Baffinland Iron Mines Corporation
Mary River Project – Phase 2 Proposal

North Railway Freshwater Habitat Survey: 2018 · Prepared for Baffinland Iron Mines Corporation

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BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT - PHASE 2 PROPOSAL

NORTH RAILWAY FRESHWATER HABITAT SURVEY: 2018

Prepared for:

Baffinland Iron Mines Corporation

Prepared by:

North/South Consultants Inc.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

ABBREVIATIONS AND ACRONYMS

ARCH	Arctic Char
BCMOE	British Columbia Ministry of Environment
C	Confined
CPUE	Catch-per-unit-effort
DFO	Fisheries and Oceans Canada
ERP	Early Revenue Phase
FEIS	Final Environmental Impact Statement
GPS	Global positioning system
IMP	Important
L	Lake
LP	Low point
MAR	Marginal
Mtpa	Million tonnes per annum
N	No
N/A	Not applicable
NFB	Not Fish-Bearing
NIRB	Nunavut Impact Review Board
NNST	Ninespine Stickleback
NSC	North/South Consultants Inc.
OW	Overwintering
P	Pond
PC	Partially confined
REAR	Rearing
S	Stream
SPAW	Spawning
UC	Unconfined
UTM	Universal Transverse Mercator
Y	Yes

1.0 INTRODUCTION

The Mary River Project is an operating iron ore mine located in the Qikiqtani Region of Nunavut (Figure 1). Baffinland Iron Mines Corporation (Baffinland; the Proponent) is the owner and operator of the Project. As part of the regulatory approval process, Baffinland submitted a Final Environmental Impact Statement (FEIS) to the Nunavut Impact Review Board (NIRB), which presented in-depth analyses and evaluation of potential environmental and socioeconomic effects associated with the Project.

In 2012, NIRB issued Project Certificate No 005 which provided approval for Baffinland to mine 18 million tonnes per annum (Mtpa) of iron ore, construct a railway to transport the ore south to a port at Steensby Inlet which operates year-round, and to ship the ore to market. The Project Certificate was subsequently amended to include the mining of an additional 4.2 Mtpa of ore, trucking this amount of ore by an existing road (the Tote Road) north to an existing port at Milne Inlet, and shipping the ore to market during the open water season. The total approved iron ore production was increased to 22.2 Mtpa (4.2 Mtpa transported by road to Milne Port, and 18 Mtpa transported by rail to Steensby Port). This is now considered the Approved Project. The 18 Mtpa Steensby rail project has not yet been constructed, however 4.2 Mtpa of iron ore is being transported north by road to Milne Port currently. Baffinland recently submitted a request for a second amendment to Project Certificate No.005 (the Early Revenue Phase [ERP] operation) to allow for a short-term increase in production and transport of ore via road through Milne Port from the current 4.2 Mtpa to 6.0 Mtpa.

Baffinland submitted an Addendum to the FEIS (the Phase 2 Proposal; the third project certificate amendment request) to NIRB in August, 2018. The Phase 2 Proposal will consist of a near-term expansion of the current 4.2 Mtpa ERP operation to 12 Mtpa, followed by the subsequent additional development of the originally approved 18 Mtpa South Rail operation. The near-term proposed expansion would include construction and operation of a North Railway (North Rail) adjacent to the Milne Inlet Tote Road.

As described in the Phase 2 Proposal, the North Railway will be a heavy-haul mineral transport railway built to transport 12 Mtpa of iron ore from the Mine Site to Milne Port. The Phase 2 Proposal Technical Supporting Document No. 14 (North/South Consultant Inc. [NSC] 2018) presented estimates of the amount of fish habitat that would be lost or altered by placement of North Rail infrastructure (i.e., crossings, bridges, and encroachments/infilling) and construction of stream diversions, and provided an initial screening assessment of potential effects on fish passage at the culvert crossings to assist with final detailed engineering design of the rail. The assessment of the potential effects of the Project on Arctic Char was completed through a combination of empirical data collected through field surveys and a desktop assessment using detailed site imagery. As the latter approach is associated with greater uncertainty than the former, where sites could not be classified as either char-bearing or not char-bearing with high confidence, the potentially affected habitat was assumed to support Arctic Char to provide a conservative (i.e., maximum potential impact) assessment.

This report presents the methods and results of an aquatic habitat field program conducted along the proposed North Rail alignment presented in the Phase 2 Proposal in the open-water season of 2018. The field surveys were intended to provide empirical assessments of the presence/absence of fish, to identify fish barriers, and to document aquatic habitat in the vicinity of the proposed rail alignment footprint in freshwater systems. As part of the Phase 2 Proposal, the Milne Inlet Tote Road would undergo some changes to accommodate construction of the North Rail and a temporary haul road would be constructed at a temporary ore transfer area. One crossing would also be required for a laydown area. This report

also presents the methods and results of aquatic habitat field surveys conducted in the open-water season of 2018 at proposed new (nine sites) or relocated (five sites) Milne Inlet Tote Road stream crossings, two crossings at the temporary haul road, and one crossing at a laydown area.

It should be noted that since completion of the Phase 2 Proposal and the 2018 fish habitat field surveys, the North Rail and Tote Road realignment have undergone final detailed engineering design. This has resulted in a number of changes to the potential interactions with fresh water identified in the Phase 2 Proposal. The final detailed design of the Project components pertaining to the North Rail and the Tote Road modifications was completed in April 2019 and updated lists of rail, Tote Road, and other infrastructure interactions with freshwater habitat are provided in a Technical Memorandum (NSC 2019). An updated description of potential effects of the North Rail and Tote Road realignment on char habitat will be presented in a subsequent document.

The information presented in this report describes the methods and results of the field program undertaken in 2018, with the intent of assessing fish and fish habitat at all locations where there were potential interactions with North Rail and Tote Road infrastructure described in the Phase 2 Proposal. Although, as noted above, there have been changes in the specific design of Project-related infrastructure at many of the crossings and some new locations have been added, the fish and fish habitat information acquired during the 2018 field survey still provides a useful description of fish habitat at or near the majority of sites identified in the final design.

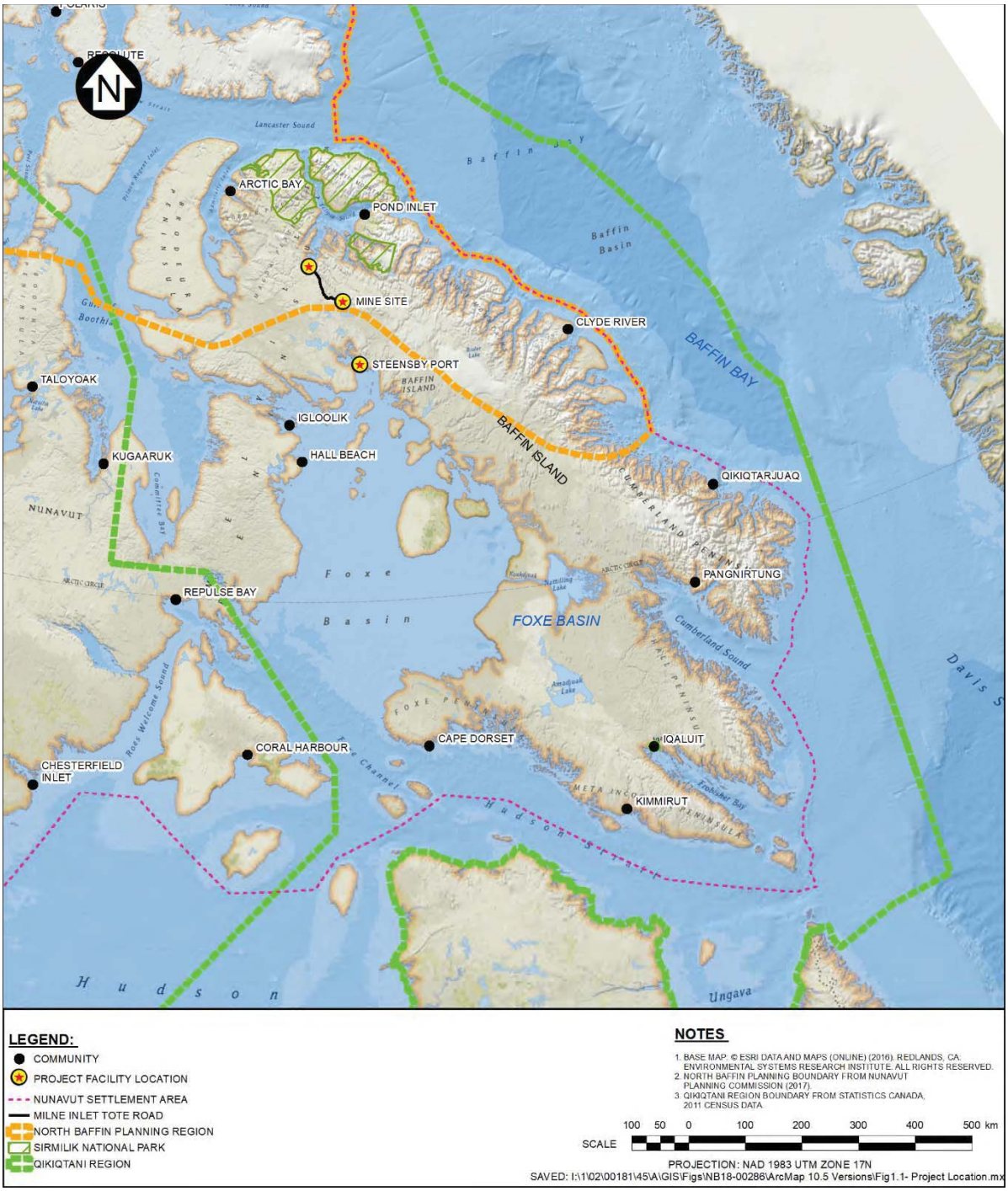


Figure 1. Project location map.

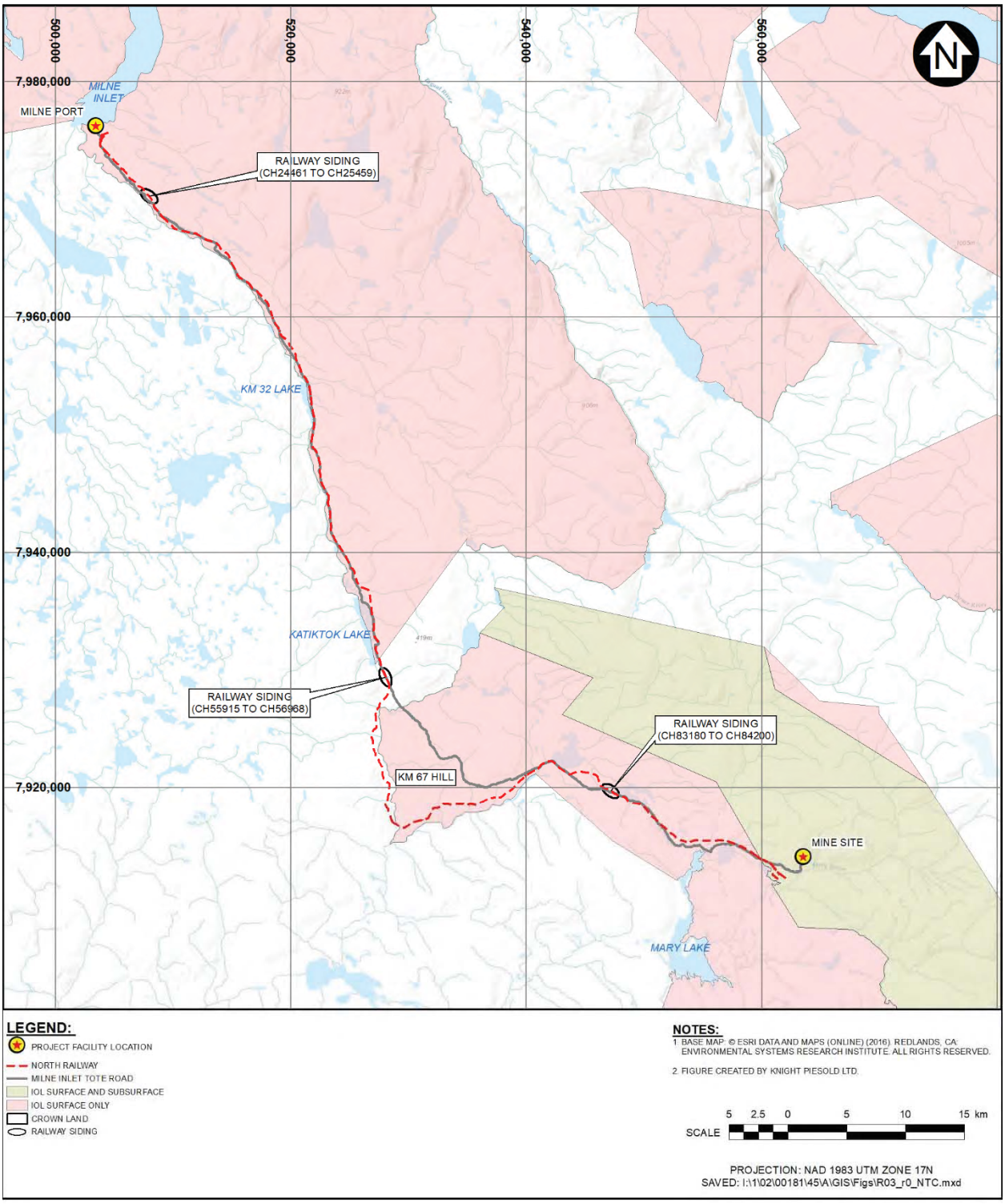


Figure 2. Location of Project activities.

2.0 METHODS

The following provides a description of field and data analysis methods for the early summer (June 28-July 11) and late summer/fall (August 23-September 3) North Rail and Tote Road realignment field programs conducted in 2018. Surveys, which consisted of determining presence/absence of the two fish species present in the study area (Arctic Char [*Salvelinus alpinus*] and Ninespine Stickleback [*Pungitius pungitius*]), and conducting habitat assessments, were undertaken at stream crossing, lake/pond encroachments/infill, bridge crossing, and diversion sites (see Appendix 1 for a list of all sites and Appendix 2 for maps of all sites). Sites were designated as fish-bearing where fish were observed or captured in 2018.

A qualitative habitat rating was assigned to each watercourse or lake (encroachments/diversions) as follows:

- Not Fish Bearing: no fish present, based on surveys completed in 2018;
- Marginal Habitat: provides limited quantity or quality of habitat; or
- Important Habitat: easily accessible to fish and provides abundant, suitable habitat for one or more life stages.

Habitat quality was described for the footprints (i.e., crossing, cut, bridge, and encroachment locations). Habitat data over larger areas was collected for cuts, where habitat quality was also characterized for the length of the streams that could potentially be affected and for lakes, where habitat quality was characterized for the lake as a whole.

2.1 FIELD METHODS

2.1.1 Stream Crossings

2.1.1.1 North Rail Crossings

Rail stream crossings identified in the Phase 2 Proposal were assessed for fish presence and habitat use using protocols specific to the Mary River Project developed in 2007 by NSC and Knight Piésold Ltd. to ensure that crossings are assessed in a standardized manner (Baffinland 2012a). The protocol was based upon those described in Fisheries and Oceans Canada (DFO) and British Columbia Ministry of the Environment's ([BCMOE] 1989) and NSC (2006). Some site-specific changes to the field methods for the Milne Inlet rail surveys were also made to better capture conditions in this study area, as noted below.

The following information was collected during an early summer survey (late June/early July) and repeated in fall (late August/early September) at all stream crossing sites:

1) If sites were deemed to be not aquatic habitat, disconnected from overwintering habitat, and/or otherwise did not provide fish habitat due to the presence of permanent barriers, representative photographs (aerial or ground-based) and a brief description of physical conditions were recorded;

2) At all sites with the potential to provide fish habitat (i.e., presence of water at sufficient depths for use by the smallest size classes, no readily apparent barriers to movement to the site from probable overwintering locations), fish presence/absence was first determined with backpack electrofishing surveys conducted from 50 m downstream to 50 m upstream of the crossing centre line. If fish were not captured or observed during this initial survey, the electrofished area was expanded to include a

greater area with an emphasis on habitat types known to be preferred by either species, as based on field programs completed over the period of 2006-2018 (Baffinland 2009, 2010, 2011, 2012a,b, 2013, 2014, 2015, 2016, 2017; Johnson and Bernhardt 2007; Knight Piésold 2007a,b, 2008; NSC 2008). All captured fish were placed in a pail filled with source water and, at the completion of the transect survey, identified to species and measured for fork length (± 1 mm) before being released back into their source waterbodies;

3) If fish were still not captured or observed during the expanded survey, but habitat appeared otherwise suitable, the stream section between the crossing and the nearest potential overwintering site (defined as lakes with maximum depth > 3.0 m) was surveyed for any potential natural barriers (e.g., high vertical drops, interrupted surface flow) to fish movement;

4) Following confirmation of fish presence (or determination of potential fish usage under other flow conditions), measurements of physical habitat characteristics were collected at 20 m intervals over a distance of 100 m upstream and downstream of the crossing, including: wetted and bankfull widths; maximum water depth; and a profile of water depth and velocity across the stream (at 25, 50 and 75% of the width) using a digital flow metre. Channel confinement, gradient, and morphology, as well as substrate composition were also evaluated at each fish-bearing water-crossing. Photographs were taken of representative habitat at each surveyed profile transect. At sites where existing habitat was determined to be highly uniform or where habitat quality was marginal and deemed to have probable intermittent use only, profiles were limited to every 50 m; and

5) Any identified barriers to fish movement, specifically for juvenile Arctic Char, were described and mapped. Fish movement information and barrier characteristics derived from past mine area and Milne Inlet Tote Road surveys were used to assist with barrier identification along the Rail alignment. For example, a gradient greater than 15°, falls, and channel blockages such as boulders were considered impassable barriers.

2.1.1.2 Milne Inlet Tote Road and Temporary Haul Road Crossings

New and relocated stream crossings along the Tote Road and the temporary haul road associated with the Phase 2 Proposal were also surveyed in 2018. All sites assessed along the Tote Road realignment and the temporary haul road were on the same streams as, and in close proximity to, rail crossing sites (i.e., within the 200 m reach assessed for habitat at fish-bearing rail crossings) and sites were assessed concurrently with the rail crossings. Therefore, the field surveys were conducted using the same protocols, though abbreviated, as described in Section 2.1.1.1.

In brief, the following information was collected during an early summer survey (late June/early July) and repeated in fall (late August/early September) at all sites:

1) If sites were deemed to be not aquatic habitat, disconnected from overwintering habitat, and/or otherwise did not provide fish habitat due to the presence of vertical barriers, representative photographs and a brief description of physical conditions were recorded;

2) At all remaining sites known, or with the potential, to provide fish habitat (i.e., presence of water at sufficient depths for use by the smallest size classes, no readily apparent barriers to movement to the site from probable overwintering locations), fish presence/absence was determined during the rail crossing surveys. See section 2.1.1.1 for a detailed description of fishing methods and data collected at these locations.

3) Physical habitat characteristics in fish-bearing streams were collected during rail crossing surveys and, if the crossing was more than 100 m upstream or downstream of the rail, these data were supplemented with habitat information from additional cross-sections of the stream at 50-m intervals as necessary. See Section 2.1.1.1 for detailed methods of habitat data collection; and

4) Any identified barriers to fish movement, specifically for juvenile Arctic Char, were described and mapped during rail crossing surveys and applied to Tote Road sites.

