



Baffinland Iron Mines Corporation Mary River Project

Potential Offsetting Sites: 2023 Freshwater Habitat Surveys

REPORT

Prepared for Baffinland Iron Mines Corporation
By North/South Consultants Inc. • 83 Scurfield Blvd. • Winnipeg, MB • R3Y 1G4

BAFFINLAND IRON MINES CORPORATION
MARY RIVER PROJECT – STEENSBY RAILWAY

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2023 FRESHWATER HABITAT SURVEYS

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ABBREVIATIONS AND ACRONYMS

ARCH	Arctic Char
CPUE	Catch-per-unit-effort
ERP	Early Revenue Phase
FEIS	Final Environmental Impact Statement
Mtpa	Million tonnes per annum
N	No
NIRB	Nunavut Impact Review Board
NNST	Ninespine Stickleback
NR	Not recorded
NSC	North/South Consultants Inc.
P	Potential
UTM	Universal Transverse Mercator
Y	Yes
YOY	Young-of-the-year

1.0 INTRODUCTION

The Mary River Project is an operating iron ore mine located in the Qikiqtani Region of Nunavut. 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 (Baffinland 2012).

The existing Early Revenue Phase (ERP) operation involves open pit mining of up to 6 million tonnes per annum (Mtpa) of ore and transporting the ore by long-haul trucks to a port facility at Milne Inlet (Milne Port) for shipment during the open-water season.

Baseline field surveys were undertaken in 2021-2023 to provide an updated assessment of potential interactions between Project infrastructure associated with the Steensby Rail and Port and fish habitat and to support an application for a *Fisheries Act Authorization*. The results of those surveys were presented in North/South Consultants Inc. (NSC 2024a,b).

This report presents the methods and results of a baseline field survey conducted in late summer/fall 2023 at 13 sites in nine lakes identified as potential offsetting locations (Figure 1; Table 1). The survey sites were located in nearshore habitat in the vicinity of tributary stream mouths or lake outflows. The primary objectives of the field program were to:

- Assess fish presence/absence, abundance, and size of the two fish species present in the study area (Arctic Char [*Salvelinus alpinus*] and Ninespine Stickleback [*Pungitius pungitius*]), at each of the sites; and
- Conduct a habitat assessment at each of the sites.

Table 1. Locations of the 13 potential offsetting sites.

Lake Name	Site	Survey Date	Zone	Easting	Northing
Lake ST-27	001	30-Aug-23	17 W	594350	7803713
Lake ST-93	002	03-Sep-23	17 W	596847	7803877
Lake ST-176	003	30-Aug-23	17 W	598205	7804573
Ikpikitturjuaq Lake/ 10 Km Lake/ Lake ST-347	004	30-Aug-23	17 W	597599	7805651
	005	31-Aug-23	17 W	596239	7806246
Lake ST-352	006	24-Aug-23	17 W	598818	7808224
Cockburn Lake -South Basin	007	20-Aug-23	17 W	598119	7817703
	008	20-Aug-23	17 W	598001	7818001
	009	20-Aug-23	17 W	597531	7818253
Unnamed Lake Km 8	010	18-Aug-23	17 W	568581	7907289
Unnamed Lake Km 7	011	18-Aug-23	17 W	567744	7907985
Unnamed Lake Km 3-6	012	02-Sep-23	17 W	566922	7908699
	013	02-Sep-23	17 W	565272	7909895

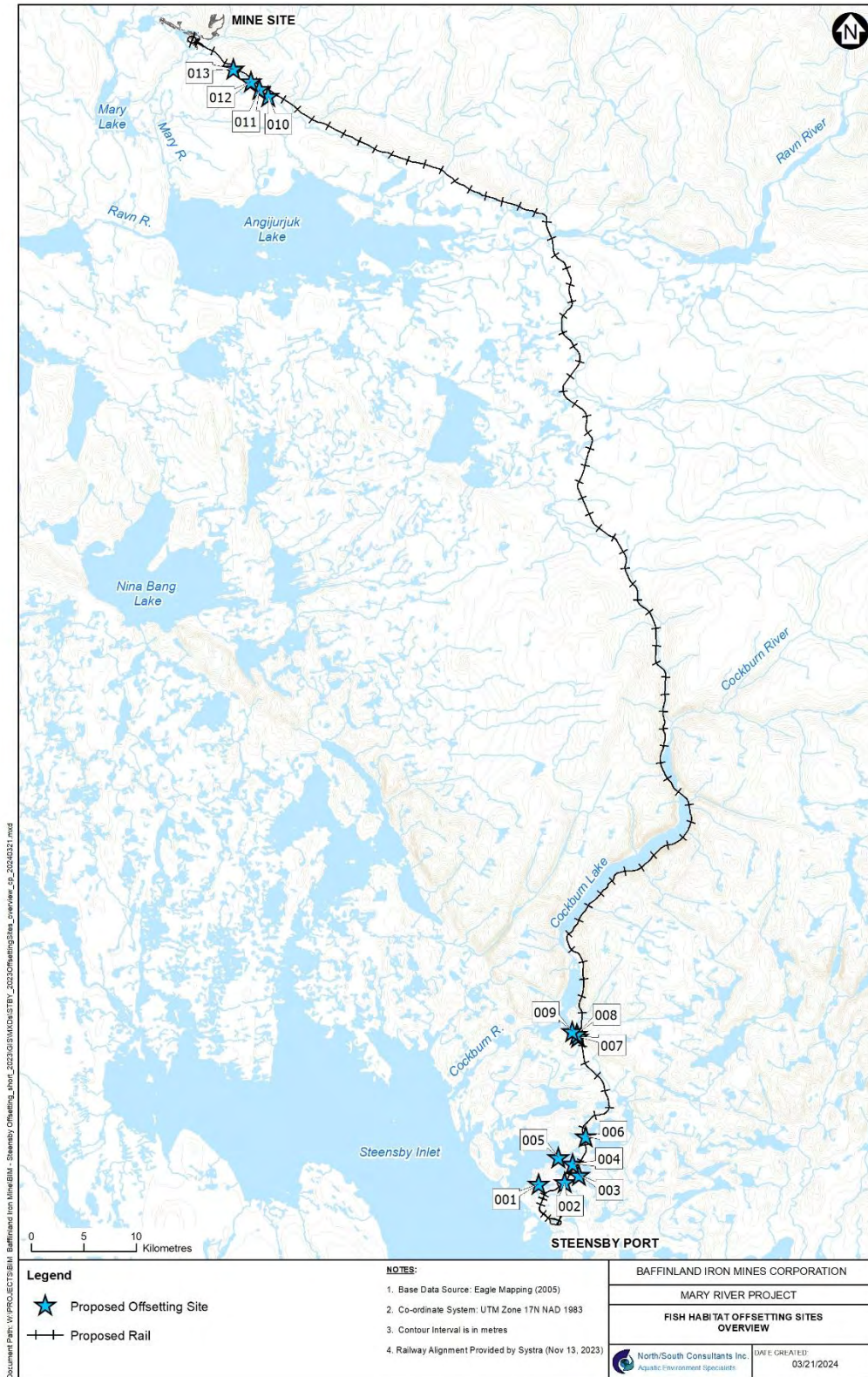


Figure 1. Proposed fish habitat offsetting sites for the Steensby railway.

2.0 METHODS

2.1 SCOPE

The scope of the field program was defined by Knight Piésold and included:

- Electrofishing a nearshore area(s) in each of the lakes for a minimum of 500 seconds;
- Measuring fork length (± 1 mm) of all captured fish and noting maturity where feasible;
- Examining fish for external anomalies or parasites;
- Recording fish habitat characteristics including substrate composition and riparian and aquatic vegetation;
- Measuring water temperature and specific conductance; and
- Collecting photographs of the survey areas.

2.2 STUDY AREA

The potential offsetting sites are located in the general vicinity of existing and proposed infrastructure near the mine and Steensby port (Figure 1). Each of the lakes are in drainage basins known to support Arctic Char based on previous field studies.

2.3 FIELD METHODS

2.3.1 Fishing

Backpack electrofishing duration, electrofisher settings, Universal Transverse Mercator (UTMs; start and end) and areas of habitat fished were recorded for each electrofishing pass. Where possible, electrofishing was conducted for approximately 500-850 seconds per site (Table 2).

Nearshore lake habitat was fished along a 38-305 m reach of shoreline out to a depth of 0.75 m (Table 2). The area of nearshore habitat fished at each location ranged from 247 to 1,930 m². Shoreline length and area fished varied in accordance with differences in slope, substrate type, and fish catch rates at each location.

All captured fish were placed in a pail filled with source water, identified to species, measured for length, examined for external anomalies and parasites, and released back into their source waterbodies. Fish were measured for fork length (Arctic Char) or total length (Ninespine Stickleback; ± 1 mm). Sexual maturity was recorded where feasible (i.e., young-of-the-year [YOY], juvenile, adult).

Table 2. Site information and electrofishing effort.

Lake Name	Site	Survey Date	Electrofishing Duration (s)	Shoreline Fished (m)	Area Fished (m ²)
Lake ST-27	001	30-Aug-23	NR	90	1,136
Lake ST-93	002	03-Sep-23	NR	80	1,015
Lake ST-176	003	30-Aug-23	665	200	852
Ikpikitturjuaq Lake/ 10 Km Lake/ Lake ST-347	004	30-Aug-23	763	305	1,930
	005	31-Aug-23	826	130	991
Lake ST-352	006	24-Aug-23	642	112	659
Cockburn Lake -South Basin	007	20-Aug-23	505	60	330
	008	20-Aug-23	536	38	990
	009	20-Aug-23	508	67	797
Unnamed Lake Km 8	010	18-Aug-23	612	50	247
Unnamed Lake Km 7	011	18-Aug-23	500	61	481
Unnamed Lake Km 3-6	012	02-Sep-23	507	45	740
	013	02-Sep-23	500	60	779

2.3.2 Habitat Assessment

Habitat assessments were conducted and representative photos were taken at a minimum of two locations (beginning and end of electrofishing passes) at each lake site. The nearshore area was defined as the area out to a depth of 0.75 m (i.e., wadeable depth). Information collected included distance from shore to a depth of 0.75 m, substrate composition (Table 3), water temperature, and specific conductance (measured with a YSI water quality meter).

Table 3. Substrate classes.

