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DND EIA Portal#: 1267-0100-2242

Department of National Defense (DND)

Due Diligence
Environmental Effects Determination (DDEED) Report

Project: Operation NANOOK-TUUGAALIK 2022 and NANOOK-NUNAKPUT 2022

Prepared by: NETE

Date: 30 June 2022

Version: 2

Final Draft

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Executive Summary

A due diligence environmental effects determination (DDEED) was conducted for two subordinate events of Operation (Op) NANOOK 2022. These subordinate events are Op NANOOK-TUUGAALIK (Op NA-TU) and NANOOK-NUNAKPUT (Op NA-NK). This DDEED does not cover exercises by the Canadian Army (CA) or Royal Canadian Air Force (RCAF). The spatial scope of Op NA-TU and Op NA-NK involves departure from Canadian Forces Base (CFB) Halifax, Nova Scotia (NS) to Cambridge Bay, Nunavut (NU) via the Labrador Sea, Baffin Bay, Davis Strait, Lancaster Sound, Peel Sound or McClintock Channel, Larson Sound, Victoria Strait and Queen Mead Gulf, and return to CFB Halifax.

Specific activities included in the DDEED are:

1. Vessel Movements and General Operations;
2. Aircraft and Helicopter Movements;
3. Fuelling Alongside and at Anchor;
4. Bottom Interaction;
5. Single/Multiple Tow;
6. Active Sonar;
7. Radar Use (Fire Control only) and Laser;
8. Live Missile Fire;
9. Torpedo Fire (Inert);
10. Surface Fire;
11. Underwater Explosion; and,
12. Air-to-Air Fire and Other Air Noise.

Potential significant adverse effects of the activities were assessed, and mitigation measures have been identified to minimize or eliminate these effects on the following Valued Ecosystem Components (VECs):

1. Air Quality;
2. Acoustic Environment (ambient noise, underwater noise);
3. Marine Water and Sediment Quality;
4. Marine Fish and Invertebrate Resources;
5. Marine Mammals and Sea Turtles;
6. Avifauna;
7. Species at Risk;
8. Special/Protected Areas;
9. Fisheries (commercial, recreational, and Indigenous);
10. Other Ocean Uses; and
11. Indigenous/Traditional Activities.

On the basis of this DDEED report and available information, it has been determined that the Op NANOOK activities are not likely to cause significant adverse environmental effects. Therefore, the activities can proceed with application of the provided mitigation measures.

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Part 1 - Activity Information

1.1 Title of Proposed Activity

Op NANOOK-TUUGAALIK 2022 and Op NANOOK-NUNAKPUT 2022

1.2 Originating Directorate, Base, or Unit

Maritime Forces Atlantic (MARLANT), Canadian Forces Base (CFB) Halifax

1.3 Location of Proposed Activity

Op NA-TU and Op NA-NA will take place in the Maritime Local Operating Areas (MARLOAs), off the coast of Newfoundland, and in the eastern Canadian Arctic, between 2 August and 29 September 2022.

Maritime participants will operate in the following general areas:

a. MARLOAs;
b. Labrador Sea;
c. Davis Strait;
d. Hudson Strait;
e. Frobisher Bay;
f. Baffin Bay;
g. Lancaster Sound; and
h. Sagleck Bay.

Ship and supporting personnel are expected to visit the following locations:

a. Pond Inlet, Nunavut (NU) (community);
b. Nanisivik, NU (future DND fuelling facility);
c. Arctic Bay, NU (community);
d. Cambridge Bay, NU (community);
e. Griffin Inlet, NU (uninhabited);
f. Lowther Island, NU (uninhabited);
g. Gascoyne, NU (DND camp);
h. Dundas Harbour, NU (community);
i. Qikiqtarquaq, NU (community);
j. Iqaluit, NU (community):
k. Nain, Newfoundland and Labrador (NL) (community);
l. Hopedale, NL (community);
m. Goose Bay, NL (community); and
n. St. John’s, NL (community).

The Port of Nuuk, Greenland (GL) will also be visited for fuelling purposes.

