520,500
522,000
523,500
525,000
7,950,000
7,948,500
7,947,000
7,945,500
7,944,000
CV-103
CV-102
CV-101
CV-100
CV-099
CV-098
CV-097
CV-096
CV-095
CV-094
CV-093
CV-092
CV-091
CV-205
Phillips Creek
0.5 0.25 0 0.5 km
SCALE

LEGEND:

- IMPORTANT FISH HABITAT
- MARGINAL FISH HABITAT
- NOT FISH BEARING HABITAT
- FALLS
- FISH BARRIER
- TOTE ROAD (EXISTING)
- CONTOUR
- WATER

NOTES:

1. BASE MAP: © HER MAJESTY THE QUEEN IN RIGHTS OF CANADA DEPARTMENT OF NATURAL RESOURCES (2009.) ALL RIGHTS RESERVED.
2. TOPOGRAPHY PROVIDED BY EAGLE MAPPING (2005)
3. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.
4. CONTOUR INTERVAL IS 25 M AND IS IN METRES.

REV	DD/MMM/10	ISSUED FOR	-	-	-	-
REV	01/09/2010	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

Milne Inlet Tote Road - 3e

North/South Consultants Inc.
Aquatic Environment Specialists

P/A NO.	REF NO.
-	-
DATE: 01/09/2010	REV 1

Path: \\terastation\GIS\Projects\Other\Mary River Freshwater\2010\Gemtd_Data\Report_Maps\ToteRD

Bulk Sample Road Watercourse Crossing Assessment

Figure 1: Downstream view from proposed crossing showing pool habitat.

Figure 2: Upstream view from proposed crossing showing more cascade-riffle habitat and cobble substrate.

Figure 3: View across CV-99.

Baffinland Iron Mines
Mary River Project
Watercourse Crossing Assessment

Location

Site: CV-99

UTM: 17W 0521811 / 7948819

Watercourse Name: Unknown River

Site Description

Watershed Size:	28.559 km^2
Regulated:	No
Channelized:	No
Bankfull Width:	24.0 m
Wetted Width:	8.0 m
Riffle-Crest Depth:	0.15 m
Pool Depth:	0.51 m
Residual Pool Depth:	0.36 m
Bankfull Depth:	0.44 m
Bank Height:	0.12 m
D_{95}:	0.88 m
D:	0.04 m
Confinement:	Moderately Confined
Channel Morphology:	Riffle-Pool
Channel Gradient:	1^0
Turbidity:	0.00 FTU
Side Slope	R – 5%; L – 5%
Approach:	R – 95%; L – 95%
Bank Stability:	High
Erosion Potential:	Low
Undercut Banks:	None

Mesohabitat Composition:	Riffle – 60%; Pool – 40%
Substrate Composition:	Cobble – 80%; Boulder – 10%; Gravel – 5%; Sand; 5%
Stream Cover:	Boulders – 10%
Riparian Vegetation:	Moss, willows, fireweed
Aquatic Vegetation:	None
Unique Features:	None
Summary:	This is a large-sized stream characterized by riffles and pools. Substrate is predominantly cobble and the banks have low erosion potential. Cover is relatively limited.

Fish Habitat Quality

Important

Potential Fish Utilization

Arctic Char

Spawning:	Possible
Migration:	Possible
Rearing:	Yes
Overwintering:	Unlikely

Ninespine Stickleback

Spawning:	Possible
Migration:	Possible
Rearing:	Possible
Overwintering:	Unlikely

Comments

This waterbody has suitable habitat for several life cycle stages of char though it is likely used primarily for rearing of young fish. Many YOY and juvenile char were observed and captured during fisheries investigations. Reduced turbidity may prevent extensive use by stickleback.

NORTH/SOUTH CONSULTANTS INC.
AQUATIC ENVIRONMENT SPECIALISTS

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name:	CV-099	**UTM:**	17W 521769 7948817
Site:	DS	**Dates Surveyed:**	24-Jun-08, 22-Jul-08

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: 1˚

Hydrology

	Spr	Sum
Bankfull Width (m):	12.80	12.80
Wetted Width (m):	12.54	10.90
Riffle-Crest Depth (m):	0.40	0.41
Pool Depth (m):	0.16	0.10
D (m):	NM	NM
D_{95} (m):	0.86	0.86
Point Velocities (m/s)		
Riffle:	1.84	1.58
Pool:	0.17	0.03
Left culvert:	1.56	1.89

Stream/Riparian Habitat

Channel Morphology: 60% riffle, 20% run, 20% pool

Substrate Composition: 70% cobble, 15% sand, 14% gravel, 1% boulder

Stream Cover: 21% lg. cobble/ boulders

Aquatic Vegetation: None

Riparian Vegetation: Willows & grasses

Barriers Present (Y/N): N
Location: NA

Lakes Present (Y/N): N
Location: NA

L/R Bank Characteristics

	Spr	Sum
Bank Height (L/R; m):	NM	0.25/0.25
Bank Stability:	Low	Low
Erosion Potential:	High	High

Water Quality

	Spr	Sum
Specific Conductance (µS/cm):	114.0	22.3
TDS (g/l):	0.07	0.14
DO (mg/l)	13.48	11.82
%DO:	104.1	NM
Water Temp (˚C):	4.0	7.9

Fish Habitat

	Spr	Sum
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - H NNST - N	ARCH - H NNST - N
Migration:	ARCH - H NNST - N	ARCH - M NNST - N

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) from the habitat assessment downstream of CV-099 during spring 2008.

Figure 2. View upstream (a), downstream (b), and across (c) from the habitat assessment downstream of CV-099 during summer 2008.

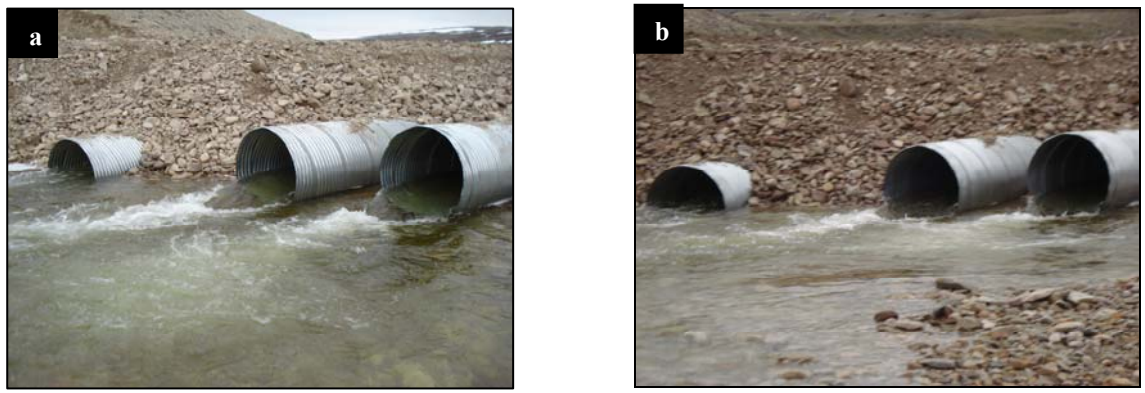

Figure 3. View from the downstream end of the culvert at crossing CV-099 during spring (a) and summer (b) 2008.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name:	CV-099	**UTM:**	17W 521835 7948814
Site:	US	**Dates Surveyed:**	24-Jun-08, 22-Jul-08

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: 1˚

Hydrology

	Spr	Sum
Bankfull Width (m):	36.56	36.56
Wetted Width (m):	35.65	25.45
Riffle-Crest Depth (m):	0.25	0.22
Pool Depth (m):	0.50	0.45
D (m):	NM	NM
D_{95} (m):	0.64	0.64
Point Velocities (m/s)		
Riffle:	1.43	0.91
Pool:	0.01	0.00
Behind a rock:	NM	0.21

Stream/Riparian Habitat

Channel Morphology: 80% riffle, 20% pool

Substrate Composition: 85% cobble, 10% sand, 4% gravel, 1% boulder

Stream Cover: 26% lg. cobble/ boulder, 20% deep pools

Aquatic Vegetation: None

Riparian Vegetation: Grasses and mosses

Barriers Present (Y/N): N
Location: NA

Lakes Present (Y/N): N
Location: NA

L/R Bank Characteristics

	Spr	Sum
Bank Height (L/R; m):	NM	0.20/0.20
Bank Stability:	Low	Low
Erosion Potential:	High	High

Water Quality

	Spr	Sum
Specific Conductance (µS/cm):	113.0	22.6
TDS (g/l):	0.07	0.15
DO (mg/l)	13.50	12.03
%DO:	104.2	NM
Water Temp (˚C):	4.0	8.0

Fish Habitat

	Spr	Sum
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - L NNST - N	ARCH - M NNST - N
Migration:	ARCH - N NNST - N	ARCH - L NNST - N

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) from the habitat assessment upstream of CV-099 during spring 2008.

Figure 2. View upstream (a), downstream (b), and across (c) from the habitat assessment upstream of CV-099 during summer 2008.

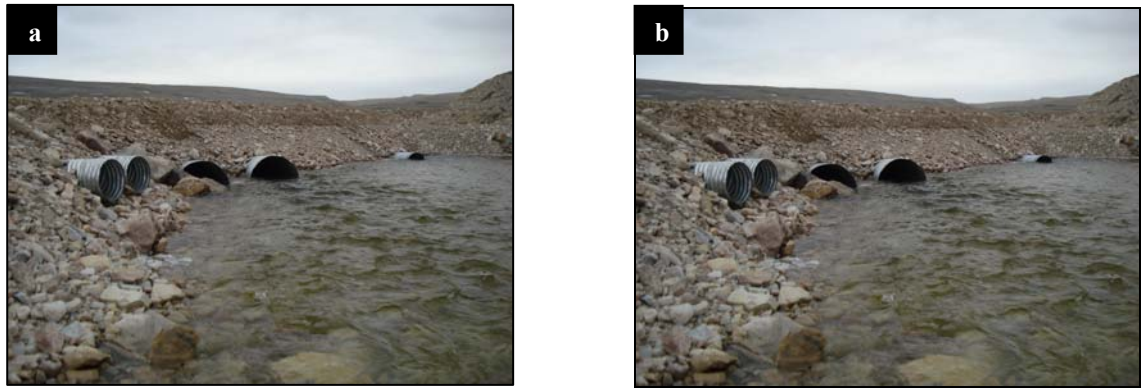

Figure 3. View from the upstream end of the culverts at crossing CV-099 during spring (a) and summer (b) 2008.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name: CV-099
Site: DS

UTM / Chainage: 17W 521811 7948820 / 37 + 840
Dates Surveyed: 3-Jul-09, 27-Aug-09

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: 1˚

Hydrology

	Spring	Fall
Bankfull Width (m):	12.80	12.80
Wetted Width (m):	9.14	7.31
Riffle Depths (m):	0.08, 0.10	0.11, 0.10
Pool Depth (m):	0.32	0.22
Culvert Depths (L,C) (m):	0.48, -	0.44, 0.20
Maximum Depth (m):	1.30	1.20
Point Velocities (m/s)		
Riffles:	0.76, 0.82	1.04, 1.10
Pool:	0.00	0.01
Culverts (L,C):	0.58, -	0.38, 1.74

Stream/Riparian Habitat

Channel Morphology: 50% flat, 25% riffle, 25% pool

Substrate Composition: 70% lg. cobble, 15% sm. cobble, 10% boulder, 5% sand

Stream Cover: 80% lg. cobble/ boulder, 10% deep pool

Aquatic Vegetation: Periphyton

Riparian Vegetation: Willows, moss

Barriers Present (Y/N): N
Location: NA

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	Undef	Undef
Bank Stability:	Mod	Mod
Erosion Potential:	Mod	Mod

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	122	343
pH:	8.52	8.63
Water Temp (˚C):	7.7	6.8

Fish Habitat

	Spring	Fall
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - H NNST - N	ARCH - H NNST - N
Migration:	ARCH - H NNST - N	ARCH - H NNST - N

Baffinland Iron Mines
Mary River Project

North/South Consultants Inc.
Aquatic Environment Specialists

Fish Habitat Quality – IMPORTANT

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site downstream of the crossing at CV-099 during early July, 2009.

Figure 2. View upstream (a), downstream (b), and across (b) at the habitat assessment site downstream of the crossing at CV-099 during late August, 2009.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name:	CV-099	**UTM / Chainage:**	17W 521811 7948820 / 37 + 840
Site:	US	**Dates Surveyed:**	3-Jul-09, 27-Aug-09

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: 1˚

Hydrology

	Spring	Fall
Bankfull Width (m):	36.56	36.56
Wetted Width (m):	36.56	17.37
Riffle Depths (m):	0.09, 0.22	0.10, 0.15
Culvert Depths (L,C) (m):	0.37, -	0.30, 0.38
Maximum Depth (m):	0.40	0.38
Point Velocities (m/s)		
Riffles:	0.49, 1.25	0.55, 1.18
Culverts (L,C):	0.87, -	0.77, 0.85

Stream/Riparian Habitat

Channel Morphology: 80% riffle, 20% pool

Substrate Composition: 50% sm. cobble, 25% lg. cobble, 10% gravel, 10%sand, 5% boulder

Stream Cover: 30% lg. cobble/ boulder

Aquatic Vegetation: Periphyton

Riparian Vegetation: Willows, moss

Barriers Present (Y/N): N

Location: NA

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	Undef	Undef
Bank Stability:	Mod	Mod
Erosion Potential:	Mod	Mod

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	124	-
pH:	8.52	-
Water Temp (˚C):	7.6	-

Fish Habitat

	Spring	Fall
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - H NNST - N	ARCH - H NNST - N
Migration:	ARCH - H NNST - N	ARCH - H NNST - N

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at CV-099 during early July, 2009.

Figure 2. View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at CV-099 during late August, 2009.

Bulk Sample Road Watercourse Crossing Assessment

Figure 1: Aerial view of proposed crossing showing a dry cobble/gravel creek bed.

Baffinland Iron Mines
Mary River Project
Watercourse Crossing Assessment

Location

Site: CV-95

UTM: 17W 0522618 / 7945799

Watercourse Name: Unknown River

Site Description

Watershed Size:	0.119 km^2
Regulated:	No
Channelized:	No
Bankfull Width:	N/A
Wetted Width:	N/A
Riffle-Crest Depth:	N/A
Pool Depth:	N/A
Residual Pool Depth:	N/A
Bankfull Depth:	N/A
Bank Height:	N/A
D_{95}:	N/A
D:	N/A
Confinement:	N/A
Channel Morphology:	N/A
Channel Gradient:	N/A
Turbidity:	N/A
Side Slope	N/A
Approach:	N/A
Bank Stability:	N/A
Erosion Potential:	N/A
Undercut Banks:	N/A

Mesohabitat Composition:	N/A
Substrate Composition:	N/A
Stream Cover:	N/A
Riparian Vegetation:	N/A
Aquatic Vegetation:	N/A
Unique Features:	N/A
Summary:	This is an extra small waterbody that was dry at the time of sampling in August. It is exclusively a spring run-off stream

Fish Habitat Quality

None

Potential Fish Utilization

Arctic Char

Spawning:	None
Migration:	None
Rearing:	None
Overwintering:	None

Ninespine Stickleback

Spawning:	None
Migration:	None
Rearing:	None
Overwintering:	None

Comments

This waterbody is ephemeral and provides no suitable fish habitat. Even during high water in spring there is not likely any fish use.

