at crossing (A) at UTM 17 W 598345 7821407 (B), at the barrier (C) downstream of site (D), at electrofishing site, (E) and upstream of site (F).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-123-1 and CV-123-2
UTM Coordinates: 17 W 598274 7820321

Date/Time Surveyed: 13-Aug-07 / 00:26

General Physical Characteristics

Floodplain Width (m):	> 200	Channel Pattern:	Braided	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	1°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

High water channel width was 1.4 m. Barriers present – no water downstream or at crossing. Lakes present – Cockburn Lake downstream

Crossing dry, no fish habitat present. Even during high water, it is unlikely that fish will move into habitat at the crossing due to the substrate and distance from overwintering habitat.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-123-1 and CV-123-2
UTM Coordinates: 17 W 598274 7820321

Date/Time Surveyed: 13-Aug-07 / 00:26

Photographs



A



B



C

Figure 1. View of habitat upstream of crossings (A), at the crossings (B) and downstream of crossings (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-123-3
UTM Coordinates: 17 W 598478 7819899

Date/Time Surveyed: 6-Aug-08 / 23:14

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	Braided	Stage:	Low
Channel Confinement:	C-PC	Channel Gradient (range):	0-1°	Flow Regime:	PER
Bank Height (range in m):	0-0.5	Bank Shape:	V	T_w (°C):	8.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
100D	15.6	16.0	0.05	0.08	0.13	0.14	0.11	0.06	0.47	0.66
80D	11.5	11.5	0.15	0.10	0.10	0.20	0.13	0.26	0.10	0.98
60D	6.1	6.1	0.14	0.15	0.17	0.25	0.17	0.33	0.22	0.63
40D	3.4	3.4	0.17	0.12	0.12	0.22	0.22	0.06	0.25	0.82
20D	3.1	3.1	0.15	0.19	0.13	0.24	0.65	0.62	0.09	0.62
0	3.8	3.8	0.16	0.21	0.14	0.26	0.22	0.17	0.50	0.89
20U	7.3	7.3	0.10	0.15	0.08	0.21	0.11	0.33	0.14	0.53
40U	3.2	3.2	0.16	0.26	0.13	0.26	0.17	0.19	0.23	0.70
60U	2.7	2.7	0.14	0.18	0.10	0.31	0.71	0.25	0.04	0.71
80U	5.2	5.2	0.14	0.13	0.13	0.22	0.17	0.02	0.42	0.81
100U	6.2	6.2	0.12	0.17	0.25	0.31	0.07	0.13	0.53	1.09

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
100D	68	30	-	-	2	-	-	2	68	25	5
80D	95	5	-	-	-	-	-	2	80	13	5
60D	90	8	-	-	2	-	-	2	86	10	2
40D	92	5	-	-	3	-	-	2	81	15	2
20D	96	2	-	-	2	-	-	2	93	5	-
0	98	2	-	-	-	-	-	2	93	5	0
20U	96	2	-	-	2	-	-	3	80	15	2
40U	95	3	-	-	2	-	-	2	86	10	2
60U	96	2	-	-	2	-	-	2	81	15	2
80U	93	2	-	-	5	-	-	5	60	30	5
100U	96	2	-	-	2	-	-	3	75	20	2

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – MARGINAL

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-123-3
UTM Coordinates: 17 W 598478 7819899

Date/Time Surveyed: 6-Aug-08 / 23:14

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 15:00 **Electrofisher Settings:** 400V, 40Hz, 30%DC
 500V, 50Hz, 40%DC

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	2	0.13	66-75	3-4
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	Moderate	No
NNST	No	No	No	No

Comments & Summary

No observed barriers.

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – MARGINAL

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-123-3
UTM Coordinates: 17 W 598478 7819899

Date/Time Surveyed: 6-Aug-08 / 23:14

Photographs



A



B



C



D



E



F



G



H



I



J



K

Figure 1. View of habitat 100 (A), 80 (B), 60 (C), 40 (D), and 20 m (E) downstream of crossing, at the crossing (F), and 20 (G), 40 (H), 60 (I), 80 (J), and 100 m (K) upstream of the crossing.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-123-4a
UTM Coordinates: 17 W 598486 7819668

Date/Time Surveyed: 28-Aug-2008/13:45

General Physical Characteristics

Floodplain Width (m):	~800	Channel Pattern:	N/M	Stage:	High
Channel Confinement:	PC-C	Channel Gradient (range):	1-5°	Flow Regime:	PER
Bank Height (range in m):	0.05-0.20	Bank Shape:	S	T_w (°C):	7.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
100D (3 ch)	30.7	35	0.21	0.15	0.25	0.37	0.70	0.25	0.36	0.70
80D (1 ch)	29.5	35	0.16	0.21	0.23	0.31	0.48	0.44	0.63	0.69
60D (2 ch)	23.2	33	0.20	0.25	0.19	0.34	0.24	0.43	0.32	0.76
40D (2 ch)	16.6	34	0.24	0.25	0.20	0.45	0.60	0.34	0.14	0.83
20D (3 ch)	19.3	33	0.31	0.37	0.11	0.37	0.43	0.67	0.26	0.72
0	16.7	28	0.15	0.8	0.6	0.27	0.78	0.31	0.20	0.78
20U (1 ch)	12.5	18	0.34	0.17	0.13	0.38	0.86	0.34	0.46	0.86
40U (3 ch)	23.8	29	0.28	0.23	0.21	0.29	0.32	0.30	0.34	0.61
60U (1 ch)	12.1	18	0.28	0.11	0.20	0.33	0.61	0.33	0.22	0.79
80U (1 ch)	10.6	14	0.43	0.32	0.18	0.43	0.45	0.31	0.14	0.66
100U (1 ch)	6.2	20	0.46	0.32	0.13	0.46	0.47	0.53	1.06	1.06

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
100D (3 ch)	100								25	75	
80D (1 ch)	90			10					45	50	5
60D (2 ch)	90			10					35	60	5
40D (2 ch)	90			10					45	50	
20D (3 ch)	95			5					40	60	
0	100								60	30	10
20U (1 ch)	100								70	30	
40U (3 ch)	100								65	30	5
60U (1 ch)	90			10					80	20	
80U (1 ch)	80		10	10				5	85	10	
100U (1 ch)	75				25				70	20	10

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-123-4a
UTM Coordinates: 17 W 598486 7819668

Date/Time Surveyed: 28-Aug-2008/13:45

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 10:00 **Electrofisher Settings:** 400V, 50 Hz, 30%

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	0	-	-	-
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	Moderate	Moderate
NNST	No	No	Low	Low

Comments & Summary

At 40 U/S- right channel is a tributary. Several juvenile ARCH were observed at this site during a 2007 survey, suggesting at least occasional use by this species.

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-123-4a
UTM Coordinates: 17 W 598486 7819668