1.4 Activity Summary

1.4.1 Mission and Objectives

The mission of Op NANOOK 2022 is to conduct operations in Canada's North with Allies and other partners to ensure the Canadian Armed Forces' (CAF) readiness to operate in the North and improve interoperability with mission partners. The Operational Objectives are:

- Increase interoperability in the North with Joint Task Force North (JTFN);
- Overcome logistical challenges of the Northern operational area;
- Increased interoperability with allies (dealing with a common threat); and
- Support whole of government effort by supporting other governmental departments (OGD) and research and development (R & D).

This DDEED focuses on the following two lines of effort, designed to meet the following specific Operational Objectives:

Op NA-TU
Increase and reinforce CAF maritime capabilities in Arctic surveillance and mobility;
Demonstrate capability to project joint force effects anywhere in the Arctic; and
Demonstrate the ability to operate with maritime allied and partner nations.

Op NA-NK
Increase CAF joint capabilities in Arctic surveillance and mobility along Canada's Northwest Passage (NWP).

1.4.2 Exercise Participants

Ships participating in the exercise are:

Royal Canadian Navy (RCN):
- Her Majesty's Canadian Ship (HMCS) HARRY DEWOLF (HDW) (Harry Dewolf Class)
- HMCS MARGARET BROOKE (MAR) (Harry Dewolf Class)
- HMCS GOOSE BAY (GBY) (Kingston Class)

Danish Navy
- His Danish Majesty's Ship (HDMS) TRITON (TRI) (Thetis Class) and helicopter

United States Coast Guard (USCG)
- USCG BEAR (BEA) (medium endurance cutter)

French Navy
- French Ship (FS) RHONE (RHO) (Loire Class)

Royal Navy
- Her Majesty's Ship (HMS) PROTECTOR (PRO) (Research Ship and Ice Breaker)

Participants in the exercise include:

- Royal Canadian Mounted Police (RCMP)
- Canadian Coast Guard (CCG) Ice Breaker with helicopter
- Department of Fisheries and Oceans (DFO) Ice Observers and Marine Mammal Lookouts
- United States Navy CF2
- USCG LANTAREA (Atlantic Area)
- Observers: 2 x Japan Joint Staff; 1 x Belgium Officer
- CAF: JTFN/Defence Research and Development Canada (DRDC)/CP-140 Aurora maritime patrol aircraft

1.4.3 Overall Exercise Schedule

The overall exercise schedule is as follows:

Phase 1 (Deployment):

- 2 August: HDW, MAR,GBY/Allies depart Halifax

Phase 2 (Employment):

- 2-12 August: Op NA-TU Fleet Integration Training and LIVEX
- 12-15 August: HDW, GBY Port Visit/Fuel Nuuk, GL
- 15-18 August: MAR Port Visit/Fuel Nuuk, GL
- 15 August – 22 September: Op NA-NK, HDW, MAR, GBY, DRDC and OGD Support

Phase 3 (Re-Deployment):

- 12 September: HDW, MAR depart Lancaster Sound (NWP)
- 12 September: GBY depart Nuuk
- 24-28 September: HDW, MAR and GBY St. John's
- 29 or 30 September: HDW, MAR and GBY return to Halifax

1.4.4 OP NANOOK-TUUGAALIK

The Command Task Group (CTG) will conduct a serialized program focusing on maritime security while transiting from Halifax, NS to Nuuk, Greenland (GL). This will include HDW, MAR, GBY, TRI, BEA, RHO and PRO, and will run from 2 to 12 August. Op NA-TU will take place south of 60ºN.

The schedule of major serials/events are shown in Table 1, and associated locations are shown on Figure 1:

Table 1 - Op NA-TU Schedule of Major Serials/Events

No. on Figure 1	Date	Serial/Event	Description	Location	Applicable Activities
1	2 Aug	HDW, MAR, GBY, TRI, BEA, RHO, PRO depart Halifax		Halifax	1.Vessel Movements and General Operations
2	2 Aug	Gunnery	Surface firing of main guns and machine guns against a towed or remotely operated target.	Within MARLOAs	1.Vessel Movements and General Operations 2.Aircraft and Helicopter Movements 5.Single/Multiple Tow 7.Radar Use (Fire Control only) and Laser 10.Surface Fire
3	4 Aug	Maritime Interdiction Operation (MIO)/BOARDEX AREA ELK	Searching for, stopping and boarding a ship to search for weapons and fugitives. One "vessel of interest" (VOI) may take the route on the west side of NL through the Cabot Strait.	Off NL east coast	1.Vessel Movements and General Operations 2.Aircraft and Helicopter Movements
4	5 Aug	Manoeuvres	Ships sailing as a group in relation to a guide ship, and changing formations.	Off NL east coast	1.Vessel Movements and General Operations
5	6 Aug	CROSSPOL	Exchange of personnel from one ship to another.	Off NL east coast	1.Vessel Movements and General Operations
6	7 Aug	ENCOUNTEREX	Multi-ship exercise to detect other ships and avoid detection.	Off NL east coast	1.Vessel Movements and General Operations 2.Aircraft and Helicopter Movements
7	8 Aug	SAREX	Location and recovery of at least one ship or aircraft in distress;	Labrador Sea	1.Vessel Movements and General Operations