2.1.2 North Rail Bridges

Field methods for assessing bridge crossings identified in the Phase 2 Proposal were similar to those applied for smaller streams, but survey transect length was smaller (i.e., area surveyed extended from 60 m downstream to 60 m upstream of the crossing site). Electrofishing was not undertaken due to the size of the watercourses at the bridge crossing locations. Previous field studies have established the presence of fish in each river and that all are important, fish-bearing waterbodies (Table 1; Baffinland 2009, 2010, 2011, 2012a,b, 2015a, 2016a, 2017a; NSC 2008)

Table 1. Confirmed fish presence in rivers with proposed rail bridge crossings since 2006.

Site	Species Present	Years Captured/Observed
CV-15-5	Arctic Char	2006, 2008, 2009, 2010, 2016, 2017
CV-70-3	Arctic Char	2006, 2008, 2009, 2010, 2015, 2016, 2018
	Ninespine Stickleback	2008, 2016
CV-85-3 & CV-85-4	Arctic Char	2006, 2008, 2009, 2010, 2014, 2015, 2016
	Ninespine Stickleback	2010
CV-102-1	Arctic Char	2006, 2009, 2014, 2015, 2016, 2017, 2018

2.1.3 North Rail Lake/Pond Encroachments/Infilling

Lakes/ponds that were identified in the Phase 2 Proposal as being affected by encroachments or infilling along the rail alignment were assessed for fish presence/absence and habitat. Fish presence was first identified using backpack electrofishing along an approximately 100 m-long section of shoreline centred at the encroachment site, targeting all nearshore habitat types. Potential habitat use (foraging, overwintering, and spawning) was assessed for the rail footprint areas and for the lake as a whole. Habitat was characterized in detail (water depth, substrate) in the area of the encroachments/infilling. Overall habitat in the lake was also characterized to identify habitat uses supported for each species and to facilitate determination of relative abundance of habitat types and whether critical or limiting habitat may be affected by the encroachment/infill.

At small, shallow lakes with 100% visibility to maximum depth and that were not navigable with a boat, habitat assessments were conducted through collection of visual information on substrate, manual sampling of substrate, and point measurements of water depth. These shallow waterbodies were surveyed by wading and/or from aerial assessment.

The early summer surveys identified two fish-bearing lakes/ponds that were identified in the Phase 2 Proposal as being encroached upon by the North Rail with the potential to have sufficient depths for overwintering for one or both fish species (CV-18-1 and CV-106-3; Appendix 2, Maps 3 and 13).

A boat-based bathymetric and habitat mapping survey was conducted at these two lakes using a Lowrance Elite 7 echosounder with an integrated global positioning system (GPS) receiver and Totalscan® transducer supporting 83/200 kHz broadband sonar frequencies and 455/800 kHz StructureScan® frequencies. Depth and geographic coordinate data were collected along transects covering the study areas and logged to a flash memory card. The entire circumference of each lake was first surveyed at a depth of 1-2 m where nearshore substrate validation could be confirmed visually. Photographs of both the substrate and shoreline were collected with a digital, GPS-linked camera.

Surveys were conducted at boat speeds of approximately 5-10 km/hr. The sonar transponder was mounted at a depth of 0.2 m to the transom of a Zodiac powered by a 10 hp outboard motor. Surveys consisted of tracking and recording acoustic data and positions at 1-second intervals along transects spaced approximately 50 m apart. One or two long transects were surveyed across the maximum length of the lake. The survey followed the methodology developed in the BCMOE bathymetric standards for lake inventories (BCMOE 2009). The bathymetric mapping in this study did not follow a specific hydrographic standard and therefore it is advised that the map products should not be relied upon for navigation.

Substrate was validated at regular intervals over a variety of depths and distances from shore either through *in situ* visualization (shallow areas) or by collecting a sediment grab using a Ponar sampler followed by visual assessment of the contents (consistency, relative composition).

2.1.4 North Rail Stream Diversions

Fish presence/absence in areas that were identified in the Phase 2 Proposal as being affected by stream diversions was assessed using the same methods applied for stream crossing site assessments (see Section 2.1.1). Similarly, habitat quantity and quality were assessed using the same methods as described in Section 2.1.1, but covering the entire stream down to its confluence with another river/pond/lake. Surveys were completed both in streams that were to be diverted and in streams that were to receive diverted flows.

In addition, an aquatic habitat survey was conducted in an unnamed lake, downstream of the diversion at CV-90-4, which could potentially experience a reduction in inflow (Appendix 2, Map 11). The habitat survey was completed using a Lowrance sidescan echosounder as described in Section 2.1.3.

2.2 DATA ANALYSIS METHODS

2.2.1 General

For all sites, all collected habitat and fishing survey results were compiled into assessment sheets with representative habitat photographs. Sites were classified as not fish-bearing if no fish were captured during the 2018 survey or if the initial assessment indicated that it was not fish habitat (as discussed in Section 2.1.1.1). Fish catch-per-unit effort (CPUE) was calculated as the number of char/stickleback per minute of electrofishing. Using these data and habitat information, habitat quality of fish-bearing sites was identified as either Marginal or Important, as follows:

- Marginal Habitat: provides limited quantity or quality of habitat; or
- Important Habitat: easily accessible to fish and provides abundant, suitable habitat for one or more life stages.

2.2.2 Hydrology

Preliminary results of the 2018 stream flow monitoring program operated by Baffinland were provided by A. Rees (pers. comm. 2018) for three sites representative of different catchment sizes located within the study area (Table 2 and Figure 3). Flows at these locations were plotted to provide a general context regarding the flow conditions in the study area in 2018, as well as during the conduct of the field programs. Results for 2018 were compared to data for other years (2006-2017) directly and to mean, median, maximum, and minimum flows recorded for that period.

Table 2. Stream hydrometric sites surveyed in 2018.

Station ID	Station Name	Period of Record	Drainage Area (km^2)	Coordinates (UTM)	
				Easting	Northing
H01	Phillips Creek Tributary	2006-2008, 2011-2018	250	532831	7946247
H05	Camp Lake Tributary (CLT-1)	2006-2008, 2010-2018	5.3	558906	7915079
H06	Mary River	2006-2008, 2010-2018	240	563922	7912984

2.2.3 Bathymetry and Substrate in Lakes/Ponds

Lake habitat survey data were processed using Reefmaster 2.0 and exported from a Lowrance log file format (.sl2) to a Microsoft Excel format. Depths were corrected according to the transducer mounting depth (~ 0.15 m) for each survey. The corrected depth files were then imported into ArcGIS and projected to a Universal Transverse Mercator (UTM) Zone 17 (NAD83) projection and saved to a GIS ready ESRI® shapefile format. In addition to depth, Reefmaster also provides three acoustically derived variables that can be used to classify and map substrate, these include: Peak SV, E1, and E2. Peak SV measures the strength of the sonar return as it is reflected off the bottom, and is correlated to the hardness of the bottom. E1 is derived from the sonar returns that immediately follow the peak return of the first echo return. This value is commonly referred to as roughness or rugosity and is a measure of the roughness of the bottom. E2 is derived from the full second echo return of the bottom and is commonly referred to as hardness. The second echo return is generated when the sonar echos once again off the bottom, after having returned once to the surface and bounced off the underside of the boat. This second echo return is particularly useful for determining the relative hardness of the bottom. Mapping these variables allows the user to delineate boundaries of basic substrate classes for a given study area.

Bathymetric surfaces were interpolated from the corrected transducer depths and vector shorelines of the lakes (provided by Eagle Mapping 2008) using the Topo to Raster interpolation tool in ESRI® ArcGIS 10.6 software. A 0.5 metre bathymetric grid was produced for each lake. Areas, volumes, and depth statistics were calculated in ArcGIS for each of the three lakes.

Side scan images of the lake bottoms of the waterbodies collected during the field surveys using the Lowrance Elite 7 with the 455 kHz StructureScan® frequency were imported into Reefmaster 2.0. Reefmaster 2.0 uses the positional and bearing information from the GPS data to georeference the side scan images of the waterbody and displays them in a seamless mosaic. The side scan image mosaic was exported to a .mbtile format and imported into QGIS, from here it was saved as a GeoTIFF and brought into ArcGIS where major substrate change boundaries were delineated and digitized from the imagery, the mapped Peak SV, E1, and E2, variables and validation data (ponar grabs) obtained during field studies were used to verify the visually delineated substrate classes. Substrates in the field were previously classed according to size by the Wentworth scale (Wentworth 1922). Final symbolization of substrate classes and cartographic output were generated in ArcGIS® 10.6.

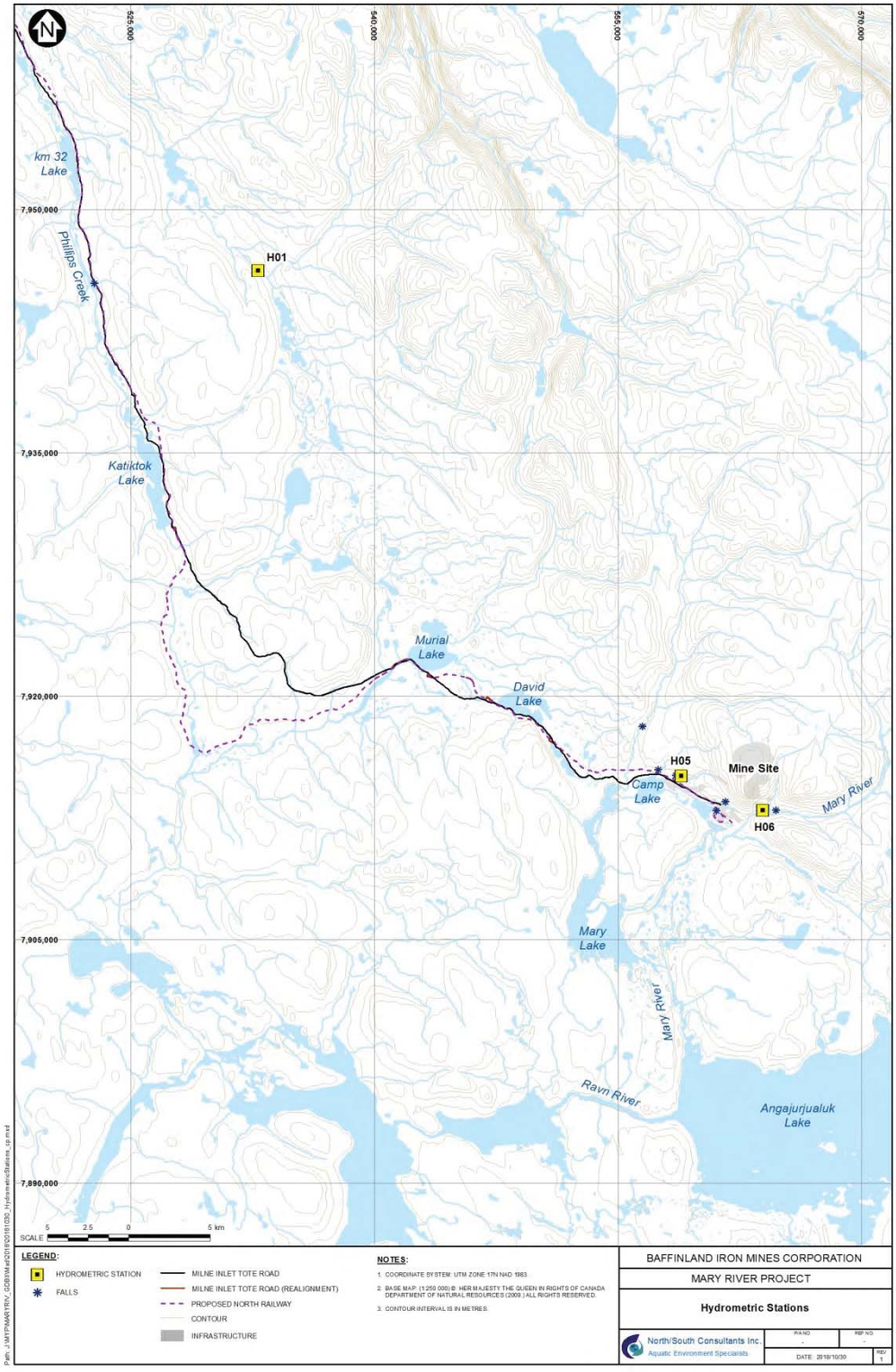


Figure 3. Hydrometric stations in the study area.

3.0 RESULTS

A total of 465 sites were assessed along the north rail alignment in early summer (June 28-July 11) and fall (August 23-September 3) 2018. An overview of fish habitat designations for all sites is provided in Appendix 1, maps of all sites are provided in Appendix 2, maps of diversion sites are provided in Appendix 3, and detailed habitat assessment sheets for each site are provided in Appendix 4. The following provides a summary of the results of the surveys.

3.1 GENERAL CONDITIONS

3.1.1 Water Temperature

Stream water temperatures during the early summer survey ranged from 6-12°C. Based on detailed studies conducted in the mine area, juvenile Arctic Char would be expected to be accessing and using stream habitat at these water temperatures. Studies conducted in the mine area have previously shown that in spring, juvenile Arctic Char typically begin to move into the small tributaries to the mine area lakes at temperatures of about 5-7°C (Baffinland 2012a). Typically, the number of Arctic Char moving upstream increased until water temperatures reach about 15°C in these streams. Although the general pattern is upstream movement during spring, Arctic Char were also observed to move downstream out of small tributary streams in spring, likely in response to changes in flow or reductions in water temperature. Juvenile Arctic Char are thought to move into these tributaries to access warmer water and foraging habitat and to avoid predators. Lake/pond temperatures were not recorded, but all surveyed lakes were ice-free at the start of the early summer survey.

During the fall survey, stream water temperatures were typically less than 6°C, though a few sites remained as high as 8°C. Based on detailed studies conducted in the mine area, Arctic Char may have moved, or begun movements, out of some of the streams to overwintering lakes at the time of the fall surveys; catches of char were greatly reduced in comparison to spring catches in most fish-bearing streams in fall, 2018. Data from Camp Lake Tributary 2 and Sheardown Lake Tributary 1 suggest that downstream movements of char in fall are generally triggered by a drop in water temperature to about 7°C (Baffinland 2012a). The number of fish moving out of tributaries to Camp and Sheardown lakes increased until water temperature in the tributaries had reached about 2°C and then declined to almost no movement.

3.1.2 Discharge

Preliminary stream flow gauging measurements collected at three representative sites (Phillips Creek tributary, Camp Lake Tributary 1, and the Mary River; Figure 3) in the open-water season of 2018 were reviewed to provide supporting information for the fish habitat field program. These preliminary results indicate that the summer field program was conducted during periods of near average (or median) flow conditions for this time of year, as estimated from the three gauging stations (Figure 4). However, the late summer/fall survey was conducted during largely below average flows (Figure 4). The summer survey also captured a brief period of relatively high flow. These short duration high flow events are common during early to mid-summer and result in higher flow compared to average summer flows for the period of record. As a result, discharge was greater during the summer survey relative to the late summer/fall program (Figure 4). The 2018 field programs therefore captured relatively high and low discharge periods

within the study area. It is noted, however, as shown in Figure 4, that discharge is typically higher during the spring freshet than discharge encountered during the summer field program.

3.2 STREAM CROSSINGS

3.2.1 North Rail Crossings

This category includes streams with culvert crossings only. Sites that have a combination of culvert with lake/pond encroachment/infill are included in Section 3.4. A total of 395 stream crossing sites were assessed along the rail alignment identified in the Phase 2 Proposal (Table 3; Appendix 1). For Arctic Char, 40 sites were identified as fish-bearing in the 2018 surveys. Twenty-nine of the char-bearing crossings were designated as important fish habitat and the remaining 11 as marginal, where habitat was not accessible throughout the open-water period and/or had less optimal habitat for juvenile char due to the absence of preferred characteristics. Char in the study area display a preference for streams with coarse substrates, riffle/pool morphology, and abundant cover (e.g., deep pools, overhanging banks, large cobble/boulder) and typically avoid shallow water over fine substrates with little to no flow (Baffinland 2012a).

Of the total of 355 sites that were classified as not char-bearing, 307 sites would not be expected to support char due to the presence of a permanent downstream barrier, the lack of connectivity to overwintering habitat, or the absence of a stream channel at the site (i.e., sites are not aquatic habitat). The remaining 48 sites may potentially support char under higher flow conditions; however, some of these sites may never be accessible due to the presence of soft barriers, such as sub-surface flow and high gradients.

Only 12 sites were identified as fish-bearing for Ninespine Stickleback in 2018. Most stickleback habitat along the rail corridor is distributed within approximately 20 km of the Mary River mine site. Stickleback prefer different habitat types than char, favouring little to no flow over fine substrates, and are thus more frequently observed in lakes/ponds.

Table 3. Summary of species-specific habitat status at stream crossings along the rail alignment.

Habitat Quality	Species	
	Arctic Char	Ninespine Stickleback
Not Fish-Bearing	355	383
Marginal	11	2
Important	29	10
Total	395	395

3.2.2 Milne Inlet Tote Road and Temporary Haul Road Crossings

Of the 17 sites surveyed in 2018, Char were present at five of the sites and stickleback were present at two of the Char-bearing streams (Table 4).

Table 4. Results of the 2018 field surveys conducted at Tote Road realignment, temporary haul road, and laydown area crossings.

Site ID	New or Relocated Crossing	Description	Arctic Char		Ninespine Stickleback	
			Fish Bearing	Habitat Quality	Fish Bearing	Habitat Quality
CV-169-1	New	Laydown Area	N	NFB	N	NFB
CV-146-1	Relocation	Tote Road Realignment	N	NFB	N	NFB
CV-146-2	Relocation	Tote Road Realignment	N	NFB	N	NFB
CV-146-3	Relocation	Tote Road Realignment	N	NFB	N	NFB
CV-131-1	New	Tote Road Realignment	N	NFB	N	NFB
CV-060-1	New	Temporary Haul Road	Y	IMP	N	NFB
CV-060-2	New	Tote Road Realignment	Y	IMP	N	NFB
CV-059-1	New	Temporary Haul Road	Y	MAR	N	NFB
CV-214-1	Relocation	Tote Road Realignment	N	NFB	N	NFB
CV-214-2	New	Tote Road Realignment	N	NFB	N	NFB
CV-215-1	Relocation	Tote Road Realignment	N	NFB	N	NFB
CV-216-1	New	Tote Road Realignment	N	NFB	N	NFB
CV-216-2	New	Tote Road Realignment	N	NFB	N	NFB
CV-020-1	New	Tote Road Realignment	N	NFB	N	NFB
CV-020-2	New	Tote Road Realignment	N	NFB	N	NFB
BG-13-1	New	Tote Road Realignment	Y	IMP	Y	IMP
BG-14-1	New	Tote Road Realignment	Y	IMP	Y	IMP

Y = Yes; N = No; NFB = Not Fish-Bearing; IMP = Important; MAR = Marginal

3.3 NORTH RAIL BRIDGES

All four bridge crossing sites identified in the Phase 2 Proposal provide abundant, important juvenile char habitat. None are deep enough to provide suitable char spawning or overwintering habitat and adult use is likely limited to migration between larger lakes. Although the bridge sites were not electrofished in 2018 for logistical reasons, juvenile char are known to use these rivers for rearing and migration in the open-water season (Table 1); therefore these sites were identified as char habitat. Two of the sites (CV-70-3 and CV-85-3) also provide habitat for Ninespine Stickleback (Appendix 1).

