



**BAFFINLAND IRON MINES CORPORATION
MARY RIVER PROJECT**

**EARLY REVENUE PHASE - TOTE ROAD UPGRADES
FISH HABITAT MONITORING
2016 ANNUAL REPORT TO
DEPARTMENT OF FISHERIES AND OCEANS**

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SECTION 1.0 - INTRODUCTION

1.1 MARY RIVER PROJECT

The Mary River Project (the Project) is an iron ore mining project operated by Baffinland Iron Mines Corporation (Baffinland) located in the North Baffin region of Baffin Island, Nunavut. The Mary River Mine Site coordinates are approximately Latitude 71 degrees, 19' 35" North and Longitude 79 degrees 22' 30" West. Detailed descriptions of the Project and annual activities can be found in annual reports from Knight Piésold (2007b, 2008) and Baffinland (2009 to-2015, incl.).

Currently, the Tote Road is used as a means of transport for iron ore, personnel, equipment, and supplies between the Mary River Mine Site and Milne Port Site. Since 2013, there have been ongoing upgrades to sections of the road as part of the construction and operation of the Early Revenue Phase (ERP) for the Project. In order to safely and efficiently transport iron ore from the Mine Site to Milne Inlet during the early operational period of the mine, the existing Tote Road has been upgraded to accommodate and facilitate safe transit of large haul trucks and other vehicles. Work on these upgrades was initiated during the winter of 2013/14 and are still ongoing. Tote Road upgrades have included the following activities:

- Replacement of sea container crossings with free-span bridges (completed in 2014).
- Widening and twinning of the tote road at strategic locations.
- Straightening and realignment along specific road sections.
- Continued installation, movement and/or extension of culverts at identified stream crossings to improve transportation safety, minimize erosion/sedimentation, and fish passage.

As part of the response to the Fisheries Act Direction received by Baffinland from Environment and Climate Change Canada (ECCC) on June 7, 2016, Baffinland undertook various works during the summer of 2016 to minimize the potential for sedimentation and erosion. A Completion Report was submitted to ECCC on September 30 (Baffinland 2016) that summarized the actions that were taken over the summer of 2016. In addition, the Completion Report included Sedimentation and Dust Mitigation Action Plans. A critical item in the Sedimentation Mitigation Action Plan included the development and implementation of a Tote Road Earthworks Execution Plan (TREETP) to address outstanding concerns (damaged culverts, embankment erosion, etc.) along the Tote Road. The TREETP will outline timelines and measurable deliverables and will discuss the planned sedimentation mitigation measures to be completed along the Tote Road in 2017 and subsequent years.

1.2 AUTHORIZATION FOR WORKS

The Department of Fisheries and Oceans (DFO) (1998) defined Harmful Alteration, Disruption or Destruction (HADD) as, "any meaningful change in one or more habitat components that can



reasonably be expected to cause a real reduction in the capacity of the habitat to support the life requisites of fish." A HADD occurs when the physical, chemical, or biological features of a water body are sufficiently altered, such that habitat becomes less suitable for one or more life history processes of fish. Detailed descriptions of the 2007 HADD authorization (DFO File: NU-06-0084) and any related amendments and Letters of Advice can be found in previous annual reports (Knight Piésold 2007b, 2008; Baffinland 2009, 2010, 2011, 2012, 2013, 2014) and the Fish Habitat No Net Loss and Monitoring Plan is described by Knight Piésold (2007a).

A total of 25 crossings were identified (as HADD) under the August 2007 Fisheries Act Authorization, and 14 crossing were identified (as Habitat Compensation) in the August 2007 No Net Loss and Monitoring Plan. The locations of these crossings along the Tote Road are presented in Figure 1.1. Of these 25 crossings, three have since been identified as not fish-bearing and they no longer qualify as HADD sites (Baffinland 2010).

During 2016, no new Letters of Advice or Fisheries Authorizations were applied for or issued for the The Mary River Project.

1.3 REPORTING

A written report summarizing the monitoring results is to be submitted to the specified office locations of the Department of Fisheries and Oceans, Fish Habitat Management, Eastern Arctic Area, on or before December 31 of each year. Annual reports have already been submitted for the years 2007 to 2015, incl. (Knight Piésold 2007b, 2008 and Baffinland 2009, 2010, 2011, 2012, 2013, 2014, 2015).

The 2016 Annual Report, herein, covers the period of activity up to and including December 30, 2016. It summarizes the fish habitat monitoring results and provides a record for additional works or undertakings completed in accordance with the approved No Net Loss and Monitoring Plan (Knight Piésold 2007a) and conditions of the authorization, subsequent amendments, and recent Letters of Advice.

SECTION 2.0 - PROJECT DESCRIPTION

2.1 CONSTRUCTION WORK

Design summaries and descriptions of work along the Tote Road completed up to the end of 2009 are presented, in detail, in Knight Piésold (2007c) and Baffinland (2009). Recent road construction activities and installation of fish access improvement structures at some crossings are described in Baffinland (2010, 2011, 2012, 2013, 2014, and 2015).

In order to safely and efficiently transport iron ore from the Mine Site to Milne Inlet during the early operational period of the mine, the existing Tote Road has been further upgraded to accommodate the efficient and safe transit of large haul trucks and other vehicles. The first phase of the upgrades involved replacement of sea container crossings with bridges. Bridge installation was completed during the winter of 2013/14, but removal of the old sea container crossings is ongoing. Two of the four old sea can bridge crossings have been removed to date; CV 217b at km 80 and CV 128 at km 17 remain to be removed. Culvert re-installation, replacement and extension work was initiated during 2014 and also remains ongoing. Culvert installations/replacements were completed between December 2015 and the end of December 2016; however, the majority of these works occurred in non-fish-bearing streams and are, therefore, not considered further within the scope of this report. A summary of the completed work on fish bearing streams is provided in Table 2.1.

In spring 2016, Baffinland retained third party expertise, led by Golder Associates to perform work in order to mitigate erosion and sediment deposition in fisheries streams and receiving environments along the Tote Road, which contributed to the Fisheries Act Direction Baffinland received on June 7, 2016. The majority of this work focused on placing clean riprap and geo- textile fabric along strategic ditching locations that directly drained into fisheries crossings and receiving environments. The entirety of sedimentation, erosional mitigation and monitoring measures performed were summarized to ECCC, DFO, and Indigenous and Northern Affairs Canada (INAC) in six bi-weekly update reports culminating in a Completion Report submitted on September 30, 2016 (Baffinland 2016).

2.2 FISH HABITAT ASSESSMENT

Watercourses initially identified as HADD (n = 25) and compensation (n = 14) sites (Knight Piésold 2007a) were each assessed for the quality of available fish habitat at least once between 2006 and 2009 (Baffinland 2009). Detailed assessments for these sites are provided in Knight Piésold (2007b, 2008) and Baffinland (2009, 2010, 2011, 2012, 2013, 2014, 2015).

In 2016, monitoring was conducted at all fish-bearing crossings. Changes to the Tote Road included the replacement of sea container crossings with bridges (bridge installation completed during the winter of 2013/14; sea container removal ongoing), and the installation/extension of new culverts at existing crossings to accommodate road widening, straightening, and/or realignment. The emphasis of the 2016 monitoring program was to assess the presence of fish, habitat quality, and fish passage at the sites where upgrades had been completed and provide recommendations for sites yet to receive upgrades (refer to Tables 2.1 and 3.3).



Habitat surveys involved observations of substrate, gradient, flow characteristics, and potential fish use along 50 m reaches upstream and downstream of each crossing. Fish presence was determined through visual surveys and the use of a backpack electrofisher. In previous years, both methods have proven to be highly reliable techniques for determining fish presence/absence in the clear, shallow streams that are typical of the study area. Descriptions of habitat and condition of culverts were noted and photographs were taken. Results of aquatic monitoring are presented in Section 3.0.

Monitoring will continue in 2017 with descriptions of changes and potential impacts to be provided upon completion of upgrades on crossings for fish bearing streams, both historical and those to be outlined in the forthcoming TREEP (Table 2.2). It is expected that there will be some habitat gains (removal of sea container crossings) and losses (due to extension/lengthening of some existing culverts) that will need to be accounted for as work continues.

2.3 FISH HABITAT COMPENSATION

Compensation works completed for the Tote Road prior to 2009 are described in detail in Knight Piésold (2007a) and the results of recent compensation works (e.g., rustic fishway at BG-30) and detailed fish habitat and fish use surveys from 2009 to 2015 are presented in Baffinland (2009, 2010, 2011, 2012, 2013, 2014, and 2015). Following successful completion of habitat works at BG-30 (Baffinland 2012), there was a net habitat gain, which together with other gains met the compensation goals described in Knight Piésold (2007a). Fish presence upstream of the fishway in BG-30 has been confirmed during site visits from 2013-2016, indicating structural integrity and successful fish passage has been maintained.

2.4 SUMMARY OF DESIGN CHANGES

Modifications to accommodate upgrades to the Tote Road and specific water crossings to support the Early Revenue Phase of the Project that were completed in 2016 are presented in Table 2.1. Baffinland received approvals from the DFO in the form of Letters of Advice (refer to Appendix A) to proceed with these changes. As of November 30, 2015, work had been completed on the four bridge crossings and seven culvert crossings were worked on in 2015. During November 2016, CV 104 was replaced with 2 new 1.2m culverts, with clean riprap placed around the culvert ends to repair the previously damaged crossing. BG-50A, the Km 62 sea can bridge, was also removed in late November to rectify fish passage concerns. Currently the scope of planned future Tote Road crossing improvements are in development, and will be summarized in the TREEP. Baffinland Iron Mines will work with the Department of Fisheries and Oceans to ensure planned modifications to fish bearing crossings (Table 3.3) are in compliance of the federal *Fisheries Act*.

SECTION 3.0 - AQUATIC MONITORING

A monitoring plan was developed to ensure that all measures and works specified in the No Net Loss and Monitoring Plan (Knight Piésold 2007a), as well as the *Fisheries Act* Authorization and amendments, have been implemented and are functioning as intended. Details of aquatic monitoring conducted up to 2015 are provided in Knight Piésold (2007b, 2008) and Baffinland (2009, 2010, 2011, 2012, 2013, 2014, and 2015). Aquatic monitoring in 2016 focussed on assessing any changes to fish, habitat, and accessibility at fish-bearing crossings where replacement/installation of culverts occurred since November 2015.

3.1 CONSTRUCTION AND TURBIDITY MONITORING

There was no in-stream construction work in 2016 during periods of flow that required turbidity monitoring. However turbidity and flow monitoring was performed on 14 HADD crossings during June and July and August of 2016 (Table 3.1).

3.2 WATER QUALITY MONITORING OF BASELINE FISHERIES CULVERTS

Water quality monitoring data from Knight Piesold baseline monitoring work performed during 2005 and 2006, in conjunction with monitoring of the same crossings from 2015 and 2016 is presented in Table 3.2.

3.3 FISH USE ASSESSMENTS AT SELECT CROSSINGS

Fish use assessments in 2016 were conducted at all fish-bearing sites, including those where ERP upgrades had been completed by early July and those where potential future upgrades may proceed. Table 3.3 summarizes assessments conducted in 2016 and provides recommendations for future monitoring or construction works for 2017. Follow-up and corrective actions are also provided in Table 3.3, subsequent to receiving field reports from the fisheries biologist.

Five normally fish-bearing streams were dry or nearly dry in 2016, with no fish observed at the time of the survey in early July. Fish were observed at all remaining known fish-bearing crossings with generally unobstructed upstream passage through most of the culverts (Table 3.3). At the fish-bearing crossings where new construction works had been completed by early July 2016, most showed no issues with fish use of habitat or passage potential through the culverts. The old sea containers at BG-50A were becoming perched and impassable as of the early July survey and were subsequently removed in late November 2016. This should restore full access to all fish using the north channel of that stream. Removal of remaining sea containers at CV-128 and CV-217B is currently ongoing and planned to be completed by March 28, 2017.

To minimize the amount of sediment entering watercourses during freshet and damage to culverts along the Tote Road, a snow management plan with an emphasis on fish-bearing streams has been implemented to mitigate future sedimentation issues. During the Fall of 2016, fish-bearing streams were identified with roadside flags/markers. This will assist in providing visual reminders that identify fish habitat streams for routine equipment operations on the road.



Mild (e.g., CV-106) to severe (e.g., south channel at BG-50) perching of culverts has been noted at a few crossings (Table 3.3). Mild perching does not appear to have affected fish passage, but the crossing at BG-50 is sufficiently perched to prevent all upstream access for fish in the south channel, however fish passage is accessible in the north channel, especially with the removal of the perched sea can bridge at this crossing. In addition, the culverts at BG-01, though improved with the addition of a rocky ramp in 2008, are becoming increasingly perched through erosion and may become impassable in the near future. Crossings with mild perches will continue to be monitored in future years, but a Tote Road Earthworks Execution Plan (TREEP) is being developed to improve fish passage issues and erosion and sedimentation, which have been noted at several crossings (Table 3.3).

3.4 FISH USE ASSESSMENTS AT COMPENSATION SITES

All compensation works remain successful (including fish use of the rustic fishway installed at BG-30). For more details on habitat compensation activities, see Baffinland (2009, 2010, 2011, 2012, 2013, 2014, and 2015).

It is expected that there will be a reduction in the original HADD footprint size at crossings where bridges replaced sea containers and some change to the footprint size at crossings where new culverts are being installed and others replaced. Following completion of ERP upgrades and any additional works as recommended by the TREEP, HADD and compensation will be revisited to determine if sufficient compensation remains or if additional works will be required.



SECTION 4.0 - AUTHORIZED HADD CROSSING INSTALLATION SUMMARY

The locations for current authorized HADD crossings and habitat compensation sites are presented in Figure 1.1. As of November 30, 2008, all authorized HADD water crossings were installed. Remedial work up to August 2009 at the habitat compensation sites was substantially completed, and by October 2011 additional habitat compensation investigations and access structure installation were complete at select crossings. In 2012, new culverts were installed at two HADD crossings (BG-04 and BG-32) and habitat compensation works were completed at BG-30. No additional work was completed in 2013 due to pending potential upgrades to large portions of the Tote Road as part of the Early Revenue Phase of the Project. In 2013/14 bridges were installed at four crossings and culvert replacement/extension was initiated on another crossing. The now obsolete sea containers were removed from the CV-223 crossing during late fall 2014 and from BG-50 in late 2016, but have not yet been removed from two other crossings. A complete and updated list of the HADD crossings and habitat compensation sites, including crossing IDs, is provided in Table 4.1. The data in this table reflect those that were presented in detail in previous reports (Knight Piésold 2007b and 2008, Baffinland 2009), as well as the results from the most recent Tote Road surveys that were completed in 2010 (Baffinland 2010), 2011 (Baffinland 2011), 2012 (Baffinland 2012), 2013 (Baffinland 2013), 2014 (Baffinland 2014), and 2015 (Baffinland 2015).

SECTION 5.0 - REFERENCES

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TABLES AND FIGURES

Table 2.1. Summary of changes to Tote Road crossings at fish-bearing streams completed from December 1, 2015 to December 30, 2016.

Crossing	Road Chainage (km.m)	Completed Work	Current Crossing Configuration	Fisheries Survey
CV104	A33+301	<ul style="list-style-type: none"> Existing culverts replaced and extended to allow widening of the road and improve fish passage. 	<ul style="list-style-type: none"> 2 x 1.2m diameter 	<ul style="list-style-type: none"> Fish observed upstream and downstream. Though fish passage was observed, the upstream end of the culvert is damaged and a little steep, which may limit passage success
BG-50	62+081	<ul style="list-style-type: none"> Bridge installed to replace old sea container crossing in 2014 Sea can bridge removed in November 2016 	<ul style="list-style-type: none"> Bridge 	<ul style="list-style-type: none"> Habitat under bridge ideal for Arctic Char use (cobble/riffle); old sea containers removed to restore habitat
		<ul style="list-style-type: none"> Existing culverts replaced with large diameter culverts on new road alignment in right-hand channel 	<ul style="list-style-type: none"> 2 x 1.2m diameter 	<ul style="list-style-type: none"> Culverts are perched, preventing upstream access to fish in the right-hand channel

Table 2.2. Technical summary of existing crossing structures installed at fish-bearing streams along the Tote Road.

Water Crossing	Culvert No.	Existing Road Chainage (km + m)	Existing Diameter of CSP Culverts (m) ¹							Fish Habitat Quality Rating ³	Notes ⁴
			Ø = 2.0	Ø = 1.2	Ø = 1.0	Ø = 0.5	Ø = 0.25	Ø = 0.15	Ø = 0.10		
			(m)	(m)	(m)	(m)	(m)	(m)	(m)		
CV169	-	A5+149	-	-	-	X	-	-	-	MAR	New
CV167		A5+820	-	-	-	X	-	-	-	MAR	-
CV129	B	A16+800	-	X	-	-	-	-	-	IMP	New
	C	A16+803	-	X	-	-	-	-	-	IMP	New
CV128		A16+807	-	-	-	-	-	-	-	IMP	Bridge
CV115	A	A27+193	-	-	-	X	-	-	-	MAR	-
	B	A27+200	-	-	X	-	-	-	-	MAR	-
CV114		A29+151	-	-	X	-	-	-	-	MAR	-
CV112	A	A30+947	-	X	-	-	-	-	-	IMP	-
	B	A30+951	-	X	-	-	-	-	-	IMP	-
	C	A30+953	-	X	-	-	-	-	-	IMP	-
CV111		A31+489	-	-	X	-	-	-	-	IMP	-
CV106		A32+681	-	-	X	-	-	-	-	MAR	-
CV104	A	A33+301	-	X	-	-	-	-	-	MAR	New
	B	A33+307	-	X	-	-	-	-	-	MAR	New
CV102	A	A35+540	-	-	X	-	-	-	-	IMP	-
	B	A35+543	-	-	-	X	-	-	-	IMP	-
	C	A35+544	-	-	-	X	-	-	-	IMP	-
	D	A35+545	-	-	-	X	-	-	-	IMP	-
CV099	A	A37+351	X	-	-	-	-	-	-	IMP	New
	B	A37+343	X	-	-	-	-	-	-	IMP	New
CV087	A	A45+741	-	-	-	X	-	-	-	MAR	-
	B	A45+737	-	-	-	X	-	-	-	MAR	-
	C	A45+752	-	-	-	X	-	-	-	MAR	-
CV080		A50+002	-	-	X	-	-	-	-	IMP	-
CV079	A	A50+109	-	X	-	-	-	-	-	IMP	-
	B	A50+066	-	X	-	-	-	-	-	IMP	-
	C	A50+225	-	-	-	X	-	-	-	IMP	-
	D	A50+226	-	-	-	X	-	-	-	IMP	-

Table 2.2. Technical summary of existing crossing structures installed at fish-bearing streams along the Tote Road.

Water Crossing	Culvert No.	Existing Road Chainage (km + m)	Existing Diameter of CSP Culverts (m) ¹							Fish Habitat Quality Rating ³	Notes ⁴
			Ø = 2.0	Ø = 1.2	Ø = 1.0	Ø = 0.5	Ø = 0.25	Ø = 0.15	Ø = 0.10		
			(m)	(m)	(m)	(m)	(m)	(m)	(m)		
CV078	A	A50+680	-	X	-	-	-	-	-	IMP	-
	B	NA	-	-	X	-	-	-	-	IMP	-
	C	NA	-	-	X	-	-	-	-	IMP	-
	D	NA	-	-	X	-	-	-	-	IMP	-
CV076		A52+536	-	X	-	-	-	-	-	MAR	New
CV072	A	A53+830	-	X	-	-	-	-	-	IMP	-
	B	A53+345	-	X	-	-	-	-	-	IMP	-
	C	A53+379	-	X	-	-	-	-	-	IMP	-
CV071	B	A54+005	-	-	X	-	-	-	-	MAR	-
CV060	A	A58+114	-	-	X	-	-	-	-	IMP	-
	B	A58+114	-	-	X	-	-	-	-	IMP	-
CV059	A	A59+217	-	-	-	X	-	-	-	MAR	-
	B	A59+216	-	-	-	X	-	-	-	MAR	-
	C	A59+217	-	-	-	X	-	-	-	MAR	-
	D	A59+218	-	-	-	X	-	-	-	MAR	-
CV058	A	A59+779	-	-	-	X	-	-	-	MAR	-
	B	A59+773	-	X	-	-	-	-	-	MAR	-
CV057	A	A59+970	-	-	-	X	-	-	-	MAR	-
	B	A59+966	-	-	-	X	-	-	-	MAR	-
	C	A59+967	-	-	-	X	-	-	-	MAR	-
BG50	A	A62+054	-	-	-	-	-	-	-	IMP	bridge
	B	A62+081	-	X	-	-	-	-	-	IMP	New
	C	A62+081	-	X	-	-	-	-	-	IMP	New
CV049	A	A62+550	-	X	-	-	-	-	-	IMP	New
	B	A62+536	-	X	-	-	-	-	-	IMP	New
CV030	A	A77+495	-	X	-	-	-	-	-	MAR	-
	B	A77+435	-	-	-	X	-	-	-	MAR	-
BG32	A	A78+123	-	X	-	-	-	-	-	IMP	-
	B	A78+120	-	X	-	-	-	-	-	IMP	-
CV217	A	79+854	X	-	-	-	-	-	-	IMP	-

Table 2.2. Technical summary of existing crossing structures installed at fish-bearing streams along the Tote Road.

Water Crossing	Culvert No.	Existing Road Chainage (km + m)	Existing Diameter of CSP Culverts (m) ¹							Fish Habitat Quality Rating ³	Notes ⁴
			Ø = 2.0	Ø = 1.2	Ø = 1.0	Ø = 0.5	Ø = 0.25	Ø = 0.15	Ø = 0.10		
			(m)	(m)	(m)	(m)	(m)	(m)	(m)		
CV216	B	80+000	-	-	-	-	-	-	-	IMP	bridge
	A	A80+951	-	X	-	-	-	-	-	MAR	-
	B	A80+580	-	X	-	-	-	-	-	MAR	-
	C	A80+582	-	X	-	-	-	-	-	MAR	-
BG30		A84+636	-	-	X	-	-	-	IMP	-	
BG29		A84+706	-	-	X	-	-	-	IMP	-	
BG27		A86+499	-	-	-	X	-	-	MAR	-	
BG24	A	A87+588	-	X	-	-	-	-	-	IMP	-
	B	A87+610	-	X	-	-	-	-	-	IMP	-
	C	A87+612	-	X	-	-	-	-	-	IMP	-
BG17	A	A90+016	-	X	-	-	-	-	-	IMP	-
	B	A90+019	-	X	-	-	-	-	-	IMP	-
BG04	A	A93+992	-	X	-	-	-	-	-	IMP	-
	B	A93+993	-	X	-	-	-	-	-	IMP	-
	C	A93+996	X							IMP	
CV001	A	A94+606	-	15	-	X	-	-	-	IMP	-
	B	A94+351	-	-	X	-	-	-	-	IMP	-
	C	A94+353	-	-	-	X	-	-	-	IMP	-
CV223	A	A97+007	-	-	-	-	-	-	-	IMP	bridge
	B	A97+050	X	-	-	-	-	-	-	IMP	-
	C	A97+052	-	X	-	-	-	-	-	IMP	-
	D	A97+082	-	X	-	-	-	-	-	IMP	-
	E	A97+084	-	X	-	-	-	-	-	IMP	-
CV224	A	A97+576	-	-	X	-	-	-	-	IMP	-
	B	A97+578	-	-	X	-	-	-	-	IMP	-
CV225	A	A98+845	-	X	-	-	-	-	-	IMP	New
	B	A98+804	-	X	-	-	-	-	-	IMP	New
BG01	A	A99+483	-	X	-	-	-	-	-	IMP	-
	B	A99+483	-	X	-	-	-	-	-	IMP	-

Table 2.2. Technical summary of existing crossing structures installed at fish-bearing streams along the Tote Road.