NORTH/SOUTH CONSULTANTS INC.
AQUATIC ENVIRONMENT SPECIALISTS

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name:	CV-094	**UTM:**	17W 522780 7945398
Site:	DS	**Dates Surveyed:**	24-Jun-08, 23-Jul-08

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: 8˚

Hydrology

	Spr	Sum
Bankfull Width (m):	16.45	16.45
Wetted Width (m):	7.20	6.80
Cascade-Crest Depth (m):	0.24	0.30
Pool Depth (m):	NA	0.35
D (m):	NM	NM
D_{95} (m):	1.80	1.80
Point Velocities (m/s)		
Cascade:	1.18	1.20
Pool:	NA	0.11
Culvert:	2.48	1.60

Stream/Riparian Habitat

Channel Morphology: 60 cascade 40% pool

Substrate Composition: 40% cobble, 30% gravel, 20% boulder, 10% sand

Stream Cover: 50% lg. cobble/ boulders, 20% d. pool

Aquatic Vegetation: None

Riparian Vegetation: Grasses and willow

Barriers Present (Y/N): Y
Location: 30m DS

Lakes Present (Y/N): N
Location: NA

L/R Bank Characteristics

	Spr	Sum
Bank Height (L/R; m):	Undef	Undef
Bank Stability:	Mod	Mod
Erosion Potential:	Mod	Mod

Water Quality

	Spr	Sum
Specific Conductance (µS/cm):	136.0	22.4
TDS (g/l):	0.09	0.15
DO (mg/l)	13.52	11.81
%DO:	105.0	NM
Water Temp (˚C):	4.5	7.5

Fish Habitat

	Spr	Sum
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - N NNST - N	ARCH - N NNST - N
Migration:	ARCH - N NNST - N	ARCH - N NNST - N

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) from the habitat assessment downstream of CV-094 during spring 2008.

Figure 2. View upstream (a), downstream (b), and across (c) from the habitat assessment downstream of CV-094 during summer 2008.

Figure 3. View from the downstream end of the culvert at crossing CV-094 during spring (a) and summer (b) 2008. View of the natural fish barrier 30 m downstream from the crossing at CV-094 (c).

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name:	CV-094	**UTM:**	17W 522817 7945391
Site:	US	**Dates Surveyed:**	24-Jun-08, 23-Jul-08

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: 8˚

Hydrology

	Spr	Sum
Bankfull Width (m):	42.96	42.96
Wetted Width (m):	6.70	10.40
Cascade-Crest Depth (m):	0.24	0.19
Pool Depth (m):	0.30	0.20
D (m):	NM	NM
D_{95} (m):	1.34	1.34
Point Velocities (m/s)		
Cascade:	1.04	0.94
Pool:	0.17	0.00
Behind a rock:	NM	NM

Stream/Riparian Habitat

Channel Morphology: 50% cascade, 50% pool

Substrate Composition: 70% cobble, 20% boulder, 10% gravel

Stream Cover: 50% lg. cobble/ boulder, 20% deep pools

Aquatic Vegetation: None

Riparian Vegetation: Willows

Barriers Present (Y/N): N
Location: NA

Lakes Present (Y/N): N
Location: NA

L/R Bank Characteristics

	Spr	Sum
Bank Height (L/R; m):	Undef	Undef
Bank Stability:	Mod	Mod
Erosion Potential:	Mod	Mod

Water Quality

	Spr	Sum
Specific Conductance (µS/cm):	136.0	22.9
TDS (g/l):	0.09	0.15
DO (mg/l)	13.65	11.86
%DO:	106.2	NM
Water Temp (˚C):	4.5	7.5

Fish Habitat

	Spr	Sum
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - N NNST - N	ARCH - N NNST - N
Migration:	ARCH - N NNST - N	ARCH - N NNST - N

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) from the habitat assessment upstream of CV-094 during spring 2008.

Figure 2. View upstream (a), downstream (b), and across (c) from the habitat assessment upstream of CV-094 during summer 2008.

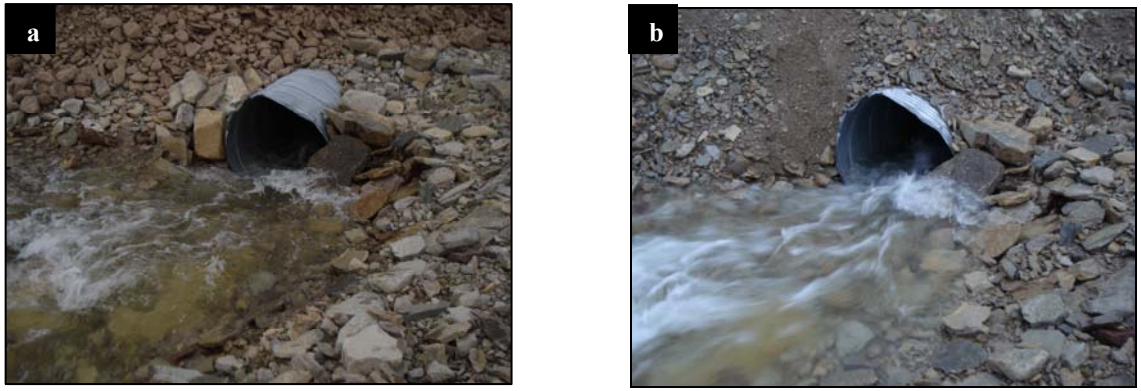

Figure 3. View from the upstream end of the culverts at crossing CV-094 during spring (a) and summer (b) 2008.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name: CV-094
Site: DS
UTM / Chainage: 17W 522805 7945397 / 41 + 613
Dates Surveyed: 3-Jul-09, 27-Aug-09

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: 8˚

Hydrology

	Spring	Fall
Bankfull Width (m):	16.45	16.45
Wetted Width (m):	N/M	8.23
Riffle Depth (m):	N/M	0.21
Cascade Depth (m)	N/M	0.06
Pool Depth (m)	N/M	0.15
Left Culvert Depth (m):	N/M	0.08
Maximum Depth (m):	N/M	0.25
Point Velocities (m/s)		
Riffle:	N/M	0.55
Cascade:	N/M	0.87
Pool:	N/M	0.00
Left Culvert:	N/M	0.20

Stream/Riparian Habitat

Channel Morphology: 60% cascade/riffle, 40% pool

Substrate Composition: 30% gravel, 30% lg. cobble, 20% boulder, 10% sm. cobble, 10% sand

Stream Cover: 50% lg. cobble/ boulder, 20% deep pool

Aquatic Vegetation: Periphyton

Riparian Vegetation: Moss, willows

Barriers Present (Y/N): Y
Location: Natural falls barrier ~50 m DS

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	Undef	Undef
Bank Stability:	Mod	Mod
Erosion Potential:	Mod	Mod

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	N/M	355
pH:	N/M	8.62
Water Temp (˚C):	N/M	6.3

Fish Habitat

	Spring	Fall
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - N NNST - N	ARCH - N NNST - N
Migration:	ARCH - N NNST - N	ARCH - N NNST - N

Baffinland Iron Mines
Mary River Project

North/South Consultants Inc.
Aquatic Environment Specialists

Fish Habitat Quality – NOT FISH-BEARING

Tote Road Aquatic Habitat Assessment

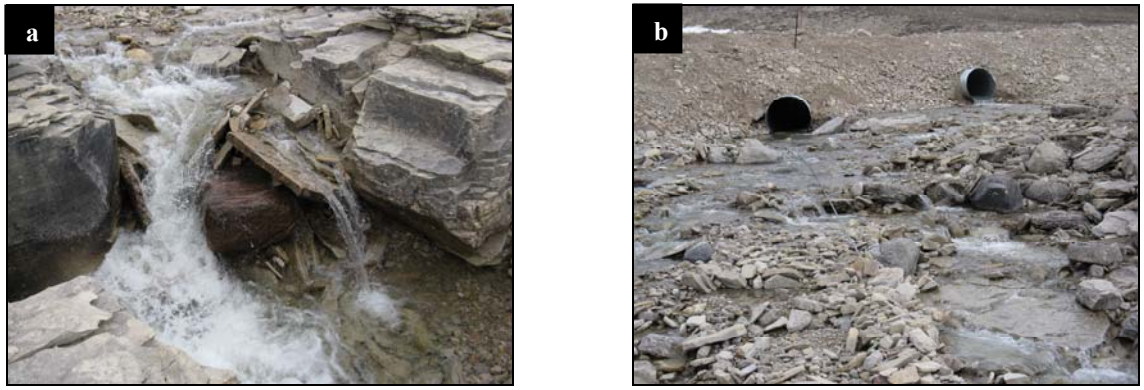

Figure 1.View of the natural downstream barrier (a) and habitat downstream of the crossing (b) at CV-094 during early July, 2009.

Figure 2. View upstream (a), downstream (b), and across (b) at the habitat assessment site downstream of the crossing at CV-094 during late August, 2009.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name: CV-094
Site: US

UTM / Chainage: 17W 522805 7945397 / 41 + 613
Dates Surveyed: 3-Jul-09, 27-Aug-09

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: 8˚

Hydrology

	Spring	Fall
Bankfull Width (m):	42.96	42.96
Wetted Width (m):	N/M	2.00
Riffle Depth (m):	N/M	0.02
Left Culvert Depth (m):	N/M	0.03
Maximum Depth (m):	N/M	0.35
Point Velocities (m/s)		
Riffle:	N/M	0.32
Left Culvert:	N/M	0.89

Stream/Riparian Habitat

Channel Morphology: 50% cascade/riffle, 50% pool

Substrate Composition: 40% sm. cobble, 30% lg. cobble, 20% boulder, 10% gravel

Stream Cover: 50% lg. cobble/ boulder, 20% deep pool

Aquatic Vegetation: Periphyton

Riparian Vegetation: Moss, willows

Barriers Present (Y/N): Y
Location: Natural falls barrier ~50 m DS

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	Undef	Undef
Bank Stability:	Mod	Mod
Erosion Potential:	Mod	Mod

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	-	-
pH:	-	-
Water Temp (˚C):	-	-

Fish Habitat

	Spring	Fall
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - N NNST - N	ARCH - N NNST - N
Migration:	ARCH - N NNST - N	ARCH - N NNST - N

Baffinland Iron Mines
Mary River Project

North/South Consultants Inc.
Aquatic Environment Specialists

Fish Habitat Quality – NOT FISH-BEARING

Tote Road Aquatic Habitat Assessment

Figure 1.No pictures taken upstream of the crossing at CV-094 during early July, 2009 because this area was identified as not fish-bearing.

Figure 2. View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at CV-094 during late August, 2009.

Bulk Sample Road Watercourse Crossing Assessment

Figure 1: Aerial view of proposed crossing showing an almost completely dry cobble/gravel creek bed.

Baffinland Iron Mines
Mary River Project
Watercourse Crossing Assessment

Location

Site: CV-93

UTM: 17W 0523116 / 7944890

Watercourse Name: Unknown River

Site Description

Watershed Size:	0.880 km^2
Regulated:	No
Channelized:	No
Bankfull Width:	N/A
Wetted Width:	N/A
Riffle-Crest Depth:	N/A
Pool Depth:	N/A
Residual Pool Depth:	N/A
Bankfull Depth:	N/A
Bank Height:	N/A
D_{95}:	N/A
D:	N/A
Confinement:	N/A
Channel Morphology:	N/A
Channel Gradient:	N/A
Turbidity:	N/A
Side Slope	N/A
Approach:	N/A
Bank Stability:	N/A
Erosion Potential:	N/A
Undercut Banks:	N/A

Mesohabitat Composition:	N/A
Substrate Composition:	N/A
Stream Cover:	N/A
Riparian Vegetation:	N/A
Aquatic Vegetation:	N/A
Unique Features:	N/A
Summary:	This is a small waterbody that was almost completely dry at the time of sampling in August. It is exclusively a spring run-off stream

Fish Habitat Quality

None

Potential Fish Utilization

Arctic Char

Spawning:	None
Migration:	None
Rearing:	None
Overwintering:	None

Ninespine Stickleback

Spawning:	None
Migration:	None
Rearing:	None
Overwintering:	None

Comments

This waterbody is ephemeral and provides no suitable fish habitat. Even during high water in spring there is not likely any fish use. There is a cliff downstream of the crossing that would represent a significant barrier to fish passage even if water levels were sufficient.

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Bulk Sample Road Watercourse Crossing Assessment

Figure 1: Aerial view of proposed crossing showing a completely dry cobble/gravel creek bed.

Baffinland Iron Mines
Mary River Project
Watercourse Crossing Assessment

Location

Site: CV-92

UTM: 17W 0523106 / 7944186

Watercourse Name: Unknown River

Site Description

Watershed Size:	3.453 km^2
Regulated:	No
Channelized:	No
Bankfull Width:	N/A
Wetted Width:	N/A
Riffle-Crest Depth:	N/A
Pool Depth:	N/A
Residual Pool Depth:	N/A
Bankfull Depth:	N/A
Bank Height:	N/A
D_{95}:	N/A
D:	N/A
Confinement:	N/A
Channel Morphology:	N/A
Channel Gradient:	N/A
Turbidity:	N/A
Side Slope	N/A
Approach:	N/A
Bank Stability:	N/A
Erosion Potential:	N/A
Undercut Banks:	N/A

Mesohabitat Composition:	N/A
Substrate Composition:	N/A
Stream Cover:	N/A
Riparian Vegetation:	N/A
Aquatic Vegetation:	N/A
Unique Features:	N/A
Summary:	This is a medium waterbody that was completely dry at the time of sampling in August. It is probably only a spring run-off stream

Fish Habitat Quality

None

Potential Fish Utilization

Arctic Char

Spawning:	None
Migration:	None
Rearing:	None
Overwintering:	None

Ninespine Stickleback

Spawning:	None
Migration:	None
Rearing:	None
Overwintering:	None

Comments

This waterbody is ephemeral and provides no suitable fish habitat. Even during high water in spring there is not likely any fish use.

NORTH/SOUTH CONSULTANTS INC.
AQUATIC ENVIRONMENT SPECIALISTS

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CV-205
CV-090
CV-089
CV-088
CV-087
CV-086
CV-085
CV-084
CV-083
CV-206
CV-082
CV-081
CV-080
CV-079
CV-207
CV-078
CV-077

Phillips Creek

0.5 0.25 0 0.5 km
SCALE

LEGEND:

- IMPORTANT FISH HABITAT
- MARGINAL FISH HABITAT
- NOT FISH BEARING HABITAT
- FALLS
- FISH BARRIER
- TOTE ROAD (EXISTING)
- CONTOUR
- WATER

NOTES:

1. BASE MAP: © HER MAJESTY THE QUEEN IN RIGHTS OF CANADA DEPARTMENT OF NATURAL RESOURCES (2009.) ALL RIGHTS RESERVED.
2. TOPOGRAPHY PROVIDED BY EAGLE MAPPING (2005)
3. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.
4. CONTOUR INTERVAL IS 25 M AND IS IN METRES.

REV	DD/MMM/10	ISSUED FOR	DESIGNED	DRAWN	CHK'D	APP'D
-	01/09/2010	DESCRIPTION	-	-	-	-

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

Milne Inlet Tote Road - 3f

North/South Consultants Inc.
Aquatic Environment Specialists

P/A NO.	REF NO.
-	-

DATE: 01/09/2010

REV 1

Path: \\terastation\GIS\Projects\Other\Mary River Freshwater\2010\Gemtd_Data\Report_Maps\ToteRD

Bulk Sample Road Watercourse Crossing Assessment

Figure 1: Downstream view from proposed crossing showing cascade habitat with cobble and boulders.