3.4 NORTH RAIL LAKE/POND ENCROACHMENTS/INFILLING

A total of 35 lake/pond encroachments/infilling sites were assessed along the rail alignment (Table 5). For Arctic Char, seven were identified as fish-bearing in 2018. The fishless ponds were of insufficient depth for overwintering (generally less than 2 m maximum depth) and were completely isolated from other waterbodies.

The unnamed ponds at CV-18-1 and CV-106-3 were identified during the early summer survey as potentially providing overwintering habitat for char (i.e., water depth was identified as potentially being sufficient) and detailed bathymetry and substrate surveys were conducted at these two encroachment locations in fall.

Maximum and mean depth in the unnamed lake at CV-18-1 was 3.73 m and 1.73 m, respectively (Figure 5) and substrates were predominantly a combination of sand/silt/clay with some patches of gravel and

cobble, particularly along the south shore (Figure 6). Habitat at the rail footprint is sand/silt with some submerged vegetation on the west side of the alignment and a mixture of silt/clay/sand and patches of gravel/cobble east of the alignment to a depth of 3.0-3.5 m. As this lake is isolated from any other waterbodies, it is used for the entire life cycle of the resident stickleback population.

The pond at CV-106-3 had a maximum and mean depth of 4.07 m and 1.97 m in fall 2018, respectively (Figure 7), and substrate was cobble/sand/boulder in most nearshore areas and sand/gravel or silt/clay at depth (Figure 8). Habitat at the encroachment site is predominantly sand with some small cobble to approximately 1.5 m depth and sparse aquatic vegetation. Shoreline electrofishing captured only stickleback, but this lake is connected downstream to known juvenile char habitat (multiple streams and ponds between Camp Lake and CV-106-3); as char were observed in the inflow and outflow of the pond, it was identified as marginal char habitat. The lake provides suitable habitat for the entire life cycle of stickleback, though spawning is also known from nearby, shallower ponds and interconnected streams.

Of the seven char-bearing ponds, six provided marginal habitat and one (CV-71-1) provided important char habitat. All seven of the encroachment sites identified as Arctic Char habitat are shallow nearshore sites with substrate that is comprised of predominantly fines, but still suitable for Arctic char feeding and rearing. The pond at CV-71-1 was identified as providing important char habitat relative to the others due to its larger size and the greater abundance of char observed during the surveys. Nearshore habitat in all of these lakes/ponds was relatively uniform.

Although the pond at CV-106-3 was deep enough (maximum depth = 4.07 m) for char overwintering, it appears that it is inaccessible to adults from Camp Lake (i.e., the connecting stream is too shallow for adult use. Based on previous studies conducted in the area, most juvenile char that use the CV-104-5 stream (i.e., Camp Lake Tributary 1) that drains the pond at CV-106-3, appear to return to Camp Lake for overwintering. The pond at CV-106-3 is likely limited to providing rearing habitat for juvenile char, though overwintering of some individuals may also occur.

Seven of the lake/pond encroachments/infilling sites were identified as providing important habitat for the Ninespine Stickleback and one of these (CV-18-1), was isolated and supported only Ninespine Stickleback. All provided important rearing and feeding habitat and were suitable for stickleback spawning, though the latter habitat is not limited to encroachment sites in any of the ponds/lakes. Two sites (CV-18-1 and CV-106-3) provided sufficient depths for overwintering and likely support year-round resident stickleback populations.

3.5 NORTH RAIL STREAM DIVERSIONS

Of the total of 31 cuts along the rail alignment described in the Phase 2 Proposal, none of the diverted streams provided fish habitat at or upstream of the cuts due to the absence of a waterbody at the cut, the presence of barriers downstream of the cut, and/or lack of connectivity with overwintering habitat in 2018. However, 14 sites were identified where char occur downstream of the cut. Based on planned flow management in the Phase 2 Proposal, there was the potential for a reduction in flow affecting char habitat in 10 of these drainages under certain flow conditions, as summarized in Table 6 and Appendix 3.

Table 5. Fish presence/absence and habitat quality for lake/pond encroachment/infilling sites surveyed during the 2018 field programs.

Site ID	2018 Fish Habitat Designation																Substrate		Comments
	Arctic Char								Ninespine Stickleback										
	Fish-Bearing	Habitat Quality	Potential Habitat Use at the Footprint			Potential Habitat Use in the Pond			Fish-Bearing	Habitat Quality	Potential Habitat Use at the Footprint			Potential Habitat Use in the Pond					
			REAR	OW	SPAW	REAR	OW	SPAW			REAR	OW	SPAW	REAR	OW	SPAW	Nearshore	Offshore	
CV-14-2	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	Fines	Fines	Connected to CV-14-3, but not to overwintering habitat
CV-14-3	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	Fines	Fines	Connected to CV-14-3, but not to overwintering habitat
CV-15-2	Y	MAR	Y	N	N	Y	N	N	Y	IMP	Y	N	Y	Y	N	Y	Fines dominant overlain by sparse (5%) small cobble with some aquatic vegetation	Loosely compacted fines/sparse cobble	Marginal open-water season use by juvenile ARCH for rearing possible in some years; char present in 2018. Important spring to fall habitat for NNST - rearing and spawning; NNST present in 2018. Upstream lake used for overwintering and ARCH spawning.
CV-15-3	Y	MAR	Y	N	N	Y	N	N	Y	IMP	Y	N	Y	Y	N	Y	Fines dominant overlain by sparse (5%) small cobble with some aquatic vegetation	Loosely compacted fines/sparse cobble	Marginal open-water season use by juvenile ARCH for rearing possible in some years; ARCH present in 2018. Important spring to fall habitat for NNST - rearing and spawning. NNST present in 2018. Upstream lake used for overwintering and ARCH spawning.
CV-15-4	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	Primarily Fines	Primarily Fines	Very shallow, marshy/pond complex.
CV-16-2	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	Fines with aquatic and terrestrial vegetation	Fines with aquatic and terrestrial vegetation	Isolated, non-fish bearing pond.
CV-17-1	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	Fines with some gravel and occasional cobble	Fines with some gravel	Isolated, non-fish bearing pond that formed because of the adjacent road (not a natural pond)
CV-18-1	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	Y	IMP	Y	Y	Y	Y	Y	Y	Primarily silt/sand dominant with small patches of cobble/gravel (including footprint area); south shore dominated by gravel/cobble/sand.	Primarily silt/clay/sand with patches of gravel/cobble/sand	Small lake never connected to Phillips Creek and does not support ARCH. There is an insufficient volume of water for overwintering and insufficient depth for spawning to establish a population of ARCH and the pond is isolated. Lake does support all life stages for a resident NNST population.
CV-19-2	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	Gravel/small cobble/fines	Gravel/small cobble/fines	Isolated, non-fish bearing pond.
CV-22-1	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	Primarily Fines	Primarily Fines	Very shallow, isolated pond.
CV-22-2	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	Primarily Fines	Primarily Fines	Very shallow, isolated pond.
CV-22-4	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	Loosely compacted fines/sparse cobble	Primarily Fines	Very shallow, isolated pond.

Table 5. - continued –

Site ID	2018 Fish Habitat Designation																Substrate		Comments
	Arctic Char								Ninespine Stickleback										
	Fish-Bearing	Habitat Quality	Potential Habitat Use at the Footprint			Potential Habitat Use in the Pond			Fish-Bearing	Habitat Quality	Potential Habitat Use at the Footprint			Potential Habitat Use in the Pond					
			REAR	OW	SPAW	REAR	OW	SPAW			REAR	OW	SPAW	REAR	OW	SPAW	Nearshore	Offshore	
CV-26-1	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	Primarily Fines	Primarily Fines	Marshy, very shallow, with no connectivity to downstream fish habitat
CV-28-5	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	Fines with aquatic and terrestrial vegetation	Fines with aquatic and terrestrial vegetation	Very shallow, isolated pond.
CV-30-7	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	Primarily Fines	Primarily Fines	Shallow, isolated, fishless pond.
CV-33-7	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	Gravel/small cobble/fines	Gravel/small cobble/fines	Isolated, non-fish bearing pond that formed due to the presence of the road
CV-53-2	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	Fines with some cobble and vegetation	Primarily fines and gravel	Isolated, non-fish bearing pond that formed due to the presence of the road
CV-60-2	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	Primarily Fines with some vegetation	Primarily Fines	Shallow, isolated, fishless pond.
CV-65-2	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	Primarily Fines	Primarily Fines	Very shallow, isolated, fishless pond.
CV-70-1	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	Primarily Fines	Primarily Fines	Shallow, isolated, fishless pond.
CV-71-1	Y	IMP	Y	N	N	Y	N	N	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	Primarily Fines	Primarily Fines	Several ARCH observed in summer and fall 2018. Pond is too shallow for ARCH overwintering or spawning, but provides abundant rearing/feeding habitat; well-connected to large river downstream and deeper, potential overwintering lake upstream. NNST were not identified from this lake 2018, but there are no obvious barriers to accessibility and NNST, though rare, have been captured in portions of the large downstream river.
CV-71-2a	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	Primarily Fines	Primarily Fines	Shallow, isolated, fishless pond.
CV-86-1	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	Primarily Fines	Primarily Fines	Shallow, isolated, fishless pond.
CV-89-2	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	Primarily Fines	Primarily Fines	Shallow, isolated, fishless pond.
CV-92-1	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	Primarily Fines	Primarily Fines	Shallow, isolated, fishless pond.
CV-99-1	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	Primarily Fines	Primarily Fines	Shallow, isolated, fishless pond.
CV-105-3	Y	MAR	Y	N	N	Y	N	N	Y	IMP	Y	N	Y	Y	N	Y	Primarily fines and vegetation with occasional cobble	Primarily fines and vegetation with occasional cobble	Footprint site was very shallow (< 4 cm); ARCH may only use the encroachment site habitat during periods of high water, preferring deeper areas of the pond or nearby stream habitat. ARCH present in 2018. NNST observed within the encroachment area in 2018.
CV-106-1	Y	MAR	Y	N	N	Y	N	N	Y	IMP	Y	N	Y	Y	N	Y	Primarily fines with occasional cobble	Primarily fines with occasional cobble	Marginal ARCH habitat. ARCH present in 2018. Important spring to fall habitat for NNST. NNST present in 2018.

Table 5. - continued –

Site ID	2018 Fish Habitat Designation																Substrate		Comments
	Arctic Char								Ninespine Stickleback										
	Fish-Bearing	Habitat Quality	Potential Habitat Use at the Footprint			Potential Habitat Use in the Pond			Fish-Bearing	Habitat Quality	Potential Habitat Use at the Footprint			Potential Habitat Use in the Pond					
			REAR	OW	SPAW	REAR	OW	SPAW			REAR	OW	SPAW	REAR	OW	SPAW	Nearshore	Offshore	
CV-106-2	Y	MAR	Y	N	N	Y	N	N	Y	IMP	Y	N	Y	Y	N	Y	Primarily fines with occasional cobble	Primarily fines with occasional cobble	Marginal ARCH habitat; ARCH present in 2018. Important spring to fall habitat for NNST. NNST present in 2018.
CV-106-3	Y [1]	MAR	Y [1]	N	N	Y	Y	N	Y	IMP	Y	Y	Y	Y	Y	Y	Sand dominant (60%) overlain with small cobble (40%) and patches of vegetation	Primarily fines with occasional large cobble/boulders	No ARCH captured or observed in the pond in 2018. However, ARCH were present in both the inflow and outflow streams in 2018 in very close proximity to the pond and presence in the pond is assumed. NNST present in pond in 2018; pond provides overwintering and spawning habitat for NNST.
CV-107-1	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	N	NFB	N	N	N	N/A	N/A	N/A	Primarily fines with occasional large cobble/boulders	Primarily fines with occasional large cobble/boulders	Fish were not captured in 2018 and the habitat quality is very poor. However lake is accessible and there is potential for use by NNST and juvenile ARCH.
CV-107-3	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	Primarily fines with sparse small cobble	Primarily fines with sparse small cobble	Roadside ditch pond.
CV-110-2	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	Primarily fines with vegetation	Primarily fines with vegetation and occasional large cobble/boulder	Upstream of known fish barrier; no access.
CV-110-3	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	Primarily fines with vegetation	Primarily fines with vegetation	Upstream of known fish barrier; no access.
CV-110-4	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	N	NFB	N/A	N/A	N/A	N/A	N/A	N/A	Primarily fines with vegetation	Primarily fines with vegetation	Upstream of known fish barrier; no access.

REAR = Rearing; OW = Overwintering; SPAW = Spawning; Y = Yes; N = No; P = Potential; NFB = Not Fish-Bearing; IMP = Important; MAR = Marginal; N/A = Not applicable; ARCH = Arctic Char; NNST = Ninespine Stickleback

[1] Fish not observed or captured in the pond in 2018 but designated as ARCH habitat due to presence in inflow and outflow in 2018.

Table 6. Rail alignment cuts and summary of habitat at and downstream of the cuts.

Site ID	Arctic Char				Ninespine Stickleback				Effects Summary
	Habitat at Cut		Habitat Downstream of Cut		Habitat at Cut		Habitat Downstream of Cut		
	Fish Bearing	Habitat Quality	Fish Bearing	Habitat Quality	Fish Bearing	Habitat Quality	Fish Bearing	Habitat Quality	
CV-0-2	N	NFB	N	NFB	N	NFB	N	NFB	No effect on char habitat. Cut stream is not char habitat and is redirected to the same drainage.
CV-8-0	N	NFB	Y	IMP	N	NFB	N	NFB	No effect on char habitat. Nearest downstream char habitat is Phillips Creek. Diversion to be returned to the same drainage upstream of char habitat.
CV-12-4b	N	NFB	N	NFB	N	NFB	N	NFB	No effect on char habitat. Cut is a dry spot with no connection to other habitat. Diversion to be returned to the same drainage upstream of char habitat.
CV-20-2	N	NFB	Y	IMP	N	NFB	N	NFB	No char habitat at or downstream of cut (first available downstream habitat is Phillips Creek). Diversion to be redirected into branch of same stream; and there is no potential for alteration of downstream habitat.
CV-35-5	N	NFB	N	NFB	N	NFB	N	NFB	No effect on char habitat. Cut is a dry spot with no connection to other habitat. Diversion to be returned to same drainage upstream of char habitat.
CV-46-1a	N	NFB	N	NFB	N	NFB	N	NFB	No effect on char habitat. Cut is in a fishless, isolated pond and will be diverted to non-char habitat. Diversion to be returned to same drainage upstream of char habitat.
CV-58-7	N	NFB	Y	IMP	N	NFB	Y	MAR	No loss of char habitat upstream of the cut. Potential for alteration to char habitat due to reduced flow near the downstream confluence, below permanent barriers under very high flow conditions (no fish use in 2018).
CV-58-8	N	NFB	Y	IMP	N	NFB	Y	MAR	Stream was dry in 2018. There is no char habitat upstream of the cut due to a permanent barrier. Potential for reduced flow to alter char habitat near the downstream confluence below permanent barriers under very high flow conditions.
CV-59-4b	N	NFB	N	NFB	N	NFB	N	NFB	No effect on char habitat. Site is a dry hillside with no connection to any other waterbody.

Table 6. - continued –

Site ID	Arctic Char				Ninespine Stickleback				Effects Summary
	Habitat at Cut		Habitat Downstream of Cut		Habitat at Cut		Habitat Downstream of Cut		
	Fish Bearing	Habitat Quality	Fish Bearing	Habitat Quality	Fish Bearing	Habitat Quality	Fish Bearing	Habitat Quality	
CV-59-4a	N	NFB	Y	IMP	N	NFB	Y	MAR	Very low water during 2018 surveys with multiple barriers from the cut (vertical drops) downstream to the confluence (surface flow disappears) with major downstream river. Potential for alteration of char habitat due to flow reductions in the lowermost reach of the stream cut by CV-59-4a. Fish were not present during the 2018 survey.
CV-60-4a	N	NFB	N	NFB	N	NFB	N	NFB	No effect on char habitat. Cut is a dry spot with no connection to other habitat. Diversion to be returned to same drainage upstream of char habitat.
CV-61-3	N	NFB	Y	IMP	N	NFB	Y	MAR	Stream to be diverted at CV-61-3 was nearly completely dry and no fish were present in the stream in both 2018 surveys. A small marshy area near the downstream confluence was present in 2018, which could potentially support fish under higher flows than observed in 2018; therefore there is potential for alteration of char habitat due to reduced flow in downstream area.
CV-62-3	N	NFB	Y	IMP	N	NFB	Y	MAR	Stream was dry to the confluence with CV-62-5 in both 2018 surveys. Very steep, dry terrain in the area of the cut (lack of channel and surface flow) likely to be impassable under most or all conditions. Soft barriers (lack of channel and surface flow) near the confluence with CV-62-5 prevented access to lower reaches in 2018. Downstream area could potentially provide intermittent fish habitat.
CV-62-6	N	NFB	Y	IMP	N	NFB	Y	MAR	No char habitat at or upstream of cut; stream is shallow and steep upstream to approximately 200 m downstream of the cut. Site was dry in fall 2018. The lowermost reaches near the confluence with large downstream river may provide marginal fish habitat during summer in some years, losing connectivity under low water levels. Potential for alteration to downstream habitat due to flow reduction.
CV-62-6b	N	NFB	Y	IMP	N	NFB	Y	MAR	Stream is small branch of stream cut at CV-62-6 with identical characteristics. No habitat in the stream branch but the stream contributes flow to stream CV-62-6 in summer and after rains. Potential for alteration to downstream habitat due to flow reduction.
CV-63-3a	N	NFB	N	NFB	N	NFB	N	NFB	Cut is not in char habitat (cut is at a low point and not a watercourse) and is diverted into non-char habitat.

Table 6. - continued -

Site ID	Arctic Char				Ninespine Stickleback				Effects Summary
	Habitat at Cut		Habitat Downstream of Cut		Habitat at Cut		Habitat Downstream of Cut		
	Fish Bearing	Habitat Quality	Fish Bearing	Habitat Quality	Fish Bearing	Habitat Quality	Fish Bearing	Habitat Quality	
CV-64-5a	N	NFB	N	NFB	N	NFB	N	NFB	Cut is not in char habitat (cur is at a low point and not a watercourse) and is diverted into non-char habitat.
CV-65-2a	N	NFB	N	NFB	N	NFB	N	NFB	Cut is not in char habitat (cut is at a low point and not a watercourse) and is diverted into non-char habitat.
CV-66-2a	N	NFB	N	NFB	N	NFB	N	NFB	Cut is in a low point (dry hillside) and is not fish habitat. Diversion is to non-char habitat. No potential for loss or alteration of char habitat.
CV-74-7	N	NFB	N	NFB	N	NFB	N	NFB	Cut is an isolated wetted area; numerous subsurface flow or water depth barriers present throughout the stream and there is no connectivity to overwintering habitat. No potential for downstream habitat alteration as cut is directed into adjacent stream that converges with cut stream.
CV-82-1a	N	NFB	N	NFB	N	NFB	N	NFB	Cut is not in a watercourse. No potential for effects on char habitat.
CV-90-2	N	NFB	Y	IMP	N	NFB	Y	MAR	Cut located in an isolated moist spot and there is no char habitat upstream or downstream of the cut, with the potential exception of the lowermost reach where elevation is similar to the downstream river (i.e., subject to backflow effect).
CV-90-4	N	NFB	Y	IMP	N	NFB	Y	IMP	No direct loss of char habitat due to known barrier at the inflow of the stream to the downstream lake; cut site was isolated and shallow in 2018.
CV-92-1b	N	NFB	N	NFB	N	NFB	N	NFB	No effect on char habitat. Site is a dry spot with no connectivity to overwintering habitat. Flow to be redirected into a shallow, isolated, fishless pond.
CV-95-1	N	NFB	N	NFB	N	NFB	N	NFB	Site is a low point and does not provide char habitat. No potential for alteration to downstream habitat as flow to be redirected to same drainage.
CV-97-6	N	NFB	Y	IMP	N	NFB	Y	IMP	Stream to be diverted is not char habitat. No potential for alteration to downstream habitat as flow to be redirected to same drainage.
CV-101-1a	N	NFB	N	NFB	N	NFB	N	NFB	Cut located in fishless habitat with no connections to overwintering habitat. No potential for alteration of char habitat downstream as cut to be redirected to same drainage at the confluence with downstream watercourse.