Substrate	Size (mm)
Fines	<2
Gravel	2-16
Small cobble	17-64
Large cobble	65-256
Boulder	>256

2.4 DATA ANALYSIS METHODS

Field survey results were compiled into habitat assessment sheets which include field data, site maps, photographs.

2.4.1 Catch-Per-Unit-Effort

Fish catch-per-unit effort (CPUE) was calculated as the number of fish per 60 seconds of electrofishing. CPUE was also expressed on an areal basis as number of fish/m² and number of fish/60 seconds/m² of

habitat fished. Fish that were observed during an electrofishing survey but escaped capture were included in the CPUE calculations. Additional visual observations of fish presence were noted but excluded from the CPUE calculations.

2.4.2 Fish Habitat Uses

As the nearshore areas of the lakes that were surveyed are ≤ 0.75 m, the habitat does not support overwintering for either species or spawning for char. There is, or is some potential for, anadromy or amphidromy (small juveniles) in populations of char in the lakes in the Steensby Port Area (sites 001-009) as there are no permanent barriers to movements between the lakes and Steensby Inlet. All char populations in the lakes near the mine (sites 010-013) are land-locked.

Stickleback use a wide range of habitat for spawning but prefer shallow (typically < 0.05 m), low flow or stagnant areas with fine substrates and, often, aquatic or flooded terrestrial vegetation. In the Mary River area, evidence suggests spawning activities are restricted to shallow, marshy areas and/or ponds with some spawning possibly occurring in nearshore areas of lakes. Baseline and post-Project monitoring programs conducted in the study area have indicated that Ninespine Stickleback spawn during the open-water season at depths as shallow as 0.02 m. As such, habitat was conservatively assumed to potentially support stickleback spawning in all lakes.

3.0 RESULTS

Arctic Char were captured or observed in all but one lake (Unnamed Lake at km 8) and from 10 of the 13 sites (Table 4). The highest CPUE expressed as # fish/60 s (3.24), # fish/m² (0.056), and # fish/60 s/m² (0.0067) occurred at Unnamed Lake km 7.

Ninespine Stickleback were captured or observed in 5 lakes and from 6 of the 13 sites. The highest CPUE expressed as # fish/60 s (0.157) occurred at site 4 in Ikpikitturjuak Lake (also referred to as 10 km Lake and Lake ST-347), though the most stickleback were captured at Site 001 in Lake ST-27 where duration was not recorded. CPUE normalized to lake area fished was highest at site 001 (0.004 fish/m²).

The following sections provide brief overviews of the results of the field surveys for each site. Detailed results are provided in Appendix 1.

3.1 SITE 001

Site 001 is located in nearshore habitat at the west end of Lake ST-27 in the Steensby Inlet area. It is the only site in a small, coastal Steensby Inlet watershed consisting of a few small lakes and connecting streams. This offsetting site was surveyed on August 30, 2023, and downstream connectivity to Steensby Inlet was confirmed in spring 2021 during additional Steensby railway baseline studies (NSC 2022). However, depths in the connecting stream are insufficient to support adult or large juvenile char movements and the lake is not thought to support anadromy.

At the time of the survey, specific conductance (mean 233.5 µS/cm) was highest among all the surveyed offsetting sites (Table 5). Aquatic habitat is comprised of a mixture of substrate types but is predominantly cobble. There was no aquatic vegetation in the area and riparian vegetation was mainly grass and willows. The area has a gentle slope with depths ≤1 m within approximately 20 m offshore.

Eleven Arctic Char and four Ninespine Stickleback were captured at this site (Table 4). The char were likely all juveniles >1+ years of age (63-193 mm) and all the stickleback captured were adults (60-62 mm). More than half of the captured char were 60-69 mm (Figure 2). Both species likely use the habitat at this site for rearing/feeding. Ninespine stickleback may use the site for spawning, though the lack of aquatic vegetation may limit this use.

3.2 SITE 002

Site 002 is located at the south end of a small, shallow lake (Lake ST-93) in the Steensby Inlet area. The lake is connected to a larger upstream lake (Lake ST-92) via a short (50 m) stream at its southeast end. The inflow stream is crossed by the proposed Steensby railway at site CV-142-2. The lake's outflow drains 550 m to the north into Ikpikitturjuak Lake (also referred to as 10 km Lake and Lake ST-347), which is known to support anadromous char. There are no barriers to fish movements between this lake and Lake ST-92. There is an intermittent barrier in the outflow stream (shallow in spring, dry in summer/fall) that may prevent access to and from Ikpikitturjuak Lake.

At the time of the survey specific conductance (mean 103.1 µS/cm) was higher than at other sites in the Ikpikitturjuak Lake/River drainage basin (Table 5). Aquatic habitat at Site 002 is comprised predominantly of boulders and cobble with fines present in areas with aquatic vegetation. Aquatic vegetation was composed of macrophytes and algae. Riparian vegetation consisted mainly of grass, willows, and moss.

Two Arctic Char and two Ninespine Stickleback were captured at this site (Table 4). The char were larger juveniles (120-140 mm) and the stickleback were likely juveniles or small adults (45-46 mm). The two char captured at this site were among the larger individuals captured in the Ikpikitturjuak Lake/River watershed (Figure 3). Both species use the habitat at this site for rearing/feeding. Ninespine stickleback may use the site for spawning.

Table 4. Summary of electrofishing data collected at offsetting sites.

Lake Name	Site	Species	Electrofishing					
			n	CPUE			Mean Length (mm) ¹	Length Range (mm) ¹
				# Fish/60 s	# Fish/m ²	# Fish/60 s/m ²		
Small Coastal Steensby Inlet Watershed								
Lake ST-27 ²	001	ARCH	11	-	0.010	-	92	63 - 193
		NNST	4	-	0.004	-	61	60 - 62
Ikpikitturjuak River Drainage Basin								
Lake ST-93 ²	002	ARCH	2	-	0.002	-	130	120 - 140
		NNST	2	-	0.002	-	46	45 - 46
Lake ST-176	003	ARCH	6	0.541	0.007	0.0006	116	80 - 230
		NNST	1	0.090	0.001	0.0001	55	55
Ikpikitturjuaq Lake/ 10 Km Lake/ Lake ST-347	004	ARCH	23	1.809	0.012	0.0009	73	44 - 111
		NNST	2	0.157	0.001	0.0001	58	54 - 61
	005	ARCH	2	0.145	0.002	0.0001	72	59 - 85
		NNST	1	0.073	0.001	0.0001	51	51
Lake ST-352	006	ARCH	5	0.467	0.008	0.0007	79	50 - 150
		NNST	0	0.000	0.000	0.0000	-	-
Cockburn Lake								
Cockburn Lake -South Basin	007	ARCH	6	0.713	0.018	0.0022	59	49 - 80
		NNST	0	0.000	0.000	0.0000	-	-
	008	ARCH	0	0.000	0.000	0.0000	-	-
		NNST	0	0.000	0.000	0.0000	-	-
	009	ARCH	19	2.244	0.024	0.0028	90	51 - 122
		NNST	1	0.118	0.001	0.0001	42	42
Angijurjuk Lake Drainage Basin								
Unnamed Lake Km 8	010	ARCH	0	0.000	0.000	0.0000	-	-
		NNST	0	0.000	0.000	0.0000	-	-
Unnamed Lake Km 7	011	ARCH	27	3.240	0.056	0.0067	45	31 - 81
		NNST	0	0.000	0.000	0.0000	-	-
Mary River Drainage Basin								
Unnamed Lake Km 3-6	012	ARCH	10	1.183	0.014	0.0016	52	32 - 64
		NNST	0	0.000	0.000	0.0000	-	-
	013	ARCH	3	0.360	0.004	0.0005	105	59 - 139
		NNST	0	0.000	0.000	0.0000	-	-

¹ Fork length for Arctic Char (ARCH) and total length for Ninespine Stickleback (NNST).

² Duration not recorded; CPUE could not be calculated.

Table 5. Summary of habitat data collected at offsetting sites.

Lake Name	Site	Water Temperature (°C)		Specific Conductance (µS/cm)		Distance from Shore (m) to Water Depth 0.75 m		Habitat Summary Description
		Mean	Range	Mean	Range	Mean	Range	
Small Coastal Steensby Inlet Drainage Basin ST-2								
Lake ST-27	001	7.2	7.2	233.5	233.5	13.4	9.6-19.3	Mainly cobble with some fines/gravel/boulder; grass and willows riparian; no aquatic vegetation
Ikpikitturjuak River Drainage Basin								
Lake ST-93	002	4.1	3.9 - 4.2	103.1	101.5 - 104.7	14.5	13.2-16.9	Mix of fines, cobble, and boulder; grass and willows riparian; algae and aquatic grasses
Lake ST-176	003	7.4	7.3 - 7.4	59.8	59.6 - 59.9	4.7	4.4-5.4	Almost exclusively boulder; moss and grass riparian; aquatic vegetation present
Ikpikitturjuaq Lake/ 10 Km Lake/ Lake ST-347	004	8.0	8.0	33.3	32.0 - 34.5	6.4	3.3-11.4	Mainly cobble/boulder; willow and cotton grass riparian; no aquatic vegetation
	005	6.0	5.8 - 6.2	31.2	30.5 - 31.9	9.9	5.9-14.6	Mainly cobble/boulder; willow, grass, and moss riparian; no aquatic vegetation
Lake ST-352	006	6.9	6.8 - 6.9	18.4	18.2 - 18.6	6.9	5.4-9.6	Mix of gravel, cobble, and boulder; willows and some grass riparian; no aquatic vegetation
Cockburn Lake Drainage Basin								
Cockburn Lake -South Basin	007	7.2	7.0 - 7.3	14.6	13.9 - 15.2	6.6	3.8-11.8	Mostly cobble/boulder with some gravel; grass and moss riparian vegetation; no aquatic vegetation
	008	7.0	7.0	13.2	13.2	43.0	32.1-59.6	Almost exclusively fines (sand) and gravel; moss/lichen riparian; no aquatic vegetation; at intersection with lake and alluvial fan
	009	6.9	6.8 - 6.9	12.3	12.3	13.3	11.2-17.3	Almost exclusively fines (sand) and gravel; no riparian or aquatic vegetation; at intersection with lake and alluvial fan
Angijurjuk Lake Drainage Basin								
Unnamed Lake Km 8	010	9.4	8.7 - 10.0	84.6	83.8 - 85.4	7.1	5.7-8.7	Survey transect transitions from gravel/cobble to sand along the shore; grass, moss, and some willows riparian; no aquatic vegetation
Unnamed Lake Km 7	011	8.7	8.7	73.2	73.1 - 73.2	8.4	7.1-9.3	Mainly sand with gravel and cobble; almost exclusively moss riparian; no aquatic vegetation
Mary River Drainage Basin								
Unnamed Lake Km 3-6	012	6.1	6.0 - 6.1	95.9	95.0 - 96.7	24.7	19.5-27.3	Almost exclusively sand; grass, willow, and moss riparian vegetation; no aquatic vegetation
	013	6.0	5.8 - 6.1	107.5	105.2 - 109.8	12.0	11.0-13.1	Almost exclusively fines/sand; willow, grass, and moss riparian; no aquatic vegetation