Figure 2: Upstream view from proposed crossing showing more cascade habitat and cobble substrate.

Figure 3: View across CV-87.

Baffinland Iron Mines
Mary River Project
Watercourse Crossing Assessment

Location

Site: CV-87

UTM: 17W 0523704 / 7941040

Watercourse Name: Unknown River

Site Description

Watershed Size:	9.873 km^2
Regulated:	No
Channelized:	No
Bankfull Width:	55.0 m
Wetted Width:	10.0 m
Riffle-Crest Depth:	0.20 m
Pool Depth:	N/A
Residual Pool Depth:	N/A
Bankfull Depth:	0.52 m
Bank Height:	0.32 m
D_{95}:	0.72 m
D:	0.04 m
Confinement:	N/A (braided stream)
Channel Morphology:	Cascade
Channel Gradient:	11^0
Turbidity:	0.00 FTU
Side Slope	R – 10%; L – 10%
Approach:	R – 90%; L – 90%
Bank Stability:	High
Erosion Potential:	Low-Moderate
Undercut Banks:	None

Mesohabitat Composition:	Cascade – 100%
Substrate Composition:	Cobble – 75%; Boulder – 20%; Gravel – 5%
Stream Cover:	Boulders – 20%
Riparian Vegetation:	Moss, small plants, grasses, willows
Aquatic Vegetation:	None
Unique Features:	None
Summary:	This is a large-sized waterbody but it has relatively shallow depths and higher velocities characterized by cascades. Substrate is predominantly cobble and the banks have low erosion potential.

Fish Habitat Quality

Marginal

Potential Fish Utilization

Arctic Char

Spawning:	None
Migration:	None
Rearing:	Possible but Unlikely
Overwintering:	None

Ninespine Stickleback

Spawning:	None
Migration:	None
Rearing:	None
Overwintering:	None

Comments

Though a large watershed, habitat in this waterbody is likely unsuitable for fish. It lacks areas of slow flow that char seem to prefer and has relatively little wetted width at the time of sampling. It is marginal fish habitat at best but more likely provides no fish habitat.

NORTH/SOUTH CONSULTANTS INC.
AQUATIC ENVIRONMENT SPECIALISTS

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name:	CV-086	**UTM / Chainage:**	17W 523746 7941983 / 46 + 300
Site:	DS	**Dates Surveyed:**	3-Jul-09

Site Description/Physical Characteristics

Confinement: N/M

Channel Gradient: N/M

Hydrology

	Spring
Bankfull Width (m):	N/M
Wetted Width (m):	N/M
Depths (m):	N/M
Culvert Depth (m):	N/M
Maximum Depth (m):	N/M
Point Velocities (m/s)	N/M

Stream/Riparian Habitat

Channel Morphology: N/M

Substrate Composition: N/M

Stream Cover: N/M

Aquatic Vegetation: N/M

Riparian Vegetation: N/M

Barriers Present (Y/N): N/M

Location: N/M

L/R Bank Characteristics

	Spring
Bank Height (m):	N/M
Bank Stability:	N/M
Erosion Potential:	N/M

Water Quality

	Spring
Specific Conductance (µS/cm):	N/M
pH:	N/M
Water Temp (˚C):	N/M

Fish Habitat Use

	Spring
Spawning:	ARCH - N NNST - N
Feeding:	ARCH - N NNST - N
Migration:	ARCH - N NNST - N

Baffinland Iron Mines
Mary River Project

North/South Consultants Inc.
Aquatic Environment Specialists

Fish Habitat Quality – NOT FISH-BEARING

Tote Road Aquatic Habitat Assessment

Figure 1.View downstream from the crossing site at CV-086 during spring, 2009.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name:	CV-086	**UTM / Chainage:**	17W 523746 7941983 / 46 + 300
Site:	US	**Dates Surveyed:**	3-Jul-09

Site Description/Physical Characteristics

Confinement: N/M

Channel Gradient: N/M

Hydrology

	Spring
Bankfull Width (m):	N/M
Wetted Width (m):	N/M
Depths (m):	N/M
Culvert Depth (m):	N/M
Maximum Depth (m):	N/M
Point Velocities (m/s)	N/M

Stream/Riparian Habitat

Channel Morphology: N/M

Substrate Composition: N/M

Stream Cover: N/M

Aquatic Vegetation: N/M

Riparian Vegetation: N/M

Barriers Present (Y/N): N

Location: N/A

L/R Bank Characteristics

	Spring
Bank Height (m):	0.10-0.20
Bank Stability:	High
Erosion Potential:	Low

Water Quality

	Spring
Specific Conductance (µS/cm):	N/M
pH:	N/M
Water Temp (˚C):	N/M

Fish Habitat Use

	Spring
Spawning:	ARCH - N NNST - N
Feeding:	ARCH - N NNST - N
Migration:	ARCH - N NNST - N

Baffinland Iron Mines
Mary River Project

North/South Consultants Inc.
Aquatic Environment Specialists

Fish Habitat Quality – NOT FISH-BEARING

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a) from the crossing site at CV-086 during spring, 2009.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name:	CV-082	**UTM / Chainage:**	17W 525254 7938131 / 49 + 655
Site:	DS	**Dates Surveyed:**	3-Jul-09

Site Description/Physical Characteristics

Confinement: N/M

Channel Gradient: N/M

Hydrology

	Spring
Bankfull Width (m):	N/M
Wetted Width (m):	N/M
Depths (m):	N/M
Culvert Depth (m):	N/M
Maximum Depth (m):	N/M
Point Velocities (m/s)	N/M

Stream/Riparian Habitat

Channel Morphology:	N/M
Substrate Composition:	N/M
Stream Cover:	N/M
Aquatic Vegetation:	N/M
Riparian Vegetation:	N/M
Barriers Present (Y/N):	N/M
Location:	N/M

L/R Bank Characteristics

	Spring
Bank Height (m):	N/M
Bank Stability:	N/M
Erosion Potential:	N/M

Water Quality

	Spring
Specific Conductance (µS/cm):	N/M
pH:	N/M
Water Temp (˚C):	N/M

Fish Habitat Use

	Spring
Spawning:	ARCH - N NNST - N
Feeding:	ARCH - N NNST - N
Migration:	ARCH - N NNST - N

Baffinland Iron Mines
Mary River Project

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Aquatic Environment Specialists

Fish Habitat Quality – NOT FISH-BEARING

Tote Road Aquatic Habitat Assessment

Figure 1.View downstream from the crossing site at CV-082 during spring, 2009.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name:	CV-082	**UTM / Chainage:**	17W 525254 7938131 / 49 + 655
Site:	US	**Dates Surveyed:**	3-Jul-09

Site Description/Physical Characteristics

Confinement: N/M

Channel Gradient: N/M

Hydrology

	Spring
Bankfull Width (m):	N/M
Wetted Width (m):	N/M
Depths (m):	N/M
Culvert Depth (m):	N/M
Maximum Depth (m):	N/M
Point Velocities (m/s)	N/M

Stream/Riparian Habitat

Channel Morphology: N/M

Substrate Composition: N/M

Stream Cover: N/M

Aquatic Vegetation: N/M

Riparian Vegetation: N/M

Barriers Present (Y/N): N

Location: N/A

L/R Bank Characteristics

	Spring
Bank Height (m):	N/M
Bank Stability:	N/M
Erosion Potential:	N/M

Water Quality

	Spring
Specific Conductance (µS/cm):	N/M
pH:	N/M
Water Temp (˚C):	N/M

Fish Habitat Use

	Spring
Spawning:	ARCH - N NNST - N
Feeding:	ARCH - N NNST - N
Migration:	ARCH - N NNST - N

Baffinland Iron Mines
Mary River Project

North/South Consultants Inc.
Aquatic Environment Specialists

Fish Habitat Quality – NOT FISH-BEARING

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream from the crossing site at CV-082 during spring, 2009.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name:	CV-079	**UTM:**	17W 525562 7937276
Site:	DS	**Dates Surveyed:**	27-Jul-08

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: 3˚

Hydrology

	Sum
Bankfull Width (m):	28.00
Wetted Width (m):	19.60
Riffle-Crest Depth (m):	0.10
Pool Depth (m):	0.06
D_{95} (m):	0.65
Point Velocities (m/s)	
Riffle:	0.28
Pool:	0.11
Maximum:	0.35

Stream/Riparian Habitat

Channel Morphology:	70% riffle, 30% pool
Substrate Composition:	50% sand, 25% sm cobble, 20% gravel, 5% lg cobble
Stream Cover:	5% lg cobble
Aquatic Vegetation:	Periphyton
Riparian Vegetation:	Grass, moss, wildflowers
Barriers Present (Y/N):	N
Location:	NA
Lakes Present (Y/N):	Y
Location:	DS

L/R Bank Characteristics

	Sum
Bank Height (L/R; m):	0.25/0.25
Bank Stability:	Mod
Erosion Potential:	Mod

Water Quality

	Sum
Specific Conductance (µS/cm):	22.3
TDS (g/l):	0.14
DO (mg/l)	11.82
%DO:	NM
Water Temp (˚C):	7.9

Fish Habitat

	Sum
Spawning:	ARCH - N NNST - N
Feeding:	ARCH - H NNST - L
Migration:	ARCH - M NNST - N

Baffinland Iron Mines
Mary River Project

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Aquatic Environment Specialists

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) from the habitat assessment downstream of CV-079 during summer 2008.

Figure 2. View from the downstream end of the culvert at crossing CV-079 during summer 2008.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name:	CV-079	**UTM:**	17W 525562 7937276
Site:	US	**Dates Surveyed:**	27-Jul-08

Site Description/Physical Characteristics

Confinement: Unconfined

Channel Gradient: 3˚

Hydrology

	Sum
Bankfull Width (m):	7.30
Wetted Width (m):	3.90
Riffle-Crest Depth (m):	0.24
Pool Depth (m):	0.14
D_{95} (m):	0.65
Point Velocities (m/s)	
Riffle:	1.08
Pool:	0.10
Flat:	0.17

Stream/Riparian Habitat

Channel Morphology:	30% riffle, 30% flat, 20% cascade, 20% pool
Substrate Composition:	55% sm cobble, 40% lg cobble, 5% sand
Stream Cover:	40% lg cobble 5% deep pool
Aquatic Vegetation:	Some periphyton,
Riparian Vegetation:	Grasses and moss
Barriers Present (Y/N):	N
Location:	NA
Lakes Present (Y/N):	Y
Location:	DS

L/R Bank Characteristics

	Sum
Bank Height (L/R; m):	0.20/1.25
Bank Stability:	High
Erosion Potential:	Low

Water Quality

	Sum
Specific Conductance (µS/cm):	26.9
TDS (g/l):	0.17
DO (mg/l)	11.57
%DO:	NM
Water Temp (˚C):	6.3

Fish Habitat

	Sum
Spawning:	ARCH - N NNST - N
Feeding:	ARCH - H NNST - N
Migration:	ARCH - M NNST - N

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) from the habitat assessment upstream of CV-079 during summer 2008.

Figure 2. View from the upstream end of the culverts at crossing CV-079 during summer 2008.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name:	CV-079	**UTM / Chainage:**	17W 525562 7937276 / 50 + 600
Site:	DS	**Dates Surveyed:**	3-Jul-09, 27-Aug-09

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: 2-5˚

Hydrology

	Spring	Fall
Bankfull Width (m):	60.32	60.32
Wetted Width (m):	13.71	13.71
Riffle Depths (m):	0.07, 0.04	0.10, 0.05
Pool Depth (m):	0.28	0.22
Right Culvert Depth (m):	0.25	0.20
Maximum Depth (m):	0.50	0.40
Point Velocities (m/s)		
Riffles:	0.36, 0.35	0.62, 0.55
Pool:	0.05	0.00
Right Culvert:	1.32	1.05

Stream/Riparian Habitat

Channel Morphology: 60% riffle, 40% pool

Substrate Composition: 60% sm. cobble, 15% gravel, 15% sand, 10% lg. cobble

Stream Cover: 10% lg. cobble

Aquatic Vegetation: Periphyton

Riparian Vegetation: Grasses, willows

Barriers Present (Y/N): N

Location: NA

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	Undef	Undef
Bank Stability:	Mod	Mod
Erosion Potential:	Mod	Mod

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	136	295
pH:	8.53	8.72
Water Temp (˚C):	7.6	6.8

Fish Habitat

	Spring	Fall
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - H NNST - L	ARCH - H NNST - L
Migration:	ARCH - H NNST - L	ARCH - H NNST - L

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site downstream of the crossing at CV-079 during early July, 2009.

Figure 2. View upstream (a), downstream (b), and across (b) at the habitat assessment site downstream of the crossing at CV-079 during late August, 2009.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name: CV-079
Site: US

UTM / Chainage: 17W 525562 7937276 / 50 + 600
Dates Surveyed: 3-Jul-09, 27-Aug-09

Site Description/Physical Characteristics

Confinement: Unconfined

Channel Gradient: 2-5˚

Hydrology

	Spring	Fall
Bankfull Width (m):	15.54	15.54
Wetted Width (m):	8.68	6.40
Riffle Depth (m):	0.13	0.13
Run Depth (m)	0.34	0.30
Right Culvert Depth (m):	0.36	0.29
Maximum Depth (m):	0.40	0.30
Point Velocities (m/s)		
Riffle:	0.86	1.16
Run:	0.14	0.12
Right Culvert:	0.91	0.96

Stream/Riparian Habitat

Channel Morphology: 60% run, 20% riffle, 20% cascade

Substrate Composition: 50% sand, 40% sm. cobble, 5% lg. cobble, 5% gravel

Stream Cover: 5% lg. cobble

Aquatic Vegetation: Periphyton

Riparian Vegetation: Grasses, willows

Barriers Present (Y/N): N
Location: NA

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	Undef	Undef
Bank Stability:	Mod	Mod
Erosion Potential:	Mod	Mod

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	136	-
pH:	8.55	-
Water Temp (˚C):	7.5	-

Fish Habitat

	Spring	Fall
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - H NNST - L	ARCH - H NNST - L
Migration:	ARCH - H NNST - L	ARCH - H NNST - L

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at CV-079 during early July, 2009.

Figure 2. View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at CV-079 during late August, 2009.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name:	CV-207	**UTM:**	17W 525640 7937120
Site:	DS	**Dates Surveyed:**	08-Sept-08, 11:41

Site Description/Physical Characteristics

Confinement: Unconfined - Partial

Channel Gradient: 0.5˚

Hydrology

	Fall
Bankfull Width (m):	12.17
Wetted Width (m):	4.05
Riffle-Crest Depth (m):	0.11
Pool Depth (m):	0.22
Pool DS of culvert depth (m):	0.32
D_{95} (m):	0.50
Point Velocities (m/s)	
Riffle:	0.12
Pool:	0.00
Culvert:	0.20

Stream/Riparian Habitat

Channel Morphology:	70% riffle, 20% deep pool, 10% pool
Substrate Composition:	50% sm cobble, 20% lg cobble, 20% gravel, 10% sand
Stream Cover:	20% lg cobble, 20% deep pool
Aquatic Vegetation:	None
Riparian Vegetation:	Willow
Barriers Present (Y/N):	N
Location:	N/A
Lakes Present (Y/N):	Y
Location:	DS

L/R Bank Characteristics

	Fall
Bank Height (L/R; m):	0.30/0.30
Bank Stability:	Low
Erosion Potential:	High

Water Quality

	Fall
Specific Conductance (µS/cm):	31.5
TDS (g/l):	0.20
DO (mg/l)	14.58
%DO:	N/M
Water Temp (˚C):	2.2
Turb:	6.9

Fish Habitat

	Fall
Spawning:	ARCH - N NNST - N
Feeding:	ARCH - M NNST - N
Migration:	ARCH - L NNST - N

Baffinland Iron Mines
Mary River Project

North/South Consultants Inc.
Aquatic Environment Specialists

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) from habitat assessment in reach 1 of CV-207 during fall 2008.