Table 6. - continued -

Site ID	Arctic Char				Ninespine Stickleback				Effects Summary
	Habitat at Cut		Habitat Downstream of Cut		Habitat at Cut		Habitat Downstream of Cut		
	Fish Bearing	Habitat Quality	Fish Bearing	Habitat Quality	Fish Bearing	Habitat Quality	Fish Bearing	Habitat Quality	
CV-101-1b	N	NFB	N	NFB	N	NFB	N	NFB	Cut located in fishless habitat with no connections to overwintering habitat. No potential for alteration of char habitat downstream as cut to be redirected to same drainage at the confluence with downstream watercourse.
CV-102-1a	N	NFB	N	NFB	N	NFB	N	NFB	Cut site was a moist low point in 2018 that is never connected to overwintering habitat. No potential for alteration to downstream habitat as flow to be redirected to adjacent stream in same drainage upstream of the confluence with the diverted stream.
CV-102-5	N	NFB	Y	IMP	N	NFB	Y	IMP	No char habitat at and upstream of cut. No potential for alteration to downstream char habitat as flow to be redirected upstream of the first available char habitat.
CV-109-1	N	NFB	Y	IMP	N	NFB	N	NFB	Area upstream and downstream of the cut was dry in 2018. Although unlikely, lowermost reaches of the stream near the confluence with a fish-bearing lake may be used during periods of high flow. No alteration to downstream lake as flow is redirected into the same drainage (i.e., adjacent tributary to larger downstream pond).

Y = Yes; N = No; NFB = Not Fish-Bearing; IMP = Important; MAR = Marginal

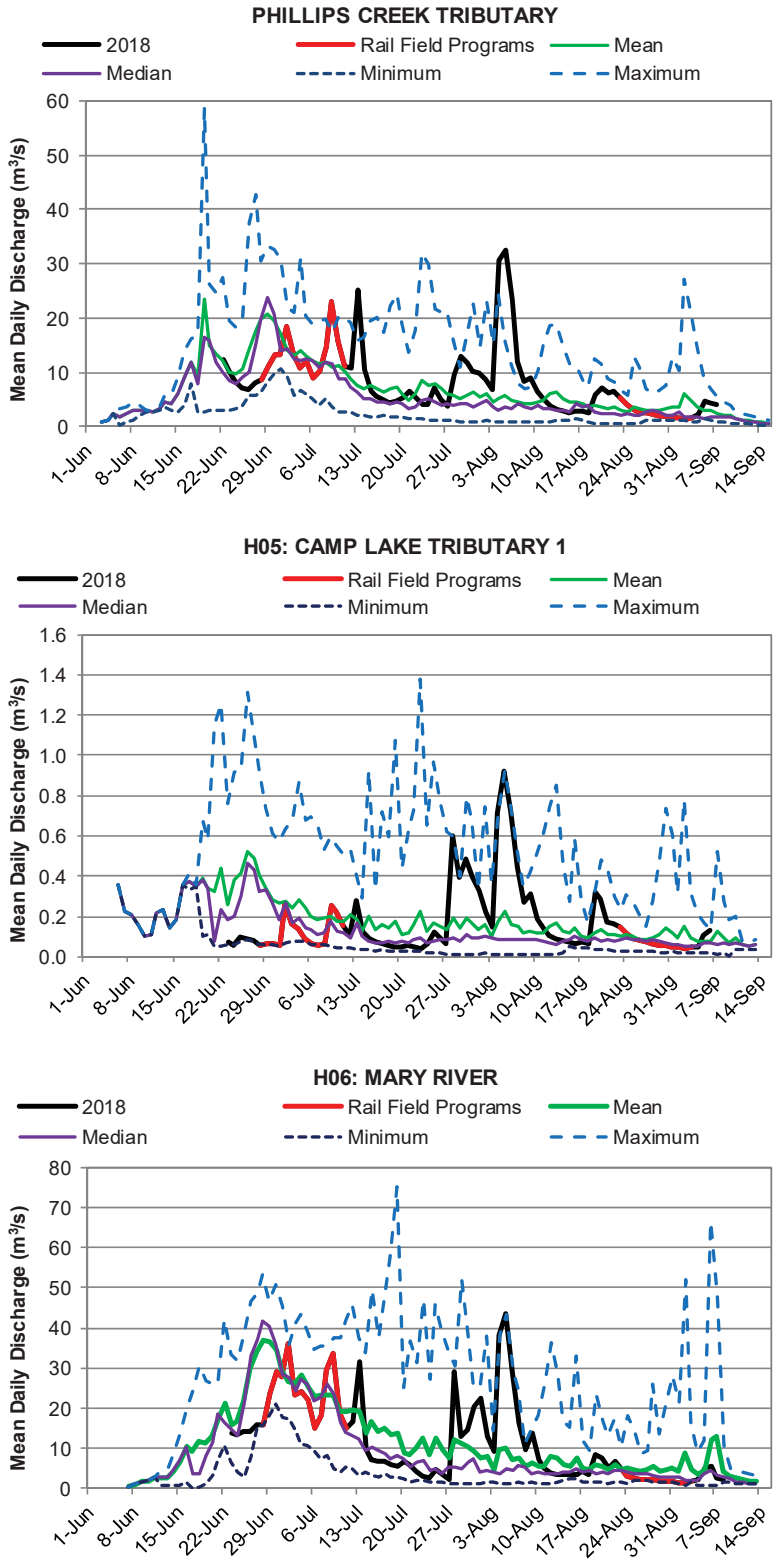


Figure 4. **Preliminary 2018 daily discharge and mean, median, minimum, and maximum daily discharges (2006-2017) for three stream gauging stations in the study area. Data provided by A. Rees (pers. comm. 2018).**

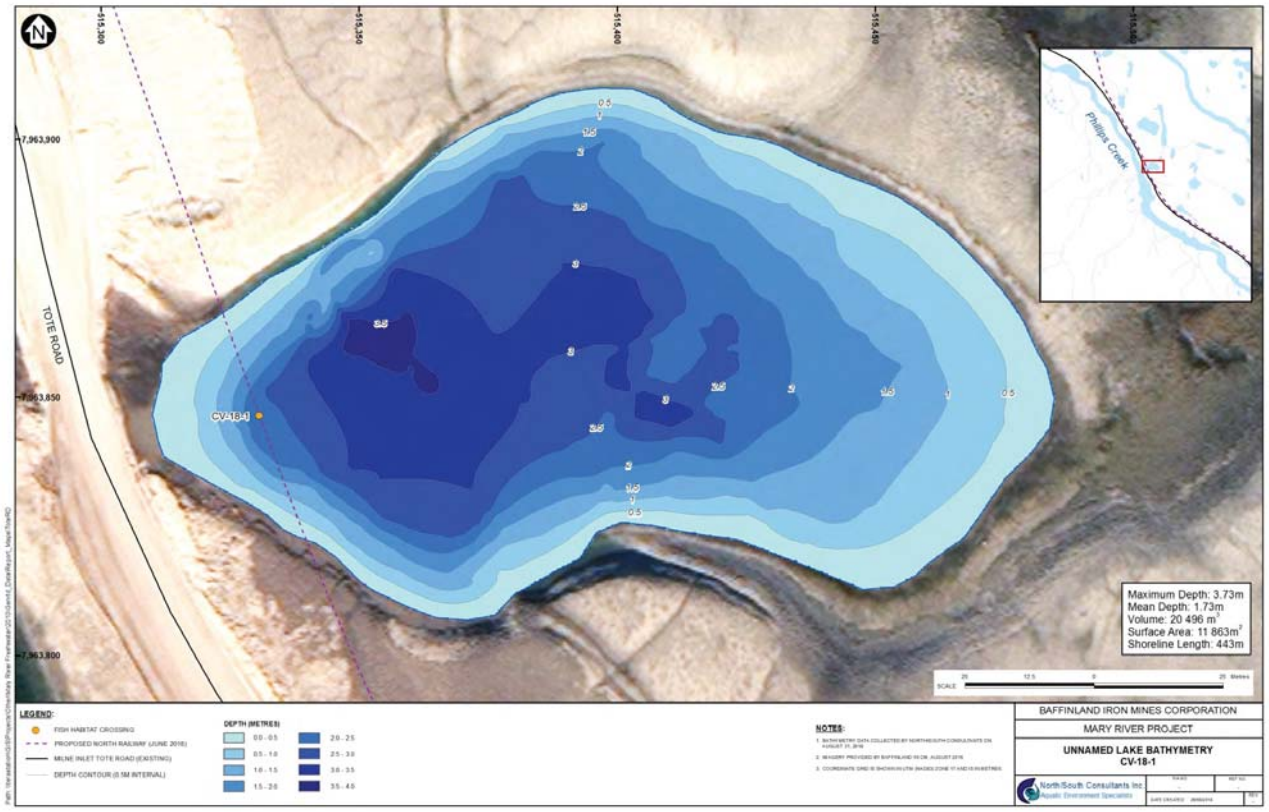


Figure 5. Bathymetry of the unnamed lake at site CV-18-1.

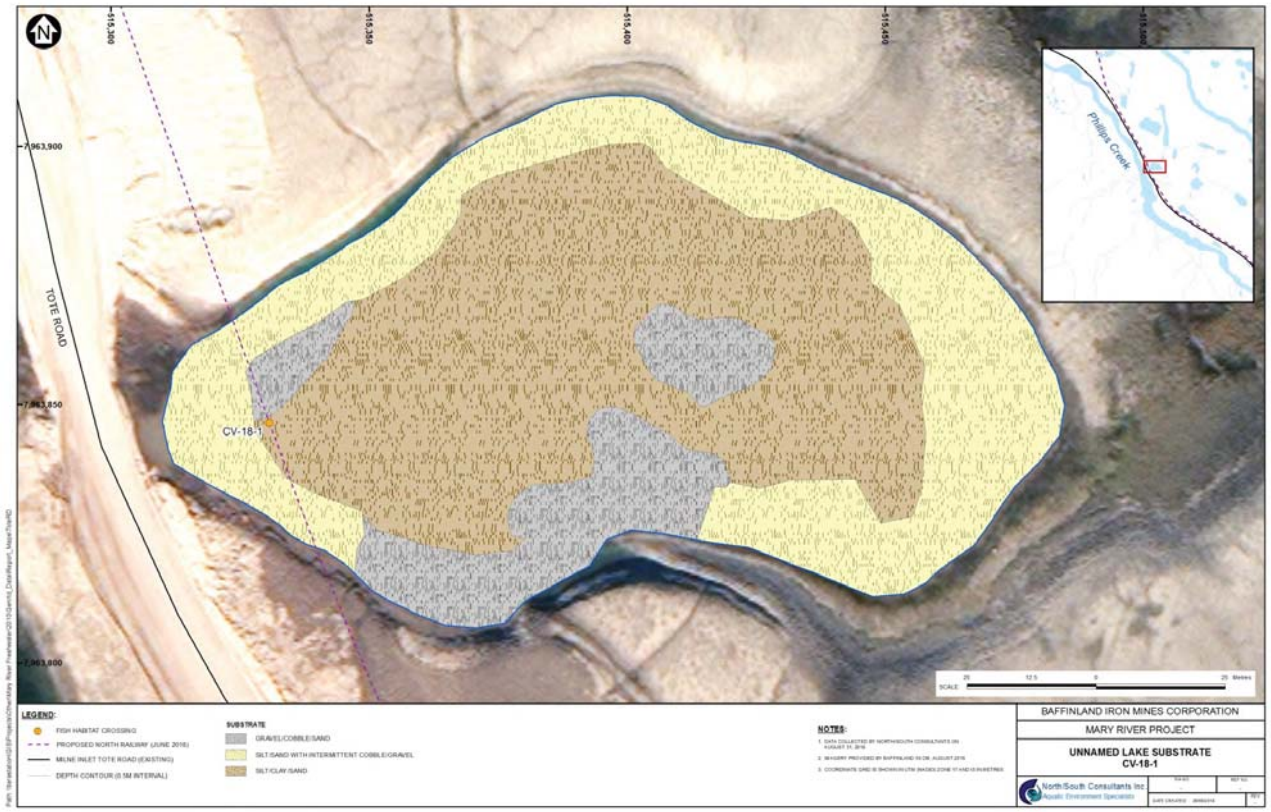


Figure 6. Substrate distribution map for the unnamed lake at site CV-18-1.

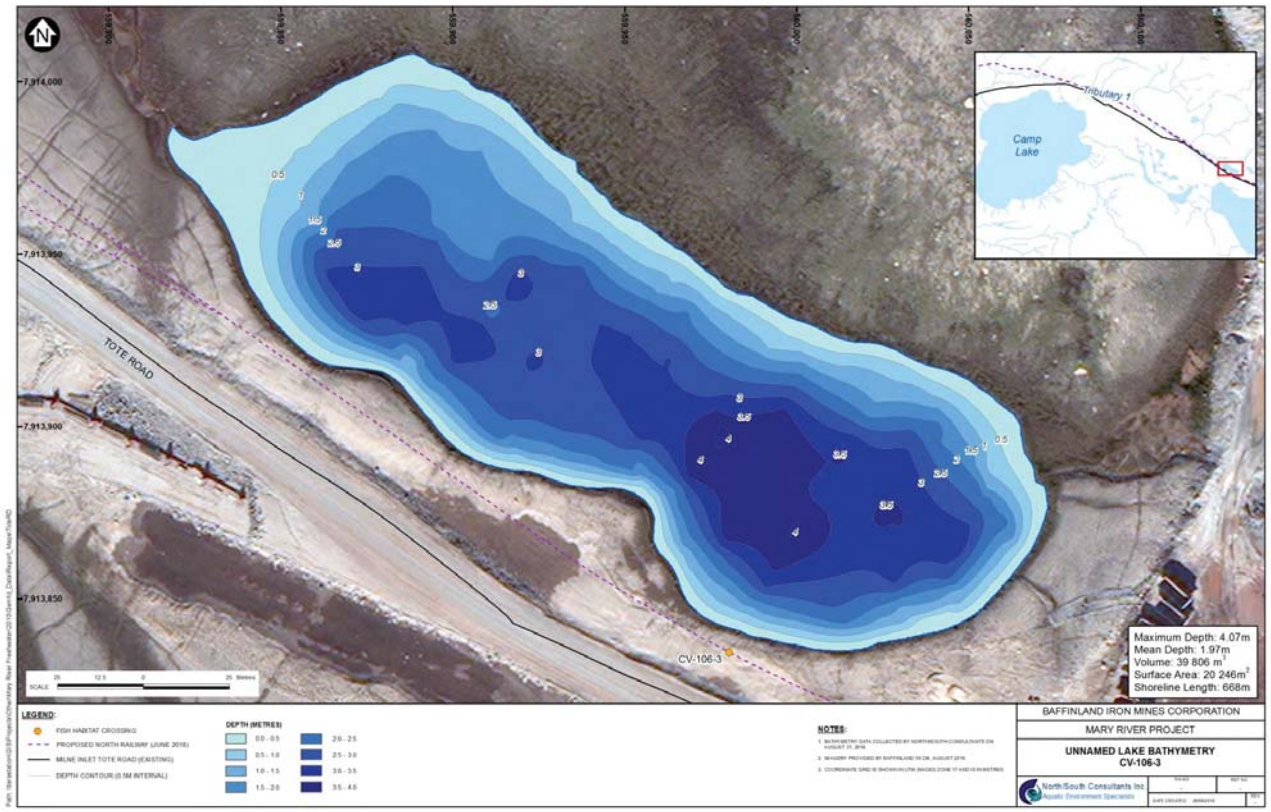


Figure 7. Bathymetry of the unnamed pond at site CV-106-3.

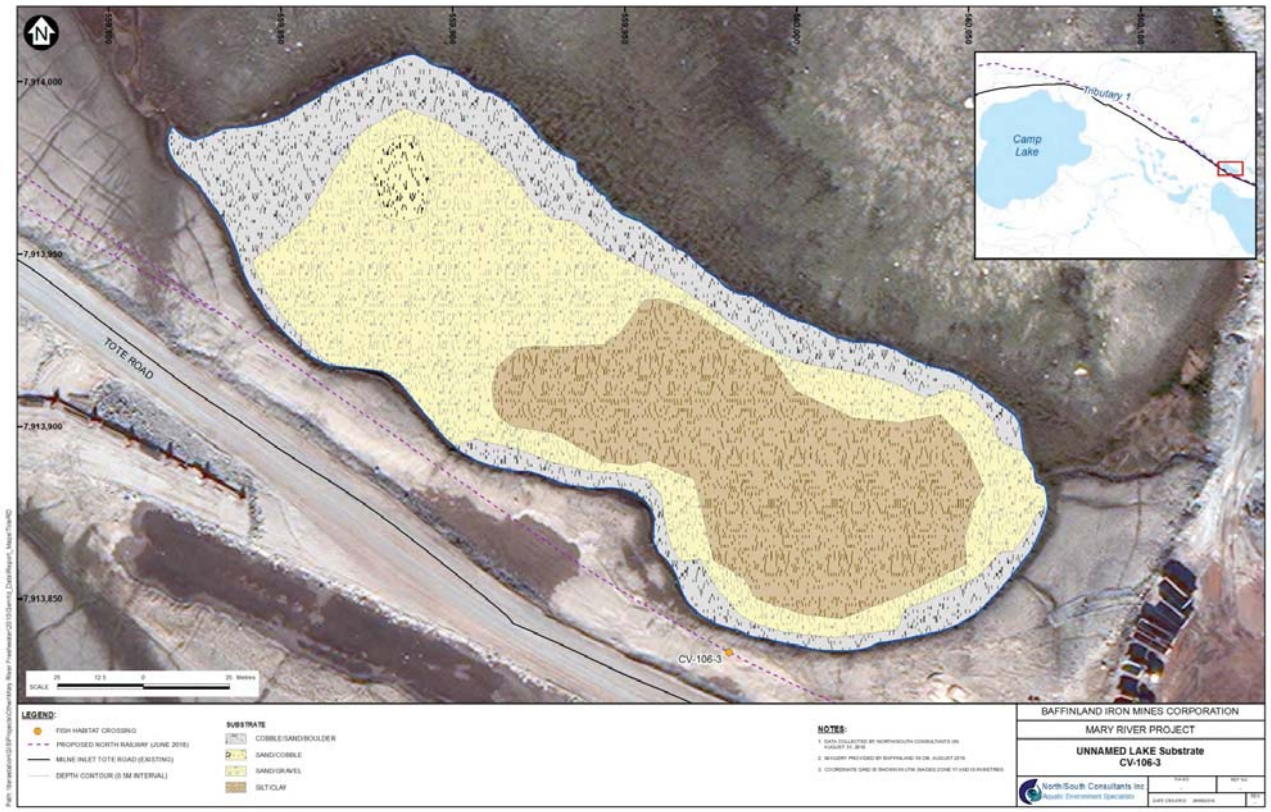


Figure 8. Substrate distribution map for the unnamed lake at site CV-106-3.