Water Crossing	Culvert No.	Existing Road Chainage (km + m)	Existing Diameter of CSP Culverts (m) ¹							Fish Habitat Quality Rating ³	Notes ⁴
			Ø = 2.0 (m)	Ø = 1.2 (m)	Ø = 1.0 (m)	Ø = 0.5 (m)	Ø = 0.25 (m)	Ø = 0.15 (m)	Ø = 0.10 (m)		
	C	NA	-	-	-	X	-	-	-	IMP	-
CV186	A	A102+812	-	-	X	-	-	-	-	IMP	-
CV187	A	A102+856	-	-	-	X	-	-	-	MAR	-
	B	NA	-	-	X	-	-	-	-	MAR	-

1 – CSP = Corrugated steel pipe; Ø = culvert diameter

2 – Final length and survey culvert installation data to be provided in issued for construction drawings

3 – MAR = marginal, IMP = important

4 – New = culvert installed or worked on in 2015 or 2016 along realigned section of the road

Table 3.1. Construction and turbidity monitoring for 2016 at fish bearing crossings.

Culvert ID	Sample Date	Crossing Location	Distance from Crossing (m)	Turbidity (NTU)	Average Wetted Channel Width (m)	Depth (m)	Surface Velocity Estimate (m/s)
BG01	2016-06-02	Upstream	-	-	1.5	0.15	0.83
		Crossing	0	0.0			
		Downstream	50	0.0			
CV225	2016-06-09	Upstream	50	4.7	8	0.15	1
		Crossing	0	5.1			
		Downstream	75	5.9			
CV223	2016-06-09	Upstream	100	4.9	25	0.25	0.75
		Crossing	1	6.6			
		Downstream	100	8.4			
BG17	2016-06-09	Upstream	50	6.0	10	0.3	1
		Crossing	1	8.0			
		Downstream	50	8.7			
BG24	2016-06-03	Upstream	15	53.6	2	0.1	0.13
		Crossing	0	39.6			
		Downstream	10	38.5			
BG29	2016-06-09	Upstream	50	34.1	5	0.35	0.5
		Crossing	1	29.0			
		Downstream	50	24.4			
BG30	2016-06-03	Upstream	10	216.0	1.5	0.03	0.1
		Crossing	0	242.0			
		Downstream	10	234.0			
CV040	2016-06-04	Upstream	2	98.7	2	0.05	0.12
		Crossing	0	97.6			
		Downstream	50	111.0			

Table 3.1. Construction and turbidity monitoring for 2016 at fish bearing crossings.

Culvert ID	Sample Date	Crossing Location	Distance from Crossing (m)	Turbidity (NTU)	Average Wetted Channel Width (m)	Depth (m)	Surface Velocity Estimate (m/s)
CV047	2016-06-09	Upstream	50	59.4	5	0.15	0.75
		Crossing	2	80.1			
		Downstream	50	68.7			
CV049	2016-06-04	Upstream	-	-	5	0.05	0.36
		Crossing	0	29.4			
		Downstream	75	27.8			
CV099	2016-06-05	Upstream	50	25.2	2	0.05	1
		Crossing	0	22.9			
		Downstream	25	10.6			
CV111	2016-06-05	Upstream			1	0.07	0.8
		Crossing	0	165.0			
		Downstream	30	436.0			
CV112	2016-06-05	Upstream	40	19.0	1	0.2	0.7
		Crossing	0	301.0			
		Downstream	40	241.0			
BG01	2016-06-28	Upstream	100	2.5	4.4		-
		Culvert	0	1.9			
		Downstream	100	2.1			
	2016-07-02	Upstream	150	1.5	3.5	0.10	0.30
		Culvert	0	1.4			
		Downstream	150	1.3			

Table 3.1. Construction and turbidity monitoring for 2016 at fish bearing crossings.

Culvert ID	Sample Date	Crossing Location	Distance from Crossing (m)	Turbidity (NTU)	Average Wetted Channel Width (m)	Depth (m)	Surface Velocity Estimate (m/s)
CV225	2016-06-29	Upstream	90	1.1			-
		Culvert	0	1.3			
		Downstream	100	1.0			
CV224	2016-06-28	Upstream	100	1.9	5.3	0.5	-
		Culvert	0	1.9			
		Downstream	85	1.5			
CV223	2016-06-27	Upstream	-	-	-	-	-
		Culvert	0	16.4			
		Downstream	139	8.7			
	2016-06-28	Upstream	73	7.0	20	-	-
		Culvert	0	7.4			
		Downstream	100	8.3			
BG04	2016-06-28	Upstream	100	0.9	4	0.54	-
		Culvert	0	1.1			
		Downstream	98	1.2			
BG17	2016-06-27	Upstream	100	4.4	-	0.55	-
		Culvert	0	4.6			
		Downstream	100	4.6			
	2016-06-28	Upstream	100	4.3	0.58	0.8	-
		Culvert	0	4.6			
		Downstream	100	4.5			
	2016-07-03	Upstream	100	4.0	3.3	0.53	0.01
		Culvert	0	4.3			
		Downstream	100	4.7			

Table 3.1. Construction and turbidity monitoring for 2016 at fish bearing crossings.

Culvert ID	Sample Date	Crossing Location	Distance from Crossing (m)	Turbidity (NTU)	Average Wetted Channel Width (m)	Depth (m)	Surface Velocity Estimate (m/s)
BG24	2016-06-27	Upstream	100	1.1	2.5	0.4	-
		Culvert	0	1.0			
		Downstream	68	1.2			
	2016-06-29	Upstream	100	1.0	4.8	0.2	-
		Culvert	10	0.9			
		Downstream	100	0.9			
BG28	29/6/2016	Upstream	40	4.4			-
		Culvert	2	9.6			
		Downstream	50	102.1			
	2016-07-03	Upstream	80	2.6	0.5	0.05	0.18
		Culvert	0	8.7			
		Downstream	100	11.7			
BG29	2016-06-29	Upstream	25	5.8	2	0.1	-
		Culvert	0	6.4			
		Downstream	100	5.4			
BG31	2016-06-29	Upstream	100	6.9	1.3	0.12	-
		Culvert	0	4.5			
		Downstream	100	16.5			
	2016-07-03	Upstream	75	2.8	0.5	0.02	0.52
		Culvert	0	3.4			
		Downstream	75	12.3			
CV216	2016-06-29	Upstream	-	1.1	2.6	0.15	-
		Culvert	0	2.1			
		Downstream	70	1.8			

Table 3.1. Construction and turbidity monitoring for 2016 at fish bearing crossings.

Culvert ID	Sample Date	Crossing Location	Distance from Crossing (m)	Turbidity (NTU)	Average Wetted Channel Width (m)	Depth (m)	Surface Velocity Estimate (m/s)
CV217	2016-06-29	Upstream	20	1.4	-	-	-
		Culvert	-	-			
		Downstream	6	1.4			
BG32	2016-06-29	Upstream	100	1.3	-	-	-
		Culvert	5	0.8			
		Downstream	100	0.9			
CV040	2016-06-29	Upstream	100	1.3	-	-	-
		Culvert	5	1.8			
		Downstream	130	1.7			
CV049	2016-06-29	Upstream	10	0.9			-
		Culvert	10	0.9			
		Downstream	125	1.0			
BG50	2016-06-30	Upstream	100	1.0			-
		Culvert	0	1.3			
		Downstream	100	0.5			
CV060	2016-06-30	Upstream	75	1.1			-
		Culvert	0	0.1			
		Downstream	60	1.4			
CV072	2016-06-30	Upstream	60	0.9			-
		Culvert	0	1.0			
		Downstream	75	1.1			
CV078	2016-06-30	Upstream	104	0.5			-
		Culvert	10	0.3			
		Downstream	59	1.1			

Table 3.1. Construction and turbidity monitoring for 2016 at fish bearing crossings.

Culvert ID	Sample Date	Crossing Location	Distance from Crossing (m)	Turbidity (NTU)	Average Wetted Channel Width (m)	Depth (m)	Surface Velocity Estimate (m/s)
CV079	2016-06-30	Upstream	60	1.4			-
		Culvert	0	1.1			
		Downstream	50	1.1			
CV093	2016-06-30	Upstream	14	2.7			-
		Culvert	0	5.9			
		Downstream	61	1.3			
CV099	2016-06-30	Upstream	100	1.3			-
		Culvert	7	1.2			
		Downstream	115	1.2			
CV104	2016-06-30	Upstream	60	0.8			-
		Culvert	0	1.0			
		Downstream	20	0.8			
CV111	2016-06-30	Upstream	70	1.5			-
		Culvert	0	1.1			
		Downstream	75	1.4			
CV114	2016-06-30	Upstream	75	0.9			-
		Culvert	0	1.3			
		Downstream	80	2.2			
CV128	2016-06-30	Upstream	100	12.6			-
		Culvert	7	17.0			
		Downstream	100	14.5			
CV129	2016-06-29	Upstream	20	1.4			-
		Culvert	10	13.1			
		Downstream	-	-			

Table 3.1. Construction and turbidity monitoring for 2016 at fish bearing crossings

Culvert ID	Sample Date	Crossing Location	Distance from Crossing (m)	Turbidity (NTU)	Average Wetted Channel Width (m)	Depth (m)	Surface Velocity Estimate (m/s)
CV128	2016-08-25	Upstream	100	-3.3	50.0	0.50	-
		Downstream	100	-3.2			
CV099	2016-08-25	Upstream	100	-4.1	2.8	0.25	-
		Downstream	100	-3.8			
CV078	2016-08-25	Upstream	90	-3.4	2.5	0.30	-
		Downstream	105	-3.8			
BG50	2016-08-25	Upstream	90	-3.8	10.0	0.35	-
		Downstream	90	-3.8			
CV040	2016-08-25	Upstream	150	-0.7	9.5	0.11	-
		Downstream	50	-3.1			
CV217	2016-08-26	Upstream	100	-2.6	100.0	0.80	-
		Downstream	100	0.6			
BG24	2016-08-26	Upstream	100	-4.0	1.5	0.50	-
		Downstream	60	-1.5			

Notes:

-Monitoring results from June 2 to June 9 impacted by freshet during construction mitigation measures. Monitoring results from subsequent monitoring rounds display much lower turbidity values

.-Probable minor YSI calibration offset for turbidity monitoring data from August 25, however these values indicate turbidity values <1 or <0.5 NTU.

.-Physical characteristics and flow measurements not taken for every monitoring event due to equipment restrictions

.-YSI 6820 V2 and YSI PRODSS utilised for in situ turbidity monitoring data. Hach FH950 Flow Meter utilised for in situ flow monitoring data



Table 3.2 Water Quality Monitoring of Baseline Fisheries Culverts
SURFACE WATER QUALITY SUMMARY FOR SAMPLE SITE N1-025 (CV128)

Parameters	Method Detection Limit ¹		LOR		CCME Guideline Limits ³ 2010	Dates										
	2005	2006	2015	2016		14-Jun-06	03-Aug-06	08-Sep-06	03-Jul-15	03-Jul-15	12-Aug-15	12-Aug-15	30-Jun-16	30-Jun-16	25-Aug-16	25-Aug-16
In Situ Parameters																
Temperature (°C)	-	-	-	-	-	0.32	10.41	3.66	-	-	7.2	7.2	6.1	7.7	9.6	9.2
Specific Conductance (mS/cm)	-	-	-	-	-	0.13	0.12	0.16	0.53	0.58	0.139	0.139	NA	NA	0.169	0.116
Dissolved Oxygen	-	-	-	-	5.5-9.5	13.02	11.71	13.03	-	-	105.9	105.1	103.5	106.2	101.6	103.7
pH	-	-	-	-	6.5 - 9.0	8.18	8.12	8.21	8.33	8.14	8.30	8.20	7.90	8.30	8.09	8.05
Wetted Width (m)	-	-	-	-	-	76.00	120.00	99.00	-	-	50.00	50.00				
Average Depth (m)	-	-	-	-	-	too much ice	0.30	0.60	-	-	0.50	0.50				
Flow Rate (m ³ /s)	-	-	-	-	-	-	26.73	-	-	-	-	-				
Physical Parameters																
pH	-	-	0.01	0.10	6.5 - 9.0	7.85	7.37	7.51	7.79	7.84	8.16	8.04	8.11	8.15	8.08	8.20
Conductivity (uS/cm)	1.00	5.00	-	-	-	145.00	125.00	166.00	-	-	-	-	-	-	-	-
Turbidity (NTU)	0.10	0.10	0.10	0.10	-	0.60	0.70	-	1.10	1.19	0.45	0.45	10.20	10.80	0.28	0.28
Hardness (mg/L CaCO ₃)	0.50	1.00	10.0	10.0	-	73.0	65.0	85.0	42.0	42.0	63.0	62.0	58.0	53.0	84.0	84.0
TSS	-	-	-	2.0	-	-	-	-	<2.0	<2.0	<2	<2	54.8	44.4	<2.0	7.9
TDS	30	5	20	20	-	94	81	108	77	67	72 *	67 *	50	240	78	79
Dissolved Anions																
Alkalinity (mg/L CaCO ₃)	2.0	5.0	10	10	-	72.0	67.0	86.0	37.0	41.0	61.0	61.0	42.0	38.0	84.0	84.0
Br ⁻	0.30	0.05	-	-	-	<0.05	<0.05	<0.05	-	-	-	-	-	-	-	-
Cl ⁻	0.20	1.00	0.50	0.50	-	1.00	<1	1.00	0.53	0.54	0.85	0.89	0.62	0.60	1.46	1.49
Fluoride	-	-	-	0.02	-	-	-	-	-	-	-	-	<0.020	<0.020	<0.020	<0.020
SO ₄ ⁻	0.50	1.00	0.30	0.76	-	2.00	<1	4.00	0.42	0.47	0.00	0.00	0.38	0.36	1.18	1.19
Nutrients																
NH ₃ +NH ₄ (mg/L N)	0.10	0.02	0.15	0.15	0.021 - 231(4)	0.10	0.03	0.08	<0.015	<0.015	<0.15	0.19	<0.15	<0.15	<0.15	<0.15
NO ₂ ⁻ (mg/L N)	0.06	0.01	-	-	0.06	<0.005	<0.005	0.02	-	-	-	-	-	-	-	-
NO ₃ ⁻ (mg/L N)	0.05	0.10	0.02	0.02	2.90	<0.10	<0.10	<0.10	<0.02	<0.02	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
NO ₂ +NO ₃ (mg/L N)	0.06	0.10	-	-	-	<0.10	<0.10	<0.10	-	-	-	-	-	-	-	-
Ammonia, Total as N	-	-	-	0.02	-	-	-	-	-	-	-	-	<0.020	<0.020	<0.020	<0.020
Total Phosphorus	0.02	0.01	0.003	0.003	-	<0.01	<0.01	0.03	0.0036	0.0044	0.0039	0.0031	0.0677	0.0354	0.0044	0.0085
Dissolved Phosphorus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Organic Compounds																
Phenols	0.00	0.00	0.00	-	0.004	<0.001	<0.001	<0.001	-	-	-	-	-	-	-	-
DOC	-	-	0.50	1.00	-	-	-	-	1.70	1.60	1.70	1.60	<1.0	<1.0	1.80	1.60
TOC	-	-	0.50	1	-	-	-	-	1.90	1.90	1.70	1.70	1.80	1.40	1.80	2.90
TKN	-	-	0.10	0.15	-	-	-	-	<0.015	<0.015	<0.15	0.19	<0.15	<0.15	<0.15	<0.15
Chlorophyll-a	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pheophytin-a	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Metals and Non-Metals																
Aluminum	0.004	0.0050	0.010	0.010	0.005 - 0.100(5)	0.01	0.01	0.101	0.03	0.03	0.02	<0.010	0.83	0.76	<0.010	0.01
Antimony	-	-	-	0.00010	-	-	-	-	-	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic	0.005	0.001	0.0010	0.00010	0.01	<0.001	<0.001	<0.001	<0.0010	<0.0010	<0.00010	<0.00010	0.0002	0.0002	0.0001	<0.00010
Barium	0.001	0.01	-	0.00020	-	<0.01	<0.01	<0.01	-	-	-	-	0.00801	0.00742	0.00663	0.00672
Beryllium	-	-	-	0.00010	-	-	-	-	-	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth	-	-	-	0.00005	-	-	-	-	-	-	-	-	<0.000050	<0.000050	<0.000050	<0.000050
Boron	0.05	0.01	-	0.010	-	<0.01	<0.01	<0.01	-	-	-	-	<0.010	<0.010	<0.010	<0.010
Cadmium	0.0001	0.0001	0.00010	0.000010	0.00002	<0.0001	<0.0001	<0.0001	<0.000090	<0.000090	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium	0.05	1.00	0.50	0.50	-	17	16	20	9.47	9.42	15.0	15.2	12.5	11.6	19.1	19.4
Cesium	-	-	-	0.00001	-	-	-	-	-	-	-	-	0.00006	0.00006	<0.000010	<0.000010
Chromium	0.001	0.001	-	0.00050	-	<0.001	<0.001	<0.001	-	-	-	-	0.00125	0.00115	<0.00050	<0.00050
Cobalt	0.0003	0.0002	-	0.00010	-	<0.0002	<0.0002	<0.0002	-	-	-	-	0.00042	0.00038	<0.00010	<0.00010
Copper	0.0008	0.0010	0.0010	0.0010	0.002 - 0.004(6)	<0.001	<0.001	<0.001	<0.0010	<0.0010	<0.0010	<0.0010	0.00140	0.00130	<0.0010	<0.0010
Iron	0.02	0.03	0.05	0.050	0.30	<0.03	<0.03	0.12	<0.050	<0.050	<0.050	<0.050	0.805	0.734	<0.050	<0.050
Lead	0.0002	0.0010	0.00050	0.00010	0.001 - 0.007(7)	<0.001	<0.001	<0.001	<0.00050	<0.00050	<0.00010	<0.00010	0.00069	0.00061	<0.00010	<0.00010
Lithium	-	-	-	0.0010	-	-	-	-	-	-	-	-	0.0016	0.0014	<0.0010	<0.0010
Magnesium	0.005	1.00	0.5	0.050	-	7.00	6.00	8.00	4.24	4.27	6.97	7.23	6.39	5.86	8.93	8.60
Manganese	0.001	0.01	0.001	0.00050	-	<0.01	<0.01	<0.01	0.0012	0.0013	0.0010	0.0006	0.02470	0.02150	0.0018	0.0027



Table 3.2 Water Quality Monitoring of Baseline Fisheries Culverts
SURFACE WATER QUALITY SUMMARY FOR SAMPLE SITE N1-025 (CV128)

Parameters	Method Detection Limit ¹		LOR		CCME Guideline Limits ³	Dates										
	2005	2006	2015	2016	2010	14-Jun-06	03-Aug-06	08-Sep-06	03-Jul-15	03-Jul-15	12-Aug-15	12-Aug-15	30-Jun-16	30-Jun-16	25-Aug-16	25-Aug-16
Mercury	0.0001	0.0001	0.00001	0.00001	0.000026	<0.0001	<0.0001	<0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum	0.0003	0.005	0.001	0.000050	0.07	<0.005	<0.005	<0.005	<0.00050	<0.00050	<0.00050	<0.00050	0.000059	0.000062	0.000157	0.000164
Nickel	0.001	0.005	0.0010	0.00050	0.025 - 0.150(8)	<0.005	<0.005	<0.005	<0.0010	<0.0010	<0.0010	<0.0010	0.00093	0.00085	<0.00050	<0.00050
Phosphorus				0.050									0.054	<0.050	<0.050	<0.050
Potassium	0.02	0.01	1.0	0.050	-	0.51	0.35	0.51	<1.0	<1.0	0.45	0.45	0.687	0.670	0.564	0.561
Rubidium				0.00020									0.00235	0.00231	0.00121	0.00122
Selenium	0.01	0.001	0.0004	0.0001	0.001	<0.001	<0.001	<0.001	<0.00040	<0.00040	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon				0.0500									1.980	1.750	0.437	0.451
Silver	0.0001	0.0001	-	0.0001	0.0001	<0.0001	<0.0001	<0.0001	-	-	-	-	<0.000050	<0.000050	<0.000050	<0.000050
Sodium	0.05	0.05	0.50	0.50	-	0.61	0.34	1.15	<0.50	0.89	0.62	0.63	<0.50	<0.50	0.89	0.88
Strontium	0.0010	0.0010	-	0.0010	-	0.012	0.010	0.015	-	-	-	-	0.0074	0.0070	0.0114	0.0116
Sulphur				0.50									<0.50	<0.50	<0.50	0.64
Tellurium				0.00020									<0.00020	<0.00020	<0.00020	<0.00020
Thallium	0.0002	-	0.0003	0.000010	0.0008	-	-	-	<0.00030	<0.00030	<0.000010	<0.000010	0.000016	0.000014	<0.000010	<0.000010
Thorium				0.00010									0.00138	0.00131	<0.00010	<0.00010
Tin	0.0010	0.010	-	0.00010	-	<0.01	<0.01	<0.01	-	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010
Titanium				0.00030									0.02560	0.02380	<0.00030	0.000420
Tungsten				0.00010									<0.00010	<0.00010	<0.00010	<0.00010
Uranium	-	-	0.0010	0.00001	0.02	-	-	-	<0.0010	<0.0010	0.00135	0.00135	0.00051	0.00048	0.00212	0.00209
Vanadium	0.0009	0.001	-	0.00050	-	<0.001	<0.001	<0.001	-	-	-	-	0.00163	0.00149	<0.00050	<0.00050
Zinc	0.0010	0.010	0.003	0.0030	0.03	<0.01	<0.01	<0.01	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Zirconium				0.00030									0.00083	0.00076	<0.00030	<0.00030
Dissolved Metals and Non-Metals																
Aluminum	0.0040	0.0050	0.005			<0.005	<0.005	0.01	0.0290	0.0180	0.0068	0.0122	-	-	-	-
Arsenic	0.0050	0.001	0.0001			<0.001	<0.001	<0.001	<0.0001	<0.0001	<0.00010	<0.00010	-	-	-	-
Barium	0.00	0.01				<0.01	<0.01	<0.01	-	-	-	-	-	-	-	-
Boron	0.050	0.010				<0.01	<0.01	<0.01	-	-	-	-	-	-	-	-
Cadmium	0.0001	0.00010	0.00001			<0.0001	<0.0001	<0.0001	<0.000010	<0.000010	<0.000010	<0.000010	-	-	-	-
Calcium	0.050	1.0	0.05			16.00	16.00	21.00	9.65	9.46	14.10	14.20	-	-	-	-
Chromium	0.0010	0.001				<0.001	<0.001	<0.001	-	-	-	-	-	-	-	-
Cobalt	0.0003	0.0002				<0.0002	<0.0002	<0.0002	-	-	-	-	-	-	-	-
Copper	0.0008	0.001	0.0002			<0.001	<0.001	<0.001	-	0.00033	0.00041	0.00043	-	-	-	-
Iron	0.020	0.030	0.01			<0.03	<0.03	<0.03	0.030	0.015	<0.010	0.014	-	-	-	-
Lead	0.0002	0.001	0.0001			<0.001	<0.001	<0.001	<0.000050	<0.000050	<0.000050	<0.000050	-	-	-	-
Magnesium	0.0050	1.0	0.05			8.00	6.00	8.00	4.44	4.46	6.62	6.47	-	-	-	-
Manganese	0.0007	0.010	0.0005			<0.01	<0.01	<0.01	0.00102	0.00072	0.00064	0.00084	-	-	-	-
Mercury	-	-	0.000010			-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	-	-	-	-
Molybdenum	0.0003	0.005	0.00001			<0.005	<0.005	<0.005	0.00006	0.00006	0.00012	0.00012	-	-	-	-
Nickel	0.0010	0.005	0.0001			<0.005	<0.005	<0.005	<0.00050	<0.00050	<0.00050	<0.00050	-	-	-	-
Potassium	0.020	0.010	0.0005			0.52	0.26	0.55	0.361	0.348	0.465	0.463	-	-	-	-
Selenium	0.0050	0.001	0.05			<0.001	<0.001	<0.001	<0.000050	<0.000050	<0.000050	<0.000050	-	-	-	-
Silver	0.0001	0.00010	0.0001			<0.0001	<0.0001	<0.0001	-	-	-	-	-	-	-	-
Sodium	0.050	0.050	0.50			0.64	0.28	0.60	<0.50	<0.50	0.62	0.62	-	-	-	-
Strontium	0.0010	0.001				0.01	0.01	0.02	-	-	-	-	-	-	-	-
Thallium	0.0002	-	0.00001			-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	-	-	-	-
Tin	0.0010	0.010				<0.01	<0.01	<0.01	-	-	-	-	-	-	-	-
Uranium	-	-	0.00001			-	-	-	0.00032	0.00032	0.00127	0.00127	-	-	-	-
Vanadium	0.0009	0.001				<0.001	<0.001	<0.001	-	-	-	-	-	-	-	-
Zinc	0.0010	0.010	0.0010			<0.01	<0.01	<0.01	0.00210	<0.0010	<0.0010	0.0011	-	-	-	-