Figure 1.Views of the culverts at CV-207 from the downstream end (a, b, & c) during fall 2008.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name:	CV-207	**UTM:**	17W 525640 7937120
Site:	Reach 2 (upstream of culverts)	**Dates Surveyed:**	08-Sept-08, 12:19

Site Description/Physical Characteristics

Confinement: Unconfined

Channel Gradient: 0.5˚

Hydrology

	Fall
Bankfull Width (m):	21.70
Wetted Width (m):	3.93
Riffle-Crest Depth (m):	0.10
Pool Depth (m):	0.18
Pool US of culvert depth (m):	0.18
D_{95} (m):	0.14
Point Velocities (m/s)	
Riffle:	0.45
Pool:	0.12
Culvert:	0.55

Stream/Riparian Habitat

Channel Morphology: 60% pool, 35% riffle, 5% deep pool

Substrate Composition: 50% gravel, 35% sm cobble, 10% sand, 5% lg cobble

Stream Cover: 15% UC banks, 5% deep pool, 5% lg cobble

Aquatic Vegetation: Periphyton

Riparian Vegetation: Grass

Barriers Present (Y/N): N
Location: N/A

Lakes Present (Y/N): Y
Location: DS

L/R Bank Characteristics

	Fall
Bank Height (L/R; m):	0.25/0.25
Bank Stability:	Moderate-High
Erosion Potential:	Moderate-Low

Water Quality

	Fall
Specific Conductance (µS/cm):	31.3
TDS (g/l):	0.20
DO (mg/l)	13.97
%DO:	N/M
Water Temp (˚C):	2.4
Turb:	9.0

Fish Habitat

	Fall
Spawning:	ARCH - N NNST - N
Feeding:	ARCH - M NNST - N
Migration:	ARCH - L NNST - N

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) from habitat assessment in reach 2 of CV-207 during fall 2008.

Figure 1.Views of the culverts at CV-207 from the upstream end (a, b, & c) during fall 2008.

Bulk Sample Road Watercourse Crossing Assessment

Figure 1: Downstream view from proposed crossing showing riffle-pool habitat with cobble and boulders.

Figure 2: Upstream view from proposed crossing showing more cascade habitat and cobble substrate.

Figure 3: View across CV-78.

Baffinland Iron Mines
Mary River Project
Watercourse Crossing Assessment

Location

Site: CV-78

UTM: 17W 0525852 / 7936787

Watercourse Name: Unknown River

Site Description

Watershed Size:	19.440 km^2
Regulated:	No
Channelized:	No
Bankfull Width:	31.0 m
Wetted Width:	21.0 m
Riffle-Crest Depth:	0.06 m
Pool Depth:	0.38 m
Residual Pool Depth:	0.44 m
Bankfull Depth:	0.55 m
Bank Height:	0.49 m
D_{95}:	0.30 m
D:	0.02 m
Confinement:	Partially Confined
Channel Morphology:	Riffle-Pool
Channel Gradient:	2^0
Turbidity:	0.00 FTU
Side Slope	R – 5%; L – 5%
Approach:	R – 95%; L – 95%
Bank Stability:	High
Erosion Potential:	Low-Moderate
Undercut Banks:	None

Mesohabitat Composition:	Riffle – 50%; Pool – 50%
Substrate Composition:	Cobble – 80%; Gravel – 15%; Boulder – 5%
Stream Cover:	Boulders – 5%
Riparian Vegetation:	Moss, small plants, grasses
Aquatic Vegetation:	None
Unique Features:	None
Summary:	This is a large-sized waterbody with typical riffle-pool habitat. Substrate is predominantly cobble and the banks have low erosion potential.

Fish Habitat Quality

Important

Potential Fish Utilization

Arctic Char

Spawning:	Possible but Unlikely
Migration:	Possible
Rearing:	Yes
Overwintering:	None

Ninespine Stickleback

Spawning:	Possible
Migration:	Possible
Rearing:	Possible
Overwintering:	None

Comments

This large waterbody has sufficient slow-moving habitat for juvenile char. Many small char were captured during fisheries studies. The habitat, however, is less suitable for ninespine stickleback.

NORTH/SOUTH CONSULTANTS INC.
AQUATIC ENVIRONMENT SPECIALISTS

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name:	CV-078	**UTM:**	17W 525823 7936786
Site:	DS	**Dates Surveyed:**	01-Sept-08, 10:38

Site Description/Physical Characteristics

Confinement: Partial - Confined

Channel Gradient: 0.5˚

Hydrology

	Fall
Bankfull Width (m):	33.82
Wetted Width (m):	25.75
Riffle-Crest Depth (m):	0.13
Pool Depth (m):	0.11
Pool DS of culvert depth (m):	> 1.00
D_{95} (m):	0.51
Point Velocities (m/s)	
Riffle:	1.18
Pool:	0.43
Culvert:	0.87

Stream/Riparian Habitat

Channel Morphology: 80% riffle, 20% pool

Substrate Composition: 35% gravel, 30% sm cobble, 15% lg cobble, 10% FT, 10% sand

Stream Cover: 15% lg cobble, 10% UC banks, 5% deep pool

Aquatic Vegetation: Periphyton

Riparian Vegetation: moss, willow

Barriers Present (Y/N): N
Location: N/A

Lakes Present (Y/N): Y
Location: DS

L/R Bank Characteristics

	Fall
Bank Height (L/R; m):	Undef/Flooded
Bank Stability:	Low-mod
Erosion Potential:	Mod-high

Water Quality

	Fall
Specific Conductance (µS/cm):	27.6
TDS (g/l):	0.15
DO (mg/l)	14.50
%DO:	N/M
Water Temp (˚C):	3.5
Turb:	4.2

Fish Habitat

	Fall
Spawning:	ARCH - N NNST - N
Feeding:	ARCH - M NNST - L
Migration:	ARCH - M NNST - N

a

b

c

Figure 1.View upstream (a), downstream (b), and across (c) from the habitat assessment downstream of CV-078 during fall 2008.

a

Figure 2. View upstream of culvert #1 (a) and culvert #2 (b) downstream of CV-078 during fall 2008.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name:	CV-078	**UTM:**	17W 525883 7936793
Site:	US	**Dates Surveyed:**	01-Sept-08

Site Description/Physical Characteristics

Confinement: Partial - Unconfined

Channel Gradient: 0.5˚

Hydrology

	Fall
Bankfull Width (m):	21.03
Wetted Width (m):	21.03
Riffle-Crest Depth (m):	0.20
Pool Depth (m):	0.10
D_{95} (m):	0.45
Point Velocities (m/s)	
Riffle:	0.88
Pool:	0.00
Culvert:	0.91

Stream/Riparian Habitat

Channel Morphology: 90% riffle, 10% pool

Substrate Composition: 20% lg cobble, 60% sm cobble, 20% gravel.

Stream Cover: 20% lg cobble, 30% UC banks, 2% deep pool

Aquatic Vegetation: Periphyton

Riparian Vegetation: Grass, moss, wildflowers

Barriers Present (Y/N): N
Location: N/A

Lakes Present (Y/N): Y
Location: DS

L/R Bank Characteristics

	Fall
Bank Height (L/R; m):	0.40/0.30
Bank Stability:	High
Erosion Potential:	Low

Water Quality

	Fall
Specific Conductance (µS/cm):	28.2
TDS (g/l):	0.18
DO (mg/l)	14.18
%DO:	N/M
Water Temp (˚C):	3.4
Turb:	1.8

Fish Habitat

	Fall
Spawning:	ARCH - N NNST - N
Feeding:	ARCH - H NNST - N
Migration:	ARCH - M NNST - N

Baffinland Iron Mines
Mary River Project

North/South Consultants Inc.
Aquatic Environment Specialists

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) from the habitat assessment upstream of CV-078 during fall 2008.

Figure 2. View of the culverts from the upstream end (a & b) upstream of CV-078 during fall 2008.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name:	CV-078	**UTM / Chainage:**	17W 525852 7936787 / 51 + 171
Site:	DS	**Dates Surveyed:**	3-Jul-09, 27-Aug-09

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: 2-5˚

Hydrology

	Spring	Fall
Bankfull Width (m):	31.99	31.99
Wetted Width (m):	22.85	17.37
Riffle Depths (m):	0.19, 0.09	0.07, 0.05
Pool Depth (m):	1.00-2.00	> 1.00
Right Culvert Depth (m):	0.50	0.53
Maximum Depth (m):	1.00-2.00	> 1.00
Point Velocities (m/s)		
Riffles:	0.96, 1.19	0.69, 0.76
Pool:	0.01	0.01
Right Culvert:	1.19	0.76

Stream/Riparian Habitat

Channel Morphology: 75% riffle, 25% pool

Substrate Composition: 40% sm. cobble, 40% lg. cobble, 10% gravel, 10% boulder

Stream Cover: 50% lg. cobble/ boulder, 15% deep pool

Aquatic Vegetation: Periphyton

Riparian Vegetation: Grasses, willows, moss

Barriers Present (Y/N): N

Location: NA

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	Undef	Undef
Bank Stability:	Mod	Mod
Erosion Potential:	Mod	Mod

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	140	285
pH:	8.50	8.56
Water Temp (˚C):	7.8	7.3

Fish Habitat

	Spring	Fall
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - H NNST - L	ARCH - H NNST - L
Migration:	ARCH - H NNST - N	ARCH - H NNST - N

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site downstream of the crossing at CV-078 during early July, 2009.

Figure 2. View upstream (a), downstream (b), and across (b) at the habitat assessment site downstream of the crossing at CV-078 during late August, 2009.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name: CV-078
Site: US

UTM / Chainage: 17W 525852 7936787 / 51 + 171
Dates Surveyed: 3-Jul-09, 27-Aug-09

Site Description/Physical Characteristics

Confinement: Unconfined

Channel Gradient: 2-10˚

Hydrology

	Spring	Fall
Bankfull Width (m):	26.51	26.51
Wetted Width (m):	19.19	9.14
Riffle Depths (m):	0.21, 0.13	0.16, 0.14
Right Culvert Depth (m):	0.70	0.42
Maximum Depth (m):	0.75	0.45
Point Velocities (m/s)		
Riffles:	0.47, 1.38	0.41, 0.57
Right Culvert:	0.78	0.90

Stream/Riparian Habitat

Channel Morphology: 90% riffle, 10% pool

Substrate Composition: 45% sm. cobble, 45% lg. cobble, 5% gravel, 5% boulder

Stream Cover: 50% boulder/ lg. cobble

Aquatic Vegetation: Periphyton

Riparian Vegetation: Grasses, willows, moss

Barriers Present (Y/N): N
Location: NA

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	Undef-0.25	Undef-0.25
Bank Stability:	Mod	Mod
Erosion Potential:	Mod	Mod

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	141	-
pH:	8.48	-
Water Temp (˚C):	7.8	-

Fish Habitat

	Spring	Fall
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - H NNST - L	ARCH - H NNST - L
Migration:	ARCH - H NNST - L	ARCH - H NNST - L

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at CV-078 during early July, 2009.

Figure 2. View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at CV-078 during late August, 2009.

525,600
527,400
529,200
7,936,200
7,934,400
7,932,600
7,930,800
7,929,000

CV-077
CV-076
CV-075
CV-074
CV-073
CV-072
CV-071
CV-070
CV-069
CV-068
CV-067
CV-066
CV-065
CV-064
CV-063
CV-062
CV-061
CV-060
CV-059
CV-058
CV-057

Katiktok Lake

SCALE 0.5 0.25 0 0.5 km

LEGEND:

- IMPORTANT FISH HABITAT
- MARGINAL FISH HABITAT
- NOT FISH BEARING HABITAT
- FALLS
- FISH BARRIER
- TOTE ROAD (EXISTING)
- CONTOUR
- WATER

NOTES:

1. BASE MAP: © HER MAJESTY THE QUEEN IN RIGHTS OF CANADA DEPARTMENT OF NATURAL RESOURCES (2009.) ALL RIGHTS RESERVED.
2. TOPOGRAPHY PROVIDED BY EAGLE MAPPING (2005)
3. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.
4. CONTOUR INTERVAL IS 25 M AND IS IN METRES.

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
-	DDMMM'10	ISSUED FOR	-	-	-	-
REV	01/09/2010	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

Milne Inlet Tote Road - 3g

North/South Consultants Inc.
Aquatic Environment Specialists

P/A NO.	REF NO.
-	-
DATE: 01/09/2010	REV 1

Path: \\terastation\GIS\Projects\OtherMary River Freshwater\2010\Genrtd_Data\Report_Maps\ToteRD

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name: CV-076
Site: DS
UTM / Chainage: 17W 526617 7935335 / 53 + 028
Dates Surveyed: 3-Jul-09, 27-Aug-09

Site Description/Physical Characteristics

Confinement: Unconfined

Channel Gradient: N/M

Hydrology

	Spring	Fall
Bankfull Width (m):	20.0	20.0
Wetted Width (m):	6.2	6.4
Riffle Depth (m):	0.06	0.05
Pool Depth (m):	0.31	0.31
Culvert Depth (m):	0.24	0.24
Maximum Depth (m):	0.31	N/M
Point Velocities (m/s)		
Riffle:	0.56	0.28
Pool:	0.0	0.00
Culvert:	0.09	0.07

Stream/Riparian Habitat

Channel Morphology: 60% pool, 40% riffle

Substrate Composition: 40% gravel, 40% sand, 20% sm. cobble

Stream Cover: 5% d. pool

Aquatic Vegetation: N/M

Riparian Vegetation: grass

Barriers Present (Y/N): N
Location: N/A

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	Undefined	Undefined
Bank Stability:	Moderate	Moderate
Erosion Potential:	Moderate	Moderate

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	184	290
pH:	8.54	8.41
Water Temp (˚C):	10.1	9.3

Fish Habitat Use

	Spring	Fall
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - M NNST - N	ARCH - M NNST - N
Migration:	ARCH - L NNST - N	ARCH - L NNST - N

Baffinland Iron Mines
Mary River Project

North/South Consultants Inc.
Aquatic Environment Specialists

Fish Habitat Quality – MARGINAL

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site downstream of the crossing at CV-076 during spring, 2009.