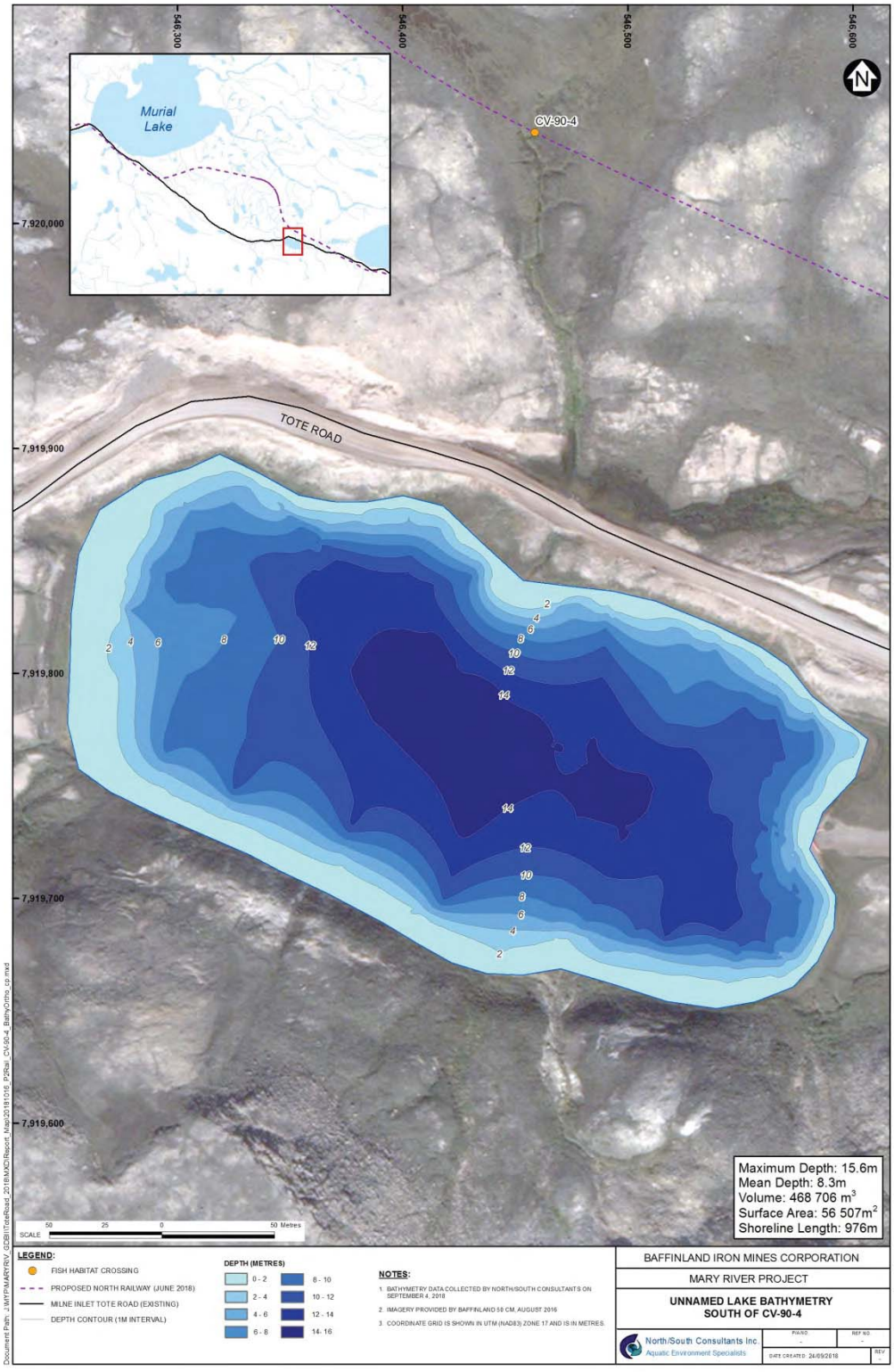


Figure 9. Bathymetry of the unnamed pond located downstream of the stream diversion site CV-90-4.

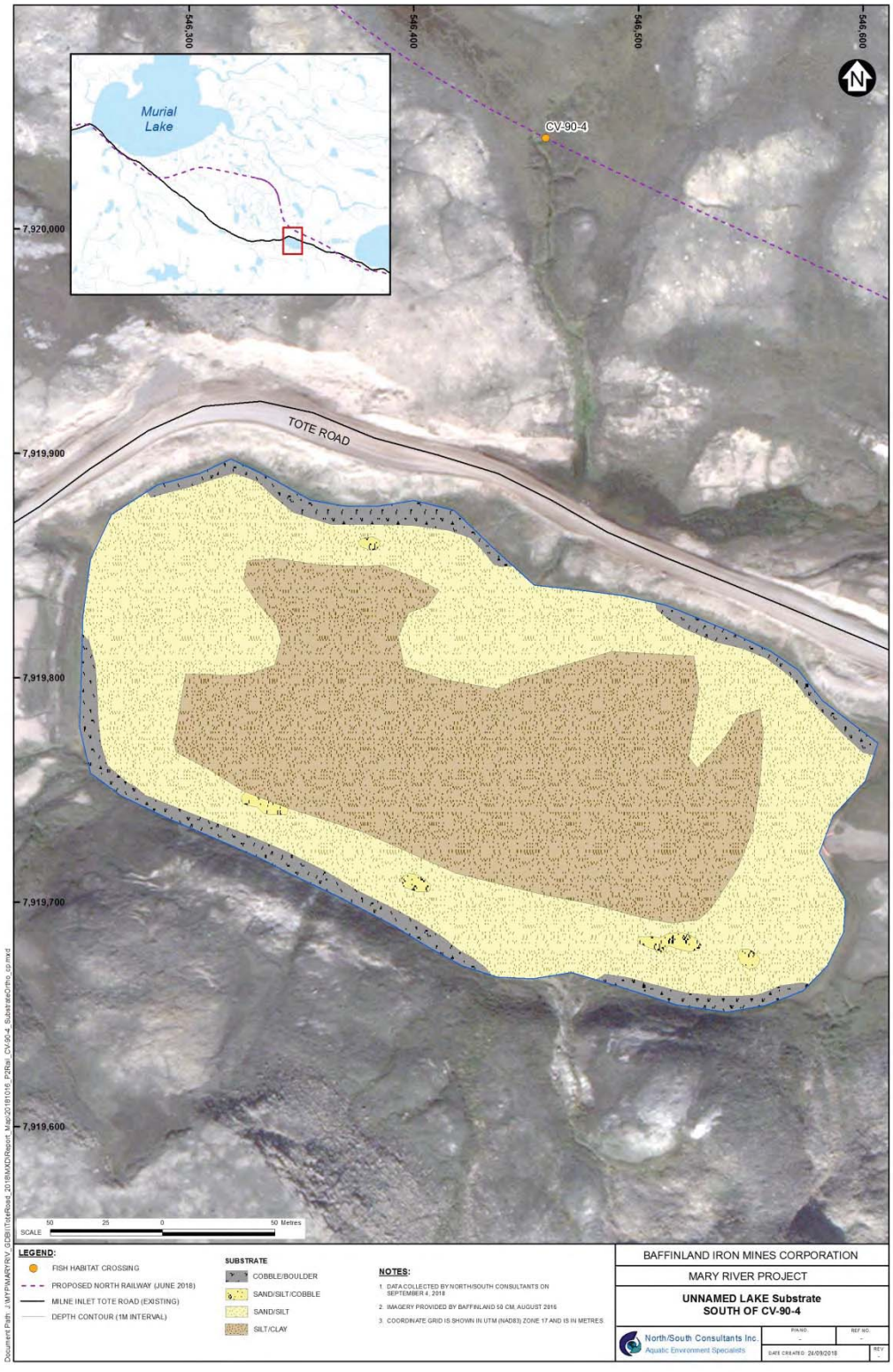


Figure 10. Substrate distribution map for the unnamed pond located downstream of the stream diversion site CV-90-4.

4.0 REFERENCES

4.1 LITERATURE CITED

Baffinland Iron Mines Corporation (Baffinland), 2009. Mary River Project Bulk Sampling Program - Tote Road Upgrades, Fish Habitat Monitoring 2008 Annual Report to Department of Fisheries and Oceans.

Baffinland. 2010. Mary River Project Bulk Sampling Program - Tote Road Upgrades, Fish Habitat Monitoring 2010 Annual Report to Department of Fisheries and Oceans.

Baffinland. 2011. Mary River Project Bulk Sampling Program - Tote Road Upgrades, Fish Habitat Monitoring 2011 Annual Report to Department of Fisheries and Oceans.

Baffinland. 2012a. Mary River Project - Final Environmental Impact Statement. Volume 7: Freshwater Environment. February 2012.

Baffinland. 2012b. Mary River Project Bulk Sampling Program - Tote Road Upgrades, Fish Habitat Monitoring 2012 Annual Report to Department of Fisheries and Oceans.

Baffinland. 2013. Mary River Project Bulk Program - Tote Road Upgrades, Fish Habitat Monitoring 2013 Annual Report to Department of Fisheries and Oceans.

Baffinland. 2014. Mary River Project Early Revenue Phase - Tote Road Upgrades, Fish Habitat Monitoring 2014 Annual Report to Department of Fisheries and Oceans.

Baffinland. 2015. Mary River Project Early Revenue Phase - Tote Road Upgrades, Fish Habitat Monitoring 2015 Annual Report to Department of Fisheries and Oceans.

Baffinland. 2016. Mary River Project Early Revenue Phase - Tote Road Upgrades, Fish Habitat Monitoring 2016 Annual Report to Department of Fisheries and Oceans.

Baffinland. 2017. Mary River Project - Tote Road Upgrades, Fish Habitat Monitoring, 2017 Annual Report, Early Revenue Phase, Tote Road Upgrades. Annual Report to Department of Fisheries and Oceans.

British Columbia Ministry of Environment (BCMOE). 2009. Bathymetric standards for lake inventories, Version 3. A standards manual prepared by BCMOE Ecosystems Branch for the Aquatic Ecosystems Task Force Resources Information Standards Committee. 50 pp.

Fisheries and Oceans Canada (DFO and BCMOE. 1989. Fish habitat inventory and information program: Stream survey field guide. 33 p.

Johnson, M.W. and W.J. Bernhardt. 2007. Fish and fish habitat report. A report prepared for Baffinland Iron Mines Corporation by North/South Consultants Inc., Winnipeg, Manitoba. 49 p.

Knight Piésold Ltd. 2007a. Baffinland Iron Mines Corporation, Mary River Project Bulk Sampling Program, Fish Habitat No Net Loss and Monitoring Plan. North Bay, Ontario. Ref. No. NB102-00181/10-4.

Knight Piésold Ltd. 2007b. Baffinland Iron Mines Corporation, Mary River Project Bulk Sampling Program - Tote Road Upgrades, Fish Habitat Monitoring 2007 Annual Report to Department of Fisheries and Oceans. North Bay, Ontario. Ref. No. NB102-00181/10-8.

Knight Piésold Ltd. 2008. Baffinland Iron Mines Corporation, Mary River Project Bulk Sampling Program, Road Upgrades. Fish Habitat Monitoring 2008 Annual Report to Department of Fisheries and Oceans. North Bay, Ontario. Ref. No. NB102-00181/13-1.

North/South Consultants Inc. (NSC). 2006. Alberta standard watercourse crossing assessment protocol. 17 p.

NSC. 2008. Freshwater Aquatic Environment Baseline Report: Fish and Fish Habitat. A report prepared for Knight Piésold Ltd. and Baffinland Iron Mines Corporation by North/South Consultants Inc., Winnipeg, Manitoba. 182 p. + appendices.

NSC. 2018. Mary River Project - Phase 2 Proposal - Technical Supporting Document No. 14, Freshwater Biota and Habitat Assessment. August 2018.

NSC. 2019. Mary River Phase 2 Proposal Update: Project Infrastructure Interactions with Fresh Water Streams and Ponds. Technical Memorandum prepared for Baffinland Iron Mines Corporation by North/South Consultants Inc., Winnipeg, Manitoba. May 1, 2019.

Wentworth, C.K. 1922. A scale of grade and class terms for clastic sediments. The Journal of Geology 30: 377-392.

4.2 PERSONAL COMMUNICATIONS

A. Rees. 2018. Email communication, October 29, 2018.

APPENDIX 1: LIST OF CROSSINGS, CUTS, ENCROACHMENTS/INFILLS, AND BRIDGES AND 2018 FISH HABITAT DESIGNATIONS

Table A1-1. List of stream crossings (culverts), bridges, cuts/diversions, and lake/pond encroachments/infills along the North Rail alignment and habitat designations.

Site	Description	Waterbody Type	Diversion to	Receives Diversion From	UTMs		Arctic Char		Ninespine Stickleback	
					Easting	Northing	Y/N	Habitat Quality	Y/N	Habitat Quality
CV-0-1	Culvert	S		CV-0-2	504289	7975593	N	NFB	N	NFB
CV-0-2	Cut	S	CV-0-1		504234	7975572	N	NFB	N	NFB
CV-0-3	Culvert	S			503796	7975281	N	NFB	N	NFB
CV-1-1	Culvert	LP			503802	7975052	N	NFB	N	NFB
CV-1-2	Culvert	S			503830	7974912	N	NFB	N	NFB
CV-1-3	Culvert	S			503820	7974824	N	NFB	N	NFB
CV-1-4	Culvert	LP			503877	7974421	N	NFB	N	NFB
CV-1-5	Culvert	LP			503938	7974333	N	NFB	N	NFB
CV-1-6	Culvert	S			504292	7974064	N	NFB	N	NFB
CV-1-7	Culvert	S			504662	7973667	N	NFB	N	NFB
CV-1-8	Culvert	S			504895	7973426	N	NFB	N	NFB
CV-1-9	Culvert	S			504924	7973381	N	NFB	N	NFB
CV-2-1	Culvert	S			505154	7973121	N	NFB	N	NFB
CV-2-2	Culvert	S			505217	7973067	N	NFB	N	NFB
CV-3-1	Culvert	LP			505388	7972906	N	NFB	N	NFB
CV-3-2	Culvert	S			505396	7972893	N	NFB	N	NFB
CV-4-1	Culvert	S			505666	7972585	N	NFB	N	NFB
CV-4-2	Culvert	S			505774	7972512	N	NFB	N	NFB
CV-4-3	Culvert	S			505836	7972435	N	NFB	N	NFB
CV-4-4	Culvert	S			505862	7972397	N	NFB	N	NFB
CV-4-5	Culvert	S			506070	7972201	N	NFB	N	NFB
CV-5-1	Culvert	S			506158	7972031	N	NFB	N	NFB
CV-5-2	Culvert	LP			506172	7971999	N	NFB	N	NFB
CV-5-3	Culvert	S			506297	7971792	N	NFB	N	NFB
CV-5-4	Culvert	S			506540	7971622	N	NFB	N	NFB

Table A1-1. List of stream crossings (culverts), bridges, cuts/diversions, and lake/pond encroachments/infills along the North Rail alignment and habitat designations.

Site	Description	Waterbody Type	Diversion to	Receives Diversion From	UTMs		Arctic Char		Ninespine Stickleback	
					Easting	Northing	Y/N	Habitat Quality	Y/N	Habitat Quality
CV-5-5	Culvert	S			506643	7971540	N	NFB	N	NFB
CV-5-6	Culvert	S			506661	7971526	N	NFB	N	NFB
CV-5-7	Culvert	LP			506781	7971420	N	NFB	N	NFB
CV-6-1	Culvert	LP			506927	7971257	N	NFB	N	NFB
CV-6-2	Culvert	LP			507170	7971061	N	NFB	N	NFB
CV-6-3	Culvert	S			507417	7970910	N	NFB	N	NFB
CV-6-4	Culvert	S			507476	7970841	N	NFB	N	NFB
CV-7-1	Culvert	LP			507732	7970526	N	NFB	N	NFB
CV-7-2	Culvert	LP			507884	7970336	N	NFB	N	NFB
CV-7-3	Culvert	LP			507953	7970255	N	NFB	N	NFB
CV-7-4	Culvert	LP			508038	7970146	N	NFB	N	NFB
CV-7-5	Culvert	LP			508060	7970116	N	NFB	N	NFB
CV-7-6	Culvert	LP			508094	7970073	N	NFB	N	NFB
CV-7-7	Culvert	LP			508097	7970069	N	NFB	N	NFB
CV-8-0	Cut	S	CV-8-1 and CV-8-2		508293	7969747	N	NFB	N	NFB
CV-8-1	Culvert	S		CV-8-0	508311	7969712	N	NFB	N	NFB
CV-8-2	Culvert	S		CV-8-0	508325	7969683	N	NFB	N	NFB
CV-8-3	Culvert	S			508351	7969601	N	NFB	N	NFB
CV-8-4	Culvert	LP			508412	7969338	N	NFB	N	NFB
CV-9-1	Culvert	S			508805	7968873	N	NFB	N	NFB
CV-10-1	Culvert	LP			509365	7968264	N	NFB	N	NFB
CV-10-2	Culvert	LP			509637	7968011	N	NFB	N	NFB
CV-10-3	Culvert	LP			509653	7967999	N	NFB	N	NFB
CV-10-4	Culvert	LP			509829	7967867	N	NFB	N	NFB
CV-10-5	Culvert	S			509872	7967824	N	NFB	N	NFB

Table A1-1. List of stream crossings (culverts), bridges, cuts/diversions, and lake/pond encroachments/infills along the North Rail alignment and habitat designations.

Site	Description	Waterbody Type	Diversion to	Receives Diversion From	UTMs		Arctic Char		Ninespine Stickleback	
					Easting	Northing	Y/N	Habitat Quality	Y/N	Habitat Quality
CV-11-1	Culvert	LP			509931	7967723	N	NFB	N	NFB
CV-11-2	Culvert	LP			510076	7967537	N	NFB	N	NFB
CV-11-3	Culvert	S			510214	7967455	N	NFB	N	NFB
CV-11-4	Culvert	LP			510472	7967402	N	NFB	N	NFB
CV-11-5	Culvert	LP			510589	7967385	N	NFB	N	NFB
CV-12-1	Culvert	LP			510933	7967256	N	NFB	N	NFB
CV-12-2	Culvert	LP			511019	7967241	N	NFB	N	NFB
CV-12-3	Culvert	LP			511127	7967223	N	NFB	N	NFB
CV-12-4	Culvert	LP			511355	7967185	N	NFB	N	NFB
CV-12-4b	Cut	LP	CV-12-5 and CV-13-1		511455	7967168	N	NFB	N	NFB
CV-12-5	Culvert	S		CV-12-4b	511552	7967152	N	NFB	N	NFB
CV-13-1	Culvert	LP		CV-12-4b	511798	7967111	N	NFB	N	NFB
CV-13-2	Culvert	LP			512120	7966981	N	NFB	N	NFB
CV-13-3	Culvert	LP			512375	7966823	N	NFB	N	NFB
CV-13-4	Culvert	S			512415	7966799	Y	IMP	N	NFB
CV-13-5	Culvert	S			512556	7966712	N	NFB	N	NFB
CV-14-1	Culvert	LP			513252	7966428	N	NFB	N	NFB
CV-14-2	Pond Infilling + Culvert	P			513436	7966375	N	NFB	N	NFB
CV-14-3	Pond Infilling + Culvert	P			513532	7966333	N	NFB	N	NFB
CV-15-1	Culvert	LP			513624	7966294	N	NFB	N	NFB
CV-15-2	Stream Crossing + Pond Infilling	S/P			513781	7966188	Y	MAR	Y	IMP
CV-15-3	Pond Infilling + Culvert	P			513892	7966034	Y	MAR	Y	IMP
CV-15-4	Pond Infilling + Culvert	P			514123	7965711	N	NFB	N	NFB
CV-15-5	Bridge	S			514239	7965626	Y	IMP	N	NFB
CV-16-1	Culvert	LP			514325	7965565	N	NFB	N	NFB

Table A1-1. List of stream crossings (culverts), bridges, cuts/diversions, and lake/pond encroachments/infills along the North Rail alignment and habitat designations.