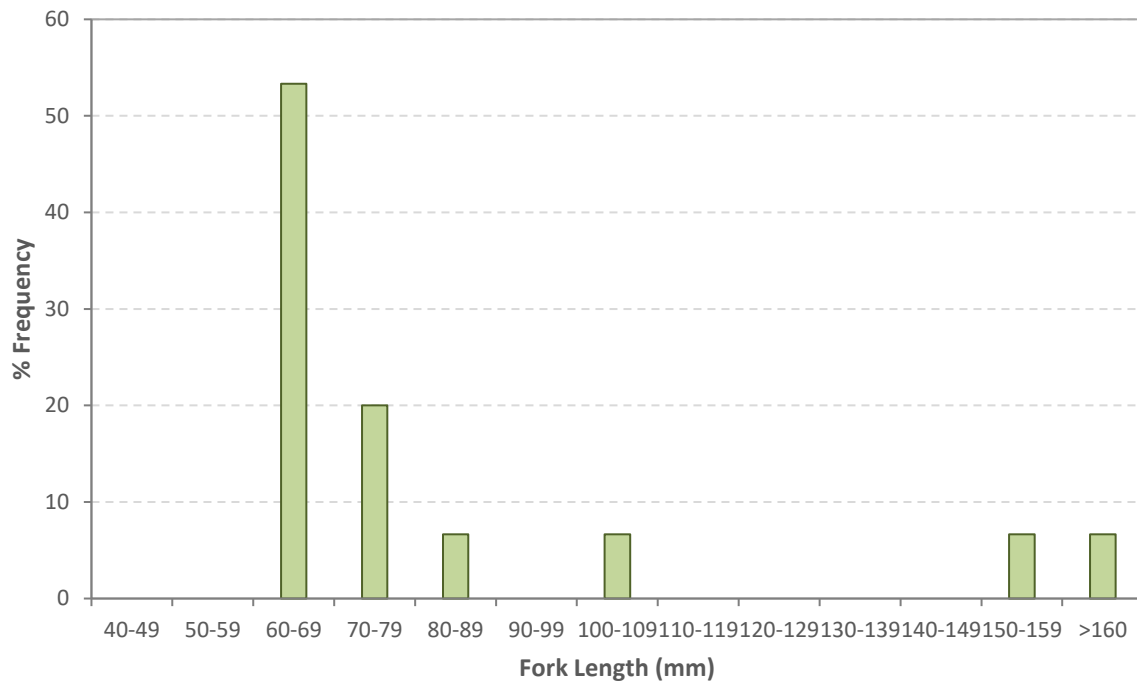


Figure 2. Length-frequency of Arctic Char (n = 11) captured via electrofishing at Site 001 (Lake ST-27) in Steensby Inlet drainage basin ST-2 .

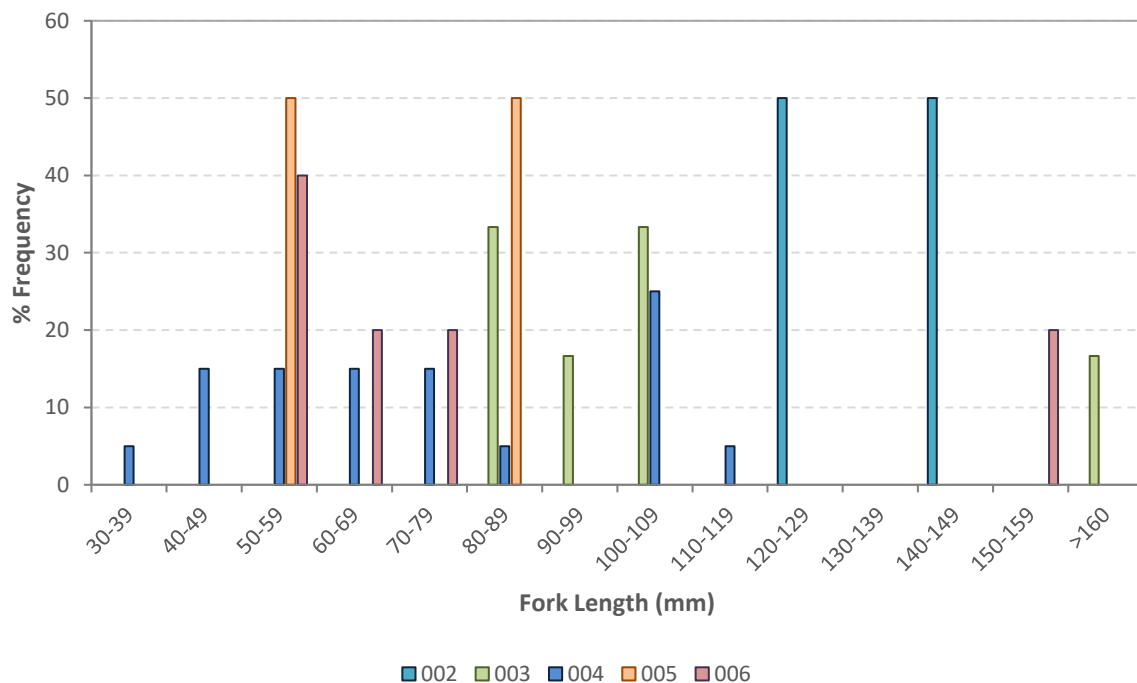


Figure 3. Length-frequency of Arctic Char (n = 38) captured via electrofishing at Sites 002 (Lake ST-93; n = 2), 003 (Lake ST-176; n = 6), 004 (Lake ST-352; n = 23), 005 (Ikpikitturjuaq Lake/10 Km Lake; n = 2), and 006 (Ikpikitturjuaq Lake/10 Km Lake; n = 5) in the Ikpi-kitturjuaq Lake/River drainage.

3.3 SITE 003

Site 003 is located in the nearshore area of the western arm of Lake ST-176, near its outflow to Ikpikitturjuak Lake, which is known to support anadromous char. The outflow is a large river crossed by the proposed Steensby railway at site BR-141-1. Although strontium analyses conducted on several adult char from Lake ST-176 in September 2021 did not show evidence of anadromy, there is no barrier to fish movements between the two lakes. This offsetting site was surveyed on August 30, 2023. Detailed habitat assessment and fishing surveys were conducted in the outflow stream during additional Steensby railway baseline studies (2021-2023; NSC 2024a, b).

At the time of the survey, mean specific conductance was 59.8 $\mu\text{S}/\text{cm}$ (Table 5). Aquatic habitat at the offsetting site is comprised predominantly of boulders and cobble with some aquatic vegetation in the area. Aquatic vegetation was composed of macrophytes and algae and riparian vegetation mainly of willows and moss.

Six Arctic Char and one Ninespine Stickleback were captured at this site (Table 4). The char were mostly larger juveniles (mean 116 mm) and the stickleback was likely an adult (55 mm). These char were among the larger individuals captured in the Ikpikitturjuak Lake/River watershed (Figure 3). Both species use the habitat at this site for rearing/feeding. Although not observed, adult Arctic Char could also use this area. Ninespine stickleback may use the site for spawning.

3.4 SITES 004 AND 005

Sites 004 and 005 are located on Ikpikitturjuak Lake (also referred to as 10 km Lake and Lake ST-347) which is known to support anadromous char. Detailed habitat assessments and fishing were conducted in the inflow streams from lakes ST-176 and ST-352 during Steensby railway baseline studies (2021-2023; NSC 2024a,b).

3.4.1 Site 004

Site 004 is located on the east shoreline of Ikpikitturjuak Lake near the inflow from Lake ST-176. The inflow is a large river crossed by the proposed Steensby railway at site BR-141-1. Although strontium analyses conducted on several adult char from two upstream lakes (lakes ST-176 and ST-352) in September 2021 did not show evidence of anadromy, there is no permanent barrier to fish movements between the two lakes or other large lakes in the watershed. However, there is an intermittent barrier (shallow in spring, dry in summer/fall) in the stream flowing from ST-93 to Ikpikitturjuak Lake that may periodically prevent movements between the two lakes.

At the time of the survey, specific conductance (mean 33.3 $\mu\text{S}/\text{cm}$) was among the lowest surveyed (Table 5). Aquatic habitat at the offsetting site is comprised mainly of cobble and boulder. There was no aquatic vegetation in the area and riparian vegetation was mainly grass and willows. The area has a relatively steep slope with depths ≤ 0.75 m within approximately 3-4 m offshore for much of the surveyed area.

Twenty-three Arctic Char and two Ninespine Stickleback were captured at this site (Table 4). The char were mostly smaller juveniles (mean 73 mm), including some potential young-of-the-year. The stickleback were likely adults (54-61 mm). These char were among the smallest of individuals captured in the Ikpikitturjuak Lake/River watershed (Figure 3). Both species use the habitat at this site for rearing/feeding. Although not observed, adult Arctic Char could also use this area. Ninespine stickleback may use the site for spawning, though there was a lack of aquatic vegetation.

3.4.2 Site 005

Site 005 is a second site located on west shoreline of Ikpikitturjuak Lake near the Ikpikitturjuak River, which flows 250 m to Steensby Inlet.

At the time of the survey, specific conductance (mean 31.2 $\mu\text{S}/\text{cm}$) was among the lowest surveyed (Table 5). Aquatic habitat at the offsetting site is comprised mainly of cobble and boulder. There was no aquatic vegetation in the surveyed area and riparian vegetation was mainly grass, moss, lichens, and willows. The area has a moderate slope with depths ≤ 0.75 m within approximately 5-15 m of the shoreline for much of the surveyed area.