Figure 2. View upstream (a), downstream (b), and across (c) at the habitat assessment site downstream of the crossing at CV-076 during fall, 2009.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name:	CV-076	**UTM / Chainage:**	17W 526617 7935335 / 53 + 028
Site:	US	**Dates Surveyed:**	3-Jul-09, 27-Aug-09

Site Description/Physical Characteristics

Confinement: Unconfined

Channel Gradient: N/M

Hydrology

	Spring	Fall
Bankfull Width (m):	2.5	2.5
Wetted Width (m):	1.9	1.9
Riffle Depth (m):	0.06	0.03
Pool Depth (m):	N/M	N/M
Culvert Depth (m):	0.16	0.15
Maximum Depth (m):	0.16	0.24
Point Velocities (m/s)		
Riffle:	0.46	0.56
Pool:	N/M	N/M
Culvert:	0.13	0.16

Stream/Riparian Habitat

Channel Morphology: 50% riffle, 50% pool

Substrate Composition: 70% gravel, 20% sm. cobble, 5% sand

Stream Cover: 5% d. pool

Aquatic Vegetation: N/M

Riparian Vegetation: grass

Barriers Present (Y/N): N

Location: N/A

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	0.10	N/M
Bank Stability:	Moderate	Moderate
Erosion Potential:	Moderate	Moderate

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	180	N/M
pH:	8.53	N/M
Water Temp (˚C):	10.0	N/M

Fish Habitat Use

	Spring	Fall
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - M NNST - N	ARCH - M NNST - N
Migration:	ARCH - L NNST - N	ARCH - L NNST - N

Baffinland Iron Mines
Mary River Project

North/South Consultants Inc.
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Fish Habitat Quality – MARGINAL

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at CV-076 during spring, 2009.

Figure 2. View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at CV-076 during fall, 2009.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name: CV-072
Site: DS

UTM / Chainage: 17W 526897 7934576 / 53 + 878
Dates Surveyed: 3-Jul-09, 27-Aug-09

Site Description/Physical Characteristics

Confinement: Unconfined

Channel Gradient: 2-5˚

Hydrology

	Spring	Fall
Bankfull Width (m):	22.85	22.85
Wetted Width (m):	15.54	2.8
Riffle Depths (m):	0.10, 0.26	-, 0.13
Pool Depth (m):	0.30	0.15
Culvert Depths (L, R) (m):	0.36, -	Dry, 0.35
Maximum Depth (m):	0.80	0.35
Point Velocities (m/s)		
Riffles:	0.39, 0.36	-, 0.43
Pool:	0.10	0.01
Culverts (L, R):	0.03, -	Dry, 0.20

Stream/Riparian Habitat

Channel Morphology: 90% riffle, 10% pool

Substrate Composition: 70% sm. cobble, 15% lg. cobble, 10% gravel, 5% sand

Stream Cover: 15% lg. cobble, 5% deep pool

Aquatic Vegetation: Periphyton

Riparian Vegetation: Grasses, willows, moss

Barriers Present (Y/N): N
Location: NA

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	Undef	Undef
Bank Stability:	Mod	Mod
Erosion Potential:	Mod	Mod

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	110	249
pH:	8.44	8.49
Water Temp (˚C):	4.2	5.4

Fish Habitat

	Spring	Fall
Spawning:	ARCH - N NNST - L	ARCH - N NNST - N
Feeding:	ARCH - M NNST - L	ARCH - M NNST - L
Migration:	ARCH - M NNST - L	ARCH - M NNST - L

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site downstream of the crossing at CV-072 during early July, 2009.

Figure 2. No photos taken of the crossing at CV-072 during late August, 2009.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name: CV-072
Site: US

UTM / Chainage: 17W 526897 7934576 / 53 + 878
Dates Surveyed: 3-Jul-09, 27-Aug-09

Site Description/Physical Characteristics

Confinement: Unconfined

Channel Gradient: 2-10˚

Hydrology

	Spring	Fall
Bankfull Width (m):	18.28	18.28
Wetted Width (m):	12.80	4.10
Riffle Depth (m):	0.08	0.08
Pool Depth (m):	0.13	0.11
Culvert Depths (L, R) (m):	0.10, -	Dry, 0.17
Maximum Depth (m):	0.20	0.17
Point Velocities (m/s)		
Riffle:	0.75	0.70
Pool:	0.04	0.01
Culverts (L, R):	0.38, -	Dry, 0.70

Stream/Riparian Habitat

Channel Morphology: 80% riffle, 10% pool, 10% cascade

Substrate Composition: 75% sm. cobble, 20% lg. cobble, 5% gravel

Stream Cover: 20% lg. cobble

Aquatic Vegetation: Periphyton

Riparian Vegetation: Grasses, willows, moss

Barriers Present (Y/N): N
Location: NA

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	Undef	Undef
Bank Stability:	Mod	Mod
Erosion Potential:	Mod	Mod

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	111	-
pH:	8.45	-
Water Temp (˚C):	4.2	-

Fish Habitat

	Spring	Fall
Spawning:	ARCH - N NNST - L	ARCH - N NNST - N
Feeding:	ARCH - M NNST - L	ARCH - M NNST - L
Migration:	ARCH - M NNST - L	ARCH - M NNST - L

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at CV-072 during early July, 2009.

Figure 2. No photos taken of the crossing at CV-072 during late August, 2009.

Bulk Sample Road Watercourse Crossing Assessment

Figure 1: Downstream view from proposed crossing showing abundant pool habitat and vegetation.

Figure 2: Upstream view from proposed crossing showing more pool habitat.

Figure 3: View across CV-60.

Baffinland Iron Mines
Mary River Project
Watercourse Crossing Assessment

Location

Site: CV-60

UTM: 17W 0527621 / 7930342

Watercourse Name: Unknown River

Site Description

Watershed Size:	5.257 km^2
Regulated:	No
Channelized:	No
Bankfull Width:	12.0 m
Wetted Width:	3.6 m
Riffle-Crest Depth:	0.12 m
Pool Depth:	0.62 m
Residual Pool Depth:	0.50 m
Bankfull Depth:	0.62 m
Bank Height:	N/A
D_{95}:	N/A
D:	<0.001 m
Confinement:	Unconfined
Channel Morphology:	Riffle-Pool
Channel Gradient:	0^0
Turbidity:	0.00 FTU
Side Slope	R – 5%; L – 5%
Approach:	R – 95%; L – 95%
Bank Stability:	Low-Moderate
Erosion Potential:	Low-Moderate
Undercut Banks:	Some

Mesohabitat Composition:	Pool – 90%; Riffle – 10%
Substrate Composition:	Sand – 90%; Gravel – 10%
Stream Cover:	Undercut – 5%; In- and Overstream Vegetation – 20%
Riparian Vegetation:	Moss, grasses, willows
Aquatic Vegetation:	None
Unique Features:	None
Summary:	This is a medium-sized, low-velocity waterbody with predominantly sand substrate. The banks have moderate erosion potential and there is relatively abundant vegetative cover.

Fish Habitat Quality

Important

Potential Fish Utilization

Arctic Char

Spawning:	Unlikely
Migration:	Unlikely
Rearing:	Yes
Overwintering:	None

Ninespine Stickleback

Spawning:	Possible
Migration:	Possible
Rearing:	Possible
Overwintering:	None

Comments

This waterbody has abundant pool habitat for juvenile char. Many small char were observed or captured during fisheries studies. There is likely little to no use by adult char. Though not captured ninespine stickleback may also use this creek as both a feeding and refuge area.

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AQUATIC ENVIRONMENT SPECIALISTS

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name: CV-060
Site: DS

UTM / Chainage: 17W 527622 7930342 / 58 + 856
Dates Surveyed: 3-Jul-09, 27-Aug-09

Site Description/Physical Characteristics

Confinement: Unconfined

Channel Gradient: 1˚

Hydrology

	Spring	Fall
Bankfull Width (m):	8.50	8.50
Wetted Width (m):	8.50	7.40
Riffle Depth (m):	0.04	0.03
Pool Depth (m):	0.75	0.68
Left Culvert Depth (m):	0.11	0.11
Maximum Depth (m):	0.75	0.70
Point Velocities (m/s)		
Riffle:	0.66	0.22
Pool:	0.00	0.00
Left Culvert:	0.54	0.48

Stream/Riparian Habitat

Channel Morphology: 70% pool, 30% riffle

Substrate Composition: 60% silt/sand, 30% gravel, 10% sm. cobble

Stream Cover: 35% deep pool

Aquatic Vegetation: Periphyton

Riparian Vegetation: Grasses, willows

Barriers Present (Y/N): N
Location: NA

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	Undef	Undef
Bank Stability:	Low	Low
Erosion Potential:	High	High

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	171	266
pH:	8.47	8.36
Water Temp (˚C):	9.9	9.7

Fish Habitat

	Spring	Fall
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - H NNST - L	ARCH - H NNST - L
Migration:	ARCH - H NNST - N	ARCH - H NNST - N

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site downstream of the crossing at CV-060 during early July, 2009.

Figure 2. View upstream (a), downstream (b), and across (b) at the habitat assessment site downstream of the crossing at CV-060 during late August, 2009.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name: CV-060
Site: US

UTM / Chainage: 17W 527622 7930342 / 58 + 856
Dates Surveyed: 3-Jul-09, 27-Aug-09

Site Description/Physical Characteristics

Confinement: Unconfined

Channel Gradient: 1˚

Hydrology

	Spring	Fall
Bankfull Width (m):	6.00	6.00
Wetted Width (m):	6.00	5.70
Pool Depth (m):	0.63	0.62
Left Culvert Depth (m):	0.14	0.14
Maximum Depth (m):	0.70	0.62
Point Velocities (m/s)		
Pool:	0.00	0.06
Left Culvert:	0.46	0.56

Stream/Riparian Habitat

Channel Morphology: 90% pool, 10% riffle

Substrate Composition: 60% sm. cobble, 15% gravel, 15% sand/silt, 10% lg. cobble

Stream Cover: 75% deep pool, 10% lg. cobble,

Aquatic Vegetation: Periphyton

Riparian Vegetation: Grasses, willows

Barriers Present (Y/N): N
Location: NA

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	Undef	Undef
Bank Stability:	Low	Low
Erosion Potential:	High	High

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	175	-
pH:	8.48	-
Water Temp (˚C):	10.0	-

Fish Habitat

	Spring	Fall
Spawning:	ARCH - N NNST - L	ARCH - N NNST - N
Feeding:	ARCH - H NNST - L	ARCH - H NNST - L
Migration:	ARCH - H NNST - L	ARCH - H NNST - L

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at CV-060 during early July, 2009.

Figure 2. View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at CV-060 during late August, 2009.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name: CV-059
Site: DS

UTM / Chainage: 17W 528102 7929356 / 59 + 960
Dates Surveyed: 3-Jul-09, 27-Aug-09

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: N/M

Hydrology

	Spring	Fall
Bankfull Width (m):	4.1	4.1
Wetted Width (m):	4.1	4.1
Riffle Depth (m):	0.05-0.07	0.03-0.06
Pool Depth (m):	0.25	0.22
Culvert Depth (m):	0.14	0.11
Maximum Depth (m):	0.25	N/M
Point Velocities (m/s)		
Riffle:	0.66-0.94	0.31-0.66
Pool:	0.00	0.0
Culvert:	0.57	0.38

Stream/Riparian Habitat

Channel Morphology: 50% riffle, 50% pool

Substrate Composition: 40% sand, 30% gravel, 25% sm. cobble, 5% l. cobble

Stream Cover: 25% d. pool, 5% cobble

Aquatic Vegetation: N/M

Riparian Vegetation: grass

Barriers Present (Y/N): N
Location: N/A

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	Undefined	Undefined
Bank Stability:	Low	Low
Erosion Potential:	Moderate	Moderate

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	142	275
pH:	8.43	8.42
Water Temp (˚C):	8.4	7.6

Fish Habitat Use

	Spring	Fall
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - M NNST - N	ARCH - H NNST - N
Migration:	ARCH - L NNST - N	ARCH - L NNST - N

Baffinland Iron Mines
Mary River Project

North/South Consultants Inc.
Aquatic Environment Specialists

Fish Habitat Quality – MARGINAL

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site downstream of the crossing at CV-059 during spring, 2009.

Figure 2. View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at CV-059 during fall, 2009.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name: CV-059
Site: US
UTM / Chainage: 17W 528102 7929356 / 59 + 960
Dates Surveyed: 3-Jul-09, 27-Aug-09

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: N/M

Hydrology

	Spring	Fall
Bankfull Width (m):	5.5	5.5
Wetted Width (m):	5.5	5.5
Pool Depth (m):	0.35	0.3
Culvert Depth (m):	0.35	0.49
Maximum Depth (m):	0.35	0.24
Point Velocities (m/s)		
Pool:	0.00	0.00
Culvert:	0.02	0.04

Stream/Riparian Habitat

Channel Morphology: 100% pool

Substrate Composition: 85% sand/silt, 10% gravel, 5% sm. cobble

Stream Cover: 50% d. pool

Aquatic Vegetation: N/M

Riparian Vegetation: grass

Barriers Present (Y/N): N
Location: N/A

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	Undef	Undef
Bank Stability:	Low	Low
Erosion Potential:	High	High

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	142	N/M
pH:	8.45	N/M
Water Temp (˚C):	8.4	N/M

Fish Habitat Use

	Spring	Fall
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - M NNST - N	ARCH - H NNST - N
Migration:	ARCH - L NNST - N	ARCH - L NNST - N

Baffinland Iron Mines
Mary River Project

North/South Consultants Inc.
Aquatic Environment Specialists

Fish Habitat Quality – MARGINAL

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at CV-059 during spring, 2009.

Figure 2. View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at CV-059 during fall, 2009.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name: CV-058
Site: DS

UTM / Chainage: 17W 528322 7928839 / 60 + 523
Dates Surveyed: 4-Jul-09, 27-Aug-09

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: N/M

Hydrology

	Spring	Fall
Bankfull Width (m):	4.8	4.8
Wetted Width (m):	1.8	2.0
Riffle Depth (m):	0.11	0.08
Pool Depth (m):	0.31	0.46
Culvert Depth (m):	0.16	0.14
Maximum Depth (m):	0.31	N/M
Point Velocities (m/s)		
Riffle:	0.59	0.52
Pool:	0.04	0.1
Culvert:	0.19	0.10

Stream/Riparian Habitat

Channel Morphology: 50% riffle, 50% pool

Substrate Composition: 90% sand, 10% gravel

Stream Cover: 10% d. pool

Aquatic Vegetation: N/M

Riparian Vegetation: grass

Barriers Present (Y/N): N
Location: N/A

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	N/A	N/M
Bank Stability:	Low	Low
Erosion Potential:	High	High

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	167	250
pH:	8.34	8.42
Water Temp (˚C):	4.0	8.0

Fish Habitat Use

	Spring	Fall
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - M NNST - N	ARCH - H NNST - N
Migration:	ARCH - L NNST - N	ARCH - L NNST - N

Baffinland Iron Mines
Mary River Project

North/South Consultants Inc.
Aquatic Environment Specialists

Fish Habitat Quality – MARGINAL

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site downstream of the crossing at CV-058 during spring, 2009.