Date/Time Surveyed: 28-Aug-2008/13:45

Photographs

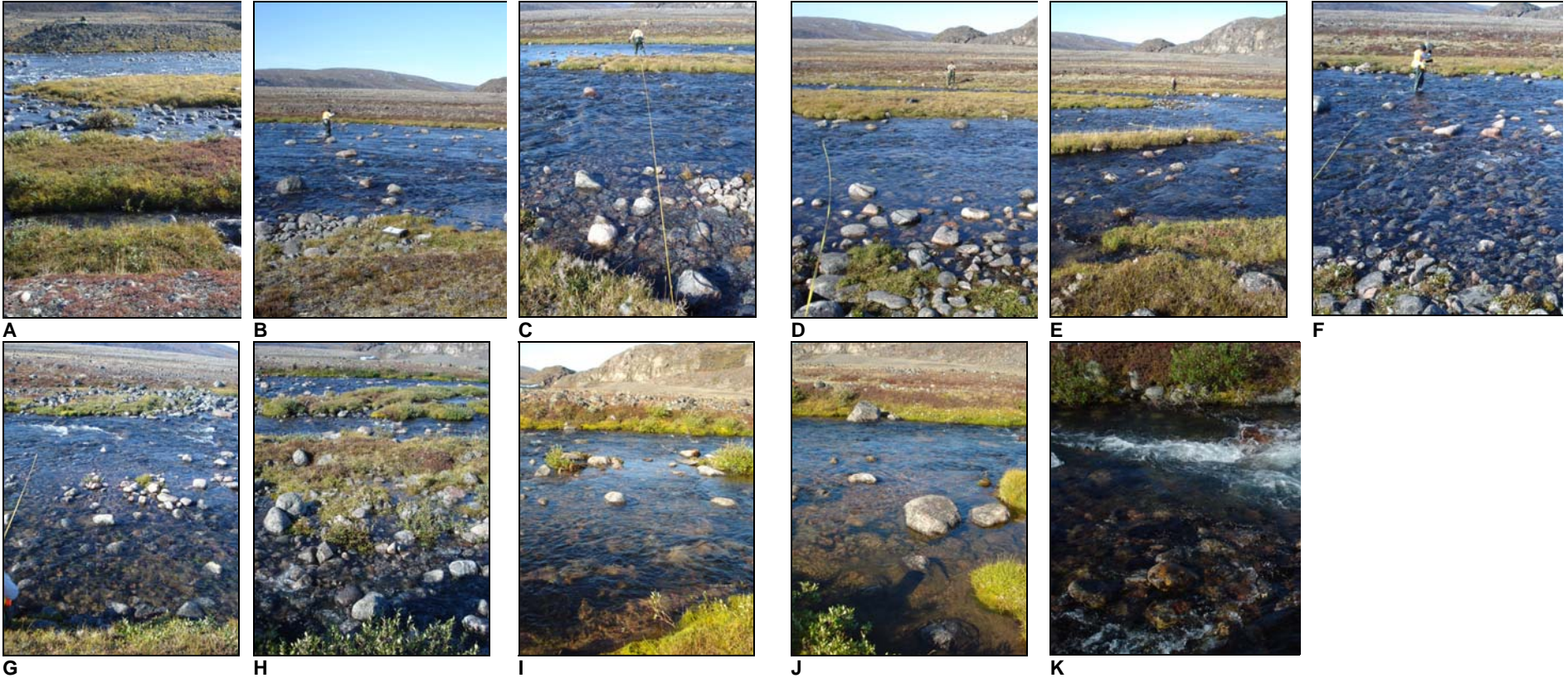


Figure 1. Views of available stream habitat at 20 m intervals starting at 100 m downstream (A) and ending at 100 m upstream (K).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-123-5a
UTM Coordinates: 17 W 598486 7819646

Date/Time Surveyed: 28-Aug-2008/16:09

General Physical Characteristics

Floodplain Width (m):	~800	Channel Pattern:	Sinuuous	Stage:	High
Channel Confinement:	PC-C	Channel Gradient (range):	1-10°	Flow Regime:	PER
Bank Height (range in m):	20-40	Bank Shape:	S	T_w (°C):	7.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
20D	6.5	8	0.14	0.13	0.11	0.20	0.55	0.60	0.35	0.60
0	8.6	12	0.15	0.13	0.9	0.17	0.40	0.24	0.30	0.54
20U	15.4	16	0.17	0.15	0.24	0.24	0.38	0.40	0.68	0.68
40U	6.58	8	0.28	0.23	0.32	0.32	0.42	0.34	0.63	0.63
60U	6.8	9	0.15	0.17	0.26	0.28	0.21	0.26	0.81	0.81
80U	5.6	9	0.21	0.12	0.29	0.29	0.84	0.64	0.75	0.84
100U	8.4	12	0.18	0.36	0.21	0.36	0.33	0.75	0.46	0.75

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
20D	100						1	1	90	8	
0	100								90	10	
20U	60		10	30					50	45	5
40U	80		5	15					60	30	10
60U	90	10					5		20	70	5
80U	100								50	50	
100U	80	10	10					5	40	50	5

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-123-5a
UTM Coordinates: 17 W 598486 7819646

Date/Time Surveyed: 28-Aug-2008/16:09

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 5:00 **Electrofisher Settings:** 400V, 50Hz, 20%

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	0	-	-	-
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	High	High
NNST	No	No	Low	Low

Comments & Summary

After 20 D/S the stream joins other river.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-123-5a
UTM Coordinates: 17 W 598486 7819646

Date/Time Surveyed: 28-Aug-2008/16:09

Photographs



A



B



C



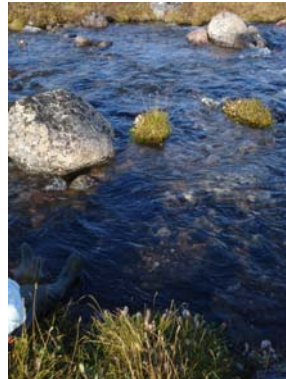
D



E



F



G

Figure 1. Views of available stream habitat at 20 m intervals starting at 20 m downstream (A) and ending at 100 m upstream (F).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-123-6a
UTM Coordinates: 17 W 598487 7819613

Date/Time Surveyed: 28-Aug-2008

General Physical Characteristics

Floodplain Width (m):	~800	Channel Pattern:	Sinuuous	Stage:	High
Channel Confinement:	PC-C	Channel Gradient (range):	4-10°	Flow Regime:	PER
Bank Height (range in m):	20-40	Bank Shape:	S	T_w (°C):	7.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
40D (2 chnls)	9.4	14	0.16	0.11	0.10	0.18	0.85	0.27	0.59	0.85
20D	4.1	7	0.18	0.14	0.14	0.23	0.12	0.81	0.27	0.81
0	4.4	12	0.20	0.13	0.16	0.22	0.33	0.40	0.33	1.01
20U	2.5	6	0.14	0.26	0.21	0.26	0.98	0.45	0.76	0.98

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
40D (2 chnls)	100								50	50	
20D	90	10							75	20	15
0	90		10						50	50	5
20U	100								80	20	

Fisheries Information

Electrofishing Conducted: N **Effort (min):** N/A **Electrofisher Settings:** N/A

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	High	High
NNST	No	No	Low	Low

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-123-6a
UTM Coordinates: 17 W 598487 7819613

Date/Time Surveyed: 28-Aug-2008

Comments & Summary

Downstream ends joins CV-124-4 and the upstream end joins CV-123-5. No barriers within 200m of crossing.

Photographs



A



B



C



D

Figure 1. Views of available stream habitat at 20 m intervals starting at 20 m downstream (A) and ending at 40 m upstream (D).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-123-7a
UTM Coordinates: 17 W 598490 7819542

Date/Time Surveyed: 30-Aug-2008/12:00

General Physical Characteristics

Floodplain Width (m):	~800	Channel Pattern:	Straight	Stage:	High
Channel Confinement:	N/M	Channel Gradient (range):	1-7°	Flow Regime:	PER
Bank Height (range in m):	N/A	Bank Shape:	S	T_w (°C):	6.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
100D	14.5	17	0.12	0.10	0.9	0.13	0.27	0.37	0.79	0.80
80D	4.6	15	0.21	0.26	0.18	0.26	0.57	0.78	0.36	0.78
60D	5.7	8	0.9	0.20	0.21	0.31	0.76	0.04	0.84	0.84
40D	3.6	14	0.24	0.26	0.16	0.26	0.69	1.15	0.41	1.15
20D	3.8	15	0.21	0.36	0.18	0.36	0.68	0.00	0.87	0.87
0	3.5	15	0.29	0.29	0.19	0.36	0.40	0.51	0.46	0.51
20U	5.4	10	0.36	0.23	0.34	0.36	0.13	0.61	0.85	0.85
40U	4.0	0.21	0.24	0.21	0.19	0.24	0.52	0.73	0.79	0.79
60U	4.4	40	0.25	0.31	0.33	0.33	0.66	0.85	0.22	0.85
80U	4.1	18	0.20	0.21	0.26	0.38	0.43	0.19	0.98	0.98
100U	5.8	15	0.21	0.21	0.30	0.30	0.38	0.25	1.01	1.01

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
100D	100								25	75	
80D	50			50					35	60	5
60D	75	5		20					10	80	10
40D	80			20					25	70	5
20D			20	80			10		20	65	5
0				100			20		25	50	5
20U	90	10					5		20	60	15
40U	60			40					25	75	
60U				75	25				5	45	50
80U			10		90				10	65	25
100U			10	10	80				5	10	80