Two Arctic Char and one Ninespine Stickleback were captured at this site (Table 5). The char were smaller juveniles (59-85 mm). The stickleback was likely an adult (51 mm). Both species likely use the habitat at this site for rearing/feeding. Although not observed, adult Arctic Char could also use this area. Ninespine stickleback may use the site for spawning, though there was no aquatic vegetation present.

3.5 SITE 006

Site 006 is located in a large lake (Lake ST-352) at its outflow to Ikpikitturjuak Lake. The outflow stream is crossed by the proposed Steensby railway at site BR-137-1. There are no barriers to fish movements between this lake and Ikpikitturjuak Lake, however, strontium analyses conducted on several adult char captured in Lake ST-352 in September 2021 did not show evidence of anadromy. Detailed habitat assessments and fishing were conducted in the outflow stream to Ikpikitturjuak Lake during additional Steensby railway baseline studies (2021-2023; NSC 2024a,b).

At the time of the survey, specific conductance (mean 18.4 $\mu\text{S}/\text{cm}$) was the lowest of all the sites within the Ikpikitturjuak Lake/River watershed (Table 5). Aquatic habitat at the site is comprised mainly of boulder and cobble. There was no aquatic vegetation in the surveyed area and riparian vegetation was mainly grass and willows. The area has a moderate slope with depths ≤ 0.75 m within approximately 5-10 m of the shoreline within the surveyed area.

Five Arctic Char were captured at this site (Table 5); four of the char were smaller juveniles (<80 mm). Although not captured, stickleback are known to be present in other waterbodies in the watershed, including Ikpikitturjuak Lake downstream. Arctic Char use the habitat at this site for rearing/feeding and, although not observed, adult Arctic Char can also use this area. Ninespine stickleback could potentially use the site for rearing/feeding and spawning, if present, though there was no aquatic vegetation.

3.6 SITES 007-009

Three sites (sites 007, 008, and 009) were surveyed in the south basin of Cockburn Lake. Cockburn Lake is a narrow lake, approximately 37 km long, confined within a steep-sided valley. It is comprised of three basins separated by two narrow and relatively shallow channels. The middle basin is by far the largest (approximately 19.5 km long and 22.5 km²), while the south basin (approximately 11 km long and 11.5 km²) and north basin (approximately 6 km long and 3.4 km²) are substantially smaller. There are several small inflow streams 100-300 m south of site 007 offsetting site and a large inflow 300-500 m north, near sites 008 and 009. Bathymetry, substrate, and gillnetting surveys were previously conducted in Cockburn Lake (Baffinland 2012; NSC 2023). A large number of Cockburn Lake tributaries have also been surveyed for habitat and fish presence as part of the Steensby railway baseline field studies (2021-2023; NSC 2024a,b).

3.6.1 Site 007

Site 007 is located in the southeast bay at the southern end of Cockburn Lake. At the time of the survey, specific conductance (mean 14.6 $\mu\text{S}/\text{cm}$) was very low and, collectively, the three Cockburn Lake sites had the lowest specific conductance values of all the potential offsetting sites surveyed (Table 5). Aquatic habitat at the offsetting site is comprised mainly of cobble, boulder, and gravel. There was no aquatic vegetation in the surveyed area and riparian vegetation was mainly grass and moss. The area has a moderate to steep slope with depths <0.75 m within approximately 4-12 m of the shoreline.

Six Arctic Char were captured at this site (Table 4); all the captured char were smaller juveniles (49-80 mm), including some potential young-of-the-year. Cockburn Lake char sizes classes, in general, were skewed to the smaller size range with a modal range of 50-59 mm (Figure 4). Although none were captured at this offsetting site during the survey, a single stickleback was captured at Site 009 to the north. Both species likely use the habitat at this site for rearing/feeding. Although not observed, adult Arctic Char could also use this area. Ninespine stickleback could potentially use the site for spawning, though there was no aquatic vegetation for nest-building present.

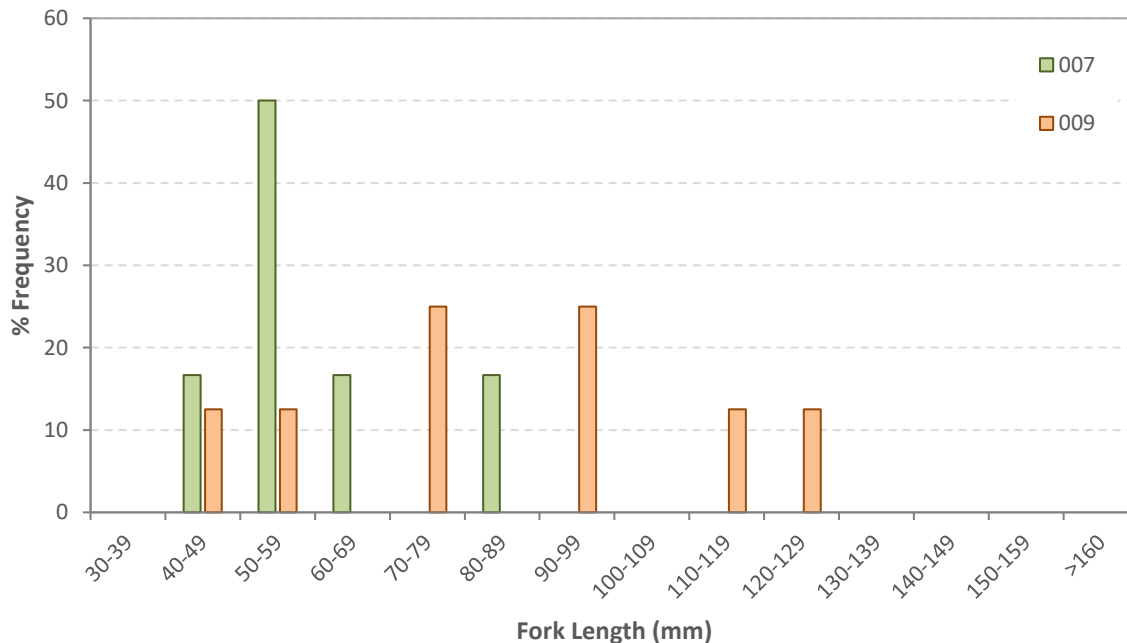


Figure 4. Length-frequency of Arctic Char captured via electrofishing surveys in Cockburn Lake Sites 007 (n = 6) and 009 (n = 19).

3.6.2 Site 008

Site 008 is located at the southeast end of the alluvial fan of a large inflow stream in the south basin of Cockburn Lake.

At the time of the survey, specific conductance (mean 13.2 $\mu\text{S}/\text{cm}$) was low (Table 5). Aquatic habitat at the offsetting site is comprised mainly of fines (sand) and gravel. There was no aquatic vegetation in the surveyed area and riparian vegetation was mainly lichens and moss. The area has a very low slope due to sediment input and deposition from the adjacent tributary stream, with depths <0.75 m within approximately 30-60 m of the shoreline.

Although no fish were captured at this offsetting site during the survey (Table 4), both species were captured at one or both of the other Cockburn Lake sites. Both species could use the habitat at this site for rearing/feeding and may also stage in the area prior to moving upstream into the large inflow river. Although not observed, adult Arctic Char could also use this area. Ninespine stickleback could potentially use the site for spawning, though there was no aquatic vegetation for nest-building present.

3.6.3 Site 009

Site 009 is located at the northwest edge of the alluvial fan of a large inflow stream at the southern end of Cockburn Lake.

At the time of the survey, specific conductance (mean 12.3 $\mu\text{S}/\text{cm}$) was low (Table 5). Aquatic habitat at the offsetting site is comprised mainly of fines (sand) and gravel. There was no aquatic or riparian vegetation in the survey area. The area has a low slope due to input and deposition of sediment from the large inflow stream, with depths <0.75 m within approximately 11-17 m of the shoreline.

Nineteen Arctic Char and one Ninespine Stickleback were captured at this site (Table 5). Mean size of char captured at this site (90 mm) was larger than at Site 007 to the south, though most juveniles were still relatively small and included some potential young-of-the-year. Cockburn Lake char sizes classes, in general, were skewed smaller with a modal range of 50-59 mm (Figure 4). Both species can use the habitat at this site for rearing/feeding and may also stage in the area prior to moving upstream into the large inflow river. Although not observed, adult Arctic Char could also use this area. Ninespine stickleback could potentially use the site for spawning, though there was no aquatic vegetation for nest-building present.

3.7 SITE 010

Site 010 is located on the western shoreline of a small, unnamed lake within a large river system that drains 10 km generally southeast towards the north end of Angijurjuk Lake. Several of the tributaries to this lake on the north shore were surveyed for habitat and fish presence during Steensby railway baseline field studies (2021-2023; NSC 2024a,b).

At the time of the survey, specific conductance (mean 84.6 $\mu\text{S}/\text{cm}$) was low, though higher than most of the sites surveyed farther to the south (Table 5). Aquatic habitat at in the surveyed area is comprised mainly of gravel/fines/cobble at one end of the polygon, transitioning to almost exclusively fines at the other end. There was no aquatic vegetation in the survey area. Riparian vegetation was mainly grass and moss. The area has a moderate slope, with depths <0.75 m within approximately 5-9 m of the shoreline.

No fish were captured at this site in August 2023 (Table 4). However, juvenile char have been captured in other streams/lakes in this watershed. If present, both species could use the habitat at this site for rearing/feeding. Although not observed, adult Arctic Char could also use this area. Ninespine stickleback could potentially use the site for spawning, though there was an absence of aquatic vegetation for nest-building.

3.8 SITE 011

Site 011 is located on the southeastern shoreline of an unnamed lake at the headwaters of a large river system that drains 11 km generally southeast towards the north end of Angijurjuk Lake. Several of the tributaries to this lake on the north shore were surveyed for habitat and fish presence during Steensby railway baseline field studies (2021-2023; NSC 2024a,b).

At the time of the survey, specific conductance (mean 73.2 $\mu\text{S}/\text{cm}$) was low, though higher than most of the sites surveyed farther to the south (Table 5). Aquatic habitat at this site is comprised mainly of sand with some gravel and cobble. There was no aquatic vegetation in the survey area. Riparian vegetation was almost exclusively moss. The area has a moderate slope, with depths <0.75 m within approximately 7-10 m of the shoreline.