Notes:
Yellow highlight denotes exceedance to CCME guidelines or Baffinland's 2AM-MRY-1325 Water Licence
2006 dissolved oxygen values in mg/L; 2015 and 2016 dissolved oxygen values in % saturation

Table 3.2 Water Quality Monitoring of Baseline Fisheries Culverts
 SURFACE WATER QUALITY SUMMARY FOR SAMPLE SITE N1-050 (CV099)

Parameters	Method Detection Limit ¹		LOR		CCME Guideline Limits ^{3 2010}	Dates														
	2005	2006	2015	2016		13-Jun-05	06-Aug-05	09-Sep-05	14-Jun-06	03-Aug-06	08-Sep-06	03-Jul-15	03-Jul-15	12-Aug-15	12-Aug-15	30-Jun-16	30-Jun-16	25-Aug-16	25-Aug-16	
In Situ Parameters																				
Temperature (°C)	-	-	-	-	-	0.11	9.36	4.13	0.04	8.31	2.74	-	-	9.3	8.2	10.8	12.2	9.0	9.1	
Specific Conductance (mS/cm)	-	-	-	-	-	0.104	0.220	0.308	0.112	0.254	0.305	0.112	0.111	0.337	0.338	-	-	0.347	0.353	
Dissolved Oxygen	-	-	-	-	5.5-9.5	13.69	10.95	12.74	13.80	12.02	13.37	-	-	103.5	101.7	97.4	97.0	102.5	107.5	
pH	-	-	-	-	6.5 - 9.0	7.54	8.31	8.07	8.17	8.36	8.55	8.27	8.28	8.55	8.53	7.97	7.93	8.24	8.30	
Wetted Width (m)	-	-	-	-	-	-	-	-	ice	11	12	6	6	2	2	-	-	-	-	
Average Depth (m)	-	-	-	-	-	-	-	-	0.1	0.15	0.3	0.1	0.1	0.15	0.15	-	-	-	-	
Flow Rate (m ³ /s)	-	-	-	-	-	-	-	-	-	0.82	1.88	-	-	-	-	-	-	-	-	
Physical Parameters																				
pH	-	-	0.01	0.01	6.5 - 9.0	-	-	-	7.68	8.14	8.13	8.13	8.13	8.37	8.36	8.09	8.08	8.42	8.46	
Conductivity (uS/cm)	1	5	-	-	-	105	235	296	122	259	315	-	-	-	-	-	-	-	-	
Turbidity (NTU)	0.1	0.1	0.10	0.10	-	0.84	0.23	<0.10	0.9	0.2	-	0.3	0.5	1.1	0.1	0.42	0.47	0.13	0.16	
Hardness (mg/L CaCO ₃)	0.5	1	10	10	-	54.2	128	177	62	144	162	81	80	157	156	59	60	185	187	
TSS				2	-							<2.0	2	<2	<2	<2.0	<2.0	<2.0	<2.0	
TDS	30	5	20	-	-	57	123	170	79	168	205	93	77	168	157	70	65	176	178	
Dissolved Anions																				
Alkalinity (mg/L CaCO ₃)	2	5	10	10	-	52	134	156	61	141	163	80	81	161	160	60	61	176	179	
Br ⁻	0.3	0.05	-	-	-	<0.3	<0.3	<0.3	<0.05	<0.05	<0.05	-	-	-	-	-	-	-	-	
Cl ⁻	0.2	1	0.50	0.50	-	1.1	0.6	1.9	<1	1	3	1	1.22	4.14	4.15	1.16	1.06	8.54	8.68	
Fluoride																0.021	<0.020	0.030	0.029	
SO ₄ ⁻	0.5	1	0.30	0.30	-	0.6	1.1	2.5	2.0	2.0	6.0	1	1.20	4.80	5.12	1.03	0.84	7.13	6.77	
Nutrients																				
NH ₃ +NH ₄ (mg/L N)	0.1	0.02	0.15	0.15	0.021 - 231(4)	0.3	0.2	0.6	0.09	0.04	<0.02	<0.15	<0.15	0.23	0.17	<0.15	<0.15	<0.15	0.16	
NO ₂ ⁻ (mg/L N)	0.06	0.005			0.06	<0.06	<0.06	<0.06	<0.005	<0.005	0.017	-	-	-	-	-	-	-	-	
NO ₃ ⁻ (mg/L N)	0.05	0.10	0.02	0.02	2.9	<0.05	<0.05	<0.05	<0.10	<0.10	<0.10	<0.020	<0.020	0.03	0.04	<0.020	<0.020	<0.020	<0.020	
NO ₂ +NO ₃ (mg/L N)	0.06	0.10			-	<0.06	<0.06	<0.06	<0.10	<0.10	<0.10	-	-	-	-	-	-	-	-	
Total Ammonia as N				0.02	-											<0.020	<0.020	<0.020	0.05	
Total Phosphorus	0.02	0.01	0.003	0.003	-	<0.02	<0.02	<0.10	<0.01	<0.01	<0.01	<0.0030	<0.0030	<0.0030	0.0034	0.0051	0.0037	0.0041	0.0137	
Dissolved Phosphorus	0.02	-	-	-	-	<0.02	<0.02	<0.10	-	-	-	-	-	-	-	-	-	-	-	
Organic Compounds																				
Phenols																				
DOC	-	-	1.0		-	-	-	-	-	-	-	1.8	1.7	2.700	2.80	1.3	1.3	2.5	2.5	
TOC	-	-	1.0		-	-	-	-	-	-	-	1.8	1.8	2.70	2.80	1.4	1.5	2.6	2.8	
TKN	-	-	0.15		-	-	-	-	-	-	-	<0.15	0.23	0.23	0.17	<0.15	<0.15	<0.15	0.16	
Chlorophyll-a	-	-			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Pheophytin-a	-	-			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total Metals and Non-Metals																				
Aluminum	0.004	0.005	0.010	0.010	0.005 - 0.100(5)	0.026	0.005	<0.004	0.015	<0.005	<0.005	0.01	0.014	<0.010	<0.010	0.021	0.015	<0.010	<0.010	
Antimony	0.0004	-	-	0.00010	-	<0.0004	<0.0004	<0.0004	-	-	-	-	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010	
Arsenic	0.005	0.001	0.001	0.00010	0.0050	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.0010	<0.0010	0.00010	0.00011	<0.00010	<0.00010	0.00014	0.00014	
Barium	0.001	0.01	-	0.00020	-	0.002	0.004	0.005	<0.01	<0.01	<0.01	-	-	-	-	0.00241	0.00253	0.00660	0.00680	
Beryllium	0.005	-	-	0.00010	-	<0.005	<0.005	<0.005	-	-	-	-	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010	
Bismuth	0.0003	-	-	0.00005	-	<0.0003	<0.0003	<0.0003	-	-	-	-	-	-	-	<0.000050	<0.000050	<0.000050	<0.000050	
Boron	0.05	0.01	-	0.010	-	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	-	-	<0.010	<0.010	<0.010	<0.010	
Cadmium	0.0001	0.0001	0.0001	0.000010	0.000017	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.000090	<0.000090	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	
Calcium	0.05	1	0.5000	0.50	-	13.0	29.3	39.8	16	34	37	17.6	18	35.9	34.9	13.7	13.2	41.3	41.2	
Cesium				0.000010	-											<0.000010	<0.000010	<0.000010	<0.000010	
Chromium	0.001	0.001	-	0.00050	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	<0.00050	<0.00050	<0.00050	<0.00050	
Cobalt	0.0003	0.0002	-	0.00010	-	<0.0003	<0.0003	<0.0003	<0.0002	<0.0002	<0.0002	-	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010	
Copper	0.0008	0.001	0.001	0.001	0.002 - 0.004(6)	<0.0008	<0.0008	<0.0008	<0.001	<0.001	<0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
Iron	0.02	0.03	0.05	0.05	0.3	<0.05	<0.02	<0.02	<0.03	<0.03	<0.03	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	
Lead	0.0002	0.001	0.001	0.00010	0.001 - 0.007(7)	<0.0002	<0.0002	<0.0002	<0.001	<0.001	<0.001	<0.00050	<0.00050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	
Lithium				0.001	-											<0.0010	<0.0010	0.002	0.002	
Magnesium	0.005	1	0.5	0.1	-	5.29	13.2	18.7	6	15	17	8.0	7.96	19.00	18.40	6.04	6.63	19.90	20.50	
Manganese	0.0007	0.01	0.001	0.001	-	0.0079	<0.0007	<0.0007	<0.01	<0.01	<0.01	<0.0010	<0.0010	<0.00050	<0.00050	0.00	<0.00050	<0.00050	<0.00050	
Mercury	0.0001	0.0001	0.00001	0.00001	0.000026	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	
Molybdenum	0.0003	0.005	0.001	0.000050	0.073	<0.0003	<0.0003	<0.0003	<0.005	<0.005	<0.005	<0.00050	<0.00050	<0.00050	<0.00050	<0.000050	<0.000050	0.000	0.000	



Table 3.2 Water Quality Monitoring of Baseline Fisheries Culverts
SURFACE WATER QUALITY SUMMARY FOR SAMPLE SITE N1-050 (CV099)

Parameters	Method Detection Limit ¹		LOR		CCME Guideline Limits ^{3 2010}	Dates													
	2005	2006	2015	2016		13-Jun-05	06-Aug-05	09-Sep-05	14-Jun-06	03-Aug-06	08-Sep-06	03-Jul-15	03-Jul-15	12-Aug-15	12-Aug-15	30-Jun-16	30-Jun-16	25-Aug-16	25-Aug-16
Nickel	0.001	0.005	0.001	0.00050	0.025 - 0.150(8)	<0.001	<0.001	<0.001	<0.005	<0.005	<0.005	<0.0010	<0.0010	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus				0.050												<0.050	<0.050	<0.050	<0.050
Potassium	0.02	0.01	1.0	0.050	-	0.53	0.45	0.54	0.52	0.34	0.52	<1.0	<1.0	0.61	0.63	0.34	0.39	0.69	0.69
Rubidium				0.00020												0.00033	0.00036	0.00057	0.00061
Selenium	0.005	0.001	0.0004	0.0001	0.001	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.00040	<0.00040	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon				0.0500												0.501	0.471	0.709	0.945
Silver	0.0001	0.0001	-	0.00005	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	-			<0.000050	<0.000050	<0.000050	<0.000050
Sodium	0.05	0.05	0.50	0.50	-	0.39	0.67	1.15	0.37	0.67	1.61	0.76	0.75	2.6400	2.5500	0.66	0.71	4.03	4.02
Strontium	0.001	0.001	-	0.0010	-	0.0068	0.0140	0.0198	0.010	0.018	0.022					0.007	0.007	0.024	0.024
Sulfur				0.50												0.590	<0.50	2.790	3.040
Tellurium				0.00020												<0.00020	<0.00020	<0.00020	<0.00020
Thallium	0.0002	-	0.0003	0.0000	0.0008	<0.0002	<0.0002	<0.0002	-	-	-	<0.00030	<0.00030	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium				0.0001												<0.00010	<0.00010	<0.00010	<0.00010
Tin	0.001	0.01	-	0.00010	-	<0.001	<0.001	<0.001	<0.01	<0.01	<0.01					<0.00010	<0.00010	<0.00010	<0.00010
Titanium	0.003	-	-	0.00030	-	<0.003	<0.003	<0.003	-	-	-					0.00090	0.00070	<0.00030	0.00033
Tungsten				0.00010												<0.00010	<0.00010	<0.00010	<0.00010
Uranium			0.001	0.000010								<0.0010	<0.0010	0.000982	0.001040	0.000173	0.000137	0.001220	0.001170
Vanadium	0.0009	0.001	-	0.00050	-	<0.0009	<0.0009	<0.0009	<0.001	<0.001	0.001					<0.00050	<0.00050	<0.00050	<0.00050
Zinc	0.001	0.01	0.003	0.003	0.03	0.002	<0.001	<0.001	<0.01	<0.01	<0.01	<0.0030	0.0044	<0.0030	0.019300	0.004500	<0.0030	0.007000	<0.0030
Zirconium				0.00030												<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals and Non-Metals																			
Aluminum	0.004	0.005	0.005			0.004	<0.004	<0.004	<0.005	<0.005	<0.005	<0.0050	<0.0050	<0.0050	<0.0050	-	-	-	-
Antimony	0.0004	-	0.0001			<0.0004	<0.0004	<0.0004	-	-	-	-	-	-	-	-	-	-	-
Arsenic	0.005	0.001				<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.00010	<0.00010	0.00011	0.00010	-	-	-	-
Barium	0.001	0.01				0.002	0.004	0.005	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	-
Beryllium	0.005	-				<0.005	<0.005	<0.005	-	-	-	-	-	-	-	-	-	-	-
Bismuth	0.0003	-				<0.0003	<0.0003	<0.0003	-	-	-	-	-	-	-	-	-	-	-
Boron	0.05	0.01				<0.05	0.02	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	-
Cadmium	0.0001	0.0001	0.00001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.000010	<0.000010	<0.000010	<0.000010	-	-	-	-
Calcium	0.05	1	0.0500			12.3	29.7	37.4	15	33	37	18.4	18.8	34.7	34.7	-	-	-	-
Chromium	0.001	0.001				<0.001	0.002	0.002	<0.001	<0.001	<0.001	-	-	-	-	-	-	-	-
Cobalt	0.0003	0.0002				<0.0003	<0.0003	<0.0003	<0.0002	<0.0002	<0.0002	-	-	-	-	-	-	-	-
Copper	0.0008	0.001	0.00020			<0.0008	<0.0008	<0.0008	<0.001	<0.001	<0.001	0.00030	0.00031	0.00050	0.00055	-	-	-	-
Iron	0.02	0.03	0.010			<0.05	<0.02	<0.02	<0.03	<0.03	<0.03	<0.010	<0.010	<0.010	<0.010	-	-	-	-
Lead	0.0002	0.001	0.000050			<0.0002	<0.0002	<0.0002	<0.001	<0.001	<0.001	<0.000050	<0.000050	<0.000050	<0.000050	-	-	-	-
Magnesium	0.005	1	0.05			5.67	13.3	17.3	6	15	17	8.6	7.9	17.1	17	-	-	-	-
Manganese	0.0007	0.01	0.00050			0.0060	<0.0007	<0.0007	<0.01	<0.01	<0.01	<0.00050	<0.00050	<0.00050	<0.00050	-	-	-	-
Mercury												<0.000010	<0.000010	<0.000010	<0.000010	-	-	-	-
Molybdenum	0.0003	0.005	0.00001			<0.0003	<0.0003	<0.0003	<0.005	<0.005	<0.005	<0.000010	<0.000010	0.000	0.000	-	-	-	-
Nickel	0.001	0.005	0.0001			<0.001	<0.001	<0.001	<0.005	<0.005	<0.005	<0.000050	0.000059	<0.00050	<0.00050	-	-	-	-
Potassium	0.02	0.01	0.0005			0.52	0.44	0.52	0.52	0.34	0.53	<0.00050	<0.00050	0.616	0.631	-	-	-	-
Selenium	0.005	0.001	0.050			<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	0.386	0.360	<0.000050	<0.000050	-	-	-	-
Silver	0.0001	0.0001	0.00005			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.000050	<0.000050	-	-	-	-	-	-
Sodium	0.05	0.05	0.50			0.42	0.67	1.10	0.34	0.68	1.61	0.76	0.73	2.41	2.39	-	-	-	-
Strontium	0.001	0.001				0.0070	0.0147	0.0188	0.009	0.019	0.023	-	-	-	-	-	-	-	-
Thallium	0.0002	-	0.00001			<0.0002	<0.0002	<0.0002	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	-	-	-	-
Tin	0.001	0.01				<0.001	<0.001	<0.001	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	-
Titanium	0.003	-				<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-
Uranium			0.00001									0.00023	0.00025	0.00091	0.00097	-	-	-	-
Vanadium	0.0009	0.001				<0.0009	0.0046	0.0046	<0.001	<0.001	0.001	-	-	-	-	-	-	-	-
Zinc	0.001	0.01	0.001			0.009	0.002	0.002	<0.01	<0.01	<0.01	0.0017	0.0044	<0.0010	0.0182	-	-	-	-

Notes:
Yellow highlight denotes exceedance to CCME guidelines or Baffinland's 2AM-MRY-1325 Water Licence
2005 and 2006 dissolved oxygen values in mg/L; 2015 and 2016 dissolved oxygen values in % saturation



Table 3.2 Water Quality Monitoring of Baseline Fisheries Culverts
SURFACE WATER QUALITY SUMMARY FOR SAMPLE SITE N1-053 (CV093)

Parameters	Method Detection Limit ¹		LOR		CCME Guideline Limits ^{3 2010}	Dates						
	2005	2006	2015	2016		14-Jun-06	03-Aug-06	08-Sep-06	12-Aug-15	12-Aug-15	30-Jun-16	30-Jun-16
In Situ Parameters												
Temperature (°C)	-	-	-	-	-	-0.08	9.96	5.77	5.5	5.9	11.3	5.6
Specific Conductance (mS/cm)	-	-	-	-	-	0.148	0.160	0.182	0.340	0.320	NA	NA
Dissolved Oxygen %	-	-	-	-	5.5-9.5	13.70	10.81	12.46	99.4	101.1	99.4	99.0
pH	-	-	-	-	6.5 - 9.0	8.32	8.15	8.24	8.42	8.43	8.02	7.99
Wetted Width (m)	-	-	-	-	-	20	33	28	2.5	2.5	-	-
Average Depth (m)	-	-	-	-	-	0.15	0.2	0.2	0.5	0.5	-	-
Flow Rate (m ³ /s)	-	-	-	-	-	2	4.62	6.85	-	-	-	-
Physical Parameters												
pH	-	-	0.01	-	6.5 - 9.0	7.91	7.84	7.64	8.36	8.26	8.27	8.20
Conductivity (uS/cm)	1	5	-	-	-	161	165	190	-	-	-	-
Turbidity (NTU)	0.1	0.1	0.10	-	-	0.5	0.2	-	0.2	1.22	0.92	1.31
Hardness (mg/L CaCO ₃)	0.5	1	10	-	-	85	86	95	152	158	99	100
TSS	-	-	-	-	-	-	-	-	<2	2	<2.0	4.4
TDS	30	5	13	-	-	105	107	123	147	159	115	105
Dissolved Anions												
Alkalinity (mg/L CaCO ₃)	2	5	10	-	-	80	85	93	155	163	103	99
Br ⁻	0.3	0.05	-	-	-	<0.05	<0.05	<0.05	-	-	-	-
Cl ⁻	0.2	1	0.50	-	-	<1	<1	<1	0.74	3.07	0.61	0.57
Fluoride	-	-	-	-	-	-	-	-	-	-	0.04	0.03
SO ₄ ⁻	0.5	1	0.30	-	-	3	2	7	2.66	3.90	1.22	1.24
Nutrients												
NH ₃ +NH ₄ (mg/L N)	0.1	0.02	0.15	-	0.021 - 231(4)	0.04	<0.02	<0.02	0.23	<0.15	<0.15	<0.15
NO ₂ ⁻ (mg/L N)	0.06	0.005	-	-	0.06	<0.005	<0.005	0.015	-	-	-	-
NO ₃ ⁻ (mg/L N)	0.05	0.10	0.020	-	2.9	<0.10	<0.10	<0.10	0.023	0.026	<0.020	0.023
NO ₂ +NO ₃ (mg/L N)	0.06	0.10	-	-	-	<0.10	<0.10	<0.10	-	-	<0.020	<0.020
Ammonia total as N	-	-	-	-	-	-	-	-	-	-	<0.020	<0.020
Total Phosphorus	0.02	0.01	0.0030	-	-	<0.01	<0.01	<0.01	<0.0030	0.0037	0.0216	0.0657
Dissolved Phosphorus	0.02	-	-	-	-	-	-	-	-	-	-	-
Organic Compounds												
Phenols	0.001	0.001	-	-	0.004	<0.001	<0.001	<0.001	-	-	-	-
DOC	-	-	1.0	-	-	-	-	-	1.8	2.4	<1.0	<1.0
TOC	-	-	1.0	-	-	-	-	-	1.8	2.1	1.2	<1.0
TKN	-	-	0.15	-	-	-	-	-	0.23	<0.15	<0.15	<0.15
Chlorophyll-a	-	-	-	-	-	-	-	-	-	-	-	-
Pheophytin-a	-	-	-	-	-	-	-	-	-	-	-	-
Total Metals and Non-Metals												
Aluminum	0.004	0.005	0.01	0.01	0.005 - 0.100(5)	<0.005	<0.005	0.007	0.018	0.012	0.025	0.139
Antimony	0.0004	-	-	0.0001	-	-	-	-	-	-	<0.00010	<0.00010
Arsenic	0.005	0.001	0.001	0.0001	0.0050	<0.001	<0.001	<0.001	<0.00010	<0.00010	<0.00010	<0.00010
Barium	0.001	0.01	-	0.00020	-	<0.01	<0.01	<0.01	-	-	0.0046	0.0043
Beryllium	0.005	-	-	0.0001	-	-	-	-	-	-	<0.00010	<0.00010
Bismuth	0.0003	-	-	0.00005	-	-	-	-	-	-	<0.000050	<0.000050
Boron	0.05	0.01	-	0.01	-	<0.01	<0.01	<0.01	-	-	<0.010	<0.010
Cadmium	0.0001	0.0001	0.0001	0.000010	0.000017	<0.0001	<0.0001	<0.0001	<0.000010	<0.000010	<0.000010	<0.000010
Calcium	0.05	1	0.5	0.5	-	24	25	27	44.0	43.6	31.2	31.6
Cesium	-	-	-	0.00001	-	-	-	-	-	-	<0.000010	0.000018
Chromium	0.001	0.001	-	0.00050	-	<0.001	<0.001	<0.001	-	-	<0.00050	<0.00050
Cobalt	0.0003	0.0002	-	0.00010	-	<0.0002	<0.0002	<0.0002	-	-	<0.00010	<0.00010
Copper	0.0008	0.001	0.001	0.0010	0.002 - 0.004(6)	<0.001	<0.001	<0.001	<0.0010	<0.0010	<0.0010	<0.0010
Iron	0.02	0.03	0.05	0.050	0.3	<0.03	<0.03	<0.03	<0.050	<0.050	<0.050	0.179
Lead	0.0002	0.001	0.001	0.00010	0.001 - 0.007(7)	<0.001	<0.001	<0.001	<0.00010	<0.00010	<0.00010	<0.00010
Lithium	-	-	-	0.0010	-	-	-	-	-	-	<0.0010	<0.0010
Magnesium	0.005	1	0.5	0.05	-	6	5	6	11.8	13.8	5.0	5.2
Manganese	0.0007	0.01	0.001	0.00050	-	<0.01	<0.01	<0.01	<0.00050	<0.00050	0.00058	0.00362
Mercury	0.0001	0.0001	0.00001	0.000010	0.000026	<0.0001	<0.0001	<0.0001	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum	0.0003	0.005	0.001	0.0001	0.073	<0.005	<0.005	<0.005	<0.00050	<0.00050	0.000093	0.000091
Nickel	0.001	0.005	0.001	0.0005	0.025 - 0.150(8)	<0.005	<0.005	<0.005	<0.0010	<0.0010	<0.00050	<0.00050
Phosphorus	-	-	-	0.050	-	-	-	-	-	-	<0.050	<0.050
Potassium	0.02	0.01	1.0	0.05	-	0.24	0.15	0.23	0.34	0.52	0.62	0.54
Rubidium	-	-	-	0.0002	-	-	-	-	-	-	0.00122	0.00107