No. on Figure 1	Date	Serial/Event	Description	Location	Applicable Activities
			dropping smoke markers and conducting a search pattern. CCG icebreaker will join for 2 days.		2.Aircraft and Helicopter Movements
8	9 Aug	PHOTOEX	Taking photographs from a helicopter or drone.	Labrador Sea	1.Vessel Movements and General Operations 2.Aircraft and Helicopter Movements
Star	10 Aug	MAR to Iqaluit	Re-supply	Iqaluit	1.Vessel Movements and General Operations 4. Bottom Interaction
9	11 Aug	Fjord NAV	Navigating the fjord into and out of Nuuk, GL.	Nuuk, GL	1.Vessel Movements and General Operations
10	12 Aug	HDW – JTF(N) Key Leadership Engagement (KLE)	This involves briefs to the ships' Command Teams.	Nuuk, GL	
11	12-17 Aug	Re-Supply, Crew Rest, HDW, GBY, MAR to embark DRDC personnel		Nuuk, GL	1. Vessel Movements and General Operations

Figure 1 – Overview of Op NA-TU (Source: ref. A)

1.4.5 OP NANOOK-NUNAKPUT

OP NA-NU includes community engagement (COMREL), reconnaissance shore landings (RECCE) and four scientific trials. HDW, MAR and GBY each have a different program, which are described in the following sections.

JTFN activities involving CA and RCAF will also be taking place in the Arctic at this time, and the RCN supports JTFN by providing maritime surveillance, presence and sometimes interaction with CA personnel. The RCN is prepared to respond to any emergency situation in the Northwest Passage all the way to the border with Alaska. This could include a search and rescue, escort duties or a medical emergency. HDW and MAR plan to travel to Cambridge Bay as the point furthest west.

The planned routes of HDW, MAR and GBY are shown in Figures 2 and 3.

Figure 2 - Overview of Phase 1 of Op NA-NK (Source: ref. A)

Figure 3 – Overview of Phase 2 of Op NA-NK (Source: ref. A)

The schedule of events for HDW, MAR and GBY are shown on Tables 2, 3 and 4, respectively. Table 5 summarizes the activities at each community/port to show the dates where they will be affected.

Table 2 - Op NA-NK Schedule of Events for HDW

No. on Figure	Date	Serial/Event	Description	Location	Applicable Activities
Phase 1 – see Figure 2					
White 1	15-18 Aug	Towed Reelable Active Passive Sonar (TRAPS)/Expendable Mobile Anti-submarine Warfare Training Target (EMATT)Trials	DRDC Trial – see 1.4.6.1	Baffin Bay	1.Vessel Movements and General Operations 4.Bottom Interaction 5.Single/Multiple Tow 6.Active Sonar
White 2	19-21 Aug	TRAPS/Behavioural Response Study (BRS) Trials	DRDC Trial – see 1.4.6.1	Baffin Bay	1.Vessel Movements and General Operations 4.Bottom Interaction 5.Single/Multiple Tow 6.Active Sonar
White 3	24 Aug	Disembark TRAPS personnel		Pond Inlet, NU	1.Vessel Movements and General Operations
White 4	26 Aug	Fuelling	Fuelling by commercial barge.	Nanisivik, NU	3.Fuelling Alongside and at Anchor 4.Bottom Interaction
White 5	28 or 29 Aug	RECCE	Shore Landing of personnel – reconnaissance; day only (no overnight camping); may include landing of all-terrain vehicle (ATV)	Griffith Island, NU / Lowther Island, NU	1.Vessel Movements and General Operations
White 6	3-5 Sep	Re-supply, fuelling, COMREL	Fuelling by commercial barge or CCG at anchor; re-supply using small boats; community relations	Cambridge Bay, NU	3.Fuelling Alongside and at Anchor 4.Bottom Interaction
White 7	11 Sep	COMREL	Community relations	Dundas Harbour, NU	1.Vessel Movements and General Operations