Site	Description	Waterbody Type	Diversion to	Receives Diversion From	UTMs		Arctic Char		Ninespine Stickleback	
					Easting	Northing	Y/N	Habitat Quality	Y/N	Habitat Quality
CV-16-2	Stream Crossing + Pond Encroachment	S/P			514768	7965089	N	NFB	N	NFB
CV-16-3	Culvert	S			514811	7964916	N	NFB	N	NFB
CV-17-1	Pond Infilling + Culvert	P			515261	7964025	N	NFB	N	NFB
CV-18-1	Pond Infilling + Culvert	P			515331	7963846	N	NFB	Y	IMP
CV-18-2	Culvert	S			515405	7963693	N	NFB	N	NFB
CV-18-3	Culvert	LP			515607	7963389	N	NFB	N	NFB
CV-18-4	Culvert	LP			515682	7963328	N	NFB	N	NFB
CV-19-1	Culvert	S			515927	7963175	N	NFB	N	NFB
CV-19-2	Pond Infilling + Culvert	P			516161	7963031	N	NFB	N	NFB
CV-19-3	Culvert	LP			516613	7962587	N	NFB	N	NFB
CV-20-1	Culvert	LP		CV-20-2	517040	7962255	N	NFB	N	NFB
CV-20-2	Cut	S	CV-20-1		517267	7962029	N	NFB	N	NFB
CV-21-1	Culvert	LP			517365	7961888	N	NFB	N	NFB
CV-21-2	Culvert	LP			517607	7961640	N	NFB	N	NFB
CV-21-3	Culvert	S			517928	7961308	N	NFB	N	NFB
CV-21-4	Culvert	LP			518010	7961196	N	NFB	N	NFB
CV-22-1	Pond Infilling + Culvert	P			518123	7960950	N	NFB	N	NFB
CV-22-2	Pond Encroachment	P			518232	7960617	N	NFB	N	NFB
CV-22-3	Culvert	LP			518295	7960427	N	NFB	N	NFB
CV-22-4	Pond Encroachment	P			518370	7960198	N	NFB	N	NFB
CV-23-1	Culvert	LP			518441	7959981	N	NFB	N	NFB
CV-23-2	Culvert	S			518501	7959798	N	NFB	N	NFB
CV-23-3	Culvert	LP			518695	7959425	N	NFB	N	NFB
CV-23-4	Culvert	LP			518754	7959335	N	NFB	N	NFB

Table A1-1. List of stream crossings (culverts), bridges, cuts/diversions, and lake/pond encroachments/infills along the North Rail alignment and habitat designations.

Site	Description	Waterbody Type	Diversion to	Receives Diversion From	UTMs		Arctic Char		Ninespine Stickleback	
					Easting	Northing	Y/N	Habitat Quality	Y/N	Habitat Quality
CV-24-1	Culvert	LP			518988	7958946	N	NFB	N	NFB
CV-24-2	Culvert	LP			519081	7958667	N	NFB	N	NFB
CV-24-3	Culvert	S			519153	7958481	N	NFB	N	NFB
CV-25-1	Culvert	LP			519237	7958346	N	NFB	N	NFB
CV-25-2	Culvert	S			519507	7958144	N	NFB	N	NFB
CV-25-3	Culvert	S			519661	7958016	N	NFB	N	NFB
CV-26-1	Pond Infilling + Culvert	P			519989	7957450	N	NFB	N	NFB
CV-26-3	Culvert	LP			520156	7957209	N	NFB	N	NFB
CV-26-4	Culvert	LP			520224	7957110	N	NFB	N	NFB
CV-26-5	Culvert	LP			520386	7956847	N	NFB	N	NFB
CV-27-1	Culvert	LP			520406	7956775	N	NFB	N	NFB
CV-27-2	Culvert	S			520412	7956735	Y	MAR	N	NFB
CV-27-3	Culvert	LP			520516	7956235	N	NFB	N	NFB
CV-27-4	Culvert	LP			520564	7956131	N	NFB	N	NFB
CV-27-5	Culvert	LP			520699	7955833	N	NFB	N	NFB
CV-28-1	Culvert	LP			520722	7955784	N	NFB	N	NFB
CV-28-2	Culvert	S			520749	7955722	N	NFB	N	NFB
CV-28-3	Culvert	LP			520891	7955261	N	NFB	N	NFB
CV-28-4	Culvert	LP			520924	7955182	N	NFB	N	NFB
CV-28-5	Pond Infilling + Culvert	P			521005	7955067	N	NFB	N	NFB
CV-28-6	Culvert	S			521092	7954969	Y	IMP	N	NFB
CV-28-7	Culvert	S			521305	7954680	N	NFB	N	NFB
CV-29-1	Culvert	S			521341	7954608	N	NFB	N	NFB
CV-29-2	Culvert	S			521379	7954516	Y	IMP	N	NFB
CV-29-3	Culvert	S			521464	7954306	N	NFB	N	NFB

Table A1-1. List of stream crossings (culverts), bridges, cuts/diversions, and lake/pond encroachments/infills along the North Rail alignment and habitat designations.

Site	Description	Waterbody Type	Diversion to	Receives Diversion From	UTMs		Arctic Char		Ninespine Stickleback	
					Easting	Northing	Y/N	Habitat Quality	Y/N	Habitat Quality
CV-29-4	Culvert	S			521512	7954187	N	NFB	N	NFB
CV-29-5	Culvert	S			521541	7954115	N	NFB	N	NFB
CV-30-1	Culvert	S			521569	7954040	N	NFB	N	NFB
CV-30-2	Culvert	LP			521609	7953873	N	NFB	N	NFB
CV-30-3	Culvert	LP			521635	7953720	N	NFB	N	NFB
CV-30-4	Culvert	LP			521676	7953461	N	NFB	N	NFB
CV-30-5	Culvert	S			521687	7953363	Y	MAR	N	NFB
CV-30-6	Culvert	LP			521700	7953250	N	NFB	N	NFB
CV-30-7	Pond Infilling + Culvert	P			521712	7953143	N	NFB	N	NFB
CV-31-1	Culvert	S			521748	7952788	Y	IMP	N	NFB
CV-31-2	Culvert	S			521749	7952776	Y	IMP	N	NFB
CV-31-3	Culvert	LP			521763	7952346	N	NFB	N	NFB
CV-31-4	Culvert	LP			521772	7952278	N	NFB	N	NFB
CV-32-1	Culvert	LP			521827	7952066	N	NFB	N	NFB
CV-32-2	Culvert	LP			521882	7951861	N	NFB	N	NFB
CV-32-3	Culvert	LP			521946	7951620	N	NFB	N	NFB
CV-32-4	Culvert	S			521983	7951453	N	NFB	N	NFB
CV-33-1	Culvert	LP			521990	7951011	N	NFB	N	NFB
CV-33-2	Culvert	S			521991	7950911	N	NFB	N	NFB
CV-33-3	Culvert	LP			521990	7950839	N	NFB	N	NFB
CV-33-4	Culvert	S			521976	7950733	N	NFB	N	NFB
CV-33-5	Culvert	LP			521964	7950662	N	NFB	N	NFB
CV-33-6	Culvert	S			521947	7950568	Y	IMP	N	NFB
CV-33-7	Pond Encroachment + Culvert	P			521885	7950215	N	NFB	N	NFB
CV-34-1	Culvert	S			521789	7949673	N	NFB	N	NFB

Table A1-1. List of stream crossings (culverts), bridges, cuts/diversions, and lake/pond encroachments/infills along the North Rail alignment and habitat designations.

Site	Description	Waterbody Type	Diversion to	Receives Diversion From	UTMs		Arctic Char		Ninespine Stickleback	
					Easting	Northing	Y/N	Habitat Quality	Y/N	Habitat Quality
CV-34-2	Culvert	LP			521801	7949153	N	NFB	N	NFB
CV-35-2	Culvert	S			521947	7948828	Y	IMP	N	NFB
CV-35-4	Culvert	LP		CV-35-5	522249	7948287	N	NFB	N	NFB
CV-35-5	Cut	LP	CV-35-4		522298	7948170	N	NFB	N	NFB
CV-37-1	Culvert	LP			522533	7946398	N	NFB	N	NFB
CV-38-1	Culvert	S			522570	7946000	N	NFB	N	NFB
CV-38-2	Culvert	S			522646	7945802	N	NFB	N	NFB
CV-38-3	Culvert	S			522846	7945387	N	NFB	N	NFB
CV-39-1	Culvert	S			523125	7944922	N	NFB	N	NFB
CV-40-1	Culvert	LP			523148	7944309	N	NFB	N	NFB
CV-40-2	Culvert	S			523147	7944150	N	NFB	N	NFB
CV-40-3	Culvert	LP			523231	7943898	N	NFB	N	NFB
CV-40-4	Culvert	LP			523301	7943665	N	NFB	N	NFB
CV-41-1	Culvert	LP			523332	7943397	N	NFB	N	NFB
CV-41-2	Culvert	LP			523342	7943311	N	NFB	N	NFB
CV-41-3	Culvert	LP			523359	7943152	N	NFB	N	NFB
CV-41-4	Culvert	LP			523351	7942963	N	NFB	N	NFB
CV-42-1	Culvert	S			523423	7942323	N	NFB	N	NFB
CV-42-2	Culvert	LP			523475	7941603	N	NFB	N	NFB
CV-43-1	Culvert	S			523647	7941268	N	NFB	N	NFB
CV-43-2	Culvert	LP			523721	7941127	N	NFB	N	NFB
CV-43-3	Culvert	S			523738	7941095	N	NFB	N	NFB
CV-43-4	Culvert	S			523749	7941075	N	NFB	N	NFB
CV-43-5	Culvert	S			523846	7940904	N	NFB	N	NFB
CV-44-1	Culvert	LP			524074	7940563	N	NFB	N	NFB

Table A1-1. List of stream crossings (culverts), bridges, cuts/diversions, and lake/pond encroachments/infills along the North Rail alignment and habitat designations.

Site	Description	Waterbody Type	Diversion to	Receives Diversion From	UTMs		Arctic Char		Ninespine Stickleback	
					Easting	Northing	Y/N	Habitat Quality	Y/N	Habitat Quality
CV-44-2	Culvert	S			524174	7940415	N	NFB	N	NFB
CV-44-3	Culvert	S			524536	7939827	N	NFB	N	NFB
CV-45-1	Culvert	LP			525004	7938965	N	NFB	N	NFB
CV-46-1	Culvert	LP			525118	7938743	N	NFB	N	NFB
CV-46-1a	Cut	P	CV-46-3		525225	7938529	N	NFB	N	NFB
CV-46-2	Culvert	LP			525278	7938537	N	NFB	N	NFB
CV-46-3	Culvert	S		CV-46-1a	525380	7938336	N	NFB	N	NFB
CV-46-4	Culvert	S			525394	7938239	N	NFB	N	NFB
CV-46-6	Culvert	S			525404	7938168	N	NFB	N	NFB
CV-47-1A	Culvert	S			525415	7938089	N	NFB	N	NFB
CV-47-1B	Culvert	S			525454	7937939	N	NFB	N	NFB
CV-47-1	Culvert	S			525683	7937366	Y	IMP	N	NFB
CV-47-2	Culvert	S			525698	7937327	Y	IMP	N	NFB
CV-47-3	Culvert	S			525729	7937268	N	NFB	N	NFB
CV-48-1	Culvert	S/LP			525839	7937127	N	NFB	N	NFB
CV-48-2	Culvert	S/LP			525916	7937063	N	NFB	N	NFB
CV-48-3	Culvert	S			526356	7936875	N	NFB	N	NFB
CV-48-4	Culvert	S			526523	7936808	Y	IMP	N	NFB
CV-49-1	Culvert	LP			526690	7936443	N	NFB	N	NFB
CV-49-2	Culvert	S			526737	7936101	N	NFB	N	NFB
CV-49-3	Culvert	S/LP			526788	7935730	N	NFB	N	NFB
CV-50-1	Culvert	LP			526835	7935393	N	NFB	N	NFB
CV-50-2	Culvert	LP			526863	7935175	N	NFB	N	NFB
CV-50-3	Culvert	LP			526868	7935095	N	NFB	N	NFB
CV-50-4	Culvert	LP			526874	7934905	N	NFB	N	NFB

Table A1-1. List of stream crossings (culverts), bridges, cuts/diversions, and lake/pond encroachments/infills along the North Rail alignment and habitat designations.

Site	Description	Waterbody Type	Diversion to	Receives Diversion From	UTMs		Arctic Char		Ninespine Stickleback	
					Easting	Northing	Y/N	Habitat Quality	Y/N	Habitat Quality
CV-50-4a	Culvert	LP			526876	7934875	N	NFB	N	NFB
CV-50-4b	Culvert	LP			526888	7934776	N	NFB	N	NFB
CV-50-5	Culvert	S			526924	7934630	N	NFB	N	NFB
CV-50-6	Culvert	S			526926	7934620	Y	IMP	N	NFB
CV-51-1	Culvert	LP			527006	7934331	N	NFB	N	NFB
CV-51-2	Culvert	LP			527054	7933628	N	NFB	N	NFB
CV-52-1	Culvert	S			527080	7932998	N	NFB	N	NFB
CV-52-2	Culvert	S			527132	7932787	N	NFB	N	NFB
CV-52-3	Culvert	LP			527180	7932698	N	NFB	N	NFB
CV-53-1	Culvert	LP			527366	7932476	N	NFB	N	NFB
CV-53-2	Pond Infilling + Culvert	P			527274	7932000	N	NFB	N	NFB
CV-54-1	Culvert	S			527333	7931375	N	NFB	N	NFB
CV-54-2	Culvert	S			527529	7930869	N	NFB	N	NFB
CV-55-1	Culvert	LP			527583	7930653	N	NFB	N	NFB
CV-55-2	Culvert	LP			527632	7930421	N	NFB	N	NFB
CV-55-3	Culvert	S			527650	7930339	Y	IMP	N	NFB
CV-56-1	Culvert	S			528085	7929337	Y	MAR	N	NFB
CV-57-1	Culvert	S			528309	7928841	Y	MAR	N	NFB
CV-57-2	Culvert	S			528345	7928683	Y	IMP	N	NFB
CV-58-1	Culvert	S			528241	7927966	N	NFB	N	NFB
CV-58-2	Culvert	S			528168	7927807	N	NFB	N	NFB
CV-58-3	Culvert	S			528109	7927716	N	NFB	N	NFB
CV-58-4	Culvert	S			528062	7927656	N	NFB	N	NFB
CV-58-4a	Culvert	S			527931	7927527	N	NFB	N	NFB
CV-58-5	Culvert	S			527751	7927378	Y	IMP	N	NFB

Table A1-1. List of stream crossings (culverts), bridges, cuts/diversions, and lake/pond encroachments/infills along the North Rail alignment and habitat designations.

Site	Description	Waterbody Type	Diversion to	Receives Diversion From	UTMs		Arctic Char		Ninespine Stickleback	
					Easting	Northing	Y/N	Habitat Quality	Y/N	Habitat Quality
CV-58-6	Culvert	S			527681	7927318	N	NFB	N	NFB
CV-58-7	Cut	S	CV-59-1		527650	7927282	N	NFB	N	NFB
CV-58-8	Cut	S	CV-59-1		527613	7927217	N	NFB	N	NFB
CV-59-1	Culvert	S		CV-58-7 and CV-58-6	527590	7927169	N	NFB	N	NFB
CV-59-2	Culvert	S			527553	7927052	N	NFB	N	NFB
CV-59-3	Culvert	S			527529	7926917	N	NFB	N	NFB
CV-59-4b	Cut	LP	CV-59-4		527467	7926817	N	NFB	N	NFB
CV-59-4	Culvert	S		CV-59-4a and b	527395	7926734	Y	MAR	N	NFB
CV-59-4a	Cut	S	CV-59-4		527329	7926595	N	NFB	N	NFB
CV-59-5	Culvert	S			527272	7926457	N	NFB	N	NFB
CV-60-1	Culvert	S			527202	7926246	N	NFB	N	NFB
CV-60-2	Pond Infilling + Stream Crossing	S/P			527214	7926070	N	NFB	N	NFB
CV-60-3	Culvert	S			527225	7925961	N	NFB	N	NFB
CV-60-4	Culvert	S			527243	7925782	N	NFB	N	NFB
CV-60-4a	Cut	LP	CV-60-5		527252	7925685	N	NFB	N	NFB
CV-60-5	Culvert	S		CV-60-4a	527273	7925480	N	NFB	N	NFB
CV-60-6	Culvert	S			527283	7925381	N	NFB	N	NFB
CV-61-1	Culvert	S			527296	7925237	N	NFB	N	NFB
CV-61-2	Culvert	S		CV-61-3	527181	7925009	N	NFB	N	NFB
CV-61-3	Cut	S	CV-61-2		527023	7924876	N	NFB	N	NFB
CV-62-1	Culvert	S			526868	7924453	Y	IMP	N	NFB
CV-62-2	Culvert	S			526897	7924167	N	NFB	N	NFB
CV-62-3	Cut	S	CV-62-4		526951	7923938	N	NFB	N	NFB
CV-62-4	Culvert	LP		CV-62-3	526975	7923621	N	NFB	N	NFB
CV-62-5	Culvert	LP		CV-62-6 and CV-62-6b	526982	7923557	N	NFB	N	NFB

Table A1-1. List of stream crossings (culverts), bridges, cuts/diversions, and lake/pond encroachments/infills along the North Rail alignment and habitat designations.

Site	Description	Waterbody Type	Diversion to	Receives Diversion From	UTMs		Arctic Char		Ninespine Stickleback	
					Easting	Northing	Y/N	Habitat Quality	Y/N	Habitat Quality
CV-62-6	Cut	S	CV-62-5		527016	7923383	N	NFB	N	NFB
CV-62-6b	Cut	S	CV-62-5		527011	7923411	N	NFB	N	NFB
CV-63-1	Culvert	S			527058	7923177	N	NFB	N	NFB
CV-63-2	Culvert	S			527100	7923086	N	NFB	N	NFB
CV-63-3	Culvert	S		CV-63-3a	527162	7922964	N	NFB	N	NFB
CV-63-3a	Cut	LP	CV-63-3		527179	7922796	N	NFB	N	NFB
CV-63-4	Culvert	S			527204	7922667	N	NFB	N	NFB
CV-63-4a	Culvert	S			527229	7922619	N	NFB	N	NFB
CV-63-5	Culvert	S			527241	7922603	N	NFB	N	NFB
CV-64-1	Culvert	S			527295	7922538	N	NFB	N	NFB
CV-64-2	Culvert	S			527414	7922399	N	NFB	N	NFB
CV-64-3	Culvert	S			527482	7922239	N	NFB	N	NFB
CV-64-4	Culvert	S			527625	7921956	N	NFB	N	NFB
CV-64-5a	Cut	LP	CV-64-5		527688	7921835	N	NFB	N	NFB
CV-64-5	Culvert	S		CV-64-5a	527743	7921726	N	NFB	N	NFB
CV-64-6	Culvert	S			527757	7921691	N	NFB	N	NFB
CV-65-1	Culvert	S			527793	7921396	N	NFB	N	NFB
CV-65-2a	Cut	LP	CV-65-2		527803	7921140	N	NFB	N	NFB
CV-65-2	Pond Infilling + Culvert	P		CV-65-2a	527828	7920934	N	NFB	N	NFB
CV-66-1	Culvert	S			527959	7920627	N	NFB	N	NFB
CV-66-2a	Cut	LP	CV-66-2		528013	7920571	N	NFB	N	NFB
CV-66-2	Culvert	LP		CV-66-2a	528063	7920532	N	NFB	N	NFB
CV-66-3	Culvert	S			528328	7920342	N	NFB	N	NFB
CV-66-4	Culvert	LP			528359	7920292	N	NFB	N	NFB
CV-66-5	Culvert	S			528389	7920187	N	NFB	N	NFB

Table A1-1. List of stream crossings (culverts), bridges, cuts/diversions, and lake/pond encroachments/infills along the North Rail alignment and habitat designations.