Table 3.2 Water Quality Monitoring of Baseline Fisheries Culverts
 SURFACE WATER QUALITY SUMMARY FOR SAMPLE SITE N1-053 (CV093)

Parameters	Method Detection Limit ¹		LOR		CCME Guideline Limits ^{3 2010}	Dates						
	2005	2006	2015	2016		14-Jun-06	03-Aug-06	08-Sep-06	12-Aug-15	12-Aug-15	30-Jun-16	30-Jun-16
Selenium	0.005	0.001	0.0004	0.00005	0.001	<0.001	<0.001	<0.001	<0.000050	<0.000050	<0.000050	<0.000050
Silicon	0.0001	0.0001	-	0.05	0.0001	<0.0001	<0.0001	<0.0001	-	-	0.643	0.846
Silver				0.000050					-	-	<0.000050	<0.000050
Sodium	0.05	0.05	0.50	0.50	-	0.34	0.23	0.58	0.6100	1.75	<0.50	<0.50
Strontium	0.001	0.001	-	0.001	-	0.019	0.018	0.022	-	-	0.0295	0.0284
Sulfur				0.50							0.74	<0.50
Tellurium				0.00020							<0.00020	<0.00020
Thallium	0.0002	-	0.0003	0.000010	0.0008	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010
Thorium				0.00010							<0.00010	<0.00010
Tin	0.001	0.01	-	0.00010	-	<0.01	<0.01	<0.01	-	-	<0.00010	<0.00010
Titanium	0.003	-	-	0.00030	-	-	-	-	-	-	0.00097	0.00745
Tungsten				0.00010							<0.00010	<0.00010
Uranium			0.0010	0.000010					0.000422	0.000590	0.000159	0.000159
Vanadium	0.0009	0.001	-	0.00050	-	<0.001	<0.001	<0.001	-	-	<0.00050	<0.00050
Zinc	0.001	0.01	0.003	0.0030	0.03	<0.01	<0.01	<0.01	<0.0030	0.0033	<0.0030	<0.0030
Zirconium				0.00030							<0.00030	<0.00030
Dissolved Metals and Non-Metals												
Aluminum	0.004	0.005	0.005			<0.005	<0.005	<0.005	<0.0050	0.0412		
Antimony	0.0004	-	0.0001			-	-	-				
Arsenic	0.005	0.001				<0.001	<0.001	<0.001	<0.00010	<0.00010		
Barium	0.001	0.01				<0.01	<0.01	<0.01				
Beryllium	0.005	-				-	-	-				
Bismuth	0.0003	-				-	-	-				
Boron	0.05	0.01				<0.01	<0.01	<0.01				
Cadmium	0.0001	0.0001	0.000010			<0.0001	<0.0001	<0.0001	<0.000010	<0.000010		
Calcium	0.05	1	0.0500			24	26	28	43	42		
Cesium												
Chromium	0.001	0.001				<0.001	<0.001	<0.001				
Cobalt	0.0003	0.0002				<0.0002	<0.0002	<0.0002				
Copper	0.0008	0.001	0.00020			<0.001	<0.001	<0.001	0.00024	0.00038		
Iron	0.02	0.03	0.010			<0.03	<0.03	<0.03	<0.010	0.03		
Lead	0.0002	0.001	0.000050			<0.001	<0.001	<0.001	<0.000050	<0.000050		
Lithium												
Magnesium	0.005	1	0.05			6	5	6	11	13		
Manganese	0.0007	0.01	0.0005			<0.01	<0.01	<0.01	<0.00050	0.000510		
Mercury									<0.000010	<0.000010		
Molybdenum	0.0003	0.005	0.00001			<0.005	<0.005	<0.005	0.000076	0.000118		
Nickel	0.001	0.005	0.000050			<0.005	<0.005	<0.005	<0.00050	<0.00050		
Phosphorus												
Potassium	0.02	0.01	0.001			0.24	0.15	0.25	0.344	0.538		
Rubidium												
Selenium	0.005	0.001	0.05			<0.001	<0.001	<0.001	<0.000050	<0.000050		
Silicon												
Silver	0.0001	0.0001	0.00005			<0.0001	<0.0001	<0.0001				
Sodium	0.05	0.05	0.50			0.32	0.24	0.40	0.60	1.61		
Strontium	0.001	0.001				0.018	0.019	0.022				
Thallium	0.0002	-	0.000010			-	-	-	<0.000010	<0.000010		
Tin	0.001	0.01				<0.01	<0.01	<0.01				
Titanium	0.003	-				-	-	-				
Uranium			0.00001						0.000414	0.000573		
Vanadium	0.0009	0.001				<0.001	<0.001	<0.001				
Zinc	0.001	0.01	0.0010			<0.01	<0.01	<0.01	<0.0010	0.0025		

Notes:
 Yellow highlight denotes exceedance to CCME guidelines or Baffinland's 2AM-MRY-1325 Water Licence
 NA denotes probable calibration error. Result not acceptable.
 2006 dissolved oxygen values in mg/L; 2015 and 2016 dissolved oxygen values in % saturation



Table 3.2 Water Quality Monitoring of Baseline Fisheries Culverts
SURFACE WATER QUALITY SUMMARY FOR SAMPLE SITE N1-060 (CV078)

Parameters	Units	Method Detection Limit ¹		LOR		CCME Guideline Limits ³ 2010	Date															
		2005	2006	2015	2016		13-Jun-05	06-Aug-05	09-Sep-05	13-Jun-06	02-Aug-06	08-Sep-06	12-Aug-15	12-Aug-15	30-Jun-16	30-Jun-16	25-Aug-16	25-Aug-16				
In Situ Parameters																						
Temperature	°C	-	-	-	-		0.22	9.28	4.02	-0.06	13.05	3.95	9.6	9.3	8.16	9.36	9.8	10				
Specific Conductance	mS/cm	-	-	-	-		0.079	0.222	0.284	0.097	0.237	0.267	0.314	0.315	NA	NA	0.299	0.297				
Dissolved Oxygen	mg/L	-	-	-	-		13.48	10.95	12.72	14.17	11.43	12.55	-	-	-	-	-	-				
Dissolved Oxygen	%	-	-	-	-	5.5-9.5							102.7	102.3	100.4	100.1	102.5	103.8				
pH	pH units	-	-	-	-	6.5 - 9.0	7.36	8.30	7.96	8.22	8.26	8.36	8.53	8.48	7.81	7.93	8.24	8.25				
Wetted Width	m	-	-	-	-	-	-	-	-	ice	9	9	3	3	-	-	-	-				
Average Depth	m	-	-	-	-	-	-	-	-	0.15	0.25	0.2	0.1	0.1	-	-	-	-				
Flow Rate	m ³ /s	-	-	-	-	-	-	-	-	-	0.74	0.96	-	-	-	-	-	-				
Physical Parameters																						
pH	pH units	-	-	0.01	0.01	6.5 - 9.0	-	-	-	7.56	8.10	8.10	8.16	8.32	8.09	8.09	8.42	8.42				
Conductivity	µS/cm	1	5	-	-		83	234	269	104	244	277	-	-	-	-	-	-				
Turbidity	NTU	0.1	0.1	0.10	0.10		0.40	<0.10	<0.10	0.5	<0.10	-	1.45	0.24	0.26	0.17	0.13	0.14				
Hardness	mg/L as CaCO ₃	0.5	1	10	10		41.0	124	160	52	137	141	156	152	60	59	165	163				
TSS	mg/L	30	5	2.0									2.4	<2.0	<2.0	<2.0	<2.0	<2.0				
TDS	mg/L				20		63	123	120	68	159	180	159 *	143 *	65	70	152	148				
Dissolved Anions																						
Alkalinity	mg/L as CaCO ₃	2	5	10	10		40	120	141	51	132	146	158	152	61	64	161	158				
Br ⁻	mg/L	0.3	0.05	-	-		<0.3	<0.3	<0.3	<0.05	<0.05	<0.05	-	-	-	-	-	-				
Cl ⁻	mg/L	0.2	1	0.50	0.50		0.9	0.2	0.6	<1	<1	<1	3.08	0.79	<0.50	<0.50	1.19	1.19				
Fluoride	mg/L				0.020										<0.020	<0.020	0.023	0.024				
SO ₄ ⁻	mg/L	0.5	1	0.30	0.300		0.6	0.8	1.9	2	1	5	3.84	2.68	<0.30	0.31	3.37	3.35				
Nutrients																						
NH ₃ +NH ₄	mg/L N	0.1	0.02	0.15	0.15	0.021 - 231(4)	0.2	0.6	0.8	<0.02	<0.02	<0.02	0.24	0.25	<0.15	<0.15	<0.15	<0.15				
NO ₂ ⁻	mg/L N	0.06	0.005			0.06	<0.06	<0.06	<0.06	<0.005	<0.005	0.018										
NO ₃ ⁻	mg/L N	0.05	0.10	0.02	0.02	2.9	<0.05	<0.05	<0.05	<0.10	<0.10	<0.10	0.030	0.026	<0.020	<0.020	<0.020	<0.020				
NO ₂ +NO ₃	mg/L N	0.06	0.10				<0.06	<0.06	<0.06	<0.10	<0.10	<0.10										
Ammonia total as N	mg/L			0.020											0.021	<0.020	0.027	0.041				
Total Phosphorus	mg/L	0.02	0.01	0.0030	0.0030		<0.02	<0.02	<0.10	<0.01	<0.01	<0.01	0.004	<0.0030	0.0193	0.0282	0.0100	0.0139				
Dissolved Phosphorus	mg/L	0.02	-	-	-		<0.02	<0.02	<0.10	-	-	-	-	-	-	-	-	-				
Organic Compounds																						
Phenols	mg/L	0.001	0.001			0.004	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-	-				
DOC	mg/L			1.00	0.5								2.4	1.9	1.0	<1.0	1.5	1.5				
TOC	mg/L			1.00	0.5								2.2	1.8	1.1	1.0	1.6	1.6				
TKN	mg/L			0.15	0.1								0.24	0.25	<0.15	<0.15	<0.15	<0.15				
Chlorophyll-a	mg/m3				-								-	-	-	-	-	-				
Pheophytin-a	mg/m3				-								-	-	-	-	-	-				
Total Metals and Non-Metals																						
Aluminum	mg/L	0.004	0.005	0.010	0.010	0.005 - 0.100(5)	0.006	<0.004	<0.004	0.006	<0.005	<0.005	0.059	0.016	0.011	0.016	<0.010	<0.010				
Antimony	mg/L	0.0004	-	-	0.00010	-	<0.0004	<0.0004	<0.0004	-	-	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010				
Arsenic	mg/L	0.005	0.001	0.0010	0.00010	0.0050	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	0.0001	<0.00010	<0.00010	<0.00010	0.0001	<0.00010				
Barium	mg/L	0.001	0.01	-	0.00020	-	<0.001	0.002	0.003	<0.01	<0.01	<0.01	-	-	0.00166	0.00190	0.00389	0.00385				
Beryllium	mg/L	0.005	-	-	0.00010	-	<0.005	<0.005	<0.005	-	-	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010				
Bismuth	mg/L	0.0003	-	-	0.000050	-	<0.0003	<0.0003	<0.0003	-	-	-	-	-	<0.000050	<0.000050	<0.000050	<0.000050				
Boron	mg/L	0.05	0.01	-	0.010	-	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.010	<0.010	<0.010	<0.010				
Cadmium	mg/L	0.0001	0.0001	0.00010	0.000010	0.000017	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010				
Calcium	mg/L	0.05	1	0.5	0.5	-	13.2	35.5	44.7	17	41	41	45	43.1	17.4	16.8	45.9	45.6				
Cesium	mg/L				0.000010										<0.000010	<0.000010	<0.000010	<0.000010				
Chromium	mg/L	0.001	0.001	-	0.00050	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	<0.00050	<0.00050	<0.00050	<0.00050				
Cobalt	mg/L	0.0003	0.0002	-	0.00010	-	<0.0003	<0.0003	<0.0003	<0.0002	<0.0002	<0.0002	-	-	<0.00010	<0.00010	<0.00010	<0.00010				
Copper	mg/L	0.0008	0.001	0.0010	0.0010	0.002 - 0.004(6)	<0.0008	<0.0008	<0.0008	<0.001	<0.001	<0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010				
Iron	mg/L	0.02	0.03	0.050	0.050	0.3	<0.05	<0.02	<0.02	<0.03	<0.03	<0.03	0.053	<0.050	<0.050	<0.050	<0.050	<0.050				
Lead	mg/L	0.0002	0.001	0.0005	0.00010	0.001 - 0.007(7)	<0.0002	<0.0002	<0.0002	<0.001	<0.001	<0.001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010				
Lithium	mg/L			0.5	0.0010	-							-	-	<0.0010	<0.0010	0.0015	0.0016				
Magnesium	mg/L	0.005	1	0.001	0.05	-	1.91	8.74	11.7	3	9	11	14.0	11.7	3.94	4.03	12.20	11.90				
Manganese	mg/L	0.0007	0.01	0.000010	0.00050	-	0.0016	<0.0007	<0.0007	<0.01	<0.01	<0.01	0.000850	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050				
Mercury	mg/L	0.0001	0.0001	0.00050	0.000010	0.000026	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010				
Molybdenum	mg/L	0.0003	0.005	0.001	0.000050	0.073	<0.0003	<0.0003	<0.0003	<0.005	<0.005	<0.005	<0.00050	<0.00050	<0.000050	<0.000050	0.000093	0.000091				
Nickel	mg/L	0.001	0.005	0.0010	0.00050	0.025 - 0.150(8)	<0.001	<0.001	<0.001	<0.005	<0.005	<0.005	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050				
Phosphorus					0.050										<0.050	<0.050	<0.050	<0.050				



Table 3.2 Water Quality Monitoring of Baseline Fisheries Culverts
SURFACE WATER QUALITY SUMMARY FOR SAMPLE SITE N1-060 (CV078)

Parameters	Units	Method Detection Limit ¹		LOR		CCME Guideline Limits ³ 2010	Date											
		2005	2006	2015	2016		13-Jun-05	06-Aug-05	09-Sep-05	13-Jun-06	02-Aug-06	08-Sep-06	12-Aug-15	12-Aug-15	30-Jun-16	30-Jun-16	25-Aug-16	25-Aug-16
Potassium	mg/L	0.02	0.01	0.050	0.050	-	0.26	0.26	0.27	0.22	0.28	0.30	0.508	0.355	0.210	0.216	0.344	0.355
Rubidium					0.00020										<0.00020	0.00022	0.00032	0.00034
Selenium	mg/L	0.005	0.001	0.000050	0.000050	0.001	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon	mg/L			-	0.05								-	-	0.368	0.385	0.789	0.749
Silver	mg/L	0.0001	0.0001	-	0.000050	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	-	<0.000050	<0.000050	<0.000050	<0.000050
Sodium	mg/L	0.05	0.05	0.50	0.50	0.0008	0.31	0.27	0.36	0.31	0.31	0.47	1.710	0.61	<0.50	<0.50	0.72	0.70
Strontium	mg/L	0.001	0.001	-	0.0010	-	0.0098	0.0226	0.0293	0.013	0.029	0.030	-	-	0.0123	0.0121	0.0350	0.0337
Sulfur					0.50										<0.50	<0.50	1.52	1.46
Tellurium					0.0002										<0.00020	<0.00020	<0.00020	<0.00020
Thallium	mg/L	0.0002	-	0.00010	0.000010	0.0008	<0.0002	<0.0002	<0.0002	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium					0.00010										<0.00010	<0.00010	<0.00010	<0.00010
Tin	mg/L	0.001	0.01	-	0.00010	-	<0.001	<0.001	<0.001	<0.01	<0.01	<0.01	-	-	<0.00010	<0.00010	<0.00010	<0.00010
Titanium	mg/L	0.003	-	-	0.00030		<0.003	<0.003	<0.003	-	-	-	-	-	0.00060	0.00083	<0.00030	0.00032
Tungstun					0.00010										<0.00010	<0.00010	<0.00010	<0.00010
Uranium	mg/L			0.0010	0.000010								0.000577	0.000403	0.000072	0.000073	0.000468	0.000458
Vanadium	mg/L	0.0009	0.001	-	0.00050		<0.0009	<0.0009	<0.0009	<0.001	<0.001	<0.001	-	-	<0.00050	<0.00050	<0.00050	<0.00050
Zinc	mg/L	0.001	0.01	0.0030	0.0030	0.03	<0.001	<0.001	<0.001	<0.01	<0.01	<0.01	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Zirconium					0.00030										<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals and Non-Metals																		
Aluminum	mg/L	0.004	0.005	0.0050		0.005	<0.004	<0.004	<0.004	<0.005	<0.005	<0.005	<0.0050	<0.0050	-	-	-	-
Antimony	mg/L	0.0004	-	-			<0.0004	<0.0004	<0.0004	-	-	-	-	-	-	-	-	-
Arsenic	mg/L	0.005	0.001	0.00010		0.0001	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.00010	<0.00010	-	-	-	-
Barium	mg/L	0.001	0.01	-			<0.001	0.002	0.003	<0.01	<0.01	<0.01	-	-	-	-	-	-
Beryllium	mg/L	0.005	-	-			<0.005	<0.005	<0.005	-	-	-	-	-	-	-	-	-
Bismuth	mg/L	0.0003	-	-			<0.0003	<0.0003	<0.0003	-	-	-	-	-	-	-	-	-
Boron	mg/L	0.05	0.01	-			<0.05	0.02	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-
Cadmium	mg/L	0.0001	0.0001	0.000010			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.000010	<0.000010	-	-	-	-
Calcium	mg/L	0.05	1	0.05		0.00001	13.1	37.5	42.4	16	40	40	41.3	42.8	-	-	-	-
Chromium	mg/L	0.001	0.001	-		0.05	<0.001	0.002	0.001	<0.001	<0.001	<0.001	-	-	-	-	-	-
Cobalt	mg/L	0.0003	0.0002	-			<0.0003	0.0004	<0.0003	<0.0002	<0.0002	<0.0002	-	-	-	-	-	-
Copper	mg/L	0.0008	0.001	0.00020			<0.0008	<0.0008	<0.0008	<0.001	<0.001	<0.001	0.00034	0.00024	-	-	-	-
Iron	mg/L	0.02	0.03	0.010		0.0002	<0.05	<0.02	<0.02	<0.03	<0.03	<0.03	<0.010	<0.010	-	-	-	-
Lead	mg/L	0.0002	0.001	0.000050		0.01	<0.0002	<0.0002	<0.0002	<0.001	<0.001	<0.001	<0.000050	<0.000050	-	-	-	-
Lithium	mg/L			0.05									-	-	-	-	-	-
Magnesium	mg/L	0.005	1	0.0005		0.05	2.09	9.19	11.0	3	9	10	12.80	10.9	-	-	-	-
Manganese	mg/L	0.0007	0.01	-		0.0005	0.0013	<0.0007	<0.0007	<0.01	<0.01	<0.01	<0.00050	<0.00050	-	-	-	-
Mercury	mg/L			0.000010		0.00001							<0.000010	<0.000010	-	-	-	-
Molybdenum	mg/L	0.0003	0.005	0.000050		0.00005	<0.0003	<0.0003	<0.0003	<0.005	<0.005	<0.005	0.000125	0.000086	-	-	-	-
Nickel	mg/L	0.001	0.005	0.00050		0.0005	<0.001	<0.001	<0.001	<0.005	<0.005	<0.005	<0.00050	<0.00050	-	-	-	-
Potassium	mg/L	0.02	0.01	0.050		0.05	0.26	0.28	0.26	0.20	0.27	0.28	0.488	0.361	-	-	-	-
Selenium	mg/L	0.005	0.001	0.00005		0.00005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.000050	<0.000050	-	-	-	-
Silicon	mg/L			-									-	-	-	-	-	-
Silver	mg/L	0.0001	0.0001	-			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	1.61	0.61	-	-	-	-
Sodium	mg/L	0.05	0.05	-		0.5	0.30	0.28	0.34	0.30	0.30	0.46	-	-	-	-	-	-
Strontium	mg/L	0.001	0.001				0.0099	0.0247	0.0281	0.012	0.028	0.030	-	-	-	-	-	-
Thallium	mg/L	0.0002	-	0.00010		0.00001	<0.0002	<0.0002	<0.0002	-	-	-	<0.000010	<0.000010	-	-	-	-
Tin	mg/L	0.001	0.01	-			<0.001	<0.001	<0.001	<0.01	<0.01	<0.01	-	-	-	-	-	-
Titanium	mg/L	0.003	-	-			<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-
Uranium	mg/L			0.000010		0.00001							0.000549	0.000409	-	-	-	-
Vanadium	mg/L	0.0009	0.001	-			<0.0009	0.0043	0.0042	<0.001	<0.001	0.002	-	-	-	-	-	-
Zinc	mg/L	0.001	0.01	0.0010		0.001	<0.001	0.001	0.002	<0.01	<0.01	<0.01	<0.0010	0.00260	-	-	-	-

Notes:
 Yellow highlight denotes exceedance to CCME guidelines or Baffinland's 2AM-MRY-1325 Water Licence
 NA denotes problem with field equipment calibration, result not acceptable.
 2005 and 2006 dissolved oxygen values in mg/L; 2015 and 2016 dissolved oxygen values in % saturation



Table 3.2 Water Quality Monitoring of Baseline Fisheries Culverts
SURFACE WATER QUALITY SUMMARY FOR SAMPLE SITEN1-070 (BG50)