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No. on Figure	Date	Serial/Event	Description	Location	Applicable Activities
Phase 2 – see Figure 3					
White 1	16 Sep	Fuelling	Fuelling at commercial port	Nuuk, GL	3.Fuelling Alongside and at Anchor
White 2	19-20 Sep	COMREL	Community Relations	Hopedale, NL	1.Vessel Movements and General Operations
White 3	24-27 Sep	Port Visit	Rest and recreation for sailors (no Op NA-NK activities)	St. John's	1.Vessel Movements and General Operations
White 4	29 or 30 Sep	Return		Halifax	1.Vessel Movements and General Operations

Table 3 - Op NA-NK Schedule of Events for MAR

No. on Figure	Date	Serial/Event	Description	Location	Applicable Activities
Phase 1 – see Figure 2					
Yellow 1	22-23 Aug	Maritime Autonomous and Remotely Piloted Systems (MARPS) Trial	DRDC Trial – see 1.4.6.2	Pond Inlet, NU	1.Vessel Movements and General Operations 4.Bottom Interaction 6.Active Sonar
Yellow 2	26 Aug	Fuelling	Fuelling by commercial barge	Nanisivik, NU	3.Fuelling Alongside and at Anchor
Yellow 3	29 Aug	RECCE	Shore Landing of personnel – reconnaissance; day only (no overnight camping); may include landing of all-terrain vehicle (ATV)	Griffith Island, NU/ Lowther Island, NU	1.Vessel Movements and General Operations
Yellow 4	24 Aug – 7 Sep	JTFN support, COMREL	No details provided. Community relations.	To be decided	1.Vessel Movements and General Operations
Yellow 5	3-5 Sep	Re-supply, fuelling, COMREL	Fuelling by commercial barge or CCG at anchor; re-supply using small boats; community relations	Cambridge Bay, NU	3.Fuelling Alongside and at Anchor 4.Bottom Interaction
Yellow 6	11 Sep	COMREL	Community relations	Dundas Harbour, NU	1.Vessel Movements and General Operations
Phase 2 – see Figure 3					
Yellow 1	16 Sep	Brief Fuel Stop	Fuelling at commercial port.	Nuuk, GL	3.Fuelling Alongside and at Anchor
Yellow 2	19-20 Sep	COMREL	Community relations	Nain, NL	1.Vessel Movements and General Operations 4.Bottom Interaction
Yellow 3	24-26 Sep	Port Visit	Rest and recreation for sailors (no Op NA-NK activities)	St. John's	1.Vessel Movements and General Operations
Yellow 3 – Yellow 4	27 Sep	Lieutenant Governor Sail	Visit onboard by Lt. Gov	St. John's - Halifax	1.Vessel Movements and General Operations

No. on Figure	Date	Serial/Event	Description	Location	Applicable Activities
Yellow 4	29 or 30 Sep	Return		Halifax	1.Vessel Movements and General Operations

Table 4 - Op NA-NK Schedule of Events for GBY

No. on Figure	Date	Serial/Event	Description	Location	Applicable Activities
Phase 1 – see Figure 1					
Blue 1	20-23 Aug	Embark Long-Range Underwater Acoustic Communication Trial (LRAT) staff in Gascoyne, conduct trial, disembark	DRDC Trial – see 1.4.6.3	Lancaster Sound	1.Vessel Movements and General Operations 4.Bottom Interaction 6.Active Sonar
Blue 2	24 Aug	Integrated Surveillance via Layered Arctic Networked Defence Sensors (ISLANDS) Trial: Arctic Acoustic Recorder (AAR) 1	DRDC Trial – see 1.4.6.4	Arctic Bay, NU	1.Vessel Movements and General Operations 4.Bottom Interaction
Blue 3	25 Aug	Fuelling	Fuelling from commercial barge or from MAR	Nanisivik, NU	3.Fuelling Alongside or at Anchor
Blue 4	27 Aug	ISLANDS: AAR 2	DRDC Trial – see 1.4.6.4	Pond Inlet, NU	1.Vessel Movements and General Operations 4.Bottom Interaction
Blue 5	31 Aug	ISLANDS: AAR 3	DRDC Trial – see 1.4.6.4	Qikiqtarquaq, NU	1.Vessel Movements and General Operations 4.Bottom Interaction
Blue 6	3 Sep	Brief Fuel Stop	Fuelling at commercial port	Nuuk, GL	3.Fuelling Alongside and at Anchor
Blue 7	5 Sep	Embark DFO		Iqaluit, NU	1.Vessel Movements and General Operations 4. Bottom Interaction