Twenty-seven Arctic Char were captured at this site (Table 4). Most of the captured char were very small (mean size 45 mm) with almost half in the 30-39 mm range (Figure 5). These smaller char were likely young-of-the-year, indicating that spawning may have occurred farther offshore in this lake. No stickleback were captured and it is unknown if they are present in this lake. Arctic char use the habitat at this site for rearing/feeding and, although not observed, adult Arctic Char could also use this area. Ninespine stickleback, if present in the lake, could potentially use the site for rearing/feeding and spawning, though there was an absence of aquatic vegetation for nest-building.

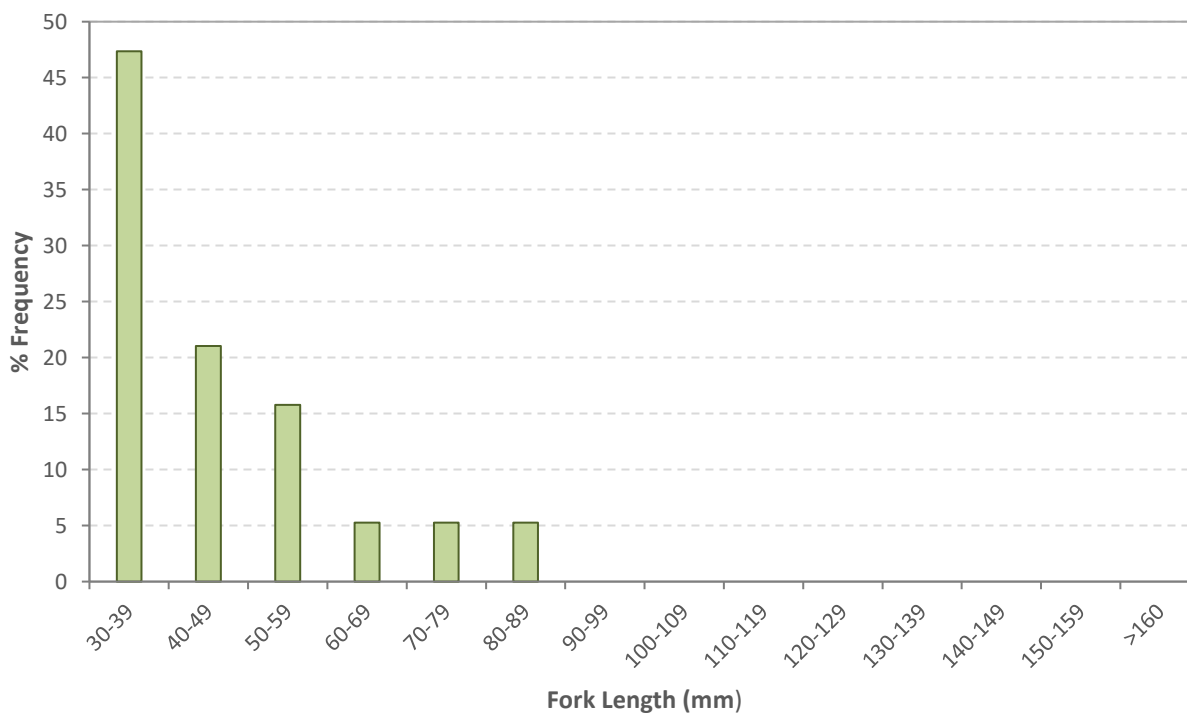


Figure 5. Length-frequency of Arctic Char (n = 27) captured via electrofishing surveys at Site 011.

3.9 SITES 012 AND 013

Sites 012 and 013 are located in an unnamed lake at the headwaters of a river system that drains 4 km generally northwest towards the Mary River. Several of the lake's tributaries on the north shore were surveyed for habitat and fish presence during Steensby railway baseline field studies (2021-2023; NSC 2024a,b).

3.9.1 Site 012

Site 012 is located on the southeastern shoreline of an unnamed lake at approximately km 6 of the proposed Steensby railway.

At the time of the survey, specific conductance (mean 95.9 $\mu\text{S}/\text{cm}$) was relatively low, though higher than most other surveyed watersheds (Table 5). Aquatic habitat at the site is comprised almost exclusively of fines/sand with small amounts of interspersed gravel and cobble. There was no aquatic vegetation in the survey area. Riparian vegetation consisted of grass, willows, and moss. The area has a shallow slope, with depths <0.75 m within approximately 20-27 m of the shoreline.

Ten Arctic Char were captured at this site (Table 4). All the captured char were small (mean size 52 mm) with the majority <59 mm (Figure 6). Several of these smaller char were likely young-of-the-year, indicating that spawning may have occurred farther offshore in this lake. No stickleback were captured and it is unknown if they are present in this lake. Arctic Char can use the habitat at this site for rearing/feeding, and although not observed, adult Arctic Char could also use this area. Ninespine stickleback, if present in the lake, could potentially use the site for rearing/feeding and spawning, though there was an absence of aquatic vegetation for nest-building.

3.9.2 Site 013

Offsetting Site 013 is located on the northwestern shoreline the unnamed lake at approximately km 3.5 of the proposed Steensby railway.

At the time of the survey, specific conductance (mean 107.5 $\mu\text{S}/\text{cm}$) was relatively low, though higher than most other surveyed watersheds (Table 5). Aquatic habitat at the site is comprised almost exclusively of fines/sand with small amounts of interspersed gravel and cobble. There was no aquatic vegetation in the survey area. Riparian vegetation consisted of grass, willows, and moss. The area has a relatively shallow slope, with depths <0.75 m within approximately 10-13 m of the shoreline.

Three Arctic Char were captured at this site (Table 5). The CPUE was lower (0.36 fish/60 s) and mean length of captured char was higher (105 mm) at this site than at Site 012 at the southeast end of the lake. Stickleback were not captured and it is unknown if they are present in this lake. Arctic char use the habitat at this site for rearing/feeding and, although not observed, adult Arctic Char could also use this area. Ninespine stickleback, if present in the lake, could potentially use the site for rearing/feeding and spawning, though there was no aquatic vegetation for nest-building present in the survey area. Fish may also move through this area to access the nearby outflow stream.

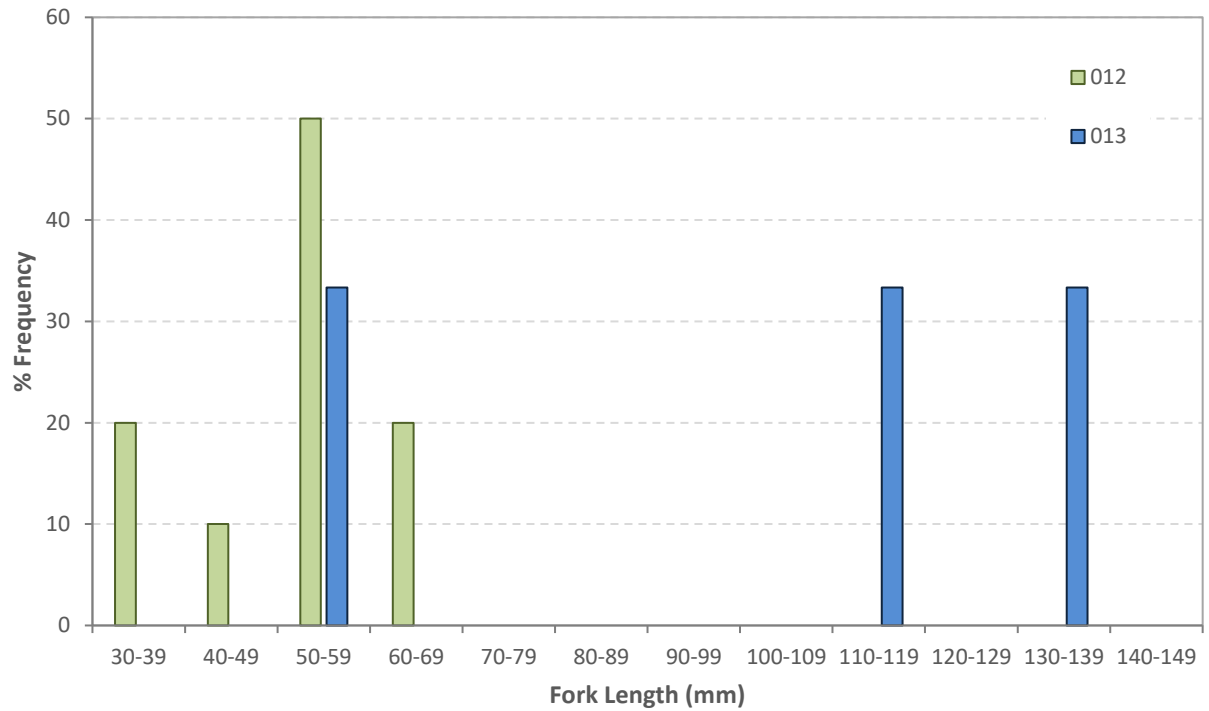


Figure 6. Length-frequency of Arctic Char captured during electrofishing surveys at Sites 012 (n = 10) and 013 (n = 3).

4.0 LITERATURE CITED

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- Nunavut Impact Review Board. 2012. In the matter of the Nunavut Land Claims Agreement, Nunavut Land Claims Agreement Act, S.C., 1993, c. 29 Article 12, Part 5 And In the matter of an application by Baffinland Iron Mines Corporation for development of the Mary River Project Proposal in the Qikiqtani Region of Nunavut - NIRB Project Certificate No. 005. December 28.