Parameters	Method Detection Limit ¹		LOR		CCME Guideline Limits ^{3 2010}	Dates													
	2005	2006	2015	2016		07-Jun-05	06-Aug-05	09-Sep-05	13-Jun-06	02-Aug-06	08-Sep-06	03-Jul-15	03-Jul-15	11-Aug-15	11-Aug-15	30-Jun-16	30-Jun-16	25-Aug-16	25-Aug-16
In Situ Parameters																			
Temperature (°C)	-	-	-	-	-	0.26	9.75	6.05	-0.05	13.74	6.53	-	-	11.4	11.3	10.4	7.2	11.5	11.3
Specific Conductance (mS/cm)	-	-	-	-	-	0.067	0.139	0.145	0.112	0.137	0.152	0.130	0.084	0.183	0.180	NA	NA	0.175	0.175
Dissolved Oxygen	-	-	-	-	5.5-9.5	13.06	10.71	11.89	13.58	10.32	-	-	-	101.5	101.9	98.5	99.4	101.4	100.5
pH	-	-	-	-	6.5 - 9.0	7.58	8.03	7.70	8.02	8.10	8.16	8.20	8.17	8.42	8.42	6.21	7.47	8.22	8.15
Wetted Width (m)	-	-	-	-	-	-	-	-	52	42	38	-	-	6	6	-	-	-	-
Average Depth (m)	-	-	-	-	-	-	-	-	-	0.3	0.3	-	-	0.2	0.2	-	-	-	-
Flow Rate (m³/s)	-	-	-	-	-	-	-	-	-	4.09	-	-	-	-	-	-	-	-	-
Physical Parameters																			
pH	-	-	0.01	0.01	6.5 - 9.0	-	-	-	7.70	7.61	7.64	7.98	7.99	8.20	8.17	7.86	7.94	8.32	8.28
Conductivity (µS/cm)	1	5	-	-	-	72	149	143	124	140	171	-	-	-	-	-	-	-	-
Turbidity (NTU)	0.1	0.1	0.10	0.10	-	0.33	0.25	0.16	0.5	0.3	-	0.29	0.28	0.2	0.2	0.60	0.46	0.28	0.26
Hardness (mg/L CaCO ₃)	0.5	1	10	10	-	32.4	79.5	82.0	61	75	80	63	62	80	81	48	48	85	93
TSS	-	-	-	2.0	-	-	-	-	-	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	<2.0	<2.0
TDS	30	5	20	-	-	54	74	86	81	91	111	70	73	86 *	84 *	60	65	83	84
Dissolved Anions																			
Alkalinity (mg/L CaCO ₃)	2	5	10	10	-	33	74	71	62	74	87	63	63	82	80	47	50	84	89
Br ⁻	0.3	0.05	-	-	-	<0.3	<0.3	<0.3	<0.05	<0.05	<0.05	-	-	-	-	-	-	-	-
Cl ⁻	0.2	1	0.50	0.50	-	0.9	0.8	0.9	<1	<1	2	1.29	1.30	2.06	2.20	1.26	1.26	1.89	1.88
Fluoride	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.020	<0.020	0.02	0.03
SO ₄ ⁻	0.5	1	0.30	0.30	-	0.7	0.5	0.6	2	<1	3	0.82	1.03	1.55	2.28	0.65	0.62	1.25	1.21
Nutrients																			
NH ₃ +NH ₄ (mg/L N)	0.1	0.02	0.15	0.15	0.021 - 231(4)	0.2	0.1	<0.10	0.04	0.11	<0.02	<0.15	<0.15	0.28	0.22	<0.15	<0.15	0.20	<0.15
NO ₂ ⁻ (mg/L N)	0.06	0.005	-	-	0.06	<0.06	<0.06	<0.06	<0.005	<0.005	0.013	-	-	-	-	-	-	-	-
NO ₃ ⁻ (mg/L N)	0.05	0.10	0.02	0.020	2.9	0.06	<0.05	<0.05	<0.10	<0.10	<0.10	<0.020	0.035	<0.020	0.052	<0.020	<0.020	<0.020	<0.020
NO ₂ +NO ₃ (mg/L N)	0.06	0.10	-	-	-	0.06	<0.06	<0.06	<0.10	<0.10	<0.10	-	-	-	-	-	-	-	-
Ammonia total as N	-	-	-	0.020	-	-	-	-	-	-	-	-	-	-	-	<0.020	0.054	0.061	<0.020
Total Phosphorus	0.02	0.01	0.003	0.0030	-	<0.02	<0.02	<0.10	<0.01	<0.01	<0.01	0.0043	0.0058	0.0040	0.0038	0.0044	0.0032	0.0231	0.0088
Dissolved Phosphorus	0.02	-	-	-	-	<0.02	<0.02	<0.10	-	-	-	-	-	-	-	-	-	-	-
Organic Compounds																			
Phenols	0.001	0.001	-	-	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-	-	-	-
DOC	-	-	0.5	0.5	-	-	-	-	-	-	-	2.1	2.1	2.5	2.6	2.1	1.9	2.1	2.3
TOC	-	-	0.5	0.5	-	-	-	-	-	-	-	2.1	1.9	2.7	2.6	2.3	2.2	2.5	2.2
TKN	-	-	0.1	0.1	-	-	-	-	-	-	-	<0.15	<0.15	0.28	0.22	<0.15	<0.15	0.20	<0.15
Chlorophyll-a	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pheophytin-a	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Metals and Non-Metals																			
Aluminum	0.004	0.005	0.010	0.010	0.005 - 0.100(5)	0.008	<0.004	<0.004	<0.005	<0.005	0.006	<0.010	<0.010	<0.010	<0.010	0.018	0.014	<0.010	<0.010
Antimony	0.0004	-	-	0.00010	-	<0.0004	<0.0004	<0.0004	-	-	-	-	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic	0.005	0.001	0.0010	0.00010	0.0050	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.0010	<0.0010	<0.00010	<0.00010	<0.00010	<0.00010	0.00011	0.00012
Barium	0.001	0.01	-	0.00020	-	0.001	0.004	0.004	<0.01	<0.01	<0.01	-	-	-	-	0.00347	0.00340	0.00545	0.00569
Beryllium	0.005	-	-	0.00010	-	<0.005	<0.005	<0.005	-	-	-	-	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth	0.0003	-	-	0.000050	-	<0.0003	<0.0003	<0.0003	-	-	-	-	-	-	-	<0.000050	<0.000050	<0.000050	<0.000050
Boron	0.05	0.01	-	0.010	-	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	-	-	<0.010	<0.010	<0.010	<0.010
Cadmium	0.0001	0.0001	0.00010	0.000010	0.000017	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.000090	<0.000090	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium	0.05	1	0.5	0.50	-	8.86	18.3	18.5	14	17	19	14.1	13.9	20.2	19.2	10.5	10.6	19.0	21.2
Cesium	-	-	-	0.000010	-	-	-	-	-	-	-	-	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010
Chromium	0.001	0.001	-	0.00050	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	0.00080	<0.00050	<0.00050	<0.00050
Cobalt	0.0003	0.0002	-	0.00010	-	<0.0003	<0.0003	<0.0003	<0.0002	<0.0002	<0.0002	-	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010
Copper	0.0008	0.001	0.0010	0.0010	0.002 - 0.004(6)	<0.0008	0.0009	<0.0008	<0.001	<0.001	<0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Iron	0.02	0.03	0.050	0.050	0.3	<0.02	<0.02	<0.02	<0.03	<0.03	<0.03	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Lead	0.0002	0.001	0.00050	0.00010	0.001 - 0.007(7)	<0.0002	<0.0002	<0.0002	<0.001	<0.001	<0.001	<0.00050	<0.00050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Lithium	-	-	-	0.0010	-	-	-	-	-	-	-	-	-	-	-	<0.0010	<0.0010	0.0012	0.0013
Magnesium	0.005	1	0.50	0.05	-	2.49	8.23	8.71	7	8	8	6.28	6.36	9.52	9.21	5.19	5.14	9.19	9.72
Manganese	0.0007	0.01	0.0010	0.00050	-	0.0071	0.0010	0.0009	<0.01	<0.01	<0.01	<0.0010	<0.0010	<0.00050	0.00118	0.00154	0.00144	0.00101	0.00106
Mercury	0.0001	0.0001	0.000010	0.000010	0.000026	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum	0.0003	0.005	0.00050	0.000050	0.073	<0.0003	<0.0003	<0.0003	<0.005	<0.005	<0.005	<0.00050	<0.00050	<0.00050	<0.00050	0.000063	0.000054	0.000067	0.000065
Nickel	0.001	0.005	0.00100	0.00050	0.025 - 0.150(8)	<0.001	<0.001	<0.001	<0.005	<0.005	<0.005	<0.0010	<0.0010	<0.0010	<0.0010	0.00071	<0.00050	<0.00050	<0.00050



Table 3.2 Water Quality Monitoring of Baseline Fisheries Culverts
 SURFACE WATER QUALITY SUMMARY FOR SAMPLE SITEN1-070 (BG50)

Parameters	Method Detection Limit ¹		LOR		CCME Guideline Limits ^{3 2010}	Dates													
	2005	2006	2015	2016		07-Jun-05	06-Aug-05	09-Sep-05	13-Jun-06	02-Aug-06	08-Sep-06	03-Jul-15	03-Jul-15	11-Aug-15	11-Aug-15	30-Jun-16	30-Jun-16	25-Aug-16	25-Aug-16
Phosphorus			1.0	0.050	-	0.49	0.47	0.50	0.62	0.45	0.51	<1.0	<1.0	0.67	0.67	<0.050	<0.050	<0.050	<0.050
Potassium	0.02	0.01	1.0	0.05	-	0.49	0.47	0.50	0.62	0.45	0.51	<1.0	<1.0	0.67	0.67	0.48	0.48	0.64	0.68
Rubidium				0.00020											0.00053	0.00051	0.00075	0.00073	
Selenium	0.005	0.001	0.00040	0.000050	0.001	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.00040	<0.00040	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon				0.05											0.400	0.393	0.545	0.567	
Silver	0.0001	0.0001	-	0.000050	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	-			<0.000050	<0.000050	<0.000050	<0.000050
Sodium	0.05	0.05	0.50	0.50	-	0.30	0.52	0.54	0.50	0.53	0.94	0.89	0.91	1.57	1.56	0.85	0.84	1.41	1.52
Sulfur				0.001											0.0073	0.0070	0.0128	0.0134	
Tellurium				0.50											<0.50	<0.50	0.59	0.66	
Strontium	0.001	0.001	-	0.00020	-	0.0057	0.0094	0.0098	0.009	0.010	0.014	-	-			<0.00020	<0.00020	<0.00020	<0.00020
Thallium	0.0002	-	0.00030	0.000010	0.0008	<0.0002	<0.0002	<0.0002	-	-	-	<0.00030	<0.00030	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium				0.00010											<0.00010	<0.00010	<0.00010	<0.00010	
Tin	0.001	0.01	-	0.00010	-	<0.001	<0.001	<0.001	<0.01	<0.01	<0.01	-	-			<0.00010	<0.00010	<0.00010	<0.00010
Titanium	0.003	-	-	0.00030	-	<0.003	<0.003	<0.003	-	-	-	-	-			0.00076	0.00049	0.00038	<0.00030
Tungsten				0.00010											<0.00010	<0.00010	<0.00010	<0.00010	
Uranium			0.001	0.000010								<0.0010	<0.0010	0.000460	0.000435	0.00022	0.00021	0.00042	0.00045
Vanadium	0.0009	0.001	-	0.00050	-	<0.0009	<0.0009	<0.0009	<0.001	<0.001	<0.001	-	-			<0.00050	<0.00050	<0.00050	<0.00050
Zinc	0.001	0.01	0.0030	0.0030	0.03	0.0010	<0.001	<0.001	<0.01	<0.01	<0.01	<0.0030	<0.0030	<0.0030	0.00380	<0.0030	<0.0030	<0.0030	<0.0030
Zirconium				0.00030											<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals and Non-Metals																			
Aluminum	0.004	0.005	0.005			<0.004	<0.004	<0.004	<0.005	<0.005	<0.005	0.01	<0.0050	<0.0050	<0.0050	-	-	-	-
Antimony	0.0004	-	0.0001			<0.0004	<0.0004	<0.0004	-	-	-	-	-	-	-	-	-	-	-
Arsenic	0.005	0.001				<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.00010	<0.00010	<0.00010	<0.00010	-	-	-	-
Barium	0.001	0.01				0.001	0.004	0.004	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	-
Beryllium	0.005	-				<0.005	<0.005	<0.005	-	-	-	-	-	-	-	-	-	-	-
Bismuth	0.0003	-				<0.0003	<0.0003	<0.0003	-	-	-	-	-	-	-	-	-	-	-
Boron	0.05	0.01				<0.05	0.02	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	-
Cadmium	0.0001	0.0001	0.000010			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.000011	<0.000010	<0.000010	<0.000010	-	-	-	-
Calcium	0.05	1	0.05			9.62	18.3	17.2	13	17	19	14.9	13.9	17.9	18.1	-	-	-	-
Chromium	0.001	0.001				<0.001	0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-	-	-	-
Cobalt	0.0003	0.0002				<0.0003	<0.0003	<0.0003	<0.0002	<0.0002	<0.0002	-	-	-	-	-	-	-	-
Copper	0.0008	0.001	0.0002			<0.0008	<0.0008	<0.0008	<0.001	<0.001	<0.001	0.0010	0.0004	0.0007	0.0005	-	-	-	-
Iron	0.02	0.03	0.010			<0.02	0.02	<0.02	<0.03	<0.03	<0.03	0.0520	<0.010	0.0170	<0.010	-	-	-	-
Lead	0.0002	0.001	0.00005			<0.0002	<0.0002	<0.0002	<0.001	<0.001	<0.001	0.00	<0.000050	<0.000050	<0.000050	-	-	-	-
Magnesium	0.005	1	0.05			2.67	8.24	7.80	7	8	8	6.24	6.64	8.57	8.60	-	-	-	-
Manganese	0.0007	0.01	0.0005			0.0068	<0.0007	<0.0007	<0.01	<0.01	<0.01	0.00271	<0.00050	0.00105	<0.00050	-	-	-	-
Mercury												<0.000010	<0.000010	<0.000010	<0.000010	-	-	-	-
Molybdenum	0.0003	0.005	0.000010			<0.0003	<0.0003	<0.0003	<0.005	<0.005	<0.005	0.000080	0.000055	0.000067	0.000072	-	-	-	-
Nickel	0.001	0.005	0.0001			<0.001	<0.001	<0.001	<0.005	<0.005	<0.005	<0.00050	<0.00050	<0.00050	<0.00050	-	-	-	-
Potassium	0.02	0.01	0.00050			0.52	0.48	0.49	0.61	0.46	0.49	0.59	0.58	0.67	0.69	-	-	-	-
Selenium	0.005	0.001	0.050			<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.000050	<0.000050	<0.000050	<0.000050	-	-	-	-
Silver	0.0001	0.0001	0.00005			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	-	-	-	-	-	-	-
Sodium	0.05	0.05	0.50			0.34	0.52	0.51	0.49	0.52	0.90	0.97	0.91	1.42	1.44	-	-	-	-
Strontium	0.001	0.001				0.0061	0.0100	0.0092	0.008	0.010	0.014	-	-	-	-	-	-	-	-
Thallium	0.0002	-	0.000010			<0.0002	<0.0002	<0.0002	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	-	-	-	-
Tin	0.001	0.01				<0.001	<0.001	<0.001	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	-
Titanium	0.003	-				<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-
Uranium			0.000010									0.00024	0.00031	0.00040	0.00041	-	-	-	-
Vanadium	0.0009	0.001				<0.0009	0.0027	0.0022	<0.001	<0.001	<0.001	-	-	-	-	-	-	-	-
Zinc	0.001	0.01	0.001			0.003	0.002	0.009	<0.01	<0.01	<0.01	0.00750	0.00130	<0.0010	0.00390	-	-	-	-

Notes:
 Yellow highlight denotes exceedance to CCME guidelines or Baffinland's 2AM-MRY-1325 Water Licence
 NA denotes problem with field equipment calibration, result not acceptable.
 2006 dissolved oxygen values in mg/L; 2015 and 2016 dissolved oxygen values in % saturation



Table 3.2 Water Quality Monitoring of Baseline Fisheries Culverts
 SURFACE WATER QUALITY SUMMARY FOR SAMPLE SITE N1-080 (CV040)

Parameters	Method Detection Limit ¹		LOR		CCME Guideline Limits ^{3 2010}	Dates														
	2005	2006	2015	2016		13-Jun-05	06-Aug-05	09-Sep-05	13-Jun-06	13-Jun-06	02-Aug-06	08-Sep-06	03-Jul-15	03-Jul-15	11-Aug-15	11-Aug-15	29-Jun-16	29-Jun-16	25-Aug-16	25-Aug-15
Tellurium				0.00020																
Thallium	0.0002	-	0.00030	0.000010	0.0008	<0.0002	<0.0002	<0.0002	-	-	-	-	<0.00030	<0.00030	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium				0.0001																
Tin	0.001	0.01	-	0.00010	-	<0.001	0.001	<0.001	<0.01	<0.01	<0.01	<0.01	-	-						
Titanium	0.003	-	-	0.00030	-	<0.003	<0.003	<0.003	-	-	-	-	-	-						
Tungsten				0.00010																
Uranium			0.0010	0.000010									0.0011	0.0010	0.0033	0.0029	<0.00010	<0.00010	<0.00010	<0.00010
Vanadium	0.0009	0.001	-	0.00050	-	<0.0009	<0.0009	<0.0009	<0.001	<0.001	0.001	<0.001	-	-			<0.00050	<0.00050	<0.00050	<0.00050
Zinc	0.001	0.01	0.0030	0.0030	0.03	<0.001	0.0010	<0.001	<0.01	<0.01	<0.01	<0.01	<0.0030	<0.0030	<0.0030	0.0043	<0.0030	<0.0030	<0.0030	<0.0030
Zirconium				0.00030													<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals and Non-Metals																				
Aluminum	0.004	0.005	0.005			<0.004	<0.004	<0.004	<0.005	<0.005	<0.005	<0.005	0.0056	<0.0050	<0.0050	0.0101	-	-	-	-
Antimony	0.0004	-	0.0001			<0.0004	<0.0004	<0.0004	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic	0.005	0.001				<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.00010	<0.00010	0.00010	<0.00010	-	-	-	-
Barium	0.001	0.01				<0.001	0.005	0.007	<0.01	<0.01	<0.01	<0.01	-	-			-	-	-	-
Beryllium	0.005	-				<0.005	<0.005	<0.005	-	-	-	-	-	-			-	-	-	-
Bismuth	0.0003	-				<0.0003	<0.0003	<0.0003	-	-	-	-	-	-			-	-	-	-
Boron	0.05	0.01				<0.05	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	-	-			-	-	-	-
Cadmium	0.0001	0.0001	0.000010			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.000010	<0.000010	<0.000010	<0.000010	-	-	-	-
Calcium	0.05	1	0.05			6.06	35.0	40.5	11	11	38	39	22.5	22.3	37.9	39.6	-	-	-	-
Chromium	0.001	0.001				<0.001	0.002	0.002	<0.001	<0.001	<0.001	<0.001	-	-			-	-	-	-
Cobalt	0.0003	0.0002				<0.0003	<0.0003	<0.0003	<0.0002	<0.0002	<0.0002	<0.0002	-	-			-	-	-	-
Copper	0.0008	0.001	0.00020			<0.0008	<0.0008	<0.0008	<0.001	<0.001	<0.001	<0.001	0.00057	0.00054	0.00076	0.00077	-	-	-	-
Iron	0.02	0.03	0.010			<0.05	<0.02	<0.02	<0.03	<0.03	<0.03	<0.03	<0.010	<0.010	<0.010	0.014	-	-	-	-
Lead	0.0002	0.001	0.000050			<0.0002	<0.0002	<0.0002	<0.001	<0.001	<0.001	<0.001	<0.000050	<0.000050	<0.000050	<0.000050	-	-	-	-
Magnesium	0.005	1	0.05			2.50	13.3	16.0	5	5	14	15	9.49	9.32	17.80	17.00	-	-	-	-
Manganese	0.0007	0.01	0.00050			0.0022	<0.0007	<0.0007	<0.01	<0.01	<0.01	<0.01	<0.00050	<0.00050	<0.00050	0.00	-	-	-	-
Mercury													<0.000010	<0.000010	<0.000010	<0.000010	-	-	-	-
Molybdenum	0.0003	0.005	0.000010			<0.0003	<0.0003	<0.0003	<0.005	<0.005	<0.005	<0.005	0.00007	0.000073	0.000176	0.000174	-	-	-	-
Nickel	0.001	0.005	0.0001			<0.001	<0.001	<0.001	<0.005	<0.005	<0.005	<0.005	<0.00050	<0.00050	<0.00050	<0.00050	-	-	-	-
Potassium	0.02	0.01	0.00050			0.39	0.72	0.76	0.61	0.60	0.73	0.80	0.644	0.607	1.240	1.240	-	-	-	-
Selenium	0.005	0.001	0.050			<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.000050	<0.000050	<0.000050	<0.000050	-	-	-	-
Silver	0.0001	0.0001	0.00005			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	-			-	-	-	-
Sodium	0.05	0.05	0.50			0.29	1.25	1.96	0.42	0.46	1.38	3.12	2.54	2.41	7.10	6.67	-	-	-	-
Strontium	0.001	0.001				0.0027	0.0192	0.0224	0.005	0.005	0.023	0.026	-	-			-	-	-	-
Thallium	0.0002	-	0.000010			<0.0002	<0.0002	<0.0002	-	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	-	-	-	-
Tin	0.001	0.01				<0.001	<0.001	<0.001	<0.01	<0.01	<0.01	<0.01	-	-			-	-	-	-
Titanium	0.003	-				<0.003	<0.003	<0.003	-	-	-	-	-	-			-	-	-	-
Uranium			0.00001										0.00101	0.00096	0.00300	0.00288	-	-	-	-
Vanadium	0.0009	0.001				<0.0009	0.0047	0.0045	<0.001	<0.001	<0.001	<0.001	-	-			-	-	-	-
Zinc	0.001	0.01	0.0010			0.001	0.002	0.002	<0.01	<0.01	<0.01	<0.01	0.0025	0.0037	<0.0010	0.0029	-	-	-	-

Notes:
 Yellow highlight denotes exceedance to CCME guidelines or Baffinland's 2AM-MRY-1325 Water Licence
 2005 and 2006 dissolved oxygen values in mg/L; 2015 and 2016 dissolved oxygen values in % saturation



Table 3.2 Water Quality Monitoring of Baseline Fisheries Culverts
SURFACE WATER QUALITY SUMMARY FOR SAMPLE SITE N1-100 (CV217)