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No. on Figure	Date	Serial/Event	Description	Location	Applicable Activities
Phase 2 – see Figure 2					
Blue 1	5-18 Sep	FISHPAT	Fisheries Patrol – monitoring of fishing vessels and enforcement of fishing regulations through inspections	Davis Strait	1.Vessel Movements 2.Aircraft and Helicopter Movements
Blue 2	12 Sep	Brief Fuel Stop	Fuelling at commercial port	Nuuk, GL	3.Fuelling Alongside and at Anchor
Blue 3	18-20	COMREL (Namesake visit), disembark DFO	Community relations	Goose Bay, NL	1.Vessel Movements
Blue 4	24-27 Sep	Port Visit	Rest and recreation for sailors (no Op NA-NK activities)	St. John's	1.Vessel Movements
Blue 4	29 or 30 Sep	Return		Halifax, NS	1.Vessel Movements

Table 5 – Activities by Community/Port

Community/Port	Date	Activity
Halifax, NS	2 August	HDW, MAR, GBY, TRI, BEA, RHO, PRO Depart
	29-30 September	HDW, MAR, GBY return
Nuuk, GL	12 August	Command Team briefs (HDW)
	3 September	Fuelling GBY
	12 September	Fuelling GBY
	16 September	Fuelling HDW and MAR Embark MARPS personnel (MAR)
Iqaluit, NU	10 August	MAR to re-supply
	5 September	Embark DFO on GBY for FISHPAT
Gascoyne, NU	20-23 August	LRAT Trial – embark, conduct trial, disembark
Pond Inlet, NU	20-24 August	Possible CA exercise in the area (P11 Eclipse Sound) – insertion/extraction by RCN vessel may be possible
	22-23 August	MARPS Trial (MAR)
	24 August	Disembark MARPS personnel from MAR
	24 August	Disembark TRAPS personnel from HDW
	27 August	ISLANDS Trial: placement of AAR No. 2 (GBY)
Arctic Bay, NU	24 August	ISLANDS Trial: placement of AAR No. 1 (GBY)
Nanisivik, NU	25 August	Fuelling of GBY by commercial barge or MAR
	26 August	Fuelling of HDW by commercial barge Fuelling of MAR by commercial barge
Griffith IslandNU/ Lowther Island, NU	28 or 29 August	RECCE (HDW and MAR)
Qikiqtarquaq, NU	31 August	ISLANDS Trial: placement of AAR No. 3 (GBY)
Cambridge Bay, NU	3-5 September	Fuelling by commercial barge or CCG (HDW and MAR); re-supply; community relations
Dundas Harbour, NU	11 September	Community Relations (HDW and MAR)
Goose Bay, NL	18-20 September	Disembark DFO (FISHPAT); community relations (GBY)
Hopedale, NL	19-20 September	Community Relations (HDW)
Nain, NL	19-20 September	Community Relations (MAR)
St. John's, NL	24-27 September	Port Visit (no Op-NK activities) (HDW, MAR,GBY) Embark Lt. Gov (MAR)

1.4.6 Research and Development

During OP NA-NK, four scientific trials will be conducted.

1.4.6.1 Maritime Evaluation (ME) with Towed Reelable Active Passive Sonar Trial combined with a Behavioural Response Study

TRAPS and EMATT Trial

TRAPS is a portable, containerized system with active and passive sonar capability for detection, classification, tracking and localization of underwater targets. A crane is required to deploy and tow the 12 meter (m) long sonar array. The TRAPS will be located on the HDW, and will be involved in a 2-part trial taking place in Baffin Bay (ref. B).