Figure 2. View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at CV-058 during spring, 2009.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name:	CV-058	**UTM / Chainage:**	17W 528322 7928839 / 60 + 523
Site:	US	**Dates Surveyed:**	4-Jul-09, 27-Aug-09

Site Description/Physical Characteristics

Confinement: Unconfined

Channel Gradient: N/M

Hydrology

	Spring	Fall
Bankfull Width (m):	12.50	12.50
Wetted Width (m):	6.5	2.70
Riffle Depth (m):	0.14	0.08
Pool Depth (m):	0.81	0.46
Culvert Depth (m):	0.32	0.30
Maximum Depth (m):	0.81	N/M
Point Velocities (m/s)		
Riffle:	0.45	1.18
Pool:	0.00	0.00
Culvert:	0.40	0.33

Stream/Riparian Habitat

Channel Morphology: 90% pool, 10% riffle

Substrate Composition: 90% sand, 5% gravel, 5% sm. cobble

Stream Cover: 50% d. pool

Aquatic Vegetation: N/M

Riparian Vegetation: grass

Barriers Present (Y/N): N

Location: N/A

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	N/A	N/M
Bank Stability:	Low	Low
Erosion Potential:	High	High

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	166	N/M
pH:	8.31	N/M
Water Temp (˚C):	4.0	N/M

Fish Habitat Use

	Spring	Fall
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - M NNST - N	ARCH - H NNST - N
Migration:	ARCH - L NNST - N	ARCH - L NNST - N

Baffinland Iron Mines
Mary River Project

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Aquatic Environment Specialists

Fish Habitat Quality – MARGINAL

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at CV-058 during spring, 2009.

Figure 2. View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at CV-058 during fall, 2009.

Bulk Sample Road Watercourse Crossing Assessment

Figure 1: Downstream view from proposed crossing showing pool habitat with vegetation.

Figure 2: Upstream view from proposed crossing showing more pool habitat.

Figure 3: View across CV-57.

Baffinland Iron Mines
Mary River Project
Watercourse Crossing Assessment

Location

Site: CV-57

UTM: 17W 0528378 / 7928656

Watercourse Name: Unknown River

Site Description

Watershed Size:	0.563 km^2
Regulated:	No
Channelized:	No
Bankfull Width:	8.0 m
Wetted Width:	1.0 m
Riffle-Crest Depth:	N/A
Pool Depth:	0.60 m
Residual Pool Depth:	N/A
Bankfull Depth:	0.60 m
Bank Height:	N/A
D_{95}:	N/A
D:	<0.001 m
Confinement:	Unconfined
Channel Morphology:	Pool
Channel Gradient:	0^0
Turbidity:	0.00 FTU
Side Slope	R – 5%; L – 5%
Approach:	R – 95%; L – 95%
Bank Stability:	Low-Moderate
Erosion Potential:	Low-Moderate
Undercut Banks:	Some

Mesohabitat Composition:	Pool – 100%
Substrate Composition:	Sand – 95%; Gravel – 5%
Stream Cover:	Undercut – 5%; In- and Overstream Vegetation – 20%
Riparian Vegetation:	Moss, grasses, Arctic cotton
Aquatic Vegetation:	None
Unique Features:	None
Summary:	This is a small-sized waterbody composed almost entirely of pool habitat with sand substrate. The banks have moderate erosion potential and there is relatively abundant vegetative cover.

Fish Habitat Quality

Important

Potential Fish Utilization

Arctic Char

Spawning:	Unlikely
Migration:	Unlikely
Rearing:	Yes
Overwintering:	None

Ninespine Stickleback

Spawning:	Possible
Migration:	Possible
Rearing:	Possible
Overwintering:	None

Comments

This waterbody has abundant pool habitat for juvenile char. Several small char were observed or captured during fisheries studies. There is likely little to no use by adult char. Though not captured ninespine stickleback may also use this creek as both a feeding and refuge area.

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Tote Road Aquatic Habitat Assessment

Location

Watercourse Name:	CV-057	**UTM / Chainage:**	17W 528379 7928657 / 60 + 712
Site:	DS	**Dates Surveyed:**	4-Jul-09, 27-Aug-09

Site Description/Physical Characteristics

Confinement: Unconfined

Channel Gradient: N/M

Hydrology

	Spring	Fall
Bankfull Width (m):	5.5	5.5
Wetted Width (m):	5.5	4.0
Riffle Depth (m):	0.02	0.02
Pool Depth (m):	0.36	0.35
Culvert Depth (m):	0.33	0.28
Maximum Depth (m):	0.38	N/M
Point Velocities (m/s)		
Riffle:	0.28	0.36
Pool:	0.00	0.1
Culvert:	0.00	0.0

Stream/Riparian Habitat

Channel Morphology: 70% pool, 30% riffle

Substrate Composition: 50% sand, 40% gravel, 10% sm. cobble

Stream Cover: 10% d. pool

Aquatic Vegetation: N/M

Riparian Vegetation: grass

Barriers Present (Y/N): N

Location: N/A

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	N/A	N/M
Bank Stability:	Moderate	Moderate
Erosion Potential:	Moderate	Moderate

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	197	278
pH:	8.34	8.31
Water Temp (˚C):	7.0	8.5

Fish Habitat Use

	Spring	Fall
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - M NNST - N	ARCH - M NNST - N
Migration:	ARCH - N NNST - N	ARCH - N NNST - N

Baffinland Iron Mines
Mary River Project

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Fish Habitat Quality – MARGINAL

Tote Road Aquatic Habitat Assessment

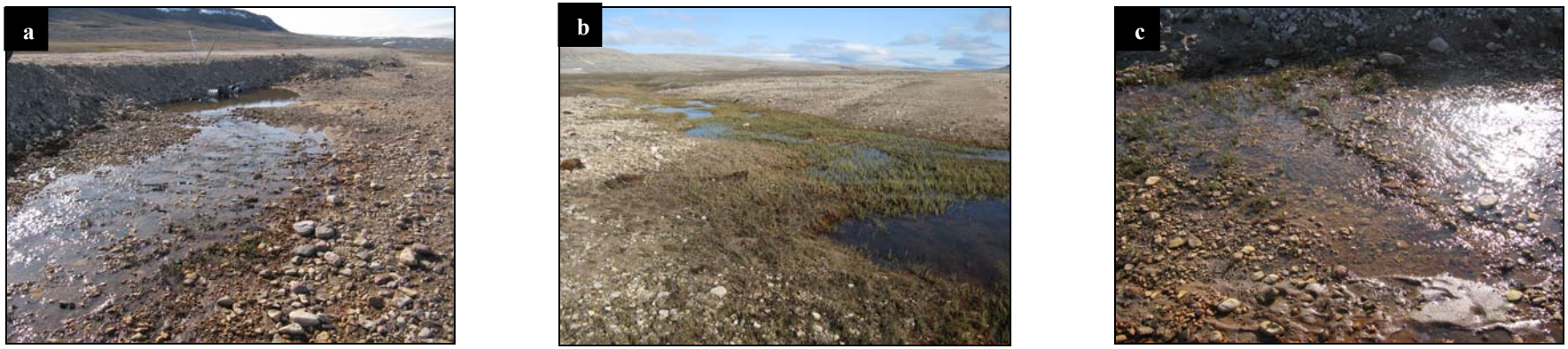

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site downstream of the crossing at CV-057 during spring, 2009.

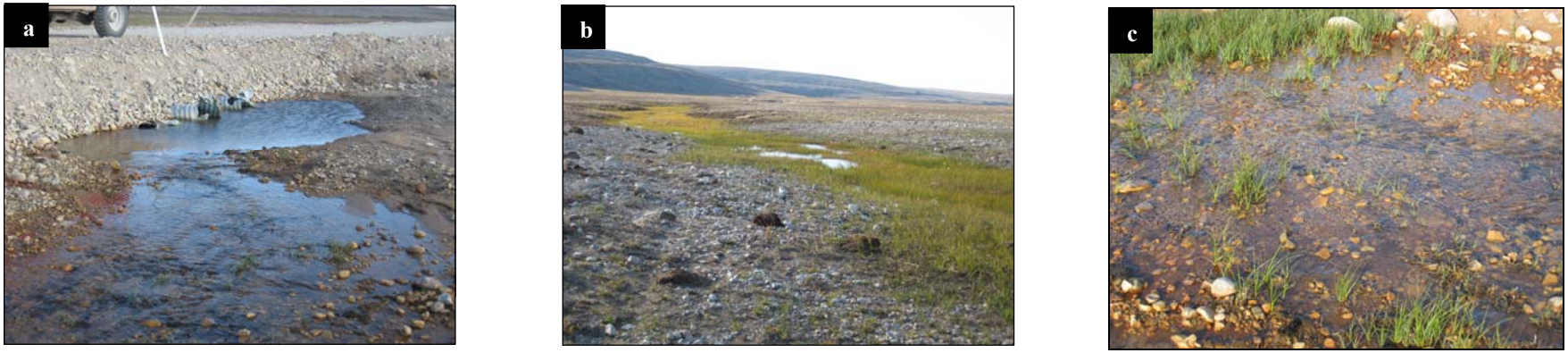

Figure 2. View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at CV-057 during fall, 2009.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name: CV-057
Site: US

UTM / Chainage: 17W 528379 7928657 / 60 + 712
Dates Surveyed: 4-Jul-09, 27-Aug-09

Site Description/Physical Characteristics

Confinement: Unconfined

Channel Gradient: N/M

Hydrology

	Spring	Fall
Bankfull Width (m):	12.8	12.8
Wetted Width (m):	12.8	11.8
Pool Depth (m):	0.15	0.15
Culvert Depth (m):	0.05	0.40
Maximum Depth (m):	0.6	0.24
Point Velocities (m/s)		
Pool:	0.01	N/M
Culvert:	0.69	0.00

Stream/Riparian Habitat

Channel Morphology: 100% pool

Substrate Composition: 90% sand/silt, 5% gravel, 5% sm. cobble

Stream Cover: 50% d. pool, 20% sub. veg.

Aquatic Vegetation: N/M

Riparian Vegetation: grass

Barriers Present (Y/N): N
Location: N/A

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	N/A	N/M
Bank Stability:	Moderate	N/M
Erosion Potential:	Moderate	N/M

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	195	N/M
pH:	8.34	N/M
Water Temp (˚C):	7.0	N/M

Fish Habitat Use

	Spring	Fall
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - M NNST - N	ARCH - M NNST - N
Migration:	ARCH - N NNST - N	ARCH - N NNST - N

Baffinland Iron Mines
Mary River Project

North/South Consultants Inc.
Aquatic Environment Specialists

Fish Habitat Quality – MARGINAL

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at CV-057 during spring, 2009.

Figure 2. View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at CV-057 during fall, 2009.

529,200
530,400
531,600
7,928,400
7,927,200
7,926,000
7,924,800
7,923,600
CV-058
CV-057
CV-056
CV-055
CV-054
CV-053
CV-052
CV-051
CV-050
BG-50
CV-049
CV-048
CV-208
CV-209
CV-046
CV-045
CV-044
CV-043
0.5 0.25 0 0.5 km
SCALE

LEGEND:

- IMPORTANT FISH HABITAT
- MARGINAL FISH HABITAT
- NOT FISH BEARING HABITAT
- FALLS
- FISH BARRIER
- TOTE ROAD (EXISTING)
- CONTOUR
- WATER

NOTES:

1. BASE MAP: © HER MAJESTY THE QUEEN IN RIGHTS OF CANADA DEPARTMENT OF NATURAL RESOURCES (2009.) ALL RIGHTS RESERVED.
2. TOPOGRAPHY PROVIDED BY EAGLE MAPPING (2005)
3. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.
4. CONTOUR INTERVAL IS 25 M AND IS IN METRES.

REV	DD/MMM/10	ISSUED FOR	-	-	-	-
REV	01/09/2010	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

Milne Inlet Tote Road - 3h

North/South Consultants Inc.
Aquatic Environment Specialists

P/A NO.	REF NO.
-	-
DATE: 01/09/2010	REV 1

Path: \\terrastation\GIS\Projects\OtherMary River Freshwater\2010\Genrtd_Data\Report_Maps\ToteRD

Bulk Sample Road Watercourse Crossing Assessment

Figure 1: Downstream view from proposed crossing showing riffle habitat with steep drop where the field crew is standing.

Figure 2: Upstream view from proposed crossing showing more cascade-riffle habitat.

Figure 3: View across CV-55.

Baffinland Iron Mines
Mary River Project
Watercourse Crossing Assessment

Location

Site: CV-55

UTM: 17W 0528842 / 7927584

Watercourse Name: Unknown River

Site Description

Watershed Size:	0.036 km^2
Regulated:	No
Channelized:	No
Bankfull Width:	3.2 m
Wetted Width:	1.1 m
Riffle-Crest Depth:	0.01 m
Pool Depth:	N/A
Residual Pool Depth:	N/A
Bankfull Depth:	N/A
Bank Height:	N/A
D_{95}:	0.32 m
D:	0.01 m
Confinement:	Unconfined
Channel Morphology:	Cascade-Riffle
Channel Gradient:	7^0
Turbidity:	0.00 FTU
Side Slope	R – 7%; L – 7%
Approach:	R – 93%; L – 93%
Bank Stability:	Moderate
Erosion Potential:	Moderate
Undercut Banks:	None

Mesohabitat Composition:	Riffle – 50%; Cascade – 50%
Substrate Composition:	Sand – 60%; Cobble – 20%; Gravel – 10%; Boulders – 10%
Stream Cover:	Boulders – 10%; In- and Overstream Vegetation – 40%
Riparian Vegetation:	Moss, grasses, willows
Aquatic Vegetation:	None
Unique Features:	None
Summary:	This is an extra small-sized waterbody consisting of riffles and cascades with sand and cobble substrate. The banks have moderate erosion potential and there is relatively abundant cover.

Fish Habitat Quality

None

Potential Fish Utilization

Arctic Char

Spawning:	None
Migration:	None
Rearing:	None
Overwintering:	None

Ninespine Stickleback

Spawning:	None
Migration:	None
Rearing:	None
Overwintering:	None

Comments

Although habitat at the proposed crossing may be marginally suitable for juvenile char, there is a steep drop downstream. This site is, therefore, likely inaccessible from further downstream. In addition, there are no suitable overwintering locations upstream.

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Bulk Sample Road Watercourse Crossing Assessment

Figure 1: Downstream view from proposed crossing showing riffle habitat with cobble substrate. The river forks around an island at this point.

Figure 2: Upstream view from proposed crossing showing more riffle habitat.

Baffinland Iron Mines
Mary River Project
Watercourse Crossing Assessment

Location

Site: BG-50

UTM: 17W 0529334 / 7926845

Watercourse Name: Unknown River

Site Description

Watershed Size:	180.263 km^2
Regulated:	No
Channelized:	No
Bankfull Width:	77.0 m
Wetted Width:	61.0 m
Riffle-Crest Depth:	0.20 m
Pool Depth:	N/A
Residual Pool Depth:	N/A
Bankfull Depth:	0.70 m
Bank Height:	0.50 m
D_{95}:	1.56 m
D:	0.02 m
Confinement:	Unconfined
Channel Morphology:	Riffle
Channel Gradient:	1^0
Turbidity:	0.00 FTU
Side Slope	R – 5%; L – 5%
Approach:	R – 95%; L – 95%
Bank Stability:	High
Erosion Potential:	Low
Undercut Banks:	None

Mesohabitat Composition:	Riffle – 100%
Substrate Composition:	Cobble – 80%; Boulders – 20%
Stream Cover:	Boulders – 20%; In- and Overstream Vegetation – 40%
Riparian Vegetation:	Moss, grasses, willows
Aquatic Vegetation:	None
Unique Features:	None
Summary:	This is an extra large-sized waterbody consisting of riffles and primarily cobble substrate. The banks have low erosion potential and there is relatively abundant rocky cover.