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – MARGINAL

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-123-7a
UTM Coordinates: 17 W 598490 7819542

Date/Time Surveyed: 30-Aug-2008/12:00

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 12:48 **Electrofisher Settings:** 700 V, 60 Hz, 12%

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	0	-	-	-
NNST	0	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	Moderate	Low
NNST	No	No	No	No

Comments & Summary

In 2008, electrofishing was not conducted at this site. The site was revisited on 14-Aug-2011 and electrofishing was conducted to confirm fish presence/absence. No fish were captured in 2011 (2011 results listed in the Fisheries Information section above), and while the habitat appeared to be high quality it was likely inaccessible due to low water downstream of the site. In some years, when water is higher, ARCH may use the habitat. As a result, the site's Fish Habitat Quality rating was adjusted from Important to Marginal.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – MARGINAL

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-123-7a
UTM Coordinates: 17 W 598490 7819542

Date/Time Surveyed: 30-Aug-2008/12:00

Photographs



A



B



C



D



E



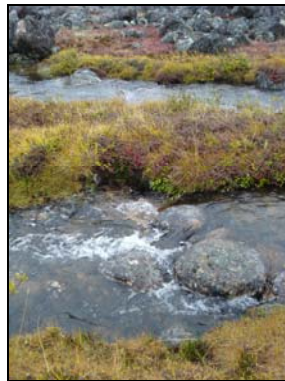
F



G



H



I



J



K

Figure 1. Views of available stream habitat at 20 m intervals starting at 100 m downstream (A) and ending at 100 m upstream (K).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-124-1a
UTM Coordinates: 17 W 598495 7819394

Date/Time Surveyed: 30-Aug-2008/13:13

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	Straight	Stage:	High
Channel Confinement:	PC-C	Channel Gradient (range):	1-15°	Flow Regime:	PER
Bank Height (range in m):	10-30	Bank Shape:	S	Tw (°C):	6.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
100D	7.65	15	0.21	0.26	0.19	0.26	0.89	0.59	1.22	1.22
80D	5.5	22	0.24	0.32	0.22	0.32	0.93	0.14	0.33	1.4
60D	6.6	18	0.24	0.18	0.23	0.38	0.35	0.07	0.41	1.41
40D	6.8	12	0.26	0.23	0.26	0.26	0.93	0.56	1.03	1.18
20D	15.8	25	0.16	0.13	0.20	0.25	0.14	0.63	0.71	0.74
0	15.9	40	0.22	0.36	0.20	0.36	0.21	0.19	0.21	0.41
20U	9.7	40	0.21	0.29	0.21	0.44	0.03	0.24	0.38	0.58
40U	23.4	30	0.18	0.16	0.9	0.34	0.09	0.54	0.21	0.92
60U	14.4	20	0.22	0.16	0.31	0.31	0.36	0.08	0.42	0.49
80U	8.6	20	0.31	0.44	0.29	0.44	0	0.31	0.72	0.72
100U	11.0	18	0.21	0.19	0.23	0.45	0.57	0.36	0.24	0.57

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
100D	50				50				10	70	20
80D	50				50				10	70	20
60D	50			50			5		5	75	15
40D					100					20	80
20D	100									30	70
0	95		5					5	35	40	20
20U	50		5	45			5		10	80	5
40U	90	10								10	10
60U	100									10	90
80U	80			20						50	50
100U	50				50					10	90

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-124-1a
UTM Coordinates: 17 W 598495 7819394

Date/Time Surveyed: 30-Aug-2008/13:13

Fisheries Information

Electrofishing Conducted: N **Effort (min):** N/A **Electrofisher Settings:** N/A

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	-	-	-	-
NNST	-	-	-	-

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	High	High
NNST	No	No	Low	Low

Comments & Summary

At 40 D/S, there is a possible barrier to NNST movement.

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-124-1a
UTM Coordinates: 17 W 598495 7819394

Date/Time Surveyed: 30-Aug-2008/13:13

Photographs

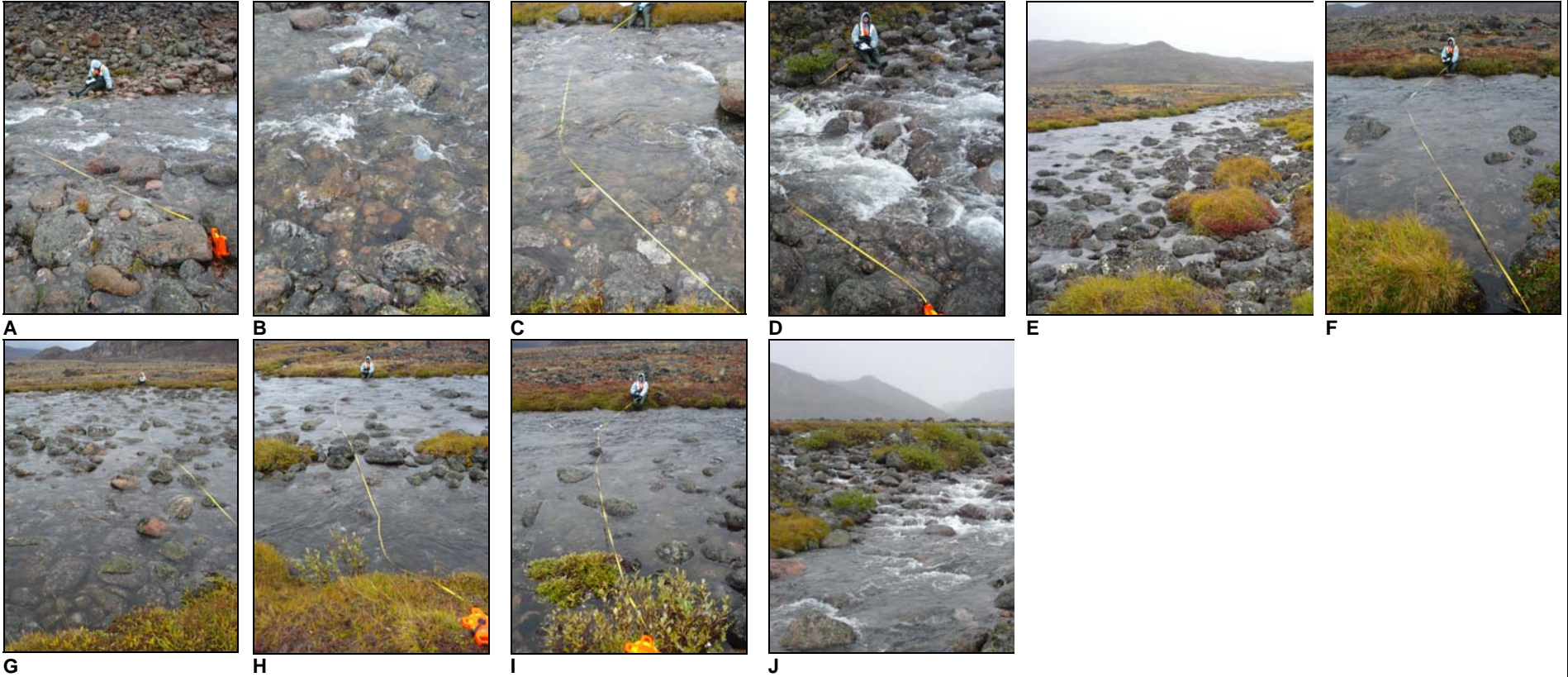


Figure 1. View of available stream habitat at 100 m d/s (A), 80 m d/s (B), 60 m d/s (C), 40 m d/s (D) at the crossing (E), 20 m u/s (F) 40 m u/s (G) 60 m u/s (H) 80 m u/s (I) and possible NNST barriers located downstream (J).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-124-2a
UTM Coordinates: 17 W 598497 7819322