The TRAPS/EMATT trial will take place 15-18 August (see White 1 and White 2 on Figure 2). The TRAPS will likely be operated using the trial plan from 2021, that is, active sonar pings every 10 kilometer (km) along the route between 10:00 – 15:00 local time. Each ping will be 11 seconds long, with a 1 second 1800 hertz (Hz) continuous tone, followed by a linear frequency sweep from 2000-2600 Hz lasting 10 seconds. For 2022, it is possible that the trial will be done within a smaller area, and if so, the pings will occur every 45 minutes assuming a tow speed of 8 knots (kt). If the ping is modified, it will be shorter, but within the same frequency range. In any case, the ping source level will be 210 decibels (dB) re 1 micro Pascal $(\mu Pa)^2 m^2$.

In conjunction with the TRAPS trial, Expendable Mobile ASW Training Targets (EMATTs) will be tracked with TRAPS in a passive mode in order to evaluate the passive detection and tracking capability of TRAPS. During this activity 4 EMATTs will be used.

<u>Modelling of TRAPS</u>

A modelling report for the TRAPS was carried out in 2021 for a trial within Lancaster Sound (Ref. C). The active sonar portion of the trial for which the modelling was conducted was not carried out in 2021, and will be carried out in Baffin Bay/Davis Strait for Op NA-NK 2022. Modelling was carried out at 8 locations, from the east end of Lancaster Sound to Herschel Island in the western Arctic. Propagation model results from Site 1 in reference C (see Figure 4) can be extended to the 2022 trial, since the sound speed profiles and bottom type from Site 1 were chosen to be representative of Baffin Bay and Davis Strait.

Figure 4 – Route used for JASCO 2021 Modelling of TRAPS (Source: ref. C)

Hearing Injury to Marine Mammals from TRAPS

Hearing injury to marine mammals from underwater noise can be permanent (Permanent Threshold Shift [PTS]) or temporary (Temporary Threshold Shift [TTS]). For injury to marine mammals, JASCO applied the specific methods and thresholds for assessing PTS and TTS summarized by the National Marine Fisheries Service (NMFS) of the United States (US) National Oceanic and Atmospheric Administration (Ref. D).

Hearing injury thresholds from reference D and the associated hearing groups are provided in Tables 6 and 7.

Table 6- Thresholds for TTS and PTS in Hearing Groups (Source: ref. D)

Hearing Group	Weighted SEL_{24h} (dB re 1 $\mu Pa^2 \cdot s$)	
	TTS	PTS
Low-frequency cetaceans	179	199
Mid-frequency cetaceans	178	198
High-frequency cetaceans	153	173
Phocid pinnipeds (underwater)	181	201
Otariid pinnipeds (underwater)	199	219

Table 7 - Generalized Hearing Range of Hearing Groups (Source: ref. D)

Hearing Group	Generalized Hearing Range
Low-frequency cetaceans (baleen whales)	7 Hz to 35 kHz
Mid-frequency cetaceans (dolphins, toothed whales, beaked whales, bottlenose whales, narwahl)	150 Hz to 160 kHz
High-frequency cetaceans (true porpoises, Kogia, river dolpins, cephalorhynchid, Lagenorthynchus cruciger & Lagenorthynchus australis)	275 Hz to 160 kHz
Phocid pinnipeds (underwater) (true seals)	50 Hz to 86 kHz
Otariid pinnipeds (underwater) (sea lions and fur seals; Atlantic Walrus)	60 Hz to 39 kHz

Table 8 presents the distances in meters to the PTS and TTS thresholds calculated by JASCO using different auditory frequency weighting functions at Site 1.

Table 8 - Range to Weighted Thresholds (Source: ref. C)

Hearing Groups and Impact Threshold		Weighted sound exposure level (SEL) thresholds (dB re 1 µPa²s)	Range to Threshold Site 1 (m)
Low-frequency cetaceans (e.g. Bowhead Whale)	PTS	199	-
	TTS	179	262
Mid-frequency cetaceans (e.g. Sperm Whale, Northern Bottlenose Whale, Beluga, Narwahl)	PTS	198	-
	TTS	178	-
High-frequency cetaceans (e.g. porpoise)	PTS	173	-
	TTS	153	290
Phocid pinnipeds (e.g. Ringed Seal)	PTS	201	-
	TTS	181	83
Otariid pinnipeds (e.g. Atlantic Walrus)	