Parameters	Method Detection Limit ¹		LOR		CCME Guideline Limits ^{3 2010}	Dates											
	2005	2006	2015	2016		07-Jun-05	06-Aug-05	09-Sep-05	13-Jun-06	29-Jul-06	10-Sep-06	12-Aug-15	12-Aug-15	29-Jun-16	29-Jun-16	25-Aug-16	25-Aug-16
In Situ Parameters																	
Temperature (°C)	-	-	-	-	-	0.74	9.35	6.59	1.56	7.36	3.02	9.6	9.4	5.6	6.4	8.7	10.7
Specific Conductance (mS/cm)	-	-	-	-	-	0.019	0.081	0.088	0.031	0.083	0.091	0.100	0.101	0.640	0.800	0.102	0.095
Dissolved Oxygen	-	-	-	-	5.5-9.5	12.14	11.62	12.82	12.71	13.40	-	102.30	102.8	107.4	109.5	94.1	100.0
pH	-	-	-	-	6.5 - 9.0	7.20	7.60	7.02	7.38	7.59	7.92	8.08	8.07	7.74	8.36	8.19	8.11
Wetted Width (m)	-	-	-	-	-	-	-	-	-	54	59	-	-	-	-	-	-
Average Depth (m)	-	-	-	-	-	-	-	-	-	5	2.5	-	-	-	-	-	-
Flow Rate (m ³ /s)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Physical Parameters																	
pH	-	-	0.01	0.01	6.5 - 9.0	-	-	-	6.97	7.03	6.97	7.79	7.84	7.42	7.41	8.08	7.96
Conductivity (uS/cm)	1	5	-	-	-	27	90	93	38	86	97	-	-	-	-	-	-
Turbidity (NTU)	0.1	0.1	0.1	0.10	-	0.50	0.99	0.55	0.7	1.1	1.4	1.0	1.1	1.10	1.13	2.02	0.99
Hardness (mg/L CaCO ₃)	0.5	1	10	10	-	8.57	42.0	46.3	16	41	43	37	37	27	29	42	38
TSS	-	-	2	2	-	-	-	-	-	-	-	32	<2	<2.0	<2.0	<2.0	<2.0
TDS	30	5	20	-	-	31	<30	<30	25	56	63	47 *	48 *	40	25	52	38
Dissolved Anions																	
Alkalinity (mg/L CaCO ₃)	2	5	10	10	-	8	43	45	16	44	47	37	36	30	31	41	35
Br ⁻	0.3	0.05	-	-	-	<0.3	<0.3	<0.3	<0.05	<0.05	<0.05	-	-	-	-	-	-
Cl ⁻	0.2	1	0.5	0.50	-	0.8	1.0	1.2	<1	1	2	4.87	5.31	2.44	2.49	3.87	3.79
Fluoride	-	-	-	-	-	-	-	-	-	-	-	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
SO ₄ ⁻	0.5	1	0.3	0.30	-	0.7	0.6	0.7	2	2	3	1.29	1.35	0.70	0.72	1.15	0.97
Nutrients																	
NH ₃ +NH ₄ (mg/L N)	0.1	0.02	0.15	0.15	0.021 - 231(4)	0.5	<0.10	0.4	0.04	0.05	0.04	<0.15	0.19	<0.15	<0.15	<0.15	<0.15
NO ₂ ⁻ (mg/L N)	0.06	0.005	-	-	0.06	<0.06	<0.06	<0.06	<0.005	0.018	0.008	-	-	-	-	-	-
NO ₃ ⁻ (mg/L N)	0.05	0.10	0.020	0.020	2.9	<0.05	<0.05	<0.05	<0.10	<0.10	<0.10	<0.020	<0.020	<0.020	<0.020	0.03	<0.020
NO ₂ +NO ₃ (mg/L N)	0.06	0.10	-	-	-	<0.06	<0.06	<0.06	<0.10	<0.10	<0.10	-	-	-	-	-	-
Ammonia total as N	-	-	-	0.020	-	-	-	-	-	-	-	-	-	<0.020	0.05	<0.020	<0.020
Total Phosphorus	0.02	0.01	0.003	0.0030	-	<0.02	<0.02	<0.10	<0.01	<0.01	0.02	0.0077	0.0058	0.0068	<0.0030	0.0071	0.0095
Dissolved Phosphorus	0.02	-	-	-	-	<0.02	<0.02	<0.10	-	-	-	-	-	-	-	-	-
Organic Compounds																	
Phenols	0.001	0.001	-	-	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-	-
DOC	-	-	0.5	0.5	-	-	-	-	-	-	-	2.6	2.2	1.8	1.9	2.3	1.9
TOC	-	-	0.5	0.5	-	-	-	-	-	-	-	2.7	2.6	1.9	1.8	2.3	2.0
TKN	-	-	0.10	0.10	-	-	-	-	-	-	-	<0.15	0.19	<0.15	<0.15	<0.15	<0.15
Chlorophyll-a	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pheophytin-a	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Metals and Non-Metals																	
Aluminum	0.004	0.005	0.010	0.010	0.005 - 0.100(5)	0.025	0.039	0.020	0.023	0.043	0.066	0.094	<0.010	0.042	0.150	0.052	0.037
Antimony	0.0004	-	-	0.00010	-	<0.0004	<0.0004	<0.0004	-	-	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic	0.005	0.0010	0.0010	0.00010	0.0050	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Barium	0.001	0.010	-	0.00020	-	0.002	0.004	0.005	<0.01	<0.01	<0.01	-	-	0.00368	0.00433	0.00576	0.00502
Beryllium	0.005	-	-	0.00010	-	<0.005	<0.005	<0.005	-	-	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth	0.0003	-	-	0.000050	-	<0.0003	<0.0003	<0.0003	-	-	-	-	-	<0.000050	<0.000050	<0.000050	<0.000050
Boron	0.05	0.010	-	0.010	-	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.010	<0.010	<0.010	<0.010
Cadmium	0.0001	0.0001	-	0.000010	0.000017	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium	0.05	1	0.5	0.5	-	1.51	8.62	9.34	3	8	9	7.83	8.02	5.19	5.58	8.32	7.66
Cesium	-	-	-	0.000010	-	-	-	-	-	-	-	-	-	<0.000010	0.000016	<0.000010	<0.000010
Chromium	0.001	0.001	-	0.00050	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt	0.0003	0.0002	-	0.00010	-	<0.0003	<0.0003	<0.0003	<0.0002	<0.0002	<0.0002	-	-	<0.00010	<0.00010	<0.00010	<0.00010
Copper	0.0008	0.001	0.0010	0.0010	0.002 - 0.004(6)	0.0009	0.0010	0.0008	<0.001	<0.001	0.001	<0.0010	<0.0010	<0.0010	0.0011	0.0010	<0.0010
Iron	0.02	0.03	0.050	0.050	0.3	0.05	0.03	0.02	0.07	0.04	0.04	0.121	<0.050	0.052	0.186	0.058	<0.050
Lead	0.0002	0.001	0.00010	0.00010	0.001 - 0.007(7)	<0.0002	<0.0002	<0.0002	<0.001	<0.001	<0.001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Lithium	-	-	-	0.0010	-	-	-	-	-	-	-	-	-	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium	0.005	1	0.001	0.05	-	1.16	4.97	5.59	2	5	5	5.01	4.93	3.30	3.59	5.04	4.71
Manganese	0.0007	0.01	0.00001	0.00050	-	0.0183	0.0012	0.0009	<0.01	<0.01	<0.01	0.00339	0.00101	0.00201	0.00408	0.00217	0.00159
Mercury	0.0001	0.0001	0.0005	0.000010	0.000026	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum	0.0003	0.005	0.001	0.000050	0.073	<0.0003	<0.0003	<0.0003	<0.005	<0.005	<0.005	<0.00050	<0.00050	0.000065	0.000069	0.000099	0.000075
Nickel	0.001	0.005	1	0.00050	0.025 - 0.150(8)	<0.001	<0.001	<0.001	<0.005	<0.005	<0.005	<0.0010	<0.0010	0.00077	0.00054	<0.00050	<0.00050



Table 3.2 Water Quality Monitoring of Baseline Fisheries Culverts
SURFACE WATER QUALITY SUMMARY FOR SAMPLE SITE N1-100 (CV217)

Parameters	Method Detection Limit ¹		LOR		CCME Guideline Limits ^{3 2010}	Dates											
	2005	2006	2015	2016		07-Jun-05	06-Aug-05	09-Sep-05	13-Jun-06	29-Jul-06	10-Sep-06	12-Aug-15	12-Aug-15	29-Jun-16	29-Jun-16	25-Aug-16	25-Aug-16
Phosphorus				0.050										<0.050	<0.050	<0.050	<0.050
Potassium	0.02	0.01	0.0004	0.05	-	0.81	0.58	0.60	0.49	0.58	0.57	0.64	0.62	0.516	0.580	0.717	0.645
Rubidium				0.00020										0.00073	0.00109	0.00138	0.00110
Selenium	0.005	0.001	-	0.000050	0.001	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon				0.050										0.390	0.603	0.636	0.525
Silver	0.0001	0.0001	0.5	0.000050	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	-	<0.000050	<0.000050	<0.000050	<0.000050
Sodium	0.05	0.05	-	0.50	-	0.34	0.68	0.70	0.31	0.72	0.93	2.93	3.05	1.40	1.49	2.25	2.39
Strontium	0.001	0.001	0.0003	0.0010	-	0.0012	0.0049	0.0054	0.002	0.006	0.007	-	-	0.0046	0.0048	0.0079	0.0074
Sulfur				0.50										<0.50	<0.50	<0.50	0.53
Tellurium				0.00020										<0.00020	<0.00020	<0.00020	<0.00020
Thallium	0.0002	-	-	0.000010	0.0008	<0.0002	<0.0002	<0.0002	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium				0.0001										<0.00010	0.00012	<0.00010	<0.00010
Tin	0.001	0.01	-	0.00010	-	<0.001	<0.001	<0.001	<0.01	<0.01	<0.01	-	-	<0.00010	<0.00010	<0.00010	<0.00010
Titanium	0.003	-	-	0.00030	-	<0.003	<0.003	<0.003	-	-	-	-	-	<0.0020 *	0.00821	0.00203	0.00165
Tungsten				0.00010										<0.00010	<0.00010	<0.00010	<0.00010
Uranium			0.0010	0.000010								0.000333	0.000323	0.000210	0.000238	0.000368	0.000319
Vanadium	0.0009	0.001	-	0.00050	-	<0.0009	<0.0009	<0.0009	<0.001	<0.001	<0.001	-	-	<0.00050	<0.00050	<0.00050	<0.00050
Zinc	0.001	0.01	0.0030	0.0030	0.03	0.0020	0.0020	<0.001	<0.01	<0.01	<0.01	<0.0030	0.0038	<0.0030	<0.0030	0.0053	<0.0030
Zirconium				0.00030										<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals and Non-Metals																	
Aluminum	0.004	0.005	0.0050			0.013	0.006	0.004	0.009	<0.005	0.007	<0.0050	0.0272	-	-	-	-
Antimony	0.0004	-	-			<0.0004	<0.0004	<0.0004	-	-	-	-	-	-	-	-	-
Arsenic	0.005	0.001	0.0001			<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.00010	<0.00010	-	-	-	-
Barium	0.001	0.01	-			0.002	0.004	0.005	<0.01	<0.01	<0.01	-	-	-	-	-	-
Beryllium	0.005	-	-			<0.005	<0.005	<0.005	-	-	-	-	-	-	-	-	-
Bismuth	0.0003	-	-			<0.0003	<0.0003	<0.0003	-	-	-	-	-	-	-	-	-
Boron	0.05	0.01	-			<0.05	0.02	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-
Cadmium	0.0001	0.0001	0.00001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.000010	<0.000010	-	-	-	-
Calcium	0.05	1	0.05			1.60	9.05	8.60	3	8	9	7.52	7.53	-	-	-	-
Chromium	0.001	0.001	-			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-	-
Cobalt	0.0003	0.0002	-			<0.0003	<0.0003	<0.0003	<0.0002	<0.0002	<0.0002	-	-	-	-	-	-
Copper	0.0008	0.001	0.00020			<0.0008	0.0009	0.0010	<0.001	<0.001	<0.001	0.00065	0.00074	-	-	-	-
Iron	0.02	0.03	0.010			0.04	<0.02	<0.02	0.06	<0.03	<0.03	<0.010	0.032	-	-	-	-
Lead	0.0002	0.001	0.00005			<0.0002	<0.0002	<0.0002	<0.001	<0.001	<0.001	<0.000050	<0.000050	-	-	-	-
Magnesium	0.005	1	0.0005			1.24	5.23	5.12	2	5	5	4.42	4.47	-	-	-	-
Manganese	0.0007	0.01	-			0.0175	<0.0007	<0.0007	<0.01	<0.01	<0.01	0.00068	0.00181	-	-	-	-
Mercury			0.000010									<0.000010	<0.000010	-	-	-	-
Molybdenum	0.0003	0.005	0.000050			<0.0003	<0.0003	<0.0003	<0.005	<0.005	<0.005	0.000074	0.000080	-	-	-	-
Nickel	0.001	0.005	0.00050			<0.001	<0.001	<0.001	<0.005	<0.005	<0.005	<0.00050	<0.00050	-	-	-	-
Potassium	0.02	0.01	0.050			0.85	0.61	0.58	0.48	0.54	0.57	0.602	0.626	-	-	-	-
Selenium	0.005	0.001	0.000050			<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.000050	<0.000050	-	-	-	-
Silver	0.0001	0.0001	-			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	-	-	-	-	-
Sodium	0.05	0.05	-			0.37	0.72	0.68	0.31	0.72	1.02	2.68	2.83	-	-	-	-
Strontium	0.001	0.001	-			0.0013	0.0052	0.0049	0.002	0.006	0.007	-	-	-	-	-	-
Thallium	0.0002	-	0.00010			<0.0002	<0.0002	<0.0002	-	-	-	<0.000010	<0.000010	-	-	-	-
Tin	0.001	0.01	-			<0.001	<0.001	<0.001	<0.01	<0.01	<0.01	-	-	-	-	-	-
Titanium	0.003	-	-			<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-
Uranium			0.000010									0.000296	0.000308	-	-	-	-
Vanadium	0.0009	0.001	-			<0.0009	0.0015	<0.0009	<0.001	<0.001	<0.001	-	-	-	-	-	-
Zinc	0.001	0.01	0.001			0.002	0.002	0.001	<0.01	<0.01	<0.01	<0.0010	0.0026	-	-	-	-

Notes:
Yellow highlight denotes exceedance to CCME guidelines or Baffinland's 2AM-MRY-1325 Water Licence
2005 and 2006 dissolved oxygen values in mg/L; 2015 and 2016 dissolved oxygen values in % saturation



Table 3.2 Water Quality Monitoring of Baseline Fisheries Culverts
 SURFACE WATER QUALITY SUMMARY FOR SAMPLE SITE N1-110 (BG24)

Site ID	Method Detection Limit ¹		LOR		CCME Guideline Limits ^{3 2010}	Dates											
	2005	2006	2015	2016		07-Jun-05	06-Aug-05	09-Sep-05	13-Jun-06	29-Jul-06	10-Sep-06	12-Aug-15	12-Aug-15	29-Jun-16	29-Jun-16	25-Aug-16	25-Aug-16
In Situ Parameters																	
Temperature (°C)	-	-	-	-	-	3.76	9.54	7.00	1.99	7.11	4.35	US	DS	DS	US	DS	US
Specific Conductance (mS/cm)	-	-	-	-	-	0.019	0.079	0.082	0.075	0.076	0.095	0.050	0.050	0.112	0.114	0.371	0.367
Dissolved Oxygen	-	-	-	-	5.5-9.5	10.40	10.91	11.71	12.8	13.55	-	104.30	103.00	104.9	105.80	99.30	103.20
pH	-	-	-	-	6.5 - 9.0	8.07	7.58	7.02	7.55	7.51	7.88	8.58	8.51	7.75	7.84	7.91	7.97
Wetted Width (m)	-	-	-	-	-	-	-	-	6	17	5	1.5	1.5	4.8	4.8	-	-
Average Depth (m)	-	-	-	-	-	-	-	-	0.4	0.9	0.3	0.25	0.25	0.2	0.2	-	-
Flow Rate (m ³ /s)	-	-	-	-	-	-	-	-	1.1	3.64	0.39	-	-	-	-	-	-
Physical Parameters																	
pH	-	-	0.01	0.01	6.5 - 9.0	-	-	-	7.40	6.95	6.95	8.34	8.29	7.84	7.91	8.15	8.30
Conductivity (uS/cm)	1	5	-	-	-	26	88	82	84	78	119	-	-	-	-	-	-
Turbidity (NTU)	0.1	0.1	0.10	0.10	-	0.42	3.64	1.93	0.5	2.3	4.9	0.16	0.27	0.41	0.39	0.34	0.22
Hardness (mg/L CaCO ₃)	0.5	1	10	10	-	7.14	43.6	43.4	47	41	52	133	136	52	52	168	169
TSS	-	-	2.0	-	-	-	-	-	-	-	-	<2	<2	<2.0	<2.0	<2.0	<2.0
TDS	30	5	-	20	-	<30	51	<30	55	51	77	146 *	139 *	45	45	183	183
Dissolved Anions																	
Alkalinity (mg/L CaCO ₃)	2	5	10	10	-	5	43	41	41	40	53	135	141	51	53	152	149
Br ⁻	0.3	0.05	-	-	-	<0.3	<0.3	<0.3	<0.05	<0.05	<0.05	-	-	-	-	-	-
Cl ⁻	0.2	1	0.50	0.50	-	1.3	0.6	0.7	1	<1	4	5.2	5.3	0.8	0.8	16.5	18.0
Fluoride	-	-	-	-	-	-	-	-	-	-	-	-	-	0.024	0.029	0.052	0.059
SO ₄ ⁻	0.5	1	0.30	0.30	-	1.2	<0.5	0.5	2	2	4	5.5	5.4	0.8	0.6	12.2	13.7
Nutrients																	
NH ₃ +NH ₄ (mg/L N)	0.1	0.02	0.15	0.15	0.021 - 231(4)	0.7	0.4	0.6	<0.02	<0.02	<0.02	0.24	0.29	<0.15	<0.15	<0.15	<0.15
NO ₂ ⁻ (mg/L N)	0.06	0.005	-	-	0.06	<0.06	<0.06	<0.06	<0.005	0.017	0.009	-	-	-	-	-	-
NO ₃ ⁻ (mg/L N)	0.05	0.1	0.02	0.02	2.9	0.12	<0.05	<0.05	<0.10	<0.10	<0.10	0.03	0.03	<0.020	<0.020	0.07	0.08
NO ₂ +NO ₃ (mg/L N)	0.06	0.1	-	-	-	0.12	<0.06	<0.06	<0.10	<0.10	<0.10	-	-	-	-	-	-
Ammonia, total as N	-	-	0.02	-	-	-	-	-	-	-	-	-	-	0.07	0.07	<0.020	<0.020
Total Phosphorus	0.02	0.01	0.003	0.003	-	0.02	<0.02	<0.10	<0.01	<0.01	0.01	<0.0030	<0.0030	<0.0030	0.0052	0.0041	0.0037
Dissolved Phosphorus	0.02	-	-	-	-	<0.02	<0.02	<0.10	-	-	-	-	-	-	-	-	-
Organic Compounds																	
Phenols	0.001	0.001	-	0.00	0.004	0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-	-	-
DOC	-	-	0.5	0.50	-	-	-	-	-	-	-	2.3	2.3	<1.0	<1.0	2.0	2.0
TOC	-	-	0.5	0.50	-	-	-	-	-	-	-	2.3	2.4	<1.0	<1.0	2.2	2.1
TKN	-	-	0.1	0.10	-	-	-	-	-	-	-	0.24	0.29	<0.15	<0.15	<0.15	<0.15
Chlorophyll-a	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pheophytin-a	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Metals and Non-Metals																	
Aluminum	0.004	0.005	0.010	0.010	0.005 - 0.100(5)	0.017	0.075	0.073	0.010	0.072	0.153	<0.010	0.018	0.022	0.015	0.011	<0.010
Antimony	0.0004	-	-	0.00010	-	<0.0004	<0.0004	<0.0004	-	-	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic	0.005	0.001	0.0010	0.00010	0.0050	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.00010	<0.00010	<0.00010	<0.00010	0.00010	0.00010
Barium	0.001	0.01	-	0.00020	-	<0.001	0.004	0.004	<0.01	<0.01	<0.01	-	-	0.00197	0.00176	0.00778	0.00702
Beryllium	0.005	-	-	0.00010	-	<0.005	<0.005	<0.005	-	-	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth	0.0003	-	-	0.000050	-	<0.0003	<0.0003	<0.0003	-	-	-	-	-	<0.000050	<0.000050	<0.000050	<0.000050
Boron	0.05	0.01	-	0.010	-	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	<0.010	<0.010	0.01	0.01
Cadmium	0.0001	0.0001	-	0.000010	0.000017	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium	0.05	1	0.5	0.5	-	1.43	9.01	8.72	8	8	12	29.9	32.2	10.9	10.8	35.3	35.8
Cesium	-	-	-	0.000010	-	-	-	-	-	-	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010
Chromium	0.001	0.001	-	0.00050	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	0.002	<0.00050	<0.00050	<0.00050
Cobalt	0.0003	0.0002	-	0.00010	-	<0.0003	<0.0003	<0.0003	<0.0002	<0.0002	<0.0002	-	-	<0.00010	<0.00010	<0.00010	<0.00010
Copper	0.0008	0.001	0.0010	0.0010	0.002 - 0.004(6)	<0.0008	0.0009	<0.0008	<0.001	<0.001	<0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Iron	0.02	0.03	0.050	0.050	0.3	<0.02	0.05	0.06	0.03	0.05	0.08	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Lead	0.0002	0.001	0.00010	0.00010	0.001 - 0.007(7)	<0.0002	0.0004	<0.0002	<0.001	<0.001	<0.001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Lithium	-	-	-	0.0010	-	-	-	-	-	-	-	<0.0010	0.001	0.004	0.004	0.004	0.004
Magnesium	0.005	1	0.001	0.05	-	0.868	5.12	5.24	5	5	7	16.4	17.4	5.9	6.0	19.3	19.3
Manganese	0.0007	0.01	0.00001	0.00050	-	0.0097	0.0024	0.0014	<0.01	<0.01	<0.01	0.00054	0.00335	0.00126	<0.00050	0.00526	0.00080
Mercury	0.0001	0.0001	0.0005	0.000010	0.000026	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum	0.0003	0.005	0.001	0.000050	0.073	<0.0003	<0.0003	<0.0003	<0.005	<0.005	<0.005	<0.00050	<0.00050	<0.000050	<0.000050	0.000109	0.000112
Nickel	0.001	0.005	1	0.00050	0.025 - 0.150(8)	<0.001	<0.001	<0.001	<0.005	<0.005	<0.005	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050



Table 3.2 Water Quality Monitoring of Baseline Fisheries Culverts
SURFACE WATER QUALITY SUMMARY FOR SAMPLE SITE N1-110 (BG24)