Site	Description	Waterbody Type	Diversion to	Receives Diversion From	UTMs		Arctic Char		Ninespine Stickleback	
					Easting	Northing	Y/N	Habitat Quality	Y/N	Habitat Quality
CV-66-6	Culvert	S			528390	7920161	N	NFB	N	NFB
CV-66-7	Culvert	S			528378	7920014	N	NFB	N	NFB
CV-66-8	Culvert	S			528376	7919987	N	NFB	N	NFB
CV-67-1	Culvert	S			528299	7919743	N	NFB	N	NFB
CV-67-2	Culvert	S			528226	7918995	N	NFB	N	NFB
CV-68-1a	Culvert	S			528200	7918864	Y	IMP	N	NFB
CV-68-1	Culvert	S			528199	7918838	Y	IMP	N	NFB
CV-68-2	Culvert	LP			528194	7918768	N	NFB	N	NFB
CV-68-3	Culvert	S			528059	7918496	N	NFB	N	NFB
CV-68-4	Culvert	LP			528055	7918461	N	NFB	N	NFB
CV-68-5	Culvert	S			528081	7918334	N	NFB	N	NFB
CV-69-1	Culvert	LP			528322	7917862	N	NFB	N	NFB
CV-69-2	Culvert	S			528438	7917517	N	NFB	N	NFB
CV-69-3	Culvert	S			528458	7917456	N	NFB	N	NFB
CV-69-4	Culvert	S			528474	7917407	N	NFB	N	NFB
CV-70-1	Pond Encroachment	P			528704	7916939	N	NFB	N	NFB
CV-70-2	Culvert	S			529030	7916745	Y	MAR	Y	MAR
CV-70-3	Bridge	S			529120	7916693	Y	IMP	Y	MAR
CV-71-1	Pond Infilling + Culvert	P			529451	7916535	Y	IMP	N	NFB
CV-71-2a	Pond Encroachment	P			529708	7916558	N	NFB	N	NFB
CV-71-3	Culvert	LP			529965	7916706	N	NFB	N	NFB
CV-71-4	Culvert	LP			530214	7916862	N	NFB	N	NFB
CV-72-1	Culvert	S			530370	7916951	N	NFB	N	NFB
CV-72-1a	Culvert	S			530587	7917015	N	NFB	N	NFB
CV-72-2	Culvert	S			530784	7917069	N	NFB	N	NFB

Table A1-1. List of stream crossings (culverts), bridges, cuts/diversions, and lake/pond encroachments/infills along the North Rail alignment and habitat designations.

Site	Description	Waterbody Type	Diversion to	Receives Diversion From	UTMs		Arctic Char		Ninespine Stickleback	
					Easting	Northing	Y/N	Habitat Quality	Y/N	Habitat Quality
CV-72-3	Culvert	S			531048	7917142	N	NFB	N	NFB
CV-72-3a	Culvert	S			531130	7917165	N	NFB	N	NFB
CV-72-4	Culvert	S			531160	7917173	N	NFB	N	NFB
CV-73-1	Culvert	LP			531795	7917555	N	NFB	N	NFB
CV-73-2	Culvert	S			532007	7918051	N	NFB	N	NFB
CV-73-3	Culvert	S			532156	7918212	N	NFB	N	NFB
CV-73-4	Culvert	S			532303	7918244	N	NFB	N	NFB
CV-74-1	Culvert	S			532376	7918246	N	NFB	N	NFB
CV-74-2	Culvert	LP			532406	7918246	N	NFB	N	NFB
CV-74-3	Culvert	LP			532735	7918374	N	NFB	N	NFB
CV-74-4	Culvert	LP			532888	7918494	N	NFB	N	NFB
CV-74-6	Culvert	S		CV-74-7	532988	7918553	N	NFB	N	NFB
CV-74-7	Cut	S	CV-74-6		533258	7918549	N	NFB	N	NFB
CV-75-1	Culvert	S			533398	7918521	N	NFB	N	NFB
CV-75-1a	Culvert	S			533444	7918512	N	NFB	N	NFB
CV-75-2	Culvert	S			533559	7918501	N	NFB	N	NFB
CV-76-1	Culvert	S			533900	7918535	N	NFB	N	NFB
CV-76-1a	Culvert	LP			534333	7918581	N	NFB	N	NFB
CV-76-2	Culvert	LP			534506	7918563	N	NFB	N	NFB
CV-76-3	Culvert	LP			534825	7918511	N	NFB	N	NFB
CV-77-1	Culvert	LP			534992	7918491	N	NFB	N	NFB
CV-77-2	Culvert	S			535267	7918560	Y	IMP	N	NFB
CV-77-3	Culvert	S			535497	7918521	N	NFB	N	NFB
CV-78-1	Culvert	LP			535691	7918488	N	NFB	N	NFB
CV-78-2	Culvert	LP			535890	7918531	N	NFB	N	NFB

Table A1-1. List of stream crossings (culverts), bridges, cuts/diversions, and lake/pond encroachments/infills along the North Rail alignment and habitat designations.

Site	Description	Waterbody Type	Diversion to	Receives Diversion From	UTMs		Arctic Char		Ninespine Stickleback	
					Easting	Northing	Y/N	Habitat Quality	Y/N	Habitat Quality
CV-78-3	Culvert	S			536006	7918599	N	NFB	N	NFB
CV-78-4	Culvert	LP			536163	7918706	N	NFB	N	NFB
CV-78-5	Culvert	LP			536237	7918756	N	NFB	N	NFB
CV-78-6	Culvert	S			536450	7918866	N	NFB	N	NFB
CV-79-0	Culvert	S			537243	7919138	N	NFB	N	NFB
CV-79-1	Culvert	LP			537418	7919175	N	NFB	N	NFB
CV-80-1	Culvert	S			537461	7919180	Y	MAR	N	NFB
CV-80-1a	Culvert	LP			537487	7919182	N	NFB	N	NFB
CV-80-2	Culvert	S			538320	7919565	N	NFB	N	NFB
CV-80-2a	Culvert	S			538307	7919556	N	NFB	N	NFB
CV-80-2b	Culvert	S			538334	7919573	N	NFB	N	NFB
CV-80-3	Culvert	S			538453	7919642	N	NFB	N	NFB
CV-80-4	Culvert	S			538510	7919675	N	NFB	N	NFB
CV-80-5	Culvert	LP			538604	7919729	N	NFB	N	NFB
CV-81-1	Culvert	S			538691	7919779	N	NFB	N	NFB
CV-81-2	Culvert	S			538879	7919924	N	NFB	N	NFB
CV-81-3	Culvert	S			538942	7920004	N	NFB	N	NFB
CV-81-4	Culvert	S			539077	7920175	N	NFB	N	NFB
CV-82-1	Culvert	S		CV-82-1a	539131	7920244	N	NFB	N	NFB
CV-82-1a	Cut	LP	CV-82-1		539242	7920376	N	NFB	N	NFB
CV-82-2	Culvert	S			539376	7920489	N	NFB	N	NFB
CV-82-3	Culvert	LP			539508	7920599	N	NFB	N	NFB
CV-82-4	Culvert	LP			539729	7920783	N	NFB	N	NFB
CV-83-1	Culvert	S			539835	7920871	Y	MAR	N	NFB
CV-83-1a	Culvert	S			539887	7920915	N	NFB	N	NFB

Table A1-1. List of stream crossings (culverts), bridges, cuts/diversions, and lake/pond encroachments/infills along the North Rail alignment and habitat designations.

Site	Description	Waterbody Type	Diversion to	Receives Diversion From	UTMs		Arctic Char		Ninespine Stickleback	
					Easting	Northing	Y/N	Habitat Quality	Y/N	Habitat Quality
CV-83-2	Culvert	S			540162	7921134	N	NFB	Y	IMP
CV-84-1	Culvert	S			540842	7921510	Y	IMP	Y	IMP
CV-84-2	Culvert	S			541030	7921642	N	NFB	N	NFB
CV-84-3	Culvert	S			541294	7921948	N	NFB	N	NFB
CV-85-1	Culvert	S			541514	7922054	N	NFB	N	NFB
CV-85-2	Culvert	S			541921	7922236	N	NFB	N	NFB
CV-85-3	Bridge	S			542213	7922215	Y	IMP	Y	IMP
CV-85-4	Culvert	S			542288	7922156	Y	IMP	Y	IMP
CV-86-1	Pond Encroachment + Culvert	P			542671	7921780	N	NFB	N	NFB
CV-86-2	Culvert	S			542753	7921708	Y	MAR	Y	IMP
CV-87-1	Culvert	LP			543078	7921473	N	NFB	N	NFB
CV-87-2	Culvert	LP			543392	7921247	N	NFB	N	NFB
CV-87-3	Culvert	LP			543532	7921170	N	NFB	N	NFB
CV-87-4	Culvert	S			543736	7921141	N	NFB	N	NFB
CV-88-1	Culvert	LP			543976	7921204	N	NFB	N	NFB
CV-88-2	Culvert	S			544209	7921282	N	NFB	N	NFB
CV-88-3	Culvert	S			544259	7921299	N	NFB	N	NFB
CV-88-4	Culvert	LP			545151	7921245	N	NFB	N	NFB
CV-89-1	Culvert	S			545492	7921173	Y	IMP	Y	IMP
CV-89-2	Pond Infilling + Culvert	P			545729	7921121	N	NFB	N	NFB
CV-90-1	Culvert	LP			545902	7921048	N	NFB	N	NFB
CV-90-2	Cut	S	CV-90-3		546181	7920409	N	NFB	N	NFB
CV-90-3	Culvert	S		CV-90-2 and CV-90-4	546240	7920244	N	NFB	N	NFB
CV-90-4	Cut	S	CV-90-3		546459	7920041	N	NFB	N	NFB
CV-91-0	Culvert	S			546858	7919853	N	NFB	N	NFB

Table A1-1. List of stream crossings (culverts), bridges, cuts/diversions, and lake/pond encroachments/infills along the North Rail alignment and habitat designations.

Site	Description	Waterbody Type	Diversion to	Receives Diversion From	UTMs		Arctic Char		Ninespine Stickleback	
					Easting	Northing	Y/N	Habitat Quality	Y/N	Habitat Quality
CV-91-1	Culvert	S			546928	7919820	N	NFB	N	NFB
CV-91-2	Culvert	S			547012	7919781	N	NFB	N	NFB
CV-92-1b	Cut	LP	CV-92-1		547125	7919725	N	NFB	N	NFB
CV-92-1	Pond Encroachment + Culvert	P		CV-92-1b	547173	7919694	N	NFB	N	NFB
CV-92-2	Culvert	LP			547416	7919506	N	NFB	N	NFB
CV-92-3	Culvert	S			547521	7919456	N	NFB	N	NFB
CV-92-4	Culvert	LP			547721	7919363	N	NFB	N	NFB
CV-92-5	Culvert	S			547879	7919262	Y	IMP	N	NFB
CV-92-6	Culvert	LP			547927	7919241	N	NFB	N	NFB
CV-92-7	Culvert	S			548001	7919220	N	NFB	N	NFB
CV-92-8	Culvert	S			548033	7919215	N	NFB	N	NFB
CV-92-9	Culvert	S			548062	7919211	N	NFB	N	NFB
CV-93-1	Culvert	LP			548228	7919188	N	NFB	N	NFB
CV-93-2	Culvert	LP			548355	7919148	N	NFB	N	NFB
CV-93-3	Culvert	LP			548601	7918857	N	NFB	N	NFB
CV-93-3a	Culvert	S			548670	7918765	N	NFB	N	NFB
CV-93-4a	Culvert	S			548749	7918703	N	NFB	N	NFB
CV-93-4b	Culvert	S			548701	7918736	N	NFB	N	NFB
CV-93-4	Culvert	S			548770	7918691	Y	IMP	N	NFB
CV-94-1	Culvert	LP			548899	7918649	N	NFB	N	NFB
CV-94-2	Culvert	S		CV-95-1	549840	7918391	N	NFB	N	NFB
CV-95-1	Cut	LP	CV-94-2		550005	7918257	N	NFB	N	NFB
CV-95-2	Culvert	S			550144	7918111	N	NFB	N	NFB
CV-95-3	Culvert	S			550483	7917613	N	NFB	N	NFB
CV-95-4	Culvert	S			550630	7917484	N	NFB	N	NFB

Table A1-1. List of stream crossings (culverts), bridges, cuts/diversions, and lake/pond encroachments/infills along the North Rail alignment and habitat designations.

Site	Description	Waterbody Type	Diversion to	Receives Diversion From	UTMs		Arctic Char		Ninespine Stickleback	
					Easting	Northing	Y/N	Habitat Quality	Y/N	Habitat Quality
CV-95-5	Culvert	LP			550708	7917426	N	NFB	N	NFB
CV-95-5a	Culvert	S			550781	7917371	N	NFB	N	NFB
CV-95-6	Culvert	S			550832	7917333	N	NFB	N	NFB
CV-95-7	Culvert	LP			550885	7917294	N	NFB	N	NFB
CV-96-1	Culvert	S			550924	7917265	Y	IMP	Y	IMP
CV-96-2	Culvert	S			550964	7917235	N	NFB	N	NFB
CV-96-3	Culvert	LP			551117	7917101	N	NFB	N	NFB
CV-97-1	Culvert	S			551191	7917013	N	NFB	N	NFB
CV-97-2	Culvert	S			551226	7916972	N	NFB	N	NFB
CV-97-3	Culvert	S			551254	7916940	N	NFB	N	NFB
CV-97-4	Culvert	S			551292	7916898	N	NFB	N	NFB
CV-97-5	Culvert	S		CV-97-6	551351	7916843	N	NFB	N	NFB
CV-97-5b	Culvert	S			551326	7916865	N	NFB	N	NFB
CV-97-6	Cut	S	CV-97-5		551457	7916754	N	NFB	N	NFB
CV-97-7	Culvert	S			551576	7916658	N	NFB	N	NFB
CV-97-7a	Culvert	S			551560	7916671	N	NFB	N	NFB
CV-97-9	Culvert	S			551629	7916614	N	NFB	N	NFB
CV-97-10	Culvert	S			551781	7916475	N	NFB	N	NFB
CV-97-11	Culvert	LP			551823	7916434	N	NFB	N	NFB
CV-97-12	Culvert	LP			551891	7916370	N	NFB	N	NFB
CV-98-0	Culvert	LP			552001	7916266	N	NFB	N	NFB
CV-98-1	Culvert	LP			552043	7916226	N	NFB	N	NFB
CV-99-1	Pond Infilling + Culvert	P			552464	7915930	N	NFB	N	NFB
CV-99-2	Culvert	S/LP			552958	7915502	N	NFB	N	NFB
CV-99-3	Culvert	S			553253	7915414	Y	IMP	Y	IMP

Table A1-1. List of stream crossings (culverts), bridges, cuts/diversions, and lake/pond encroachments/infills along the North Rail alignment and habitat designations.

Site	Description	Waterbody Type	Diversion to	Receives Diversion From	UTMs		Arctic Char		Ninespine Stickleback	
					Easting	Northing	Y/N	Habitat Quality	Y/N	Habitat Quality
CV-100-1	Culvert	LP			553579	7915319	N	NFB	N	NFB
CV-100-2	Culvert	LP			553862	7915292	N	NFB	N	NFB
CV-100-3	Culvert	LP			554050	7915379	N	NFB	N	NFB
CV-100-4	Culvert	S			554185	7915443	N	NFB	N	NFB
CV-101-1	Culvert	S		CV-101-1a and CV-101-1b	554664	7915456	N	NFB	N	NFB
CV-101-1a	Cut	S	CV-101-1		554772	7915455	N	NFB	N	NFB
CV-101-1b	Cut	S	CV-101-1		554885	7915454	N	NFB	N	NFB
CV-101-2	Culvert	S			555200	7915449	N	NFB	N	NFB
CV-102-1	Bridge	S			555728	7915442	Y	IMP	N	NFB
CV-102-1a	Cut	LP	CV-102-2		555891	7915441	N	NFB	N	NFB
CV-102-2	Culvert	S		CV-102-1a	556019	7915438	Y	IMP	N	NFB
CV-102-3	Culvert	S			556373	7915485	N	NFB	N	NFB
CV-102-4	Culvert	S			556461	7915488	N	NFB	N	NFB
CV-102-5	Cut	S	CV-103-1		557111	7915356	N	NFB	N	NFB
CV-103-1	Culvert	S		CV-102-5	557447	7915244	Y	IMP	N	NFB
CV-104-1	Culvert	S			557574	7915202	N	NFB	N	NFB
CV-104-2	Culvert	S			557882	7915099	N	NFB	N	NFB
CV-104-3	Culvert	S			557996	7915052	N	NFB	N	NFB
CV-104-4	Culvert	LP			558154	7914976	N	NFB	N	NFB
CV-104-5	Culvert	S			558340	7914885	Y	IMP	Y	MAR
CV-105-1	Culvert	S			558552	7914777	N	NFB	N	NFB
CV-105-2	Culvert	S			558750	7914656	Y	MAR	Y	IMP
CV-105-3	Pond Infilling + Culvert	P			558875	7914578	Y	MAR	Y	IMP
CV-105-4	Culvert	S			559196	7914375	Y	MAR	Y	IMP
CV-106-1	Pond Infilling + Culvert	P			559334	7914281	Y	MAR	Y	IMP

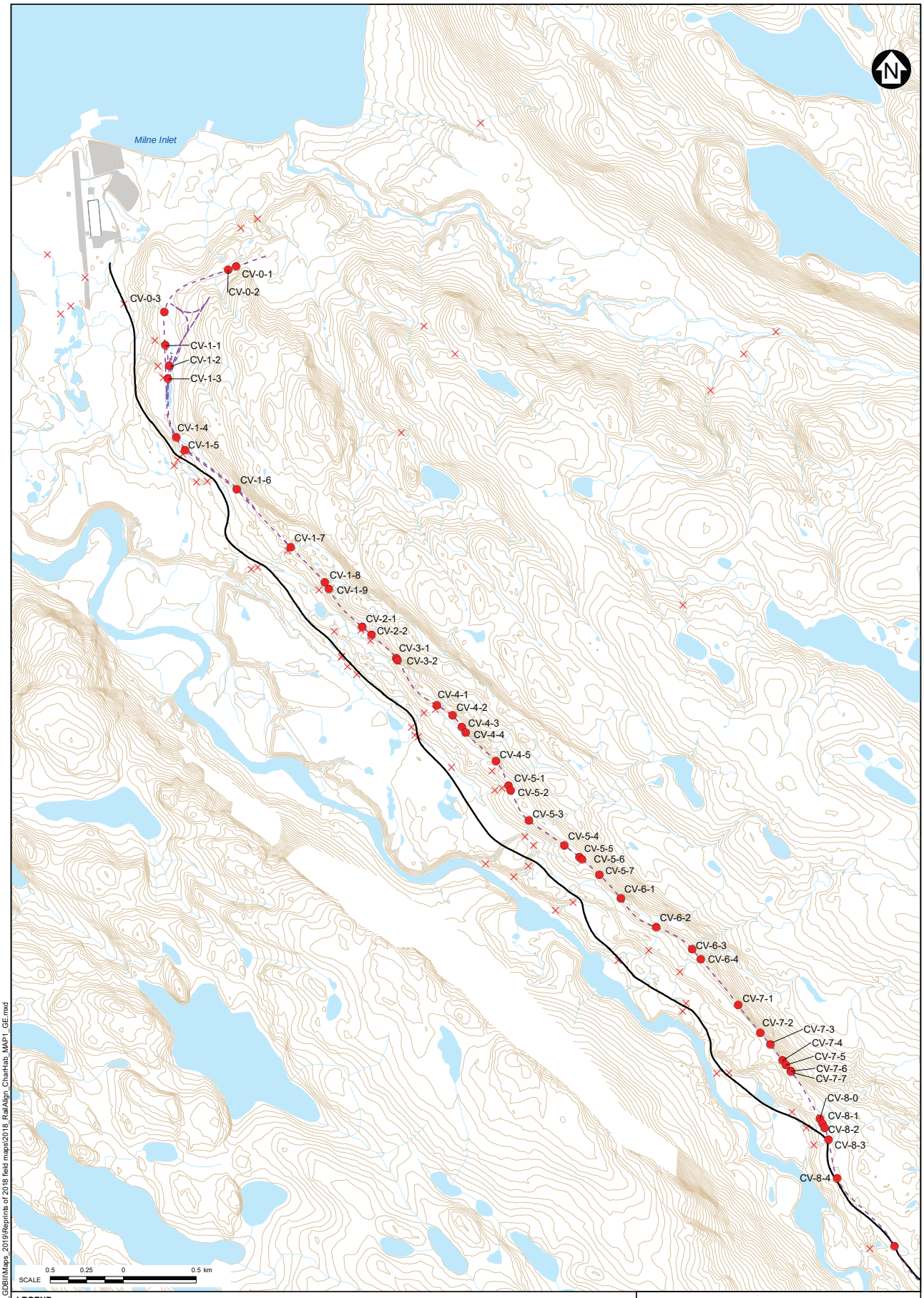
Table A1-1. List of stream crossings (culverts), bridges, cuts/diversions, and lake/pond encroachments/infills along the North Rail alignment and habitat designations.