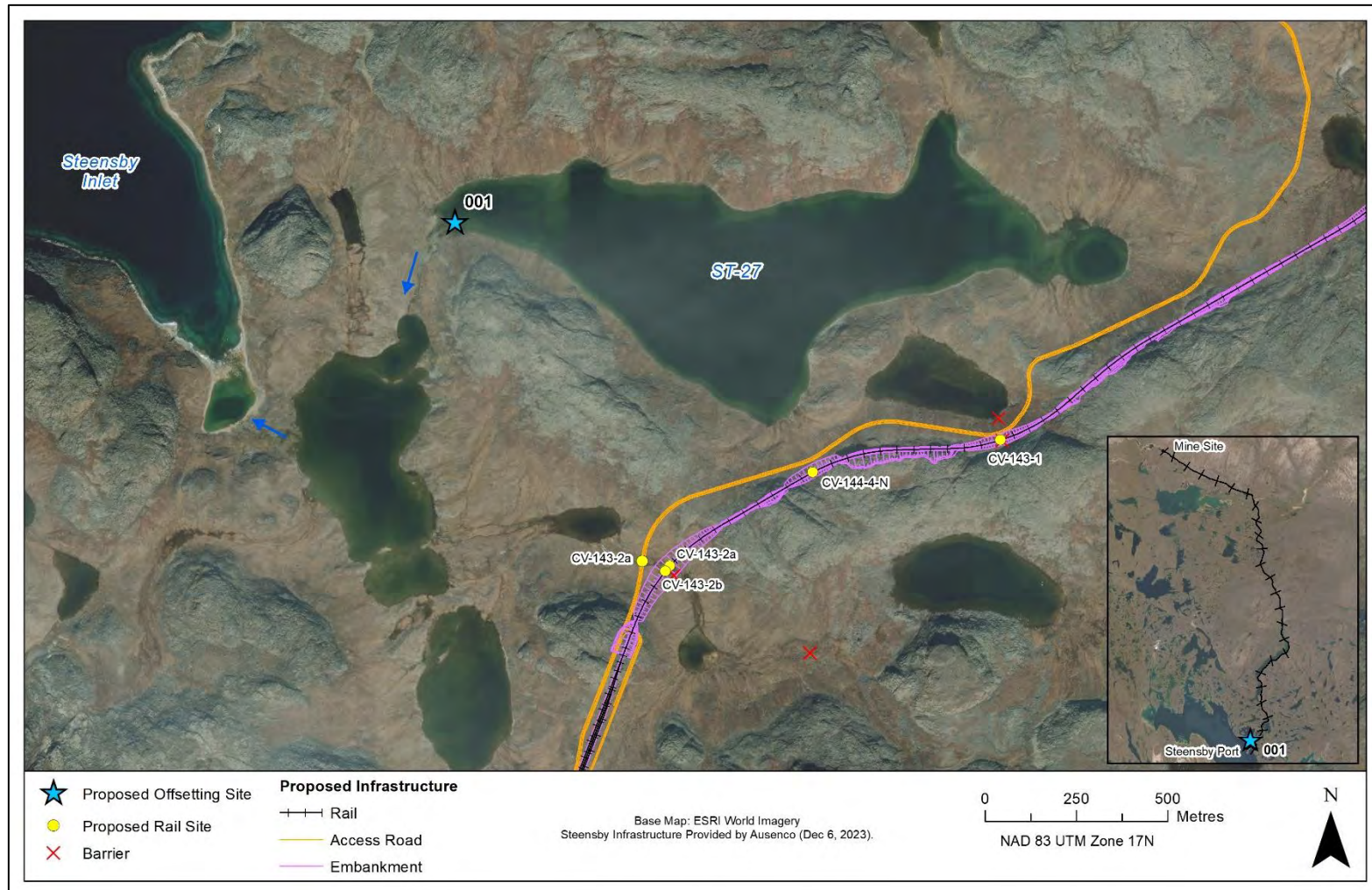
Appendix 1. Habitat assessment sheets for potential offsetting sites 001-013.

POTENTIAL OFFSETTING SITE 001

LOCATION AND SITE DESCRIPTION

Site ID: 001 Site General UTM Coordinates 17W 594350 E 7803713 N Date Surveyed: 30-Aug-23 Waterbody Type: Lake

SITE MAP



BAFFINLAND IRON MINES
MARY RIVER PROJECT

 **North/South Consultants Inc.**
Aquatic Environment Specialists

FISH HABITAT:

ARCTIC CHAR - YES

NINESPINE STICKLEBACK - YES

POTENTIAL OFFSETTING SITE 001

SITE SUMMARY

Potential Offsetting Site 001 is the nearshore area at the west end of Lake ST-27 in the Steensby port area. The lake has a surface area of 636,081 m² and shoreline length of 4,902 m. **The offsetting site is located near the lake's only outflow that drains south for 200 m to a small lake and another 300 m west to Steensby Inlet.** There are no barriers to fish movements but depths in the connecting streams are insufficient to support adult or large juvenile char movements and the lake is not thought to support anadromy. Aquatic habitat at the site is comprised of a mixture of substrate types but is predominantly cobble. There was no aquatic vegetation in the area and riparian vegetation was mainly grass and willows. The area has a gentle slope with depths ≤ 1 m within approximately 20 m offshore.

Both species were captured in the surveyed area. Habitat is used for open-water rearing/feeding. Depths (<0.75 m) are insufficient for overwintering or char spawning, both of which likely occur farther offshore in this lake, though bathymetry, substrate, and adult char use data for the lake are lacking. Stickleback spawning is unlikely given the lack of vegetation at this site for nest building.

POTENTIAL OFFSETTING SITE 001

HYDROLOGY & HABITAT CHARACTERISTICS

Habitat Transect	General Habitat Characteristics				Substrate Composition (%)				
	Depth at Offshore Edge of Polygon (m)	Distance from Shore at Offshore Edge (m)	Water Temperature (°C)	Specific Conductance (μS/cm)	Fines	Gravel	Small Cobble	Large Cobble	Boulders
1	0.75	19.3	7.2	233.5	10	15	25	35	15
2	0.75	11.2	-	-	10	10	20	50	10
3	0.75	9.6	7.2	233.5	5	10	35	30	20

FISH HABITAT POTENTIAL

Nearest Potential Overwintering Habitat - ARCH:	This lake	Distance to Nearest Potential Overwintering Habitat - ARCH (km):	0
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Nearest Potential Overwintering Habitat - ARCH:	This lake	Distance to Nearest Potential Overwintering Habitat - ARCH (km):	0
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Species	Spawning	Overwintering	Rearing	Adults Present
ARCH	N	N	Y	Y
NNST	P	N	Y	Y

POTENTIAL OFFSETTING SITE 001

FISHING AND HABITAT SURVEY SITES



POTENTIAL OFFSETTING SITE 001

ELECTROFISHING DATA

Date:	30-Aug-23	Temperature (°C):	7.2	Distance of Shoreline Fished (m):	85
Duration Fished (seconds):	500-800	Area Fished (m²):	1136		

Species	Pass	Effort (Seconds)	Fish Captured	Fish Observed	CPUE (No. Fish/60 Seconds)	Mean Length (mm)	Length Range (mm)
ARCH	1	NR	9	2	N/A	92.0	63 - 193
NNST	1	NR	3	1	N/A	61.0	60 - 62

COMMENTS

Small numbers of juvenile Arctic Char (63-193 mm) and Ninespine Stickleback (60-62 mm) were captured at Site 001. Fishing effort was not recorded and CPUE could not be calculated.

POTENTIAL OFFSETTING SITE 001

03-SEP-23



A



B



C



D



E



F

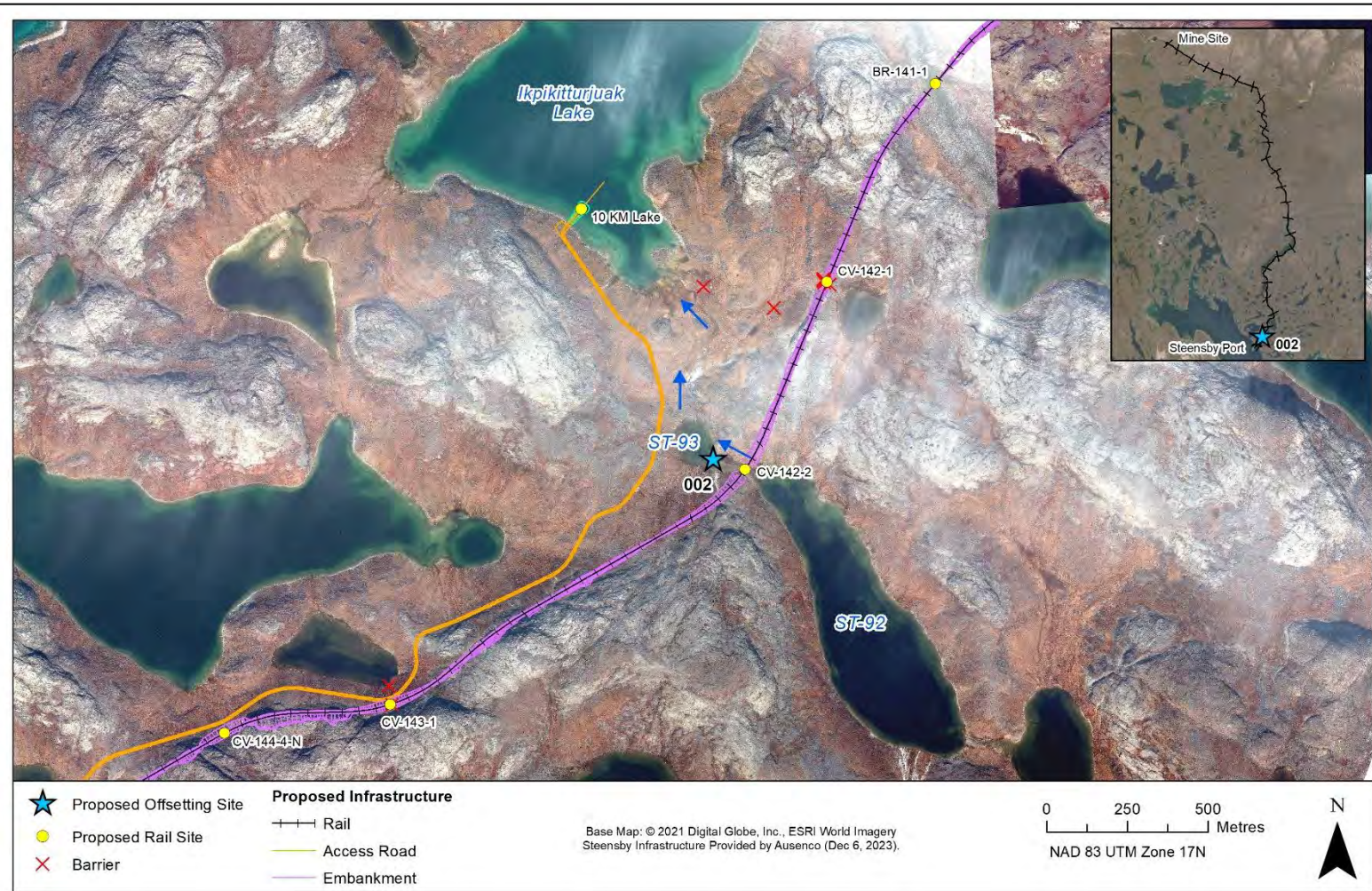
Photos 1. Photos taken at habitat transect 1 (top) and transect 3 (bottom) at Site 001: (A,D) facing west; (B,E) facing east; and (C,F) facing North.