Fish Habitat Quality

Important

Potential Fish Utilization

Arctic Char

Spawning:	Possible
Migration:	Possible
Rearing:	Yes
Overwintering:	None

Ninespine Stickleback

Spawning:	Possible but Unlikely
Migration:	Possible but Unlikely
Rearing:	Possible but Unlikely
Overwintering:	None

Comments

The river forks around an island at the crossing. Although aquatic habitat is abundant at the proposed crossing, water velocities may be too consistently high for significant use by juvenile char. Only a single young char was captured during fisheries studies. However, since this crossing is a relatively short distance upstream of a lake, summer foraging by adults may also occur. This habitat is likely unsuitable for stickleback.

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Tote Road Aquatic Habitat Assessment

Location

Watercourse Name: BG-50
Site: DS

UTM: 17W 529321 7926807
Dates Surveyed: 24-Jun-08, 23-Jul-08

Site Description/Physical Characteristics

Confinement: Unconfined

Channel Gradient: 1˚

Hydrology (culvert channel only)

	Spr	Sum
Bankfull Width (m):	9.50	9.50
Wetted Width (m):	9.50	9.20
Riffle-Crest Depth (m):	0.26	0.12
Pool Depth (m):	NA	0.22-0.50
D_{95} (m):	0.51	0.51
Point Velocities (m/s)		
Riffle:	1.42	0.81
Pool:	NA	0.11
Culvert:	2.79	1.40

Stream/Riparian Habitat

Channel Morphology: 100% riffle (spring); 80% riffle, 20% pool (summer)

Substrate Composition: 80% cobble, 10% boulder, 10% gravel

Stream Cover: 20% lg cobble, 10% boulders

Aquatic Vegetation: Periphyton

Riparian Vegetation: Grasses and moss

Barriers Present (Y/N): Y
Location: Partial culvert barrier

L/R Bank Characteristics

	Spr	Sum
Bank Height (L/R; m):	0.50/0.20	0.50/0.20
Bank Stability:	High	High
Erosion Potential:	Low	Low

Water Quality

	Spr	Sum
Specific Conductance (µS/cm):	119.0	17.5
TDS (g/l):	0.08	0.11
DO (mg/l)	13.82	11.62
%DO:	102.7	NM
Water Temp (˚C):	3.0	7.8

Fish Habitat

	Spr	Sum
Spawning:	ARCH - N NNST - L	ARCH - N NNST - M
Feeding:	ARCH - H NNST - L	ARCH - H NNST - H
Migration:	ARCH - H NNST - L	ARCH - M NNST - N

Baffinland Iron Mines
Mary River Project

North/South Consultants Inc.
Aquatic Environment Specialists

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) from the habitat assessment downstream of BG-50 during spring 2008.

Figure 2. View upstream (a), downstream (b), and across (c) from the habitat assessment downstream of BG-50 during summer 2008.

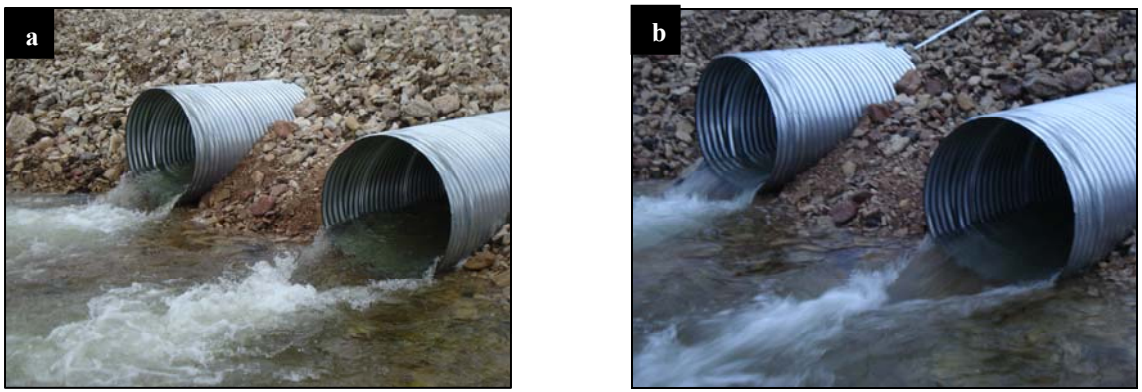

Figure 3. View from the downstream end of the culvert at crossing BG-50 during spring (a) and summer (b) 2008.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name:	BG-50	**UTM:**	17W 529366 7926822
Site:	US	**Dates Surveyed:**	24-Jun-08, 23-Jul-08

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: 1˚

Hydrology

	Spr	Sum
Bankfull Width (m):	60.35	60.35
Wetted Width (m):	46.63	53.04
Riffle-Crest Depth (m):	0.25	0.28
Pool Depth (m):	NA	NA
D_{95} (m):	0.83	0.83
Point Velocities (m/s)		
Riffle:	1.31	0.67
Pool:	NA	NA
Behind a rock:	NM	0.06

Stream/Riparian Habitat

Channel Morphology: 100% riffle

Substrate Composition: 75% cobble, 20% gravel, 5% boulder

Stream Cover: 40% lg cobble, 5% boulder

Aquatic Vegetation: Periphyton

Riparian Vegetation: Grasses, willows, moss

Barriers Present (Y/N): Y

Location: Partial culvert barrier

L/R Bank Characteristics

	Spr	Sum
Bank Height (L/R; m):	0.40/0.40	0.35/0.35
Bank Stability:	High	High
Erosion Potential:	Low	Low

Water Quality

	Spr	Sum
Specific Conductance (µS/cm):	119.0	17.6
TDS (g/l):	0.08	0.11
DO (mg/l)	14.68	11.65
%DO:	109.1	NA
Water Temp (˚C):	3.0	7.9

Fish Habitat

	Spr	Sum
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - M NNST - M	ARCH - H NNST - M
Migration:	ARCH - N NNST - N	ARCH - M NNST - L

Tote Road Aquatic Habitat Assessment

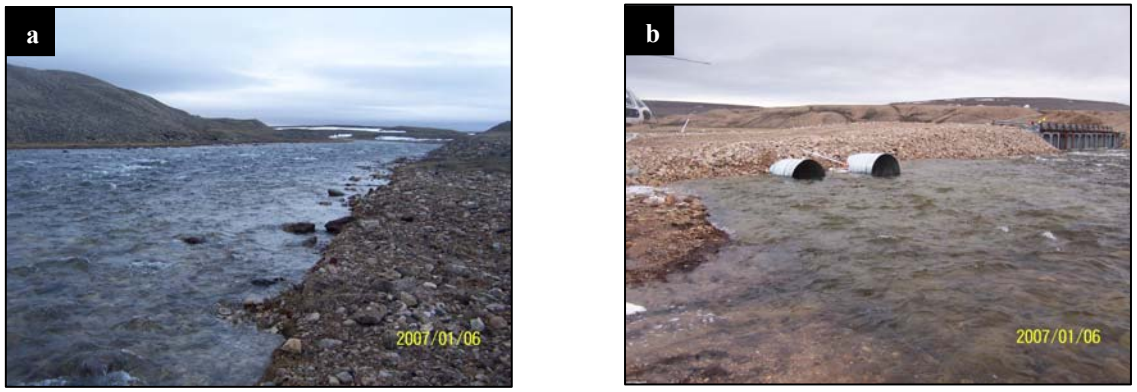

Figure 1.View upstream (a) and downstream (b) from the habitat assessment upstream of BG-50 during spring 2008.

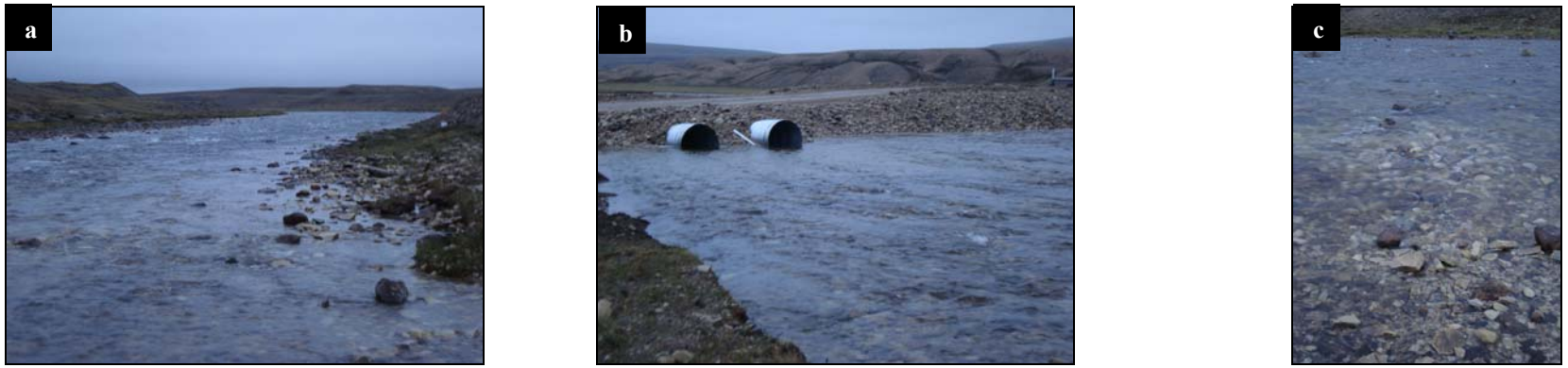

Figure 2. View upstream (a), downstream (b), and across (c) from the habitat assessment upstream of BG-50 during summer 2008.

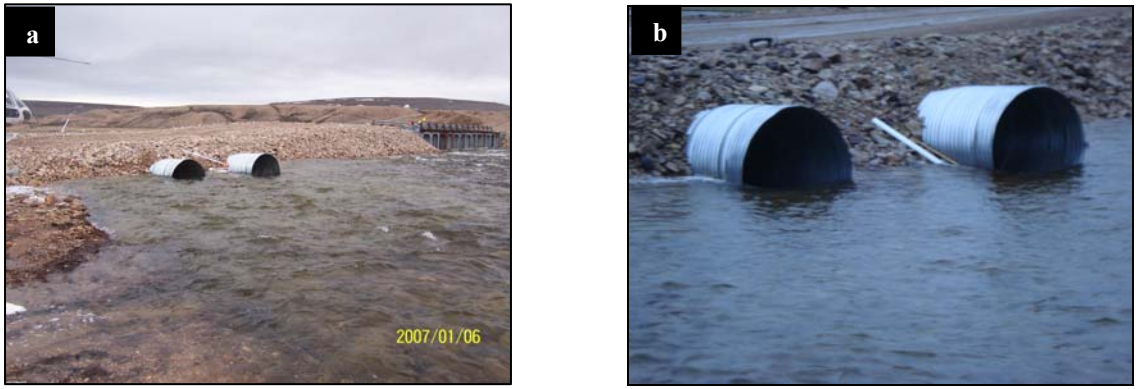

Figure 3. View from the upstream end of the culverts at crossing BG-50 during spring (a) and summer (b) 2008.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name: BG-50
Site: DS

UTM / Chainage: 17W 529334 7926846 / 62 + 804
Dates Surveyed: 4-Jul-09, 28-Aug-09

Site Description/Physical Characteristics

Confinement: Unconfined-Partial

Channel Gradient: 2-5˚

Hydrology

	Spring	Fall
Bankfull Width (m):	62.15	62.15
Wetted Width (m):	57.58	44.79
Riffle Depths (m):	0.10, 0.11, 0.18	0.10, 0.10, 0.14
Pool Depths (m):	1.20, 0.27	0.80, 0.10
Sea Can Depths (from right #'s 4, 5, 7) (m):	-, -, -	0.20, 0.40, 0.30
Culvert Depths (L, R) (m):	0.33, -	0.19, 0.28
Maximum Depth (m):	> 1.00	> 1.00
Point Velocities (m/s)		
Riffles:	0.86, 0.81, 1.02	1.09, 0.75, 0.88
Pools:	0.01, 0.05	0.01, 0.00
Sea Cans (4, 5, 7):	-, -, -	0.35, 0.75, 1.01
Culverts (L, R):	1.82, -	1.83, 2.14

Stream/Riparian Habitat

Channel Morphology: 90% riffle, 10% pool

Substrate Composition: 80% lg. cobble, 15% sm. cobble, 5% boulder

Stream Cover: 85% lg. cobble/ boulder, 1% deep. pool

Aquatic Vegetation: Periphyton

Riparian Vegetation: Grasses, willows, moss

Barriers Present (Y/N): Y - partial
Location: Culverts are slightly perched, but sea cans are passable

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	0.20-0.40	0.20-0.40
Bank Stability:	High	High
Erosion Potential:	Low	Low

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	118	175
pH:	8.49	8.12
Water Temp (˚C):	4.0	5.0

Fish Habitat

	Spring	Fall
Spawning:	ARCH - N NNST - L	ARCH - N NNST - N
Feeding:	ARCH - H NNST - L	ARCH - H NNST - L
Migration:	ARCH - H NNST - L	ARCH - H NNST - L

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site downstream of the sea can crossing at BG-50 during early July, 2009.

Figure 2. View upstream (a), downstream (b), and across (b) at the habitat assessment site downstream of the sea can crossing at BG-50 during late August, 2009.

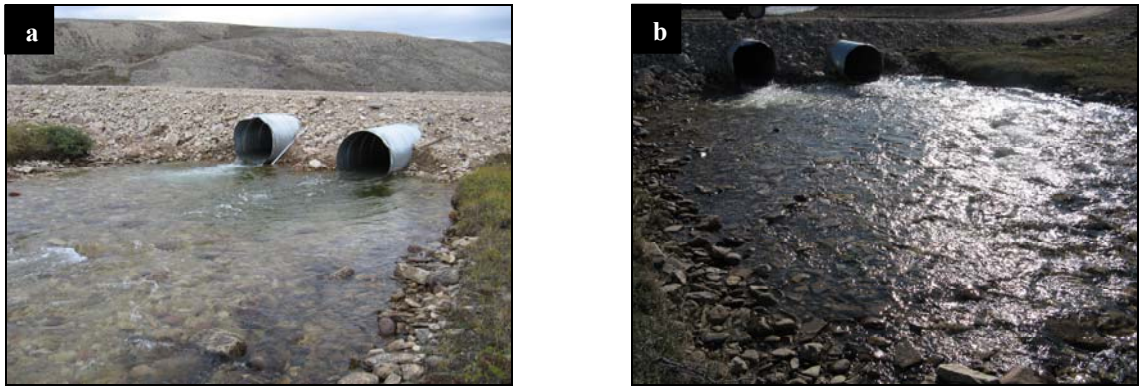

Figure 3. View upstream in early July (a) and late August (b) at the habitat assessment site downstream of the culvert crossing at BG-50.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name:	BG-50	**UTM / Chainage:**	17W 529334 7926846 / 62 + 804
Site:	US	**Dates Surveyed:**	4-Jul-09, 28-Aug-09

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: 2-5˚

Hydrology

	Spring	Fall
Bankfull Width (m):	52.10	52.10
Wetted Width (m):	50.27	45.70
Riffle Depths (m):	0.24, 0.20	0.14, 0.17
Pool Depth (m):	0.21	-
Sea Can Depths (from right #'s 4, 5, 7) (m):	-, -, -	0.42, 0.47, 0.42
Culvert Depths (L, R) (m):	0.40, -	0.35, 0.46
Maximum Depth (m):	0.50	0.47
Point Velocities (m/s)		
Riffles:	0.84, 0.65	0.98, 0.72
Pool:	0.02	0.00
Sea Cans (4, 5, 7):	-, -, -	0.25, 1.38, 1.26
Culverts (L, R):	0.71, -	0.63, 0.95

Stream/Riparian Habitat

Channel Morphology:	90% riffle, 10% pool
Substrate Composition:	80% lg. cobble, 15% sm. cobble, 5% boulder
Stream Cover:	85% lg. cobble/ boulder, 1% deep pool
Aquatic Vegetation:	Periphyton
Riparian Vegetation:	Grasses, willows, moss
Barriers Present (Y/N):	Y - partial
Location:	Culverts are slightly perched, but sea cans are passable

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	0.00-0.35	0.00-0.35
Bank Stability:	Mod	Mod
Erosion Potential:	Mod	Mod

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	120	-
pH:	8.48	-
Water Temp (˚C):	4.0	-

Fish Habitat

	Spring	Fall
Spawning:	ARCH - N NNST - L	ARCH - N NNST - N
Feeding:	ARCH - H NNST - L	ARCH - H NNST - L
Migration:	ARCH - H NNST - L	ARCH - H NNST - L

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at BG-50 during early July, 2009.