Site	Description	Waterbody Type	Diversion to	Receives Diversion From	UTMs		Arctic Char		Ninespine Stickleback	
					Easting	Northing	Y/N	Habitat Quality	Y/N	Habitat Quality
CV-106-2	Pond Infilling + Culvert	P			559615	7914085	Y	MAR	Y	IMP
CV-106-3	Pond Encroachment	P			559980	7913834	Y	MAR	Y	IMP
CV-107-1	Pond Infilling + Culvert	P			560409	7913682	N	NFB	N	NFB
CV-107-2	Culvert	LP			560529	7913655	N	NFB	N	NFB
CV-107-3	Pond Infilling + Culvert	P			560660	7913555	N	NFB	N	NFB
CV-107-4	Culvert	S			560706	7913502	Y	IMP	Y	IMP
CV-108-1	Culvert	LP			560926	7913247	N	NFB	N	NFB
CV-108-2	Culvert	LP			560963	7913204	N	NFB	N	NFB
CV-108-3	Culvert	S			561364	7912739	N	NFB	N	NFB
CV-109-1	Cut	S	CV-109-2		561858	7912345	N	NFB	N	NFB
CV-109-2	Culvert	S		CV-109-1	561975	7912252	N	NFB	N	NFB
CV-109-3	Culvert	LP			562017	7912220	N	NFB	N	NFB
CV-110-1	Culvert	S			561084	7912910	N	NFB	N	NFB
CV-110-2	Pond Encroachment + Culvert	P			561266	7912241	N	NFB	N	NFB
CV-110-3	Pond Infilling + Culvert	P			561445	7912240	N	NFB	N	NFB
CV-110-4	Pond Infilling + Culvert	P			561546	7912425	N	NFB	N	NFB

S = stream; P = pond; LP = Low point; L = Lake; Y = Yes; N = No; P = Potential; NFB = Not Fish-Bearing; IMP = Important; MAR = Marginal

[1] Fish not present in 2018 field surveys but observed in a minimum of one previous survey

APPENDIX 2. NORTH RAIL CORRIDOR AND TOTE ROAD REALIGNMENT 2018 FISH HABITAT CLASSIFICATION MAPS



LEGEND:

ARCTIC CHAR HABITAT

- NO
- YES

- PROPOSED NORTH RAILWAY (JUNE 2018)
- MILNE INLET TOTE ROAD (EXISTING)
- MILNE INLET TOTE ROAD (REALIGNMENT)
- CONTOUR (5M INTERVAL)
- INFRASTRUCTURE

- PERMANENT BARRIER
- SOFT / SEASONAL BARRIER

NOTES:

1. BASE MAP: © HER MAJESTY THE QUEEN IN RIGHTS OF CANADA DEPARTMENT OF NATURAL RESOURCES (2009.) ALL RIGHTS RESERVED.
2. TOPOGRAPHY PROVIDED BY EAGLE MAPPING (2005)
3. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.
4. CONTOUR INTERVAL IS 5 M AND IS IN METRES.

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

2018 FISH HABITAT FIELD INVESTIGATIONS (MAP 1 OF 13)

North/South Consultants Inc.
Aquatic Environment Specialists

P/A NO.	REF NO.
-	-

DATE: 02/11/2018

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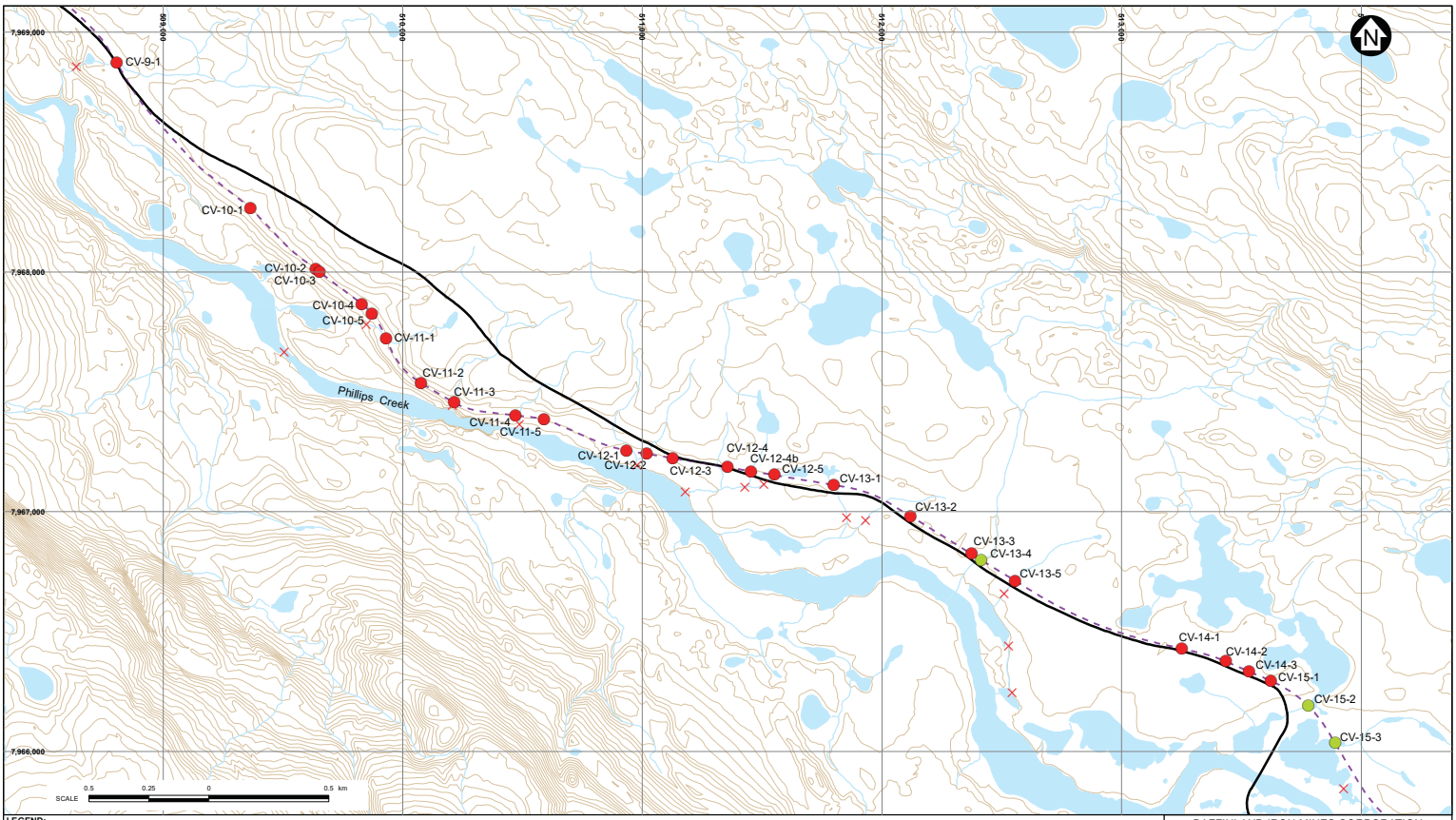

LEGEND:

ARCTIC CHAR HABITAT

- NO
- YES

- PROPOSED NORTH RAILWAY (JUNE 2018)
- MILNE INLET TOTE ROAD (EXISTING)
- CONTOUR (5M INTERVAL)
- INFRASTRUCTURE

- PERMANENT BARRIER
- SOFT / SEASONAL BARRIER

NOTES:

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2. TOPOGRAPHY PROVIDED BY EAGLE MAPPING (2005)
3. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.
4. CONTOUR INTERVAL IS 5 M AND IS IN METRES.

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

2018 FISH HABITAT FIELD INVESTIGATIONS (MAP 2 OF 13)

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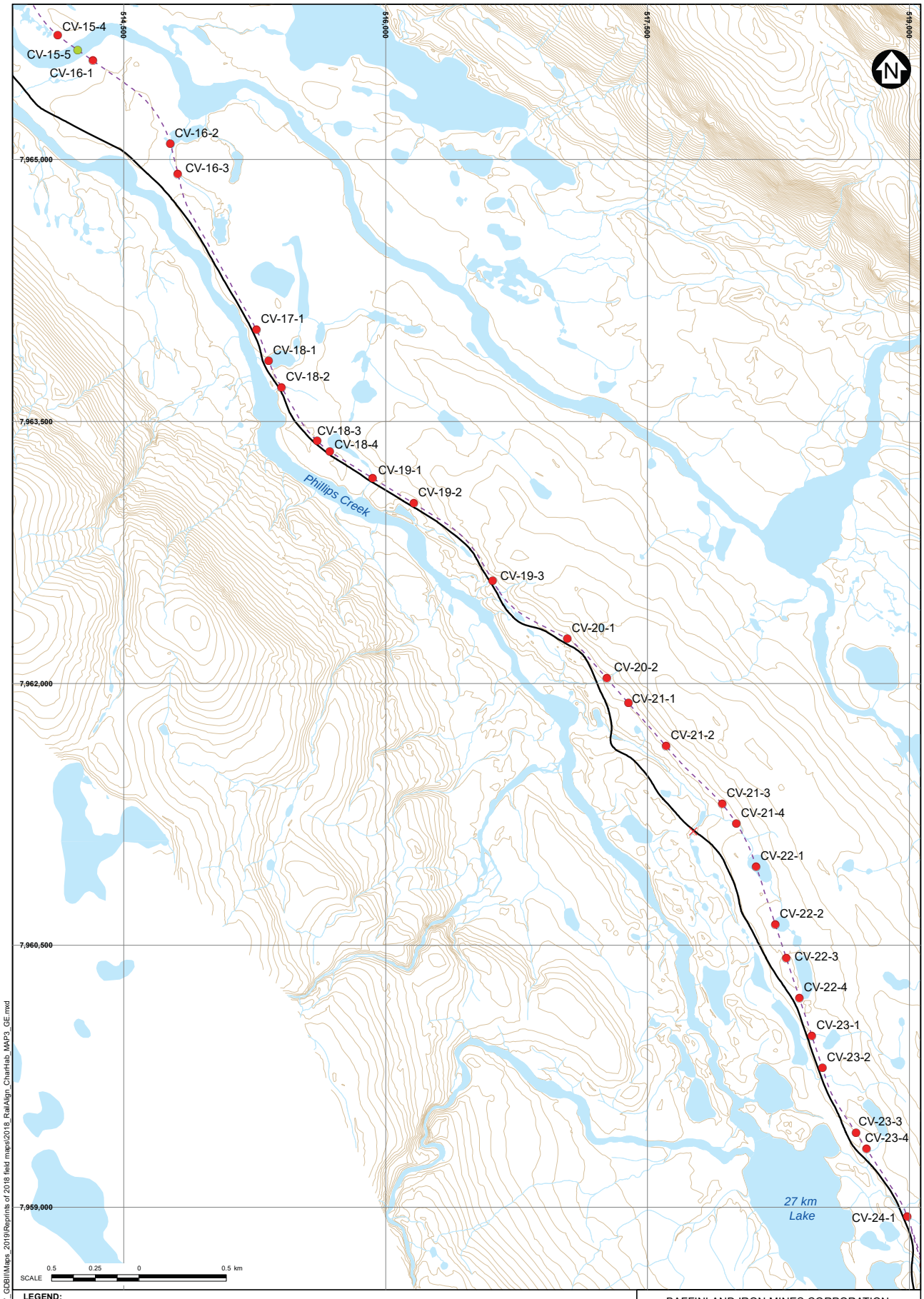

LEGEND:

ARCTIC CHAR HABITAT

- NO
- YES

- PROPOSED NORTH RAILWAY (JUNE 2018)
- MILNE INLET TOTE ROAD (EXISTING)
- CONTOUR (5M INTERVAL)
- INFRASTRUCTURE

- PERMANENT BARRIER
- SOFT / SEASONAL BARRIER

NOTES:

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2. TOPOGRAPHY PROVIDED BY EAGLE MAPPING (2005)
3. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.
4. CONTOUR INTERVAL IS 5 M AND IS IN METRES.

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

2018 FISH HABITAT FIELD INVESTIGATIONS (MAP 3 OF 13)

North/South Consultants Inc.
Aquatic Environment Specialists

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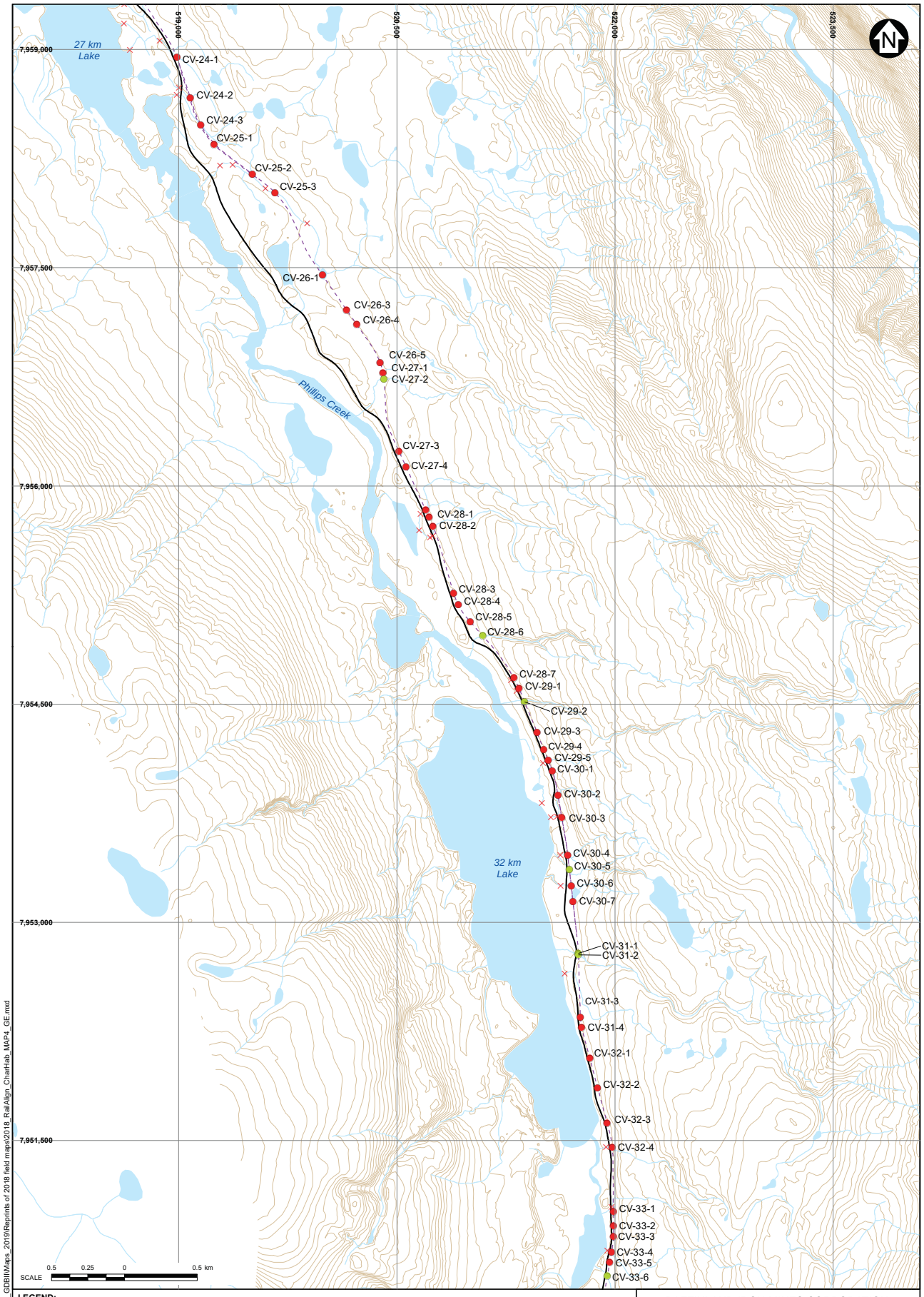

LEGEND:

ARCTIC CHAR HABITAT

- NO
- YES

- PROPOSED NORTH RAILWAY (JUNE 2018)
- MILNE INLET TOTE ROAD (EXISTING)
- CONTOUR (5M INTERVAL)
- INFRASTRUCTURE

- PERMANENT BARRIER
- SOFT / SEASONAL BARRIER

NOTES:

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2. TOPOGRAPHY PROVIDED BY EAGLE MAPPING (2005)
3. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.
4. CONTOUR INTERVAL IS 5 M AND IS IN METRES.

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MARY RIVER PROJECT

2018 FISH HABITAT FIELD INVESTIGATIONS (MAP 4 OF 13)

North/South Consultants Inc.
Aquatic Environment Specialists

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