POTENTIAL OFFSETTING SITE 002

LOCATION AND SITE DESCRIPTION

Site ID: 002 Site General UTM Coordinates 17W 596847 E 7803877 N Date Surveyed: 03-Sep-23 Waterbody Type: Lake

SITE MAP



**BAFFINLAND IRON MINES
MARY RIVER PROJECT**

North/South Consultants Inc.
Aquatic Environment Specialists

FISH HABITAT:

ARCTIC CHAR - YES

NINESPINE STICKLEBACK - YES

POTENTIAL OFFSETTING SITE 002

SITE SUMMARY

Potential Offsetting Site 002 is located at the south end of a small, shallow lake (Lake ST-93) that is connected to a larger lake (Lake ST-92) via a short (50 m) inflow stream at its southeast end. The inflow stream is crossed by the proposed Steensby railway at site CV-142-2. The lake also has an outflow stream that drains 550 m to the north into Ikpikitturjuak Lake. Lake ST-93 has an approximate surface area of 20,252 m² and shoreline length of 615 m. There are no barriers to fish movements between this lake and Lake ST-92. There is an intermittent barrier in the outflow stream (shallow in spring, dry in summer/fall) that may prevent access to and from Ikpikitturjuak Lake.

Aquatic habitat at Site 002 is comprised predominantly of boulders and cobble with fines present in areas with aquatic vegetation. Aquatic vegetation was composed of macrophytes and algae. Riparian vegetation consisted mainly of grass, willows, and moss. Two juvenile char and two stickleback were captured/observed at the offsetting site during the August 2023 survey.

Habitat at the site is used for open-water rearing/feeding by both species. Stickleback spawning may also occur among the aquatic vegetation at this site. However, depths (<0.75 m) are insufficient in the surveyed area, and possibly throughout Lake ST-93, to support char overwintering or spawning. Such uses are likely restricted to the upstream Lake ST-92 though bathymetry, substrate, and adult char use data for both lakes are lacking.

POTENTIAL OFFSETTING SITE 002

HYDROLOGY & HABITAT CHARACTERISTICS

Habitat Transect	General Habitat Characteristics				Substrate Composition (%)				
	Depth at Offshore Edge of Polygon (m)	Distance from Shore at Offshore Edge (m)	Water Temperature (°C)	Specific Conductance (µS/cm)	Fines	Gravel	Small Cobble	Large Cobble	Boulders
1	0.75	13.4	3.9	104.7	30	-	10	20	40
2	0.75	16.9	-	-	40	-	10	30	20
3	0.75	13.2	4.2	101.5	20	-	20	30	30

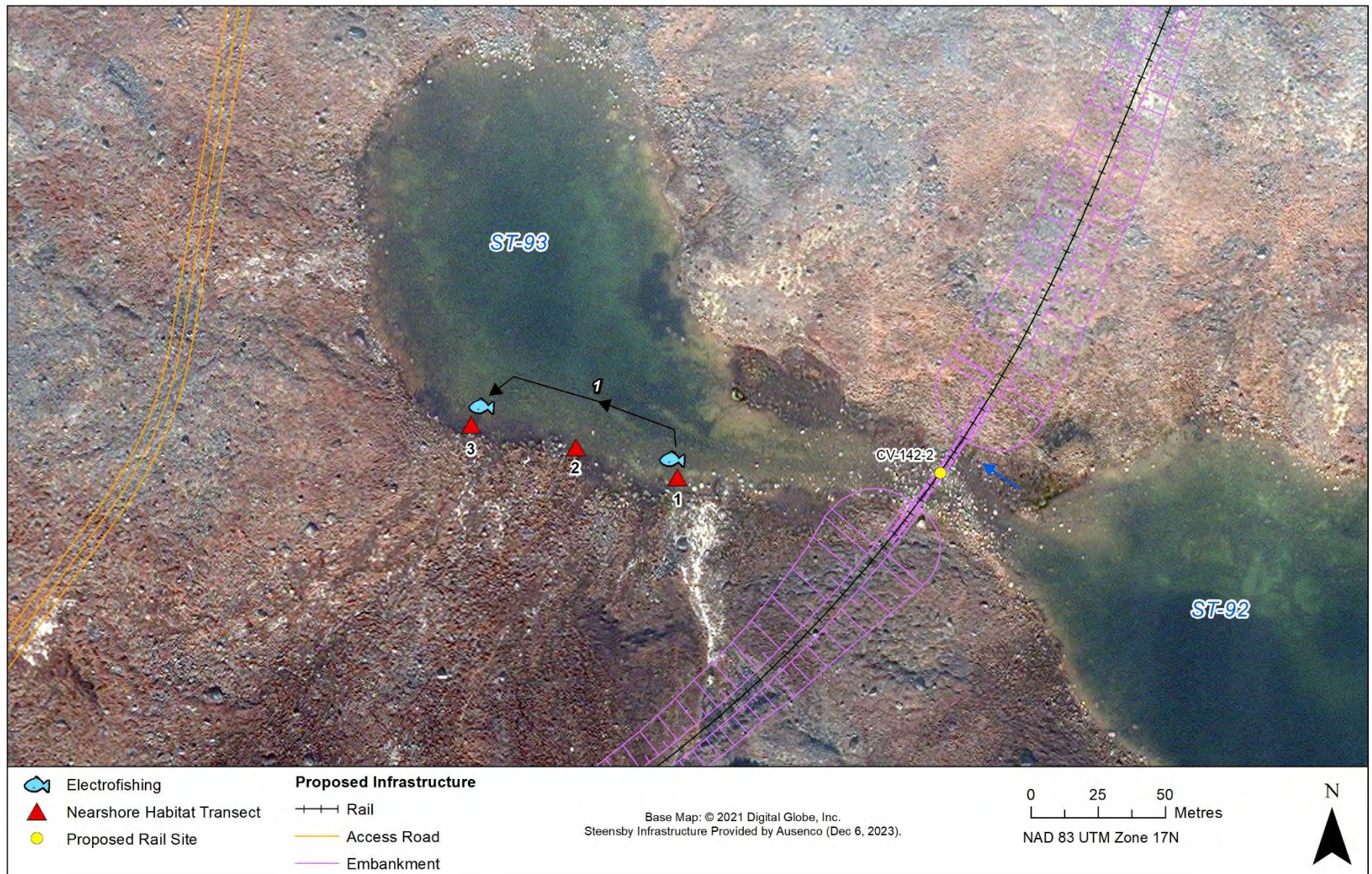
FISH HABITAT POTENTIAL

Nearest Potential Overwintering Habitat - ARCH: Lake ST-92 Distance to Nearest Potential Overwintering Habitat - ARCH (km): 0.05

Species	Spawning	Overwintering	Rearing	Adults Present
ARCH	N	N	Y	P
NNST	P	N	Y	Y

POTENTIAL OFFSETTING SITE 002

FISHING AND HABITAT SURVEY SITES



POTENTIAL OFFSETTING SITE 002

ELECTROFISHING DATA

Date:	03-Sep-23	Temperature (°C):	3.9	Distance of Shoreline Fished (m):	70
Duration Fished (seconds):	500-800	Area Fished (m²):	1015		

Species	Pass	Effort (Seconds)	Fish Captured	Fish Observed	CPUE (No. Fish/60 Seconds)	Mean Length (mm)	Length Range (mm)
ARCH	1	NR	1	1	N/A	-	120 (measured)
NNST	1	NR	1	1	N/A	-	46 (measured)

COMMENTS

Two juvenile char of similar size and two Ninespine Stickleback were captured/observed at Site 002 on September 3, 2023.