Site ID	Method Detection Limit ¹		LOR		CCME Guideline Limits ^{3 2010}	Dates											
	2005	2006	2015	2016		07-Jun-05	06-Aug-05	09-Sep-05	13-Jun-06	29-Jul-06	10-Sep-06	12-Aug-15	12-Aug-15	29-Jun-16	29-Jun-16	25-Aug-16	25-Aug-16
Phosphorus				0.050										<0.050	<0.050	<0.050	<0.050
Potassium	0.02	0.01	0.0004	0.05	-	0.77	0.48	0.51	0.50	0.51	0.50	0.57	0.65	0.30	0.27	0.82	0.73
Rubidium				0.00020										0.00033	0.00024	0.00094	0.00046
Selenium	0.005	0.001	-	0.000050	0.001	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Silicon				0.050										0.393	0.381	0.743	0.730
Silver	0.0001	0.0001	0.5	0.000050	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	-	<0.000050	<0.000050	<0.000050	<0.000050
Sodium	0.05	0.05	-	0.50	-	0.43	0.51	0.48	0.57	0.48	1.61	5.22	5.33	0.77	0.75	8.94	9.62
Strontium	0.001	0.001	0.0003	0.0010	-	0.0011	0.0049	0.0048	0.005	0.005	0.008	-	-	0.0056	0.0056	0.0250	0.0262
Sulphur				0.50										<0.50	<0.50	4.800	5.240
Tellurium				0.00020										<0.00020	<0.00020	<0.00020	<0.00020
Thallium	0.0002	-	-	0.000010	0.0008	<0.0002	<0.0002	<0.0002	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium				0.0001										<0.00010	<0.00010	<0.00010	<0.00010
Tin	0.001	0.01	-	0.00010	-	<0.001	<0.001	<0.001	<0.01	<0.01	<0.01	-	-	<0.00010	<0.00010	<0.00010	<0.00010
Titanium	0.003	-	-	0.00030	-	<0.003	<0.003	<0.003	-	-	-	-	-	0.00087	0.00052	0.00055	<0.00030
Tungsten				0.00010										<0.00010	<0.00010	<0.00010	<0.00010
Uranium	-	-	0.0010	0.000010		-	-	-	-	-	-	0.000941	0.000943	0.000116	0.000109	0.001200	0.001310
Vanadium	0.0009	0.001	-	0.00050	-	<0.0009	<0.0009	<0.0009	<0.001	<0.001	<0.001	-	-	<0.00050	<0.00050	<0.00050	<0.00050
Zinc	0.001	0.01	0.0030	0.0030	0.03	0.0040	0.0010	0.0020	<0.01	<0.01	<0.01	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Zirconium				0.00030										<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals and Non-Metals																	
Aluminum	0.004	0.005	0.0050			0.010	0.009	0.007	<0.005	<0.005	<0.005	<0.0050	<0.0050	-	-	-	-
Antimony	0.0004	-	-			<0.0004	<0.0004	<0.0004	-	-	-	-	-	-	-	-	-
Arsenic	0.005	0.001	0.0001			<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.00010	<0.00010	-	-	-	-
Barium	0.001	0.01	-			<0.001	0.003	0.004	<0.01	<0.01	<0.01	-	-	-	-	-	-
Beryllium	0.005	-	-			<0.005	<0.005	<0.005	-	-	-	-	-	-	-	-	-
Bismuth	0.0003	-	-			<0.0003	<0.0003	<0.0003	-	-	-	-	-	-	-	-	-
Boron	0.05	0.01	-			<0.05	0.02	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-
Cadmium	0.0001	0.0001	0.00001			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.000010	<0.000010	-	-	-	-
Calcium	0.05	1	0.05			1.54	9.19	8.14	9	8	11	28.0	28.9	-	-	-	-
Chromium	0.001	0.001	-			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-	-
Cobalt	0.0003	0.0002	-			<0.0003	<0.0003	<0.0003	<0.0002	<0.0002	<0.0002	-	-	-	-	-	-
Copper	0.0008	0.001	0.00020			<0.0008	<0.0008	<0.0008	<0.001	<0.001	<0.001	0.00066	0.00063	-	-	-	-
Iron	0.02	0.03	0.010			<0.02	0.02	<0.02	<0.03	<0.03	<0.03	<0.010	<0.010	-	-	-	-
Lead	0.0002	0.001	0.00005			<0.0002	<0.0002	<0.0002	<0.001	<0.001	<0.001	<0.000050	<0.000050	-	-	-	-
Magnesium	0.005	1	0.0005			0.933	5.30	4.87	6	5	6	15.4	15.6	-	-	-	-
Manganese	0.0007	0.01	-			0.0092	0.0007	<0.0007	<0.01	<0.01	<0.01	<0.00050	0.00275	-	-	-	-
Mercury	-	-	0.000010			-	-	-	-	-	-	<0.000010	<0.000010	-	-	-	-
Molybdenum	0.0003	0.005	0.000050			<0.0003	<0.0003	<0.0003	<0.005	<0.005	<0.005	0.00009	0.00010	-	-	-	-
Nickel	0.001	0.005	0.00050			<0.001	<0.001	<0.001	<0.005	<0.005	<0.005	<0.00050	<0.00050	-	-	-	-
Potassium	0.02	0.01	0.050			0.83	0.51	0.49	0.52	0.50	0.50	0.58	0.64	-	-	-	-
Selenium	0.005	0.001	0.000050			<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.000050	<0.000050	-	-	-	-
Silver	0.0001	0.0001	-			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	-	-	-	-	-
Sodium	0.05	0.05	-			0.47	0.53	0.47	0.58	0.50	1.64	5.04	4.95	-	-	-	-
Strontium	0.001	0.001	-			0.0011	0.0045	0.0044	0.005	0.005	0.008	-	-	-	-	-	-
Thallium	0.0002	-	0.00010			<0.0002	<0.0002	<0.0002	-	-	-	<0.000010	<0.000010	-	-	-	-
Tin	0.001	0.01	-			<0.001	<0.001	<0.001	<0.01	<0.01	<0.01	-	-	-	-	-	-
Titanium	0.003	-	-			<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-
Uranium	0.00001	-	0.000010			-	-	-	-	-	-	0.000883	0.000880	-	-	-	-
Vanadium	0.0009	0.001	-			<0.0009	0.0013	<0.0009	<0.001	<0.001	<0.001	-	-	-	-	-	-
Zinc	0.001	0.01	0.001			0.003	0.003	0.002	<0.01	<0.01	<0.01	<0.0010	0.0019	-	-	-	-

Notes:
Yellow highlight denotes exceedance to CCME guidelines or Baffinland's 2AM-MRY-1325 Water Licence
2005 and 2006 dissolved oxygen values in mg/L; 2015 and 2016 dissolved oxygen values in % saturation

Table 3.3. Summary of fish habitat status at existing fish-bearing streams along the Tote Road in 2016.

Water Crossing No.	Fish Habitat Quality Rating ¹	New or Replaced Culverts ²	Fish Observed during 2016 Survey	Potential Fish Passage/Habitat Issues	Detailed Observations	Recommendations and Follow-Up / Corrective Actions
CV176	MAR	Y	N	N	Water levels during survey were very low, providing no habitat near the crossing.	Note that there is no natural fish habitat upstream of these crossings, regardless of water level, so passage is unnecessary, but must make sure there are no downstream effects. To be monitored in 2017.
CV169	MAR	Y	N	N	Water levels during survey were very low, providing no habitat near the crossing.	None
CV167	MAR	N	N	N	Water levels during survey were very low, providing no habitat near the crossing.	Remove culvert on old road or ensure steaming for passage. To be completed during 2017.
CV129	IMP	Y	Y	Y	Fish observed upstream and downstream. Culvert badly damaged with pieces in the water upstream. Road dust coating much of the substrate in the vicinity of the crossing as with all crossings.	Clean up culvert debris and monitor passage in case damaged culvert becomes a larger issue. These recommendations implemented later in July and August 2016.
CV128	IMP	Bridge Only	Y	N	Fish observed upstream and downstream. No issues with passage or habitat, though old sea containers still need to be removed.	Remove old sea containers. Scheduled to be removed by end of March 2017.
CV114	MAR	N	Y	Y	Culverts damaged with debris instream; may eventually affect passage. Left culvert (looking US) has become slightly perched; right culvert OK.	Remove culvert debris and closely monitor passage in both culverts. Debris was removed during July and August 2016. Culvert to be targeted as part of the 2017 TREEP.
CV112	IMP	N	Y	Y	Fish observed upstream and downstream. Right-hand culvert (looking US) has been obliterated and may currently be obstructing some movement.	This culvert will need to be repaired or replaced if it is to continue allowing unobstructed passage. This culvert is to be targeted as part of the 2017 TREEP.

Table 3.3. Summary of fish habitat status at existing fish-bearing streams along the Tote Road in 2016.

Water Crossing No.	Fish Habitat Quality Rating ¹	New or Replaced Culverts ²	Fish Observed during 2016 Survey	Potential Fish Passage/Habitat Issues	Detailed Observations	Recommendations and Follow-Up / Corrective Actions
CV111	IMP	N	Y	N	Fish observed upstream and downstream. No passage issues.	None
CV106	MAR	N	Y	Y	Fish observed downstream. Culvert has become perched and may be affecting fish passage.	The perch is likely to worsen; will need to reinstall or build up downstream habitat. This culvert is to be targeted as part of the 2017 TREEP.
CV104	MAR	Y	Y	Y	Fish observed upstream and downstream. Though fish passage was observed, the upstream end of the culvert is damaged and a little steep, which may limit passage success.	Repair culvert to prevent culvert becoming problem for fish passage. This culvert was replaced during the Fall 2016.
CV102	IMP	N	N	N	Current water levels too low for fish. No stranding issues this year.	None
CV099	IMP	Y	Y	Y	Fish observed upstream and downstream. Right culvert is starting to become perched.	Closely monitor culvert for any worsening of the perch. May need to properly reinstall or mitigate with a fish ladder if perch increases. This culvert is to be targeted as part of the 2017 TREEP.
CV087	MAR	N	N	N	Stream dry or nearly dry at time of visit. No fish observed. Culverts should not affect passage during high water periods, when fish have access to the crossing.	None
CV080	IMP	N	Y	N	Fish observed upstream and downstream. No issues with passage or habitat.	None
CV079	IMP	N	Y	N	Fish observed upstream and downstream. No issues with stranding.	None
CV078	IMP	N	Y	N	Fish observed upstream and downstream. No issues with passage or habitat.	None

Table 3.3. Summary of fish habitat status at existing fish-bearing streams along the Tote Road in 2016.

Water Crossing No.	Fish Habitat Quality Rating ¹	New or Replaced Culverts ²	Fish Observed during 2016 Survey	Potential Fish Passage/Habitat Issues	Detailed Observations	Recommendations and Follow-Up / Corrective Actions
CV076	MAR	N	Y	N	Fish observed upstream and downstream. No issues with passage.	None
CV072	IMP	N	Y	N	Fish observed upstream and downstream. No issues with passage or habitat.	None
CV071	MAR	N	Y	N	Fish observed upstream and downstream. No issues with passage or habitat.	None
CV060	IMP	N	Y	N	Fish observed upstream and downstream. Culvert a little perched.	None
CV059	MAR	N	Y	N	Fish observed upstream and downstream. No issues with passage or habitat.	None
CV058	MAR	N	Y	Y	Fish observed upstream and downstream. Culverts are getting crushed, which could affect future passage.	Repair or replace culverts. This culvert to be targeted as part of the 2017 TREEP.
CV057	MAR	N	Y	N	Fish observed upstream and downstream. No issues with passage or habitat.	None
BG50	IMP	Y	Y	Y	Fish observed upstream and downstream. Culverts in right-hand channel are completely impassable due to very high perch. Old sea container crossing is becoming increasingly perched, limiting passage to larger juveniles in the left-hand channel.	Old sea containers were removed in late November 2016. Habitat improvement will be confirmed in 2017. Culverts in the right-hand channel will need to be re-installed and properly embedded. This culvert is being targeted as part of the 2017 TREEP.
CV049	IMP	N	Y	Y	Fish observed upstream and downstream. No issues with passage or habitat.	None

Table 3.3. Summary of fish habitat status at existing fish-bearing streams along the Tote Road in 2016.

Water Crossing No.	Fish Habitat Quality Rating ¹	New or Replaced Culverts ²	Fish Observed during 2016 Survey	Potential Fish Passage/Habitat Issues	Detailed Observations	Recommendations and Follow-Up / Corrective Actions
CV030	MAR	N	Y	N	Fish observed upstream and downstream. No issues with passage or habitat.	None
BG32	IMP	N	Y	N	Fish observed upstream and downstream. No issues with passage or habitat.	None
CV217	IMP	Y	Y	N	Fish observed upstream and downstream. No issues with passage or habitat, though old sea containers should be removed at the earliest convenience.	Remove old sea containers
CV216	MAR	N	Y	Y	Fish observed downstream only. Culvert becoming perched and YOY that use this stream will not have access US habitat if they don't already.	May need to properly reinstall or mitigate with a fish ladder if perch increases. This crossing is being targeted as part of the 2017 TREEP.
BG30	IMP	N	Y	N	Fish observed upstream and downstream. Passage is confirmed, but the fish ladder will need to be monitored annually for any changes.	Fish ladder functioning, but will need regular monitoring and possible modifications if culvert perches more.
BG29	IMP	N	Y	Y	Fish observed upstream and downstream. No issues with passage, but a large mound of apparent road sediment is present in the stream	This sediment will likely be washed DS during next high flow event; but it needs to be prevented in the future. The immediate sedimentation issue was addressed during July 2016. The culvert will be targeted for long term mitigation as part of the 2017 TREEP.
BG27	MAR	N	Y	Y	Fish observed downstream only. A rocky barrier was placed downstream of the culvert preventing all fish access.	Remove the rocky barrier. This culvert will be targeted as part of the 2017 TREEP.
BG24	IMP	N	Y	N	Fish observed upstream and downstream. No issues with passage or habitat.	None

Table 3.3. Summary of fish habitat status at existing fish-bearing streams along the Tote Road in 2016.

Water Crossing No.	Fish Habitat Quality Rating ¹	New or Replaced Culverts ²	Fish Observed during 2016 Survey	Potential Fish Passage/Habitat Issues	Detailed Observations	Recommendations and Follow-Up / Corrective Actions
BG17	IMP	N	Y	Y	Fish observed upstream and downstream. No issues with passage, but a large, unnatural mound of reddish, metallic clay observed US.	May need to remove the foreign clay. The immediate sedimentation issue was addressed during July 2016. The culvert and upstream sources of this material will be targeted for long term mitigation as part of the 2017 TREEP.
BG04	IMP	N	Y	N	Fish observed upstream and downstream. No issues with passage or habitat.	None
CV001	IMP	Y	Y	N	Fish observed downstream only due to very low water levels near the crossing. No issues with passage or habitat at normal water levels.	None
CV223	IMP	N	Y	Y	Fish observed upstream and downstream. No issues with passage, but culverts are getting damaged and some debris is accumulating instream.	Remove debris and repair or replace culverts. The immediate sedimentation issue was addressed during July 2016. This culvert will be targeted as part of the 2017 TREEP.
CV224	IMP	N	Y	Y	Fish observed upstream and downstream. No issues with passage, but road debris (plastic reflective posts) in the water.	Road debris was in the water around the culvert. The immediate debris issue was addressed during July 2016. This culvert will be targeted as part of the 2017 TREEP
CV225	IMP	Y	Y	Y	Fish observed upstream and downstream. New culvert installation is currently okay, but there is potential for perching. Right culvert blocked by sediment or ice at the time of survey.	Culvert blockage may need to be removed. This condition is to be monitored during 2017.
BG01	IMP	N	Y	Y	Fish observed upstream and downstream. Culvert remains perched, making passage during periods of high velocity or low water difficult, particularly for smaller juveniles. Rocky ramp remains intact, but any change will likely prevent all passage.	This crossing needs one or two properly embedded, larger culverts to replace the existing ones. Continue to closely monitor for change. This culvert will be targeted as part of the 2017 TREEP

Table 3.3. Summary of fish habitat status at existing fish-bearing streams along the Tote Road in 2016.

Water Crossing No.	Fish Habitat Quality Rating ¹	New or Replaced Culverts ²	Fish Observed during 2016 Survey	Potential Fish Passage/Habitat Issues	Detailed Observations	Recommendations and Follow-Up / Corrective Actions
CV186	IMP	N	Y	Y	Fish observed downstream only. Though there are no issues with passage through the culvert, there is a layer of road sediment covering the substrate within at least 50 m of the crossing upstream and downstream - this smothering of the substrate may be affecting fish use of this stream during the late summer feeding period. There has been improvement in this issue since 2015, but more needs to be done.	Diligent dust control in the vicinity of this crossing and higher, rip-rapped road embankments may alleviate much of the deposition. Spring freshet may also transport loose materials downstream into Sheardown Lake. The immediate sedimentation issue was addressed during July and August 2016. This culvert will be targeted as part of the 2017 TREEP
CV187	MAR	N	N	Y	Though there are no issues with passage through the culvert, there are similar road sediment issues as for CV187. In addition, there is a flow meter station immediately upstream of the culvert that is completely blocking any further movements of fish.	Similar recommendations to CV-186; and remove or modify the flow meter station to allow passage. The immediate sedimentation and fish passage issues were addressed during July and August 2016. This culvert will be targeted as part of the 2017 TREEP

1 - Habitat status assessed for current crossings prior to pending upgrades; NFB = not fish-bearing, MARG = marginal, IMP = important

2 - Fish habitat status assessed for new (2015 and 2016) crossings following road upgrades; NC = no change



Table 4.1. Installation summary of HADD and habitat compensation sites along the Tote Road.

Crossing ID	Road Chainage (km + m)	Crossing Size Classification	Authorization (HADD or Compensation) ¹	Initial Work Completion Date ²	Additional Work Completion Date ³	Years Monitored	Additional Monitoring Required
CV-183	0+145	Extra-large	Compensation	Oct-08	N/A	2009-2010	None
CV-181	0+583	Medium	Compensation	24-Jul-09	N/A	2008-2010	None
CV-129	15+650	Large	HADD	17-Sep-07	July 2011 Winter 2014/15	2008-2012, 2015, 2016	Culvert damaged in 2016, monitor for continued passage success
CV-128	17+486	Extra-large	HADD	23-Sep-07	Winter 2013/14 March 2017	2009-2010, 2014-2016	Routine Only
CV-114	29+647	Medium	HADD	29-Sep-07	July 2011	2009-2012, 2015, 2016	Culverts damaged in 2016, monitor for continued passage success
CV-111	31+990	Medium	HADD	28-Sep-07	N/A	2009-2010, 2015, 2016	Routine Only
CV-104	33+794	Medium	HADD	01-Oct-07	November 2016	2009-2010, 2015, 2016	Culvert replaced in 2016, monitor passage success of new culverts
CV-099	37+840	Large	HADD	04-Oct-07	Winter 2014/15	2008-2010, 2015, 2016	Routine Only
CV-079	50+600	Large	HADD	08-Jul-08	N/A	2008-2010, 2015, 2016	Routine Only
CV-078	51+171	Large	HADD	09-Jul-08	N/A	2008-2012, 2015, 2016	Routine Only
CV-072	53+878	Large	HADD	05-Mar-08	N/A	2009-2010, 2015, 2016	Routine Only
CV-060	58+856	Medium	HADD	27-Feb-08	N/A	2009-2010, 2015, 2016	Routine Only
BG-50	62+804	Extra-large	HADD	30-Oct-07	Winter 2013/14 Winter 2014/15 November 2016	2008-2010, 2014-2016	Significant monitoring post-removal of old sea containers and reinstallation of currently perched culverts
CV-049	63+302	Large	HADD	10-Mar-08	N/A	2009-2010, 2015, 2016	Routine Only

Table 4.1. Installation summary of HADD and habitat compensation sites along the Tote Road.

Crossing ID	Road Chainage (km + m)	Crossing Size Classification	Authorization (HADD or Compensation) ¹	Initial Work Completion Date ²	Additional Work Completion Date ³	Years Monitored	Additional Monitoring Required
BG-32	78+161	Large	HADD	04-Apr-08	August 2012	2009-2010, 2015, 2016	Routine Only
CV-217	79+915	Extra-large	HADD	17-Apr-08	Winter 2013/14 Winter 2014/15 March 2017	2009-2010, 2014-2016	Detailed monitoring following removal of sea containers in Dec 2016
CV-216	80+646	Large	HADD	08-Jun-08	N/A	2009-2010, 2015, 2016	Monitor increased perching
BG-30	84 + 636	Small	Compensation	2012	August 2012	2010-2013, 2015, 2016	Routine monitoring and maintenance of constructed fishway
BG-24	87+710	Medium	HADD	15-May-08	N/A	2008-2010, 2015, 2016	Routine Only
BG-17	90+167	Large	HADD	09-May-08	N/A	2009-2010, 2015, 2016	Routine and possibly remove erosional material in stream bed
BG-16	90+218	Extra-small	Compensation	Oct-08	N/A	2009	Routine Only
BG-04	94+148	Medium	HADD	05-May-08	August 2012	2009-2010, 2015, 2016	Routine Only
CV-001	94+728	Small	Compensation	08-May-08	Winter 2014/15	2009-2010, 2015, 2016	Routine Only
CV-223	97+155	Extra-large	HADD	03-May-08	Winter 2013/14	2008-2010, 2014-2016	Culverts damaged in 2016, monitor for continued passage success
CV-224	97+758	Medium	HADD	04-May-08	N/A	2008-2010, 2015, 2016	Routine Only
CV-225	98+989	Large	HADD	21-Sep-07	August 2010 Winter 2014/15	2008-2011, 2015, 2016	Routine and watch for sediment obstructions in the culverts
BG-01	99+672	Medium	HADD	20-Sep-07	August 2010	2008-2011, 2015, 2016	Monitor closely for increasing obstruction of passage
CV-187	103+078	Small	Compensation	14-Jun-08	N/A	2008-2010, 2015, 2016	Monitor for the effects of road dust on stream habitat

1 - Includes only current HADD and compensation sites and not those eliminated from calculations following 2010 surveys

2 - Includes work outlined during the initial planning and construction phase

3 - Includes repair work, installation of fish access improvement structures, and ERP upgrades

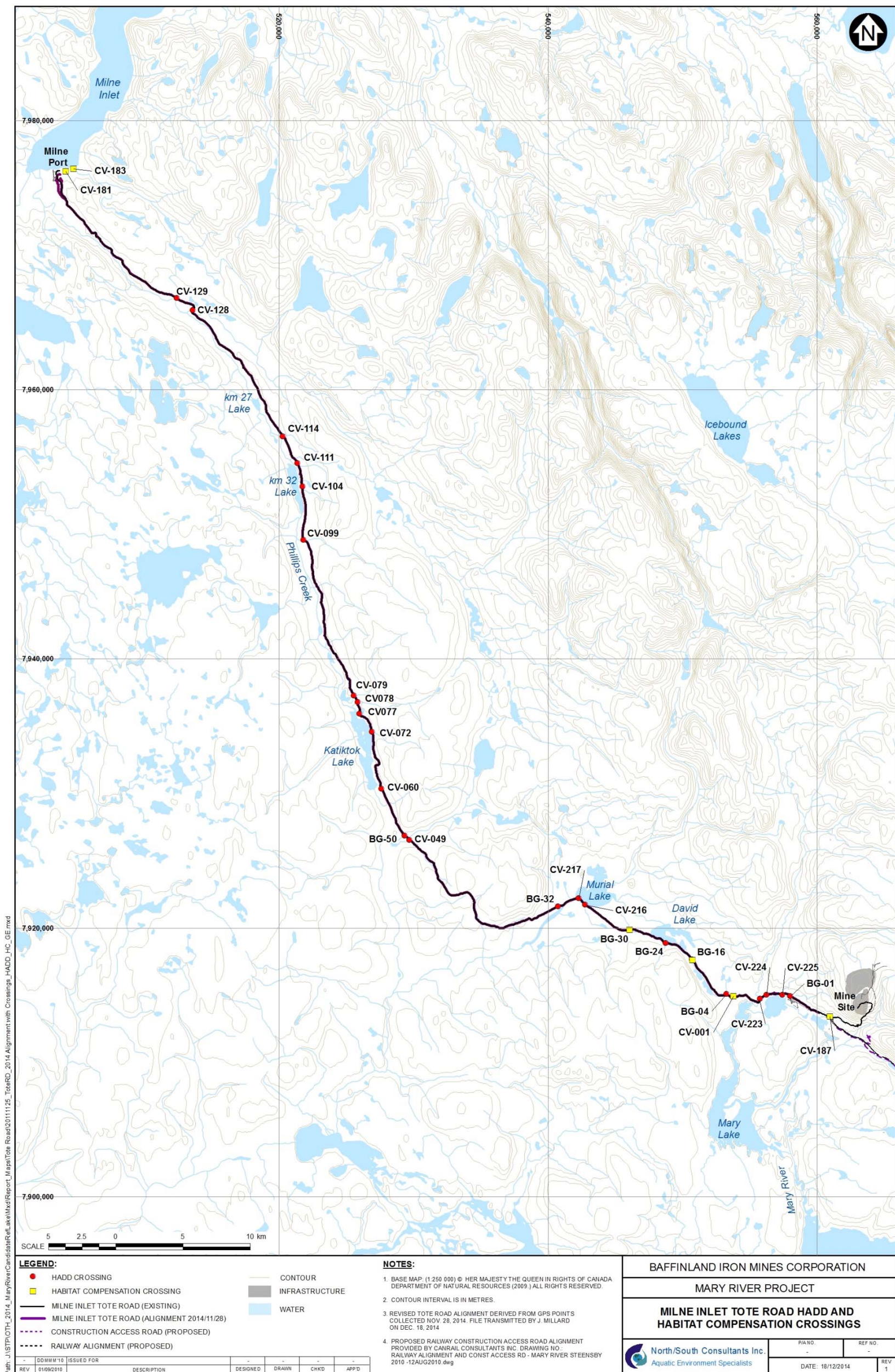


Figure 1.1. Map of the HADD and compensation crossings along the Tote Road.