Date/Time Surveyed: 30-Aug-2008/14:33

General Physical Characteristics

Floodplain Width (m):	~800	Channel Pattern:	Straight	Stage:	High
Channel Confinement:	PC-C	Channel Gradient (range):	3-6°	Flow Regime:	PER
Bank Height (range in m):	10-40	Bank Shape:	V	T _w (°C):	6.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
100D	9.7	15	0.14	0.14	0.32	0.32	0.29	0.46	0.67	0.67
80D	9.5	12	0.22	0.19	0.13	0.22	1.04	1.13	0.05	1.13
60D	7.6	10	0.20	0.16	0.20	0.20	0.80	1.08	1.42	1.42
40D	5	10	0.33	0.29	0.26	0.33	0.95	1.08	0.52	1.08
20D	3.9	10	0.24	0.22	0.18	0.24	0.67	1.04	0.48	1.04
0	4.9	10	0.21	0.21	0.42	0.42	0.83	0.84	0.03	0.84
20U	3.8	10	0.31	0.42	0.30	0.62	0.00	1.28	0.63	1.28
40U	6.4	20	0.17	0.21	0.23	0.23	0.28	0.50	1.27	1.27
60U	6.2	20	0.25	N/M	0.20	0.25	1.02	N/M	1.38	1.38
80U	16.2	25	0.16	0.22	0.9	0.22	0.45	0.59	0.50	0.85
100U	8.3	15	0.12	0.17	0.26	0.26	0.16	0.34	0.46	0.73

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
100D	50				50					30	70
80D					100					5	95
60D					100					5	95
40D					100				5	5	90
20D					100					40	60
0					100					10	90
20U					100		5			15	80
40U	100								10	80	10
60U	100								10	80	10
80U	100						5		15	70	10
100U	100								45	45	10

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-124-2a
UTM Coordinates: 17 W 598497 7819322

Date/Time Surveyed: 30-Aug-2008/14:33

Fisheries Information

Electrofishing Conducted: N **Effort (min):** N/A **Electrofisher Settings:** N/A

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	High	High
NNST	No	No	Low	Low

Comments & Summary

Baffinland Iron Mines
Mary River Project



North/South Consultants Inc.
Aquatic Environment Specialists

Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-124-2a
UTM Coordinates: 17 W 598497 7819322

Date/Time Surveyed: 30-Aug-2008/14:33

Photographs

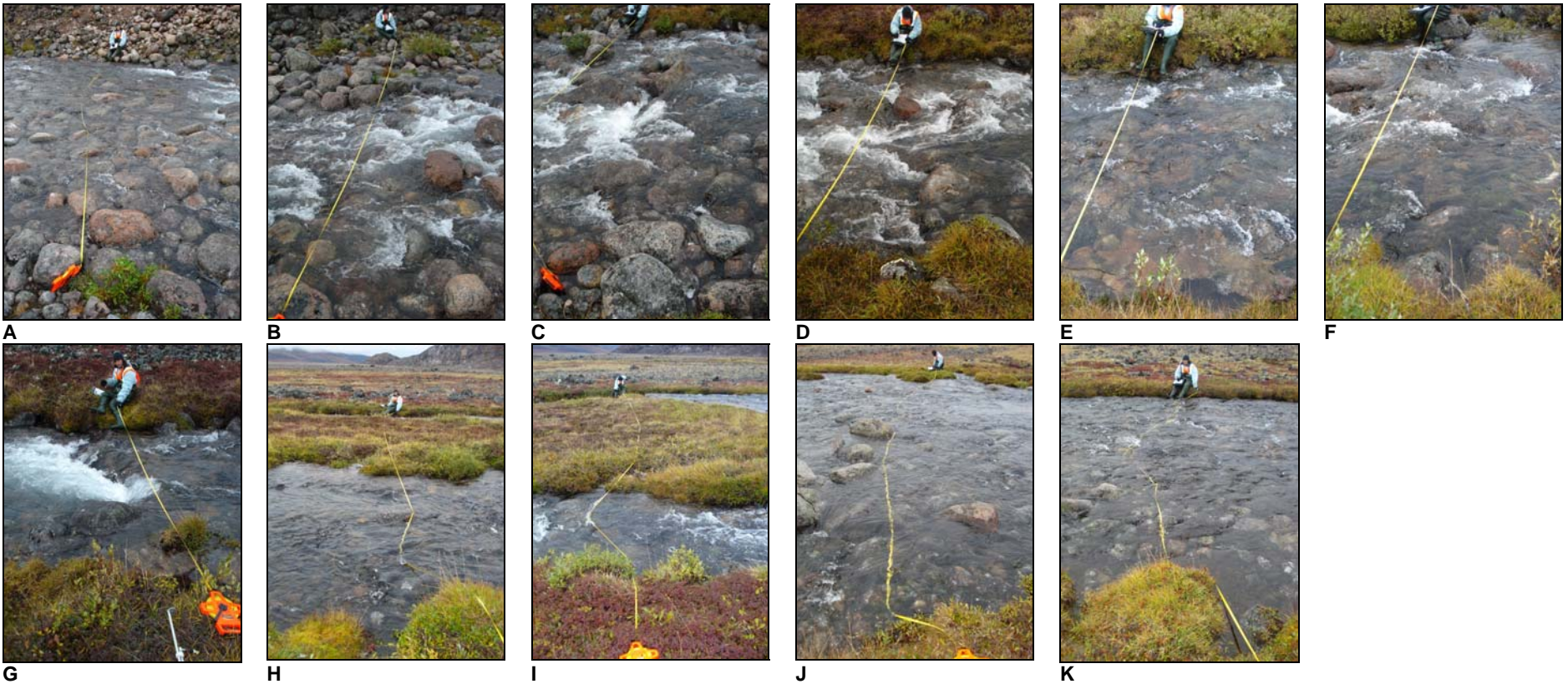


Figure 1. View of available stream habitat at 100 m d/s (A), 80 m d/s (B), 60 m d/s (C), 40 m d/s (D) 20 m d/s (E), at the crossing (F) 20 m u/s (G) 40 m u/s (H) 60 m u/s (I) 80 m u/s (J) 100 m u/s (K)

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-124-3a
UTM Coordinates: 17 W 598501 7819212

Date/Time Surveyed: 30-Aug-2008/15:45
 31-Aug-2008/08:30

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	Straight	Stage:	High
Channel Confinement:	PC-C	Channel Gradient (range):	2-6°	Flow Regime:	PER
Bank Height (range in m):	5-20	Bank Shape:	S	T_w (°C):	6.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
100D	10.1	25	0.22	0.32	0.18	0.32	0.44	0.73	0.53	0.73
80D	7.8	15	0.18	0.24	0.11	0.26	1.07	0.74	0.07	1.07
60D	5.8	8	0.16	0.24	0.35	0.35	0.47	0.53	0.55	0.55
40D	4.2	7	0.26	0.27	0.18	0.27	1.20	1.34	1.09	1.34
20D	5.2	15	0.16	0.15	0.28	0.28	0.04	0.81	0.99	1.09
0	5.5	15	0.14	0.20	0.26	0.26	0.39	0.76	0.66	0.90
20U	3.8	15	0.16	0.21	0.16	0.28	0.60	1.03	0.66	1.41
40U	6.1	17	0.17	0.18	0.15	0.18	0.76	0.62	0.81	1.16
60U	11.4	20	0.29	0.8	0.17	0.29	0.21	0.21	0.34	0.53
80U	9.4	25	0.25	0.25	0.24	0.25	0.16	0.42	0.32	0.46
100U	13.6	24	0.28	0.12	0.16	0.28	0.34	1.21	0.63	1.21

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
100D	20				80				10	10	80
80D	100									50	50
60D	50				50				10	30	60
40D	25				75				15	15	70
20D	100								10	70	20
0	50			40	10		10		20	70	
20U	50			50				5	15	80	
40U	100						5		25	70	
60U	90	10							15	60	25
80U	100								10	80	10
100U	40				60					20	80

Baffinland Iron Mines
Mary River Project



North/South Consultants Inc.
Aquatic Environment Specialists

Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-124-3a
UTM Coordinates: 17 W 598501 7819212

Date/Time Surveyed: 30-Aug-2008/15:45
 31-Aug-2008/08:30

Fisheries Information

Electrofishing Conducted: N **Effort (min):** N/A **Electrofisher Settings:** N/A

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	Moderate	Moderate
NNST	No	No	Low	Low

Comments & Summary

All fines are located near banks (and would not exist in high water levels) and found in fast velocities. Some juvenile ARCH were observed at this site during a 2007 survey, suggesting at least occasional use by this species.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-124-3a
UTM Coordinates: 17 W 598501 7819212

Date/Time Surveyed: 30-Aug-2008/15:45
31-Aug-2008/08:30

Photographs

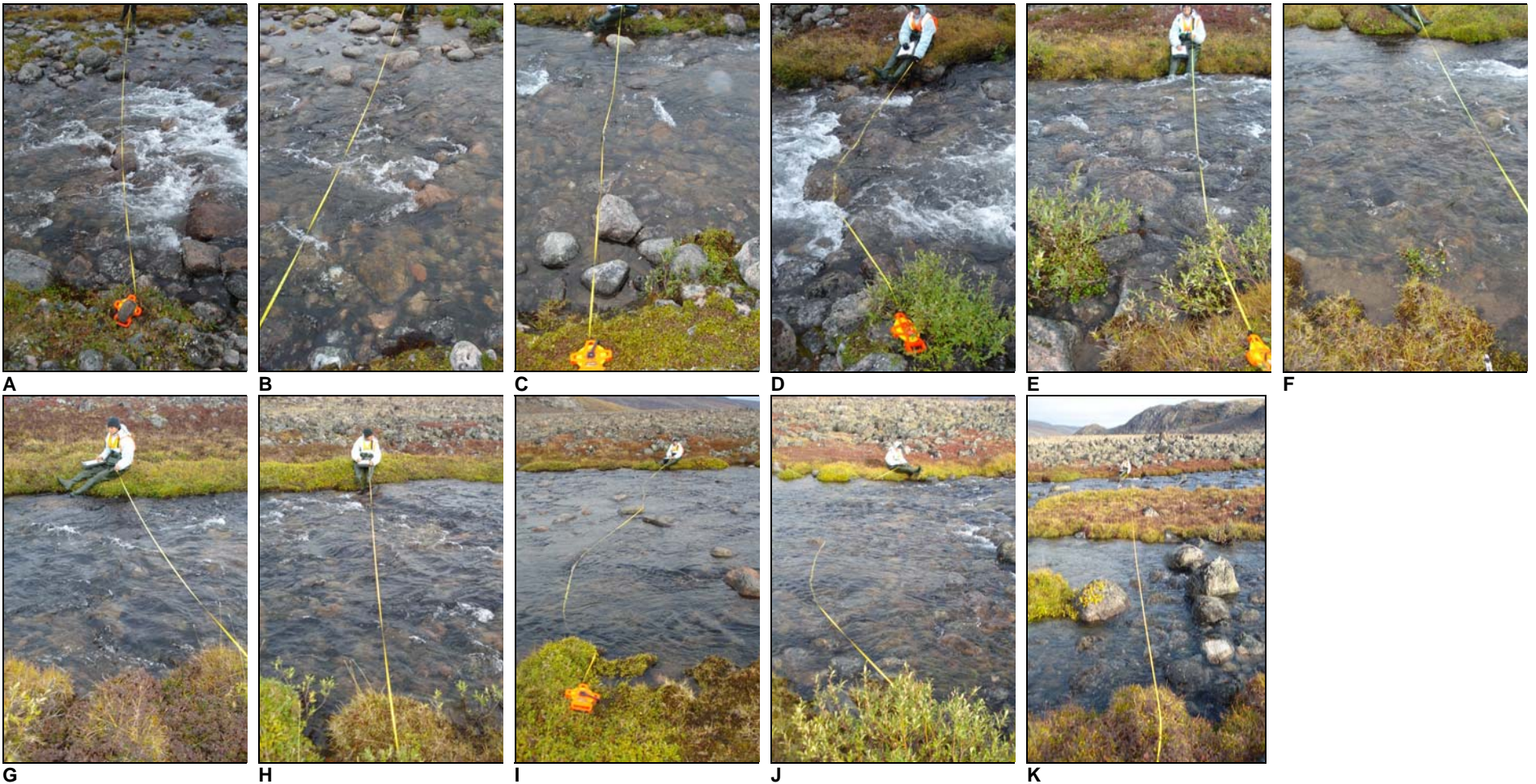


Figure 1. View of available stream habitat at 100 m d/s (A), 80 m d/s (B), 60 m d/s (C), 40 m d/s (D) 20 m d/s (E), at the crossing (F) 20 m u/s (G) 40 m u/s (H) 60 m u/s (I) 80 m u/s (J) 100 m u/s (K)

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-124-4a
UTM Coordinates: 17 W 598501 7818905

Date/Time Surveyed: 13-Aug-07 / 01:43

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	Meandering	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	3°	Flow Regime:	INT
Bank Height (range in m):	0.35	Bank Shape:	V	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	Low	No
NNST	No	No	No	No

Comments & Summary

The maximum water depth at the crossing was 0.08 m and wetted width and high water width were 4.8 m and 5.0 m respectively. The substrate was 90% fines and 10% cobble and the stream morphology was 95% pool and 5% riffle. Barriers present – dry and steep downstream. Lakes present – Cockburn Lake downstream.

Suitable habitat at the crossing for both species but it may be inaccessible due to a steep drop ~15-20m DS. Marginal at best, even during high water periods.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – MARGINAL

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-124-4a
UTM Coordinates: 17 W 598501 7818905

Date/Time Surveyed: 13-Aug-07 / 01:43

Photographs



A

B

C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-125-1a
UTM Coordinates: 17 W 598352 7818400

Date/Time Surveyed: 13-Aug-07 / 01:27

General Physical Characteristics

Floodplain Width (m):	>200	Channel Pattern:	Flooded terrestrial	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	4°	Flow Regime:	INT
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

The maximum water depth at the crossing was 0.03 m and wetted width was 2.5 m (bankfull width was undefined). The substrate was 45% flooded terrestrial, 45% fines, 5% gravel and 5% cobble. The stream morphology was 95% pool and 5% riffle. Barriers present –steep ~75m downstream. Lakes present – Cockburn Lake downstream.

The crossing might be suitable for ARCH and, in particular, NNST. However, the crossing likely inaccessible due to low water levels and the steep DS gradient.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-125-1a
UTM Coordinates: 17 W 598352 7818400

Date/Time Surveyed: 13-Aug-07 / 01:27

Photographs



A



B



C

Figure 1. View of habitat upstream of crossings (A), at the crossings (B) and downstream of crossings (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-125-3
UTM Coordinates: 17 W 598373 7817632

Date/Time Surveyed: 13-Aug-07 / 01:10

General Physical Characteristics

Floodplain Width (m):	> 200	Channel Pattern:	Sinuuous	Stage:	N/A
Channel Confinement:	PC	Channel Gradient (range):	10-12°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

There was no water at this crossing but the high water channel width was 0.4 m. Barriers present – dry at crossing and steep downstream. Lakes present – Cockburn Lake downstream

Habitat is dry at the crossing and is likely inaccessible even when wetted, due to steep gradient DS.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-125-3
UTM Coordinates: 17 W 598373 7817632

Date/Time Surveyed: 13-Aug-07 / 01:10

Photographs



A

B

C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-126-1
UTM Coordinates: 17 W 598542 7817373

Date/Time Surveyed: 13-Aug-07 / 01:00

General Physical Characteristics

Floodplain Width (m):	22.9	Channel Pattern:	Sinuuous	Stage:	N/A
Channel Confinement:	PC	Channel Gradient (range):	11°	Flow Regime:	INT
Bank Height (range in m):	0.40	Bank Shape:	V	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

The maximum water depth at the crossing was 0.05 m and wetted width and high water width were 1.2 m and 1.5 m respectively. The substrate was 75% fines and 25% cobble and the stream morphology was 90% pool and 10% cascades. Barriers present – cascades downstream. Lake(s) present – downstream.

No fish habitat at the crossing due to low water and, in particular, steep gradient. There is likely fish habitat in this stream near the confluence with the DS lake, but none this far US.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-126-1
UTM Coordinates: 17 W 598542 7817373

Date/Time Surveyed: 13-Aug-07 / 01:00

Photographs



Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-127-1
UTM Coordinates: 17 W 598611 7816294

Date/Time Surveyed: 13-Aug-07 / 00:44

General Physical Characteristics

Floodplain Width (m):	>200	Channel Pattern:	Flooded terrestrial	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	N/M	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

There was no water at the crossing but high water width was 22.9 m. Barriers present – dry downstream and at crossing. Lake(s) present – downstream.

Unlikely to provide suitable fish habitat even during periods of high water. If fish are present in DS pond(s), they may use habitat near the confluence but likely none at the crossing.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-127-1
UTM Coordinates: 17 W 598611 7816294

Date/Time Surveyed: 13-Aug-07 / 00:44

Photographs

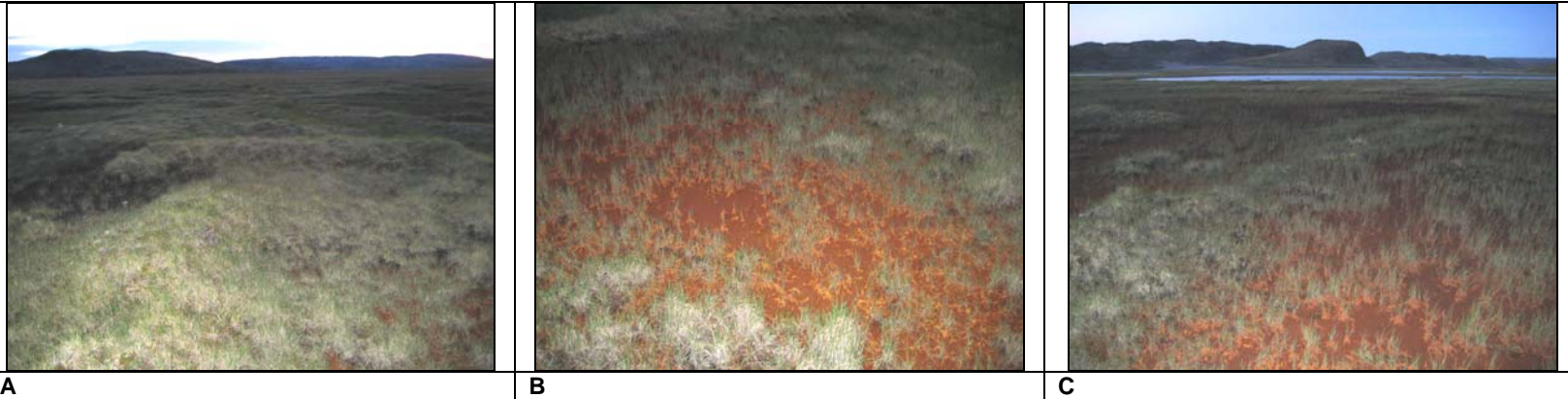


Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-127-2
UTM Coordinates: 17 W 598585 7815834

Date/Time Surveyed: 3-Aug-08 / 13:20

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	N/M	Stage:	Dry (low)
Channel Confinement:	NC	Channel Gradient (range):	N/M	Flow Regime:	EPH
Bank Height (range in m):	N/M	Bank Shape:	N/M	T_w (°C):	21.0

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

Site is 100% terrestrial vegetation and mud, no water. Noticeable channel, but is simply a depression in the vegetation that appears as isolated pools when wetted. Assessment site is not part of a wet stream; it's actually the edge of the same lake/pond as LE-127-3. A tiny stream from the hills is dry, but may drain into the lake at the crossing.

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

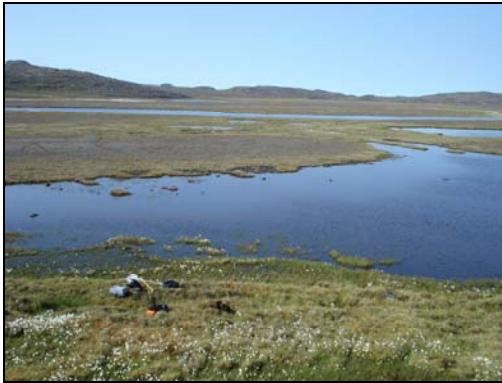
Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-127-2
UTM Coordinates: 17 W 598585 7815834

Date/Time Surveyed: 3-Aug-08 / 13:20

Photographs



A



B



C



D



E



F

Figure 1. View of habitat including nearby lake encroachment site, at crossing (A), facing north (B), dry creek and lake encroachment site facing south (C), a close-up of substrate at lake encroachment site (D-E), and wetted sections of the stream (F).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-129-1
UTM Coordinates: 17 W 599372 7814493

Date/Time Surveyed: 3-Aug-08 / 15:30

General Physical Characteristics

Floodplain Width (m):	> 183	Channel Pattern:	Braided, dead end pools	Stage:	Normal
Channel Confinement:	NC-PC	Channel Gradient (range):	0-1°	Flow Regime:	PER
Bank Height (range in m):	UD(flooded)-0.1m	Bank Shape:	70% UD, 30% V	T_w (°C):	19.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
100D	32.75	70	0.06	0.20	0.05	0.31	0.20	0.13	0.04	0.24
80D	35.0	53	0.17	0.12	0.12	0.29	0.01	0.14	0.01	0.20
60D	22.50	55	0.12	0.02	0.19	0.36	0.18	0.00	0.16	0.23
40D (2 ch)	29.8	60	0.07	0.18	0.12	0.28	0.14	0.09	0.01	0.23
20D (3 ch)	27.6	55	0.13	0.12	0.09	0.27	0.17	0.12	0.00	0.29
0	29.50	50	0.06	0.19	0.16	0.40	0.00	0.02	0.08	0.08

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
100D	10	85	5				FT 25			50	25
80D	5	90	5				FT 20		40	30	10
60D	30	65	5				FT 35			40	25
40D	70	25	5				FT 35		20	45	
20D	35	60	5				FT 20		10	60	10
0	5	90	5				FT 35		10	50	5

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 12:31 **Electrofisher Settings:** 800V, 70Hz, 20%DC

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	5	0.40	61-170	2-44
NNST	13	1.03	23-61	<1-1

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-129-1
UTM Coordinates: 17 W 599372 7814493

Date/Time Surveyed: 3-Aug-08 / 15:30

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	Moderate	No
NNST	Moderate	No	High	Low

Comments & Summary

For this stream, the high water measurements were made to the edge of the standing water present; in all cases there was standing water up until the edge of the high water, but it was in isolated pools. Wetted width = portion of stream with flow. There is a layer of green and orange periphyton over all the rocks throughout the stream. Electrofished starting at 50 m downstream of crossing because the crossing is located at the outflow of lake LE-129-1 into the stream that contains CV-129-1. At 100 m D/S-1 channel, overflowing, terrestrial vegetation.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-129-1
UTM Coordinates: 17 W 599372 7814493

Date/Time Surveyed: 3-Aug-08 / 15:30

Photographs



A



B



C



D



E



F

Figure 1. View of habitat, 100 (A), 80 (B), 60 (C), 40 (D), and 20 m (E) downstream of crossing, and at the crossing (F).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-131-1
UTM Coordinates: 17 W 600672 7812732

Date/Time Surveyed: 13-Aug-07 / 21:57

General Physical Characteristics

Floodplain Width (m):	>200	Channel Pattern:	Flooded terrestrial	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	1°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

The maximum water depth at the crossing was 0.05 m and high water width was undefined (flooded terrestrial). Stream morphology was 100% pool and substrate was 100% flooded terrestrial. Barriers present – low water downstream and at crossing.

Low water levels and its large distance from overwintering sites likely contribute to no fish habitat at this crossing.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-131-1
UTM Coordinates: 17 W 600672 7812732

Date/Time Surveyed: 13-Aug-07 / 21:57

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-133-1
UTM Coordinates: 17 W 601003 7811332

Date/Time Surveyed: 13-Aug-07 / 22:36

General Physical Characteristics

Floodplain Width (m):	18.3	Channel Pattern:	Braided	Stage:	N/A
Channel Confinement:	N/M	Channel Gradient (range):	8°	Flow Regime:	INT
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

There was no water at this crossing and high water width was 1.0 m. Barriers present – dry downstream and at crossing. Lake(s) present - downstream

Even during spring high water, there is likely no fish habitat as far upstream as the crossing. Fish from the DS lake may use the lowermost reaches when wetted.

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-133-1
UTM Coordinates: 17 W 601003 7811332

Date/Time Surveyed: 13-Aug-07 / 22:36

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-133-2
UTM Coordinates: 17 W 600856 7810619

Date/Time Surveyed: 13-Aug-07 / 22:24

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	UD	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	N/M	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

There was no water at this crossing. Barriers present – dry downstream and at crossing. Lake(s) present - downstream

Though fish were observed in the DS lake, there is likely no fish habitat at the crossing even during spring.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-133-2
UTM Coordinates: 17 W 600856 7810619

Date/Time Surveyed: 13-Aug-07 / 22:24

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-134-1
UTM Coordinates: 17 W 600686 7810499

Date/Time Surveyed: 26-Aug-10

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	N/M	Stage:	N/A
Channel Confinement:	N/M	Channel Gradient (range):	N/M	Flow Regime:	INT
Bank Height (range in m):	N/M	Bank Shape:	N/M	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

Two parallel drainages between a small, shallow (< 3 m deep) pond upstream of crossing and a larger, deeper (> 4 m deep) waterbody downstream. No channel development. Steep, impassable gradient between the downstream lake and crossing location.

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-134-1
UTM Coordinates: 17 W 600686 7810499

Date/Time Surveyed: 26-Aug-10

Photographs



A



B



C

Figure 1. View of upstream waterbody (A), View of drainages and downstream waterbody on the left hand side (B) View from large waterbody looking upstream towards crossing area (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-134-3
UTM Coordinates: 17 W 600196 7810282

Date/Time Surveyed: 13-Aug-07 / 23:02

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	UD	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	N/M	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

There was no water at this crossing and high water channel width was undefined. Barriers present – dry downstream and at crossing. Lake(s) present – upstream and downstream

Crossing site is on the side of a hill. Even during high water, water levels at the site will remain very low due to the lack of a defined channel and the steep gradient. Fish are very unlikely to use the habitat at the crossing.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-134-3
UTM Coordinates: 17 W 600196 7810282

Date/Time Surveyed: 13-Aug-07 / 23:02

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-136-1
UTM Coordinates: 17 W 598959 7809568

Date/Time Surveyed: 13-Aug-07 / 22:53

General Physical Characteristics

Floodplain Width (m):	N/M	Channel Pattern:	UD-rock field	Stage:	N/A
Channel Confinement:	N/M	Channel Gradient (range):	1°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

There was no water at this crossing and high water channel width was undefined (rock field). Barriers present – dry downstream and at crossing. Lake(s) present – upstream and downstream

Fish unlikely to use habitat at the crossing even during high water due to distance from overwintering habitat and probable rock barriers.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-136-1
UTM Coordinates: 17 W 598959 7809568

Date/Time Surveyed: 13-Aug-07 / 22:53

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-136-2
UTM Coordinates: 17 W 598552 7809073

Date/Time Surveyed: 13-Aug-07 / 23:09

General Physical Characteristics

Floodplain Width (m):	> 200	Channel Pattern:	Flooded terrestrial	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	3°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	Low
NNST	No	No	Low	Low

Comments & Summary

The maximum depth at this crossing was 0.02 m and wetted channel width was 0.30 m. High water channel width was undefined (flooded terrestrial). Channel morphology was 95% pool and 5% riffle and the substrate was 90% fines and 10% cobble. Barriers present – low water downstream and at crossing. Lake(s) present – upstream and downstream

Not likely year-round habitat but may provide habitat for some rearing and allow for potential migration between the US and DS lakes during high water periods.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – MARGINAL

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-136-2
UTM Coordinates: 17 W 598552 7809073

Date/Time Surveyed: 13-Aug-07 / 23:09

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: BR-137-1
UTM Coordinates: 17 W 598663 7807981

Date/Time Surveyed: 25-Jul-08 / 00:20

General Physical Characteristics

Floodplain Width (m): > 200 **Channel Pattern:** Straight **Stage:** High
Channel Confinement: PC **Channel Gradient (range):** 1-3° **Flow Regime:** PER
Bank Height (range in m): UD-Flooded **Bank Shape:** None **T_w (°C):** 5.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	30%	75%	Max	25%	50%	75%	Max
40D	60.0	60.0	Can't reach	0.60	0.27	0.65	-	0.23	0.55	1.11-1.50
20D	75.0	75.0	Can't reach	0.58	0.12	0.70	-	0.51	0.68	1.11-1.50
0	80.0	80.0	Can't reach	0.42	0.27	0.50	-	0.40	0.54	1.19-1.50
20U	80.0	80.0	Can't reach	0.22	0.26	0.40	-	0.37	0.25	1.20-1.50
40U	90.0	90.0	Can't reach	0.40	0.32	0.50	-	0.47	0.19	0.87-1.50

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Rapid	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
40D	50	25	25					5	20	35	40
20D	80	10	10					5	15	40	40
0	80	10	10					5	15	40	40
20U	80	10	10					5	15	40	40
40U	80	10	10					5	15	40	40

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 9:50 **Electrofisher Settings:** 600V, 60Hz, 50%

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	8	0.81	45-90	1-8
NNST	0	-	-	-

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: BR-137-1
UTM Coordinates: 17 W 598663 7807981

Date/Time Surveyed: 25-Jul-08 / 00:20

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	High	High
NNST	No	No	Low	Low

Photographs



A



B



C



D



E

Figure 1. View of habitat at 40 (A) and 20 m downstream of crossing (B), at the crossing (C), and 20 (D) and 40 m upstream of crossing (E).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-138-1
UTM Coordinates: 17 W 598855 7806964

Date/Time Surveyed: 13-Aug-07 / 23:37

General Physical Characteristics

Floodplain Width (m):	> 200	Channel Pattern:	Flooded terrestrial	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	N/M	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

The wetted channel width at the crossing was undefined (flooded terrestrial) and the wetted width was not measured (nearly dry). Channel morphology was 100% pool and substrate was 100% flooded terrestrial. Barriers present – low water downstream and at crossing. Lake(s) present – downstream

Unlikely fish habitat even during high water. Some fish habitat may exist near the confluence with the DS lake, but fish are unlikely to use the marginal habitat near crossing.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-138-1
UTM Coordinates: 17 W 598855 7806964

Date/Time Surveyed: 13-Aug-07 / 23:37

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-140-1
UTM Coordinates: 17 W 598138 7805588

Date/Time Surveyed: 13-Aug-07 / 23:51

General Physical Characteristics

Floodplain Width (m):	> 200	Channel Pattern:	Braided	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	3°	Flow Regime:	INT
Bank Height (range in m):	0.10	Bank Shape:	S	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

The maximum depth at this crossing was 0.02 m and the wetted and high water channel width were 0.10 and 0.50 m, respectively. Channel morphology was 100% isolated pool and the substrate was 100% fines. Bank stability was low. Barriers present – low water downstream and at crossing.

Unlikely fish habitat even during high water. Some fish habitat may exist near the confluence with Steensby Inlet DS, but fish are unlikely to use the marginal habitat near crossing.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-140-1
UTM Coordinates: 17 W 598138 7805588

Date/Time Surveyed: 13-Aug-07 / 23:51

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: BR-141-1
UTM Coordinates: 17 W 597527 7805029

Date/Time Surveyed: 24Jul-08 / 23:15

General Physical Characteristics

Floodplain Width (m): ~100	Channel Pattern: Sinuous	Stage: High
Channel Confinement: UC	Channel Gradient (range): 0-1°	Flow Regime: PER
Bank Height (range in m): UD-Flooded	Bank Shape: UD-flooded	T_w (°C): N/M

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
40D	50.0	50.0	0.50	0.44	0.30	0.64	0.23	0.09	0.00	0.66
20D	60.0	60.0	-	-	-	1.25	-	-	-	0.01
0	45.0	45.0	-	-	-	0.49	-	-	-	0.01
20U	45.0	45.0	-	-	-	0.47	-	-	-	0.02
40U	45.0	45.0	-	-	-	0.58	-	-	-	0.16

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
40D	25	25	50				5	5	10	30	50
20D		40	60					5	20	45	30
0		40	60						30	40	30
20U		40	60						30	40	50
40U		40	60						30	30	40

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 9:45 **Electrofisher Settings:** 400V, 40Hz, 30%DC

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	2	0.21	42-90	1-8
NNST	4	0.41	38-50	<1-1

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: BR-141-1
UTM Coordinates: 17 W 597527 7805029

Date/Time Surveyed: 24Jul-08 / 23:15

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	High	Low
NNST	Low	No	High	Low

Comments & Summary

Baffinland Iron Mines
Mary River Project



North/South Consultants Inc.
Aquatic Environment Specialists

Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: BR-141-1
UTM Coordinates: 17 W 597527 7805029

Date/Time Surveyed: 24Jul-08 / 23:15

Photographs



A



B



C



D



E

Figure 1. View of habitat at (A) 40 (A) and 20 m downstream of crossing (B), at the crossing (C) and at 20 (D) and 40 m upstream of crossing.

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-142-1
UTM Coordinates: 17 W 597201 7804426

Date/Time Surveyed: 13-Aug-07 / 23:50

General Physical Characteristics

Floodplain Width (m):	~100	Channel Pattern:	Braided	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	4°	Flow Regime:	EPH
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	No	No
NNST	No	No	No	No

Comments & Summary

The crossing site was nearly dry and high water channel width was undefined (flooded terrestrial). Channel morphology was 95% pool and 5% riffle and substrate was 50% flooded terrestrial, 45% fines and 5% cobble. Barriers present – low water upstream, downstream and at crossing. Lake(s) present – upstream.

Usually inaccessible due to low water. The upstream lake appears to be too shallow to act as overwintering habitat, and any fish in the downstream lake will be unable to reach the crossing site due to low water levels and flooded terrestrial substrate.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – NO FISH HABITAT

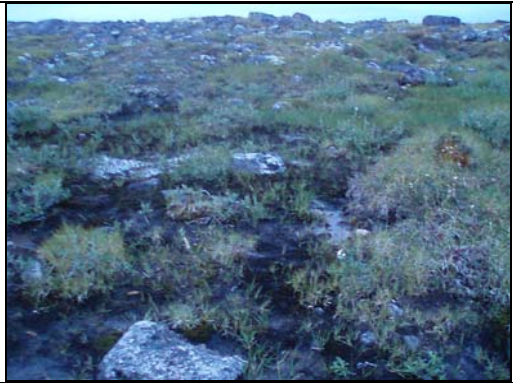
Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-142-1
UTM Coordinates: 17 W 597201 7804426

Date/Time Surveyed: 13-Aug-07 / 23:50

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-142-2
UTM Coordinates: 17 W 596927 7803835

Date/Time Surveyed: 24-Jul-08 / 21:50

General Physical Characteristics

Floodplain Width (m): ~50	Channel Pattern: Straight	Stage: N/M
Channel Confinement: NC	Channel Gradient (range): 0-1°	Flow Regime: PER
Bank Height (range in m): None	Bank Shape: N/M	T_w (°C): 9.0

Hydrology & Habitat Characteristics

Distance and Direction from Crossing (m)	Channel Width (m)		Water Depth (m)				Water Velocity (m/s)			
	Wetted	High Water	25%	50%	75%	Max	25%	50%	75%	Max
100D	60.0	60.0	-	0.40	-	~1.5	-	0.00	-	0.00
80D	50.0	50.0	-	0.44	-	0.8-1.0	-	0.00	-	0.00
60D	30.0	30.0	-	-	-	0.45	-	-	-	0.00
40D	32.0	32.0	-	-	-	0.48	-	-	-	0.00
20D	37.2	37.2	-	-	-	0.25	-	-	-	0.00
0	26.5	26.5	-	-	-	0.30	-	-	-	0.01
20U	28.9	28.9	0.09	0.40	0.22	0.48	0.00	0.18	0.00	0.18
40U	32.0	32.0	-	-	-	0.32	-	-	-	0.02
60U	50.0	58.0	-	-	-	0.60	-	-	-	0.00
80U	>100.0	>100.0	-	-	-	>1.00	-	-	-	0.00
100U	>100.0	>100.0	-	-	-	>1.50-2.00	-	-	-	0.02

Distance and Direction from Crossing (m)	Stream Morphology Composition (%)						Substrate Composition (%)				
	Riffle	Pool (<0.2 m)	Pool (>0.2 m)	Run	Cascade	Other	Fines	Gravel	Small Cobble	Large Cobble	Boulders
100D			100				30		10	30	30
80D			100				30		10	30	30
60D			100				30		10	30	30
40D			100				40		10	25	25
20D			100				30		10	30	30
0		50	50				30		10	30	30
20U	20	60	20				20		10	20	50
40U		50	50				30		10	30	30
60U			100				30		20	30	20
80U			100				30		30	30	10
100U			100				30		30	30	10

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-142-2
UTM Coordinates: 17 W 596927 7803835

Date/Time Surveyed: 24-Jul-08 / 21:50

Fisheries Information

Electrofishing Conducted: Y **Effort (min):** 10:45 **Electrofisher Settings:** 400V, 40Hz, 30%DC

Species	Total Caught/Observed	CPUE	Length Range (mm)	Weight Range (g)
ARCH	24	2.23	79-200	7-60
NNST	8	0.74	30-50	<1-1

Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No (maybe nearby)	No (nearby)	High	High
NNST	Moderate	No	High	High

Comments & Summary

Excellent habitat with some potential for movement between the 2 lakes here and additional lake DS (maybe overwintering DS and US).

Baffinland Iron Mines
Mary River Project



Fish Habitat Quality – IMPORTANT

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: CV-142-2
UTM Coordinates: 17 W 596927 7803835

Date/Time Surveyed: 24-Jul-08 / 21:50

Photographs



A



B



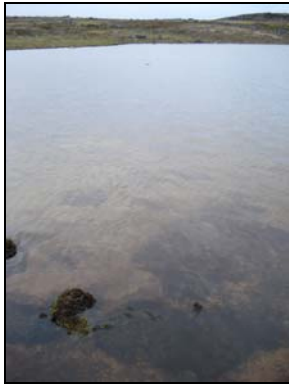
C



D



E



F



G



H

Figure 1. View of habitat (A-H).

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: 217
UTM Coordinates: 17 W 594998 7802718

Date/Time Surveyed: 14-Aug-07 / 00:33

General Physical Characteristics

Floodplain Width (m):	> 200	Channel Pattern:	Sinuuous	Stage:	N/A
Channel Confinement:	NC	Channel Gradient (range):	1°	Flow Regime:	INT
Bank Height (range in m):	UD	Bank Shape:	UD	T_w (°C):	N/M

Hydrology & Habitat Characteristics

N/M

Fisheries Information

Electrofishing Conducted:	N	Effort (min):	N/A	Electrofisher Settings:	N/A
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Fish Habitat Potential

Species	Spawning	Overwintering	Rearing	Migration Corridor
ARCH	No	No	Low	No
NNST	Low	No	Low	Low

Comments & Summary

The wetted width at the crossing was 5.5 m and the high water channel width was 10 m. Maximum water depth at the crossing was 0.1 m. Channel morphology was 5% riffle and 95% pool and the substrate was 95% fines and 5% cobble. Lake(s) present – upstream and downstream.

Although not ideal habitat, some fish might use it during high water periods (particularly NNST) and possibly year-round if fish are able to overwinter in the US and/or DS lakes.

**Baffinland Iron Mines
Mary River Project**



Fish Habitat Quality – MARGINAL

Rail Alignment Watercourse Crossing Assessment

Location

Crossing ID: 217
UTM Coordinates: 17 W 594998 7802718

Date/Time Surveyed: 14-Aug-07 / 00:33

Photographs



A



B



C

Figure 1. View of habitat upstream of crossing (A), at the crossing (B) and downstream of crossing (C).