POTENTIAL OFFSETTING SITE 002

03-SEP-23



A



B



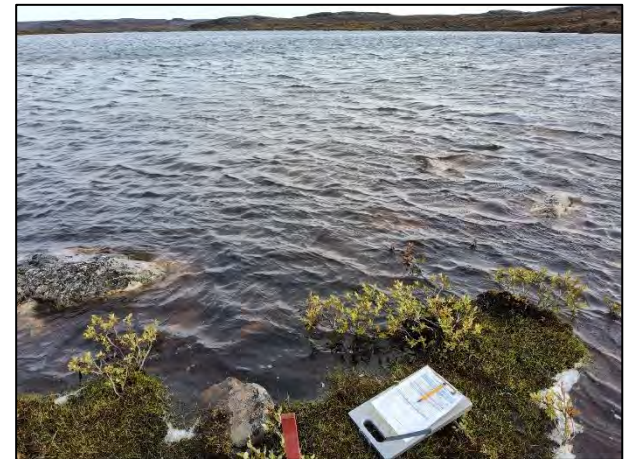
C



D



E



F

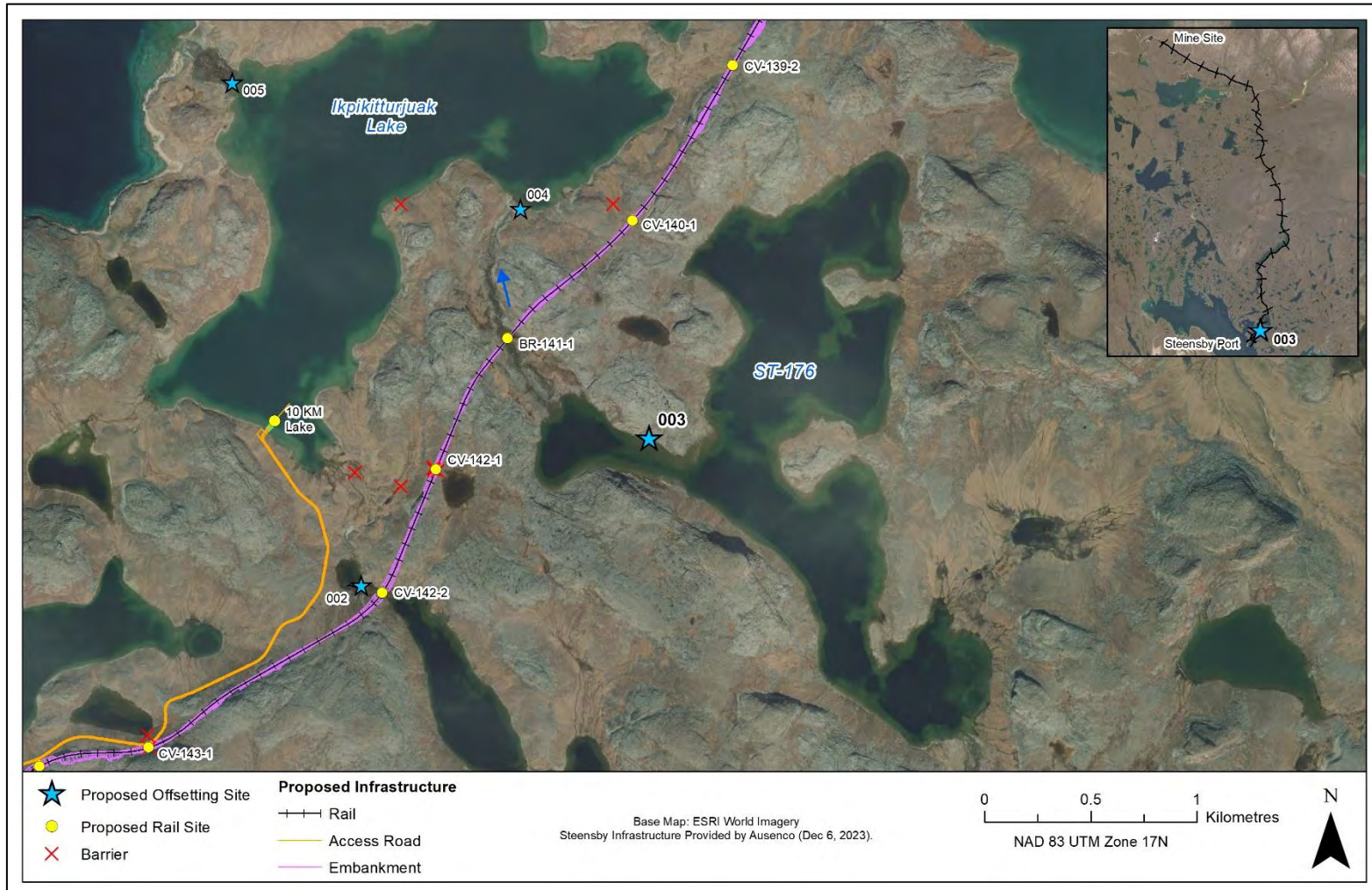
Photos 1. Photos taken at habitat transect 1 (top) and transect 3 (bottom) at Site 002: (A,D) facing northwest; (B,E) facing southeast; and (C,F) facing northeast.

POTENTIAL OFFSETTING SITE 003

LOCATION AND SITE DESCRIPTION

Site ID: 003 Site General UTM Coordinates: 17W 598205 E 7804573 N Date Surveyed: 30-Aug-23 Waterbody Type: Lake

SITE MAP



BAFFINLAND IRON MINES
MARY RIVER PROJECT

 **North/South Consultants Inc.**
Aquatic Environment Specialists

FISH HABITAT:

ARCTIC CHAR - YES

NINESPINE STICKLEBACK - YES

POTENTIAL OFFSETTING SITE 003

SITE SUMMARY

Potential Offsetting Site 003 is located in the nearshore area of the western arm of Lake ST-176, near its outflow to Ikpikitturjuak Lake. The outflow is crossed by the proposed Steensby railway at site BR-141-1. Lake ST-176 has an approximate surface area of 1,993,774 m² and shoreline length of 12,329 m. There are no barriers to fish movements between this lake and Ikpikitturjuak Lake downstream.

Aquatic habitat at the offsetting site is comprised predominantly of boulders and cobble with some aquatic vegetation in the area. Specific conductance was low (59.6-59.9 µS/cm). Aquatic vegetation was composed of macrophytes and algae and riparian vegetation mainly of willows and moss. Both species were captured at this site during the electrofishing survey.

Habitat at the site is used for open-water rearing/feeding by both species. Stickleback spawning may also occur among the aquatic vegetation at this site. The area is too shallow to support char spawning. However, several adult char in spawning condition were captured in a gill net set near this site in early September 2021 suggesting that spawning may occur in the lake. Deeper offshore areas of the lake are also likely used for overwintering by both species.

POTENTIAL OFFSETTING SITE 003

HYDROLOGY & HABITAT CHARACTERISTICS

Habitat Transect	General Habitat Characteristics				Substrate Composition (%)				
	Depth at Offshore Edge of Polygon (m)	Distance from Shore at Offshore Edge (m)	Water Temperature (°C)	Specific Conductance (µS/cm)	Fines	Gravel	Small Cobble	Large Cobble	Boulders
1	0.75	4.4	7.4	59.6	10	-	-	10	80
2	0.75	4.4	-	-	-	10	5	10	75
3	0.75	5.4	7.3	59.9	-	-	-	-	-

FISH HABITAT POTENTIAL

Nearest Potential Overwintering Habitat - ARCH: This lake Distance to Nearest Potential Overwintering Habitat - ARCH (km): 0

Species	Spawning	Overwintering	Rearing	Adults Present
ARCH	N	N	Y	Y
NNST	P	N	Y	Y

POTENTIAL OFFSETTING SITE 003

FISHING AND HABITAT SURVEY SITES



POTENTIAL OFFSETTING SITE 003

ELECTROFISHING DATA

Date:	30-Aug-23	Temperature (°C):	7.4	Distance of Shoreline Fished (m):	179.23
Duration Fished (seconds):	665	Area Fished (m²):	852		

Species	Pass	Effort (Seconds)	Fish Captured	Fish Observed	CPUE (No. Fish/60 Seconds)	Mean Length (mm)	Length Range (mm)
ARCH	1	665	5	1	0.541	116	80 - 230
NNST	1	665	1	0	0.090	55	55

COMMENTS

Five char (80-230 mm) and one stickleback (55 mm) were captured electrofishing at Site 003 in August 2023.

POTENTIAL OFFSETTING SITE 003

30-AUG-23



A



B



C



D



E



F

Photos 1. Photos taken at habitat transect 1 (top) and transect 3 (bottom) at Site 003: (A,D) facing east; (B,E) facing west; and (C,F) facing south.

POTENTIAL OFFSETTING SITE 004

LOCATION AND SITE DESCRIPTION

Site ID: 004 Site General UTM Coordinates 17W 597599 E 7805651 N Date Surveyed: 30-Aug-23 Waterbody Type: Lake

SITE MAP



BAFFINLAND IRON MINES
MARY RIVER PROJECT

 **North/South Consultants Inc.**
Aquatic Environment Specialists

FISH HABITAT:

ARCTIC CHAR - YES

NINESPINE STICKLEBACK - YES

POTENTIAL OFFSETTING SITE 004

SITE SUMMARY

Potential Offsetting Site 004 is located on the east shoreline of Ikpikitturjuak Lake (also referred to as 10 km Lake and Lake ST-347) near the inflow from Lake ST-176. The lake has an approximate surface area of 2,689,744 m² and shoreline length of 12,297 m. There are no barriers to fish movements on several of the inflows to this lake, creating a catchment with several large lakes that may support overwintering. In addition, Ikpikitturjuak Lake is directly connected to Steensby Inlet via a 250 m long outlet on its western shoreline and it is known to support an anadromous population of char. It is unknown if other lakes in the system also support anadromous populations, though limited strontium analyses of adult char captured in lakes ST-176 and ST-352 found no evidence of anadromy.

Aquatic habitat at Site 004 is comprised mainly of cobble and boulder. There was no aquatic vegetation in the area and riparian vegetation was mainly grass and willows. The area has a relatively steep slope with depths not exceeding 0.75 m within approximately 3-4 m offshore for much of the surveyed area. Specific conductance was very low (32.0-34.5 µS/cm).

Both species were captured in the surveyed area but juvenile char were particularly abundant. The char catch included some potential young-of-the-year. Habitat within the survey polygon is used for open-water rearing/feeding by both species. Depths (<0.75 m) are insufficient for overwintering or char spawning, both of which likely occur farther offshore in this lake, though bathymetry and substrate data for the lake are lacking. Stickleback spawning is unlikely given the lack of vegetation at this site for nest building, though there is sufficient cover in the form of boulders.

POTENTIAL OFFSETTING SITE 004

HYDROLOGY & HABITAT CHARACTERISTICS

Habitat Transect	General Habitat Characteristics				Substrate Composition (%)				
	Depth at Offshore Edge of Polygon (m)	Distance from Shore at Offshore Edge (m)	Water Temperature (°C)	Specific Conductance (μS/cm)	Fines	Gravel	Small Cobble	Large Cobble	Boulders
1	0.75	4.6	8.0	34.5	-	5	30	55	10
2	0.75	3.3	-	-	-	5	10	30	55
3	0.75	11.4	8.0	32.0	-		50	45	5

FISH HABITAT POTENTIAL

Nearest Potential Overwintering Habitat - ARCH:	This lake	Distance to Nearest Potential Overwintering Habitat - ARCH (km):	0
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Nearest Potential Overwintering Habitat - ARCH:	This lake	Distance to Nearest Potential Overwintering Habitat - ARCH (km):	0
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Species	Spawning	Overwintering	Rearing	Adults Present
ARCH	N	N	Y	P
NNST	P	N	Y	Y

POTENTIAL OFFSETTING SITE 004

FISHING AND HABITAT SURVEY SITES



POTENTIAL OFFSETTING SITE 004

ELECTROFISHING DATA

Date:	30-Aug-23	Temperature (°C):	8.0	Distance of Shoreline Fished (m):	300
Duration Fished (seconds):	763	Area Fished (m²):	1930		

Species	Pass	Effort (Seconds)	Fish Captured	Fish Observed	CPUE (No. Fish/60 Seconds)	Mean Length (mm)	Length Range (mm)
ARCH	1	763	20	3	1.809	73	44 - 111
NNST	1	763	2	0	0.157	58	54 - 61

COMMENTS

Twenty-one small juvenile Arctic Char (44-111 mm) and two Ninespine Stickleback (54-61 mm) were captured at Site 004. Some of the char may have been young-of-the-year.

POTENTIAL OFFSETTING SITE 004

30-AUG-23



A



B



C



D



E



F

Photos 1. Photos taken at habitat transect 1 (top) and transect 3 (bottom) at Site 004: (A,D) facing northwest; (B,E) facing southeast; and (C,F) facing northeast.