Appendix A: Applicable DFO Letters of Advice



301-5204 50th Avenue
Yellowknife, NT
X1A 1E2

September 20, 2013

our file *Votre référence*

Our file *Notre référence*
07-HCAA-CA7-00050

Oliver Curran
Baffinland Iron Mines Corporation
2275 Upper Middle Road East, Suite 300
Oakville, ON
L6H 0C3

Dear Mr. Curran:

Subject: Proposal not likely to result in impacts to fish and fish habitat.

Fisheries and Oceans Canada – Fisheries Protection Program (DFO) received your proposal on August 29, 2013. Please refer to the file number and title below:

DFO File No.: **07-HCAA-CA7-00050**
Title: **Mary River Iron Ore Project, Baffin Island (Baffinland), Nunavut**

You may be aware of changes to the *Fisheries Act*, however these have not affected the review of your project at this time. For more information on current changes to the *Fisheries Act* please refer to the DFO website at www.dfo-mpo.gc.ca/media/infocus-alaune/2012/habitat-eng.htm.

Your proposal has been reviewed to determine whether it is likely to result in impacts to fish and fish habitat which are prohibited by the habitat protection provisions of the *Fisheries Act* or those prohibitions of the *Species at Risk Act* that apply to aquatic species.*

Our review consisted of:

Changes to Culverts along the Tote Road, Submission dated August 29, 2013 from Oliver Curran - Baffinland Iron Mines Corporation

Freshwater Aquatic Baseline Synthesis Report 2005-2011 (January 2012), Baffinland Iron Mines Corporation, Mary River Project, Prepared by North/South Consultants Inc.

*Those sections most relevant to the review of development proposals include 20, 22, 32 and 35 of the *Fisheries Act* and sections 32, 33 and 58 of the *Species at Risk Act*. For more information please visit www.dfo-mpo.gc.ca.

We understand that you propose to carry out the following culvert upgrades along the Tote Road:

Culvert ID	Proposed Culvert Diameter (m)	Proposed Culvert Length (m)	Area of Rip Rap (m ²)	Proposed Culvert Upgrade
BG31A	1.2	19.5	24.96	Extend 1m left & 2.5m right
BG30	1	22	17.33	Extend 7m right
BG29	1	31	0	Extend 7.5m left & 8.5m right
BG27B	0.5	31	4.33	Extend 5m left & 8m right
BG27C	0.5	31	0	Extend 5m left & 8m right
BG27A	0.5	31	0	Extend 4.5m left & 8.5m right
BG17A	1.2	36.5	24.96	Extend 8m left & 13.5m right
BG17B	1.2	37.5	24.96	Extend 15.5m left & 7m right
BG04A	1.2	24	0	Extend 5.5m left & 3.5m right
BG04B	1.2	24	0	Extend 5m left & 4m right
CV224A	1	26	0	Extend 6m left & 5m right
CV224B	1	26.5	0	Extend 6.5m left & 5m right
CV225B	1.2	18	0	Replace with new length of 18m
CV225A	1	18.5	17.33	Replace with new length of 18.5m
BG01C	1.2	37	24.96	Extend 11m left & 8m right
BG01A	1.2	36.5	24.96	Extend 11.5m left & 7m right
BG01B	1.2	37	24.96	Extend 12m left & 7m right
BG01D	0.5	10	0	New Culvert
BG01F	0.5	18	0	New Culvert
BG01E	1.0	10	0	New Culvert
BG01G	0.5	23	0	New Culvert
CV186	1	27	0	Extend 6m left
CV187A	0.5	20.5	0	Extend 6m left & 4.5m right
CV187B	0.5	16	0	New Culvert
CV166A	1	23.5	17.33	Extend 8.5m right
CV166B	0.5	22.5	0	Extent 7.5m right
CV115A	0.5	17.5	0	Extend 2.5m left
CV115B	1	17	0	Extend 2m left

Provided that your plans are implemented as described DFO has concluded that your proposal is not likely to result in impacts to fish and fish habitat.

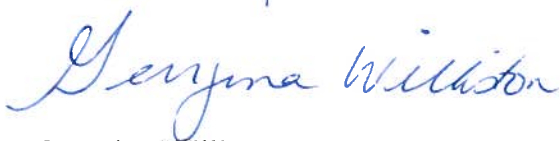
You will not need to obtain a formal approval from DFO in order to proceed with your proposal.

If the plans have changed or if the description of your proposal is incomplete you should contact this office to determine if the advice in this letter still applies.

Please be advised that any unauthorized impacts to fish and fish habitat which result from a failure to implement this proposal as described could lead to corrective action such as enforcement.

If you have any questions please contact the undersigned at (867) 669-4927 or by email at Georgina.Williston@dfo-mpo.gc.ca.

Yours sincerely,



Georgina Williston
Fisheries Protection Biologist

cc. Stuart Niven- Fisheries and Oceans Canada
Jim Millard- Baffinland Iron Mines Corporation
Bevin LeDrew- Sikumiut Environmental Management Ltd.



301-5204 50th Ave
Yellowknife, NT
X1A 1E2

Our file Notre référence
NU-07-0050

December 16, 2013

Baffinland Iron Mines Corp.
275 Upper Middle Road East Suite 300
Oakville, ON L6H 0C3

Dear Mr. Curran:

Subject: Implementation of mitigation measures to avoid and mitigate serious harm to fish.

The Fisheries Protection Program (the Program) of Fisheries and Oceans Canada received your proposal on August 28, 2013.

Your proposal has been reviewed to determine whether it is likely to result in serious harm to fish which is prohibited under subsection 35(1) of the *Fisheries Act*.

Our review consisted of:

Baffinland Submission: Tote Road Upgrade-Four Seacan Bridge Replacements, Tote Road Upgrade- Fish Bearing Culvert submission, Attachments 1 &2, August 2013.

We understand that you propose to: Upgrade the following crossings along the Tote Road.

The following seacan crossings will be removed and replaced with clear span bridges

- STA 17 (CV 128)
- STA 62 (BG50)
- STA 80 (CV 217)
- STA 97 (CV223)

The following culvert crossings will be upgraded as follows:

Culvert ID	Proposed Culvert Diameter (m)	Proposed Culvert Length (m)	Area of Rip Rap (m2)	Proposed works to be completed
CV217B	1.2	16	24.96	Extend 1m right
CV217C	1.2	16	24.96	Extend 1m right
CV217A	1.2	16	24.96	Extend 1m right
CV217D	0.15		0	Abandon
CV216B	1.2	17.5	0	Extend 1.5m left & 1m right
CV216C	1.2	16.5	0	Extend 1.5m left
CV216A	1.2	18.5	0	Extend 1.5m left & 2m right
CV216D	0.5	14.5	0	Replace with new length of 14.5m
CV216E	0.5	14	0	Abandon and replace with new length of 14m
CV216F	0.5	12	0	Replace with new length of 12m
CV223B	1.2	28	24.96	Extend 13m left
CV223C	1.2	28	24.96	Extend 13m left
CV223D	1.2	29	24.96	Extend 14m left
CV223A	2	24	69.33	Extend 14m left
CV223E	1.2	19.5	0	Extend 4.5m left
CV223F	1.2	19	0	Extend 4m left
CV115C	0.5	15.5	0	Extend 3.5m right
CV115D	0.5	17	4.33	Extend 8m left
CV114A	1	15.5	17.33	Extend 0.5m right
CV114B	0.5	14	0	Extend 5m left
CV114C	0.5	11	4.33	Replace with new length of 11m
CV114D	0.5	11.5	4.33	Extend 2m left & 0.5m right
CV112A	1.2	17.5	24.96	Extend 2.5m right
CV112B	0.5	24	0	Extend 9m right
CV112C	0.5	21	4.33	Extend 9m left
CV111	1	24	17.33	Extend 4.5m left & 1.5m right
CV106	1	19	17.33	Extend 4m left
CV104A	1.2	19	24.96	Extend 4m left
CV104B	1.2	19	24.96	Extend 4m left
CV102A	1	22.5	17.33	Extend 7.5m left
CV102B	0.5	21.5	0	Extend 6.5m left
CV102C	0.5	21.5	0	Extend 6.5m left
CV102D	0.5	20.5	0	Extend 5.5m left
CV099B	1.2	17	24.96	Replace with new length of 17m

Culvert ID	Proposed Culvert Diameter (m)	Proposed Culvert Length (m)	Area of rip rap (m ²)	Proposed works to be completed
CV099A	1.2		0	Remove culvert
CV099C	2	18.5	69.33	Replace with new length of 18.5m
CV099D	0.5		0	Remove culvert
CV099E	0.5		0	Remove culvert
CV099F	0.5	14	0	Extend 2m right
CV087B	1.2	19	24.96	Extend 6.5m left & 0.5m right
CV087A	1.2	18.5	24.96	Extend 6m left & 0.5m right
CV087C	0.5	18	0	Extend 6m right
CV079B	1.2	16.5	0	Extend 1.5m left
CV079A	1.2	16.5	0	Extend 1.5m left
CV079C	0.15		0	Remove culvert
CV079D	0.15		0	Remove culvert
CV078A	1.2	16.5	0	Extend 1.5m left
CV078B	1	19.5	0	Extend 1.5m left
CV078C	1	19.5	0	Extend 1.5m left
CV078D	2	22	0	Extend 2m right
CV076	1	11.5	0	Replace with new length of 11.5m
CV072B	1.2	17.5	0	Replace with new length of 17.5m
CV072C	1.2	17.5	0	Replace with new length of 17.5m
CV072A	1.2	17.5	0	Replace with new length of 17.5m
CV060A	1	16.5	0	Extend 1.5m left
CV060B	1	16.5	0	Extend 1.5m left
CV059B	0.5	16.5	0	Extend 3.5m left & 1m right
CV059A	0.5	16	0	Extend 3m left & 1m right
CV059C	0.5	16.5	0	Extend 4m left & 0.5m right
CV059D	0.5	16.5	0	Extend 4m left & 0.5m right
CV057B	0.5	16.5	0	Extend 1.5m left
CV057C	0.5	16.5	0	Extend 1.5m left
CV057A	0.5	16.5	0	Extend 1.5m left
BG50A	1.2	33.5	24.96	Extend 15.5m left
BG50B	1.2	32	24.96	Extend 14m left
CV049A	1.2	24.5	24.96	Extend 5.5m left & 4m right
CV049B	1.2	24.5	24.96	Extend 4.5m left & 5m right
CV030A	1	16	0	Extend 1m left
CV030B	0.5	16	0	Extend 1m left

To avoid the potential of serious harm to fish and their habitat, we are recommending that the following mitigation measures be included into your plans.

- If in-stream work is required during the open water season it should be completed in the dry by de-watering the work area and diverting and/or pumping flows around cofferdams placed at the limits of the work area.
- Existing stream flows should be maintained downstream of the de-watered work area without interruption, during all stages of the work.
- A fish stranding program should be implemented if necessary by a qualified fisheries person, who is experienced in this area, immediately following isolation and prior to de-watering to ensure that fish are removed from any dewatered area and released alive immediately downstream of the work area.
- Flow dissipaters and/or filter bags, or equivalent, should be placed at water discharge points to prevent erosion and sediment release.
- Silt or debris that has accumulated around the temporary cofferdams should be removed prior to their withdrawal.

Provided that these mitigation measures are incorporated into your plans, the Program is of the view that your proposal will not result in serious harm to fish. No formal approval is required from the Program under the *Fisheries Act* in order to proceed with your proposal.

If your plans have changed or if the description of your proposal is incomplete, or changes in the future, you should consult our website (<http://www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html>) or consult with a qualified environmental consultant to determine if further review is required by the Program.

Please notify this office at least 10 days before starting your project. A copy of this letter should be kept on site while the work is in progress.

If you have any questions, please contact Georgina Williston at our Yellowknife office at 867-669-4927, by fax at 867-669-4940 or by email at geogina.williston@dfo-mpo.gc.ca. Please refer to the file number referenced above when corresponding with the Program.

Yours sincerely,



Stu Niven
Senior Fisheries Protection Biologist
Fisheries and Oceans Canada

Georgina Williston- Fisheries and Oceans Canada
Bevin LeDrew- Sikumiut Environmental Management Ltd.
Tessa Mackay- Hatch



Suite 301 – 5204 59th Ave.
Yellowknife NT, X1A 1E2

Our file Notre référence
NU-07-0050

February 20, 2015

James Millard
Environmental Manager
Baffinland Iron Mines Corp.
275 Upper Middle Road East Suite 300
Oakville, ON L6H 0C3

Dear Mr. Millard:

Subject: Implementation of mitigation measures to avoid and mitigate serious harm to fish – Mary River Project, Tote Road Realignment.

The Fisheries Protection Program of Fisheries and Oceans Canada received your proposal on February 15, 2015.

Your proposal has been reviewed to determine whether it is likely to result in serious harm to fish which is prohibited under subsection 35(1) of the *Fisheries Act*.

Your proposal has also been reviewed to determine whether it will adversely impact listed aquatic species at risk and contravene sections 32, 33 or 58 of the *Species at Risk Act (SARA)*.

Our review considered the following:

- Letter from Baffinland Iron Mines Re: Mary River Project – Request for Advice on Realignment of Tote Road at Culvert CV076, Km 53 Tote Road, DFO File dated February 15, 2015 and submitted by James Millard with 1 attachment.
- Attachment 1 - Mark-up of proposed field change, Drawing H349000-3000-10-012-0073

We understand that you propose to:

- Realign the existing Tote Road at Culvert CV076, 160 meters upstream from the existing crossing and install one culvert which is 1.2m in diameter and 18 m in length.
- Install culverts during the winter months when the stream is frozen to bottom.
- Remove existing culvert from the old Tote Road alignment.

Since there are no *SARA* species or their habitats identified in the project area, no additional approvals under *SARA* will be required for your proposed activities. To avoid the potential for serious harm to fish that is prohibited under the *Fisheries Act*, the mitigation measures set out in your project plans are to be followed.

Provided that you implement the required mitigation measures for your project, and follow the guidance available on the DFO website at <http://www.dfo-mpo.gc.ca/pnw-ppe/measures-mesures/index-eng.html>, the Program is of the view that your proposal should not result in serious harm to fish or contravene sections 32, 33 or 58 of the *Species at Risk Act*. No formal approval is required from the Program under the *Fisheries Act* or the *Species at Risk Act* in order to proceed with your proposal.

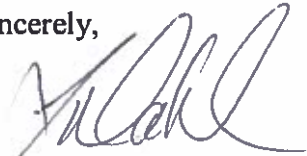
It remains your responsibility to ensure you avoid causing serious harm to fish in compliance with the *Fisheries Act*, and that you meet the requirements under the *Species at Risk Act* as it may apply to your project. If your plans have changed or if the description of your proposal is incomplete, or changes in the future, you should consult our website (<http://www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html>) or consult with a qualified environmental consultant to determine if further review is required by the Program.

Please be advised that it is also your *Duty to Notify* DFO if you have caused, or are about to cause, serious harm to fish that are part of or support a commercial, recreational or Aboriginal fishery. Such notifications should be directed to <http://www.dfo-mpo.gc.ca/pnw-ppe/violation-infraction/index-eng.html>.

A copy of this letter should be kept on site while the work is in progress. It remains your responsibility to meet all other federal or territorial requirements that apply to your project.

If you have any questions, please contact Georgina Williston at our Yellowknife office at (867) 669-4927, by fax at (867) 669-4940, or by email at georgina.williston@dfo-mpo.gc.ca. Please refer to the file number referenced above when corresponding with the Program.

Yours sincerely,



Julie Dahl
Regional Manager, Regulatory Reviews
Fisheries Protection Program

cc.
Georgina Williston- Fisheries and Oceans Canada
Oliver Curran-Baffinland Iron Mines Corp.
Erik Madsen-Baffinland Iron Mines Corp.



Fisheries and Oceans
Canada

Pêches et Océans
Canada

5204-50th Avenue
Yellowknife, NT
X1A 1E2

December 9, 2014

Your file *Votre référence*

Our file *Notre référence*
NU-07-0050

Baffinland Iron Mines Corp.
Attention: Jim Millard, Environmental Manager
2275 Upper Middle Road, Suite 300
Oakville, ON
L6H 0C3

Dear Mr. Millard:

Subject: Implementation of mitigation measures to avoid and mitigate impacts to fish and fish habitat and listed aquatic species at risk – Mary River Project

The Fisheries Protection Program (the Program) of Fisheries and Oceans Canada received your proposal on November 27, 2014.

Your proposal has been reviewed to determine whether it is likely to result in serious harm to fish which is prohibited under subsection 35(1) of the *Fisheries Act*.

Your proposal has also been reviewed to determine whether it will adversely impact listed aquatic species at risk and contravene sections 32, 33 or 58 of the *Species at Risk Act (SARA)*.

Our review considered the following:

- Letter from Baffinland Iron Mines RE: Realignment of Tote Road at Culvert CV099. Dated November 27, 2014 and submitted by James Millard, with 1 attachment.
- Attachment 1- Mark up of proposed field change, Drawing H349000-3000-10-012-0052

We understand that you propose to:

- Realign the existing Tote Road and install one 2 metre diameter culvert in the stream bed and two 1.2 metre overflow culverts. Culverts will be approximately 27 metres in length.

- Install culverts during the winter months when the stream is frozen to bottom.
- Remove existing culverts along the old Tote Road alignment.

Since there are no *SARA* species or their habitats identified in the project area, no additional approvals under *SARA* will be required for your proposed activities.

To avoid the potential for serious harm to fish that is prohibited under the *Fisheries Act*, the mitigation measures set out in your project plans are to be followed.

Provided that you implement the required mitigation measures for your project, and follow the guidance available on the DFO website at <http://www.dfo-mpo.gc.ca/pnw-ppe/measures/index-eng.html>, the Program is of the view that your proposal should not result in serious harm to fish or contravene sections 32, 33 or 58 of the *Species at Risk Act*. No formal approval is required from the Program under the *Fisheries Act* or the *Species at Risk Act* in order to proceed with your proposal.

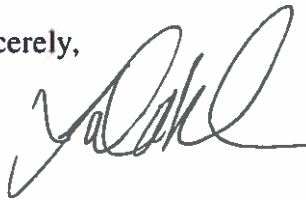
It remains your responsibility to ensure you avoid causing serious harm to fish in compliance with the *Fisheries Act*, and that you meet the requirements under the *Species at Risk Act* as it may apply to your project. If your plans have changed or if the description of your proposal is incomplete, or changes in the future, you should consult our website (<http://www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html>) or consult with a qualified environmental consultant to determine if further review is required by the Program.

Please be advised that it is also your *Duty to Notify* DFO if you have caused, or are about to cause, serious harm to fish that are part of or support a commercial, recreational or Aboriginal fishery. Such notifications should be directed to <http://www.dfo-mpo.gc.ca/pnw-ppe/violation-infraction/index-eng.html>.

A copy of this letter should be kept on site while the work is in progress. It remains your responsibility to meet all other federal or territorial requirements that apply to your project.

If you have any questions, please contact Georgina Williston at our Yellowknife office at 867-669-4927 or by email at Georgina.Williston@dfo-mpo.gc.ca. Please refer to the file number referenced above when corresponding with the Program.

Yours sincerely,



Julie Dahl
Regional Manager, Regulatory Reviews
Fisheries Protection Program

cc. Oliver Curran- Baffinland Iron Mines
Erik Madsen – Baffinland Iron Mines



5204-50th Avenue
Yellowknife, NT
X1A 1E2

October 27, 2014

Your file Votre référence

Our file Notre référence
NU-07-0050

Baffinland Iron Mines Corp.
Attention : Jim Millard, Environmental Manager
2275 Upper Middle Road, Suite 300
Oakville, ON
L6H 0C3

Dear Mr. Millard:

Subject: Implementation of mitigation measures to avoid and mitigate impacts to fish and fish habitat and listed aquatic species at risk – Mary River Project

The Fisheries Protection Program (the Program) of Fisheries and Oceans Canada received your proposal on October 17, 2014.

Your proposal has been reviewed to determine whether it is likely to result in serious harm to fish which is prohibited under subsection 35(1) of the *Fisheries Act*.

Your proposal has also been reviewed to determine whether it will adversely impact listed aquatic species at risk and contravene sections 32, 33 or 58 of the *Species at Risk Act (SARA)*.

Our review considered the following:

- Letter from Baffinland Iron Mines RE: Realignment of Tote Road at Culvert CV225B. Dated October 16, 2014 and submitted by James Millard, with 2 attachments.
- Attachment 1- Mark of proposed field change, Drawing H349000-3000-10-012-0139
- Attachment 2- Project Wide, Civil Standard Drawing, Typical Culvert Detail, H349000-1000-10-041-0003

We understand that you propose to:

- Realign the existing Tote Road and install two new 1.2 metre culverts in the stream bed and one 1.0 metre culvert 45 m away as an overflow. Culverts will be approximately 27metres in length.

- Install culverts during the winter months when the stream is frozen to bottom.
- Remove the two existing 1.2m culverts along the old Tote Road alignment.

Since there are no *SARA* species or their habitats identified in the project area, no additional approvals under *SARA* will be required for your proposed activities.

To avoid the potential for serious harm to fish that is prohibited under the *Fisheries Act*, the mitigation measures set out in your project plans are to be followed.

Provided that you implement the required mitigation measures for your project, and follow the guidance available on the DFO website at <http://www.dfo-mpo.gc.ca/pnw-ppe/measures/index-eng.html>, the Program is of the view that your proposal should not result in serious harm to fish or contravene sections 32, 33 or 58 of the *Species at Risk Act*. No formal approval is required from the Program under the *Fisheries Act* or the *Species at Risk Act* in order to proceed with your proposal.

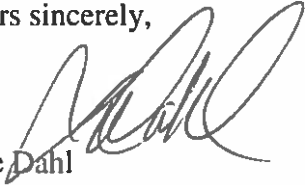
It remains your responsibility to ensure you avoid causing serious harm to fish in compliance with the *Fisheries Act*, and that you meet the requirements under the *Species at Risk Act* as it may apply to your project. If your plans have changed or if the description of your proposal is incomplete, or changes in the future, you should consult our website (<http://www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html>) or consult with a qualified environmental consultant to determine if further review is required by the Program.

Please be advised that it is also your *Duty to Notify* DFO if you have caused, or are about to cause, serious harm to fish that are part of or support a commercial, recreational or Aboriginal fishery. Such notifications should be directed to <http://www.dfo-mpo.gc.ca/pnw-ppe/violation-infraction/index-eng.html>.

A copy of this letter should be kept on site while the work is in progress. It remains your responsibility to meet all other federal or territorial requirements that apply to your project.

If you have any questions, please contact Georgina Williston at our Yellowknife office at 867-669-4927 or by email at Georgina.Williston@dfo-mpo.gc.ca. Please refer to the file number referenced above when corresponding with the Program.

Yours sincerely,



Julie Dahl
Regional Manager, Regulatory Reviews
Fisheries Protection Program

cc. Oliver Curran- Baffinland Iron Mines
Erik Madsen – Baffinland Iron Mines
Stu Niven – Fisheries and Oceans Canada