Figure 2. View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at BG-50 during late August, 2009.

Bulk Sample Road Watercourse Crossing Assessment

Figure 1: Downstream view from proposed crossing showing riffle habitat with cobble substrate.

Figure 2: Upstream view from proposed crossing showing more riffle habitat.

Location

Site: CV-49

UTM: 17W 0529676 / 7926541

Watercourse Name: Unknown River

Site Description

Watershed Size:	11.984 km^2
Regulated:	No
Channelized:	No
Bankfull Width:	14.0 m
Wetted Width:	12.0 m
Riffle-Crest Depth:	0.10 m
Pool Depth:	N/A
Residual Pool Depth:	N/A
Bankfull Depth:	0.70 m
Bank Height:	0.60 m
D_{95}:	1.24 m
D:	0.004 m
Confinement:	Partially Confined
Channel Morphology:	Riffle
Channel Gradient:	1^0
Turbidity:	0.00 FTU
Side Slope	R – 7%; L – 7%
Approach:	R – 93%; L – 93%
Bank Stability:	Moderate
Erosion Potential:	Low-Moderate
Undercut Banks:	None

Mesohabitat Composition:	Riffle – 100%
Substrate Composition:	Cobble – 95%; Boulder – 3%; Gravel – 2%
Stream Cover:	Boulders – 3%
Riparian Vegetation:	Moss, lichens, small plants
Aquatic Vegetation:	None
Unique Features:	None
Summary:	This is a large-sized waterbody consisting almost exclusively of riffles and cobble habitat. The banks have low-moderate erosion potential and there is relatively little available cover.

Fish Habitat Quality

Important

Potential Fish Utilization

Arctic Char

Spawning:	Unlikely
Migration:	Possible
Rearing:	Possible
Overwintering:	None

Ninespine Stickleback

Spawning:	Unlikely
Migration:	Unlikely
Rearing:	Unlikely
Overwintering:	None

Comments

Although habitat at the proposed crossing appears to be potentially suitable for several life cycle stages of char, none were captured or observed during fisheries investigations. Use by juveniles may be limited due to a lack of low velocity areas while adults may potentially only use the site for spawning in the fall and maybe some early spring feeding activity. However, this river is still potentially important for char. Stickleback use is also restricted by velocity.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name:	CV-049	**UTM / Chainage:**	17W 529677 7926542 / 63 + 302
Site:	DS	**Dates Surveyed:**	4-Jul-09, 28-Aug-09

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: 2-5˚

Hydrology

	Spring	Fall
Bankfull Width (m):	21.94	21.94
Wetted Width (m):	12.80	12.80
Riffle Depths (m):	0.12, 0.07	0.10, 0.08
Pool Depth (m):	0.08	0.68
Culvert Depths (L, R) (m):	0.47, -	0.43, 0.15
Maximum Depth (m):	0.70	0.68
Point Velocities (m/s)		
Riffles:	0.42, 0.75	0.86, 0.63
Pool:	0.10	0.03
Culverts (L, R):	0.60, -	0.39, 0.27

Stream/Riparian Habitat

Channel Morphology: 90% riffle, 10% pool

Substrate Composition: 75% sm. cobble, 19% lg. cobble, 5% gravel, 1% boulder

Stream Cover: 20% lg. cobble/ boulder, 1% deep pool

Aquatic Vegetation: Periphyton

Riparian Vegetation: Grasses

Barriers Present (Y/N): N

Location: N/A

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	Undef-0.15	Undef-0.15
Bank Stability:	Mod	Mod
Erosion Potential:	Mod	Mod

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	136	293
pH:	8.48	8.18
Water Temp (˚C):	4.4	4.5

Fish Habitat

	Spring	Fall
Spawning:	ARCH - N NNST - L	ARCH - N NNST - N
Feeding:	ARCH - H NNST - L	ARCH - H NNST - L
Migration:	ARCH - H NNST - L	ARCH - H NNST - L

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site downstream of the crossing at CV-049 during early July, 2009.

Figure 2. View upstream (a), downstream (b), and across (b) at the habitat assessment site downstream of the crossing at CV-049 during late August, 2009.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name: CV-049
Site: US

UTM / Chainage: 17W 529677 7926542 / 63 + 302
Dates Surveyed: 4-Jul-09, 28-Aug-09

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: 2-5˚

Hydrology

	Spring	Fall
Bankfull Width (m):	36.56	36.56
Wetted Width (m):	27.42	21.94
Riffle Depths (m):	0.04, 0.06	0.10, 0.03
Pool Depth (m):	0.15	0.02
Culvert Depths (L, R) (m):	0.34, -	0.24, 0.10
Maximum Depth (m):	0.40	0.30
Point Velocities (m/s)		
Riffles:	0.89, 0.75	0.73, 0.48
Pool:	0.00	0.00
Culverts (L, R):	1.00, -	1.04, 0.47

Stream/Riparian Habitat

Channel Morphology: 80% riffle, 20% pool

Substrate Composition: 75% sm. cobble, 19% lg. cobble, 5% gravel, 1% boulder

Stream Cover: 20% lg. cobble/ boulder, 1% deep pool

Aquatic Vegetation: Periphyton

Riparian Vegetation: Grasses

Barriers Present (Y/N): N
Location: N/A

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	Undef	Undef
Bank Stability:	Mod	Mod
Erosion Potential:	Mod	Mod

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	135	-
pH:	8.50	-
Water Temp (˚C):	4.3	-

Fish Habitat

	Spring	Fall
Spawning:	ARCH - N NNST - L	ARCH - N NNST - N
Feeding:	ARCH - H NNST - L	ARCH - H NNST - L
Migration:	ARCH - H NNST - L	ARCH - H NNST - L

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at CV-049 during early July, 2009.

Figure 2. View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at CV-049 during late August, 2009.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name: CV-048
Site: DS
UTM / Chainage: 17W 530415 7925875 / 64 + 312
Dates Surveyed: 4-Jul-09, 28-Aug-09

Site Description/Physical Characteristics

Confinement: Unconfined

Channel Gradient: 2-5˚

Hydrology

	Spring	Fall
Bankfull Width (m):	10.05	36.56
Wetted Width (m):	10.05	8.80
Riffle Depths (m):	0.03, 0.08	0.04, 0.07
Pool Depth (m):	0.11	0.11
Right Culvert Depth (m):	0.32	0.28
Maximum Depth (m):	0.32	0.28
Point Velocities (m/s)		
Riffles:	0.64, 0.65	0.49, 0.70
Pool:	0.03	0.02
Right Culvert:	0.55	0.46

Stream/Riparian Habitat

Channel Morphology: 85% riffle, 15% pool

Substrate Composition: 60% sm. cobble, 20% lg. cobble, 10% gravel, 10% boulder

Stream Cover: 30% lg. cobble/ boulder, 1% deep pool

Aquatic Vegetation: Periphyton

Riparian Vegetation: Grasses, willows, moss

Barriers Present (Y/N): Unknown
Location: Fish not captured here; reason unknown

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	0.20	0.20-0.25
Bank Stability:	Mod	Mod
Erosion Potential:	Mod	Mod

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	112	316
pH:	8.41	8.48
Water Temp (˚C):	5.2	2.0

Fish Habitat

	Spring	Fall
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - N NNST - N	ARCH - N NNST - N
Migration:	ARCH - N NNST - N	ARCH - N NNST - N

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Fish Habitat Quality – NOT-FISH BEARING

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site downstream of the crossing at CV-048 during early July, 2009.

Figure 2. View upstream (a), downstream (b), and across (b) at the habitat assessment site downstream of the crossing at CV-048 during late August, 2009.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name: CV-048
Site: US

UTM / Chainage: 17W 530415 7925875 / 64 + 312
Dates Surveyed: 4-Jul-09, 28-Aug-09

Site Description/Physical Characteristics

Confinement: Unconfined

Channel Gradient: 2-5˚

Hydrology

	Spring	Fall
Bankfull Width (m):	6.40	6.40
Wetted Width (m):	6.40	3.3
Riffle Depth (m):	0.05	0.06
Pool Depth (m):	0.23	0.11
Right Culvert Depth (m):	0.29	0.33
Maximum Depth (m):	0.30	0.33
Point Velocities (m/s)		
Riffle:	0.29	0.59
Pool:	0.13	0.01
Right Culvert:	0.55	0.43

Stream/Riparian Habitat

Channel Morphology: 80% riffle, 20% pool

Substrate Composition: 49% lg. cobble, 45% sm. cobble, 5% gravel, 1% boulder

Stream Cover: 50% lg. cobble/ boulder, 5% deep pool

Aquatic Vegetation: Periphyton

Riparian Vegetation: Grasses, willows, moss

Barriers Present (Y/N): Unknown
Location: Fish not captured here; reason unknown

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	0.10-0.20	0.10-0.20
Bank Stability:	High	High
Erosion Potential:	Low	Low

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	115	-
pH:	8.40	-
Water Temp (˚C):	5.2	-

Fish Habitat

	Spring	Fall
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - N NNST - N	ARCH - N NNST - N
Migration:	ARCH - N NNST - N	ARCH - N NNST - N

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at CV-048 during early July, 2009.

Figure 2. View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at CV-048 during late August, 2009.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name:	CV-046	**UTM / Chainage:**	17W 531686 7924265 / 66 + 490
Site:	DS	**Dates Surveyed:**	4-Jul-09, 28-Aug-09

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: N/M

Hydrology

	Spring	Fall
Bankfull Width (m):	2.6	2.6
Wetted Width (m):	2.6	2.2
Riffle Depth (m):	0.09	0.06
Pool Depth (m):	0.15	0.11
Culvert Depth (m):	0.13	0.13
Maximum Depth (m):	0.25	N/M
Point Velocities (m/s)		
Riffle:	0.55	0.35
Pool:	0.13	0.00
Culvert:	1.14	0.82

Stream/Riparian Habitat

Channel Morphology: 90% riffle, 10% pool

Substrate Composition: 50% sm. cobble, 30% lg. cobble, 10% boulder, 10% gravel

Stream Cover: 40% cobble/boulder, 10% d. pool

Aquatic Vegetation: N/M

Riparian Vegetation: grass, moss

Barriers Present (Y/N): N

Location: N/A

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	0.15-22	N/M
Bank Stability:	Moderate	Moderate
Erosion Potential:	Moderate	Moderate

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	93	299
pH:	8.41	8.42
Water Temp (˚C):	3.3	1.8

Fish Habitat Use

	Spring	Fall
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - N NNST - N	ARCH - N NNST - N
Migration:	ARCH - N NNST - N	ARCH - N NNST - N

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Fish Habitat Quality – NOT FISH-BEARING

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site downstream of the crossing at CV-046 during spring, 2009.

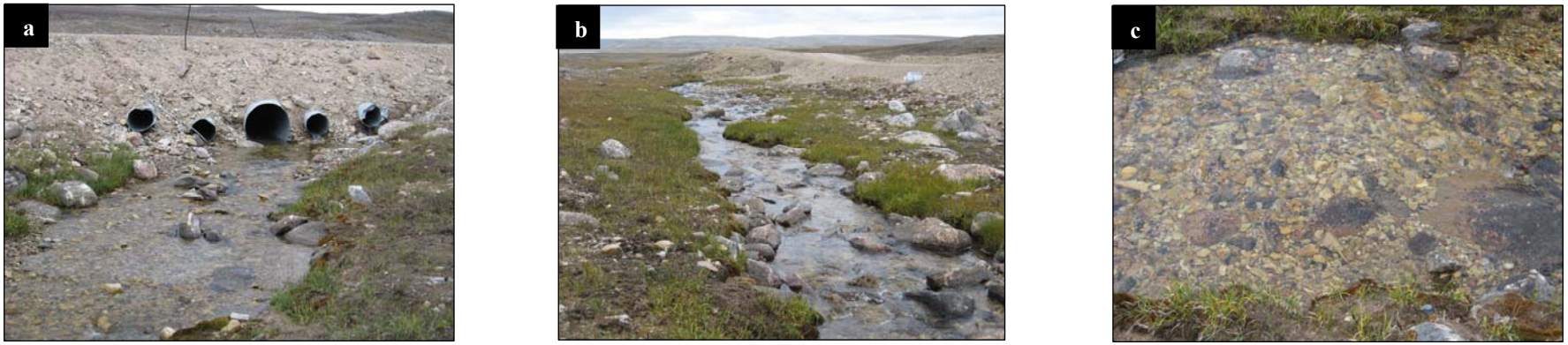

Figure 2. View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at CV-046 during fall, 2009.

Tote Road Aquatic Habitat Assessment

Location

Watercourse Name: CV-046
Site: US

UTM / Chainage: 17W 531686 7924265 / 66 + 490
Dates Surveyed: 4-Jul-09, 28-Aug-09

Site Description/Physical Characteristics

Confinement: Partial

Channel Gradient: N/M

Hydrology

	Spring	Fall
Bankfull Width (m):	2.0	2.0
Wetted Width (m):	2.0	1.7
Riffle Depth (m):	0.14	0.04
Pool Depth (m):	0.12	0.23
Culvert Depth (m):	0.13	0.07
Maximum Depth (m):	0.2	0.24
Point Velocities (m/s)		
Riffle:	1.05	0.31
Pool:	0.00	0.00
Culvert:	0.80	0.36

Stream/Riparian Habitat

Channel Morphology: 60% riffle, 40% pool

Substrate Composition: 40% lg. cobble, 30% boulder, 25% sm. cobble, 5% gravel

Stream Cover: 20% boulder, 1% d. pool

Aquatic Vegetation: N/M

Riparian Vegetation: grass, moss

Barriers Present (Y/N): N
Location: N/A

L/R Bank Characteristics

	Spring	Fall
Bank Height (m):	0.10-0.20	N/M
Bank Stability:	Moderate	Moderate
Erosion Potential:	Moderate	Moderate

Water Quality

	Spring	Fall
Specific Conductance (µS/cm):	93	N/M
pH:	8.43	N/M
Water Temp (˚C):	3.2	N/M

Fish Habitat Use

	Spring	Fall
Spawning:	ARCH - N NNST - N	ARCH - N NNST - N
Feeding:	ARCH - N NNST - N	ARCH - N NNST - N
Migration:	ARCH - N NNST - N	ARCH - N NNST - N

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Fish Habitat Quality – NOT FISH-BEARING

Tote Road Aquatic Habitat Assessment

Figure 1.View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at CV-046 during spring, 2009.

Figure 2. View upstream (a), downstream (b), and across (c) at the habitat assessment site upstream of the crossing at CV-046 during fall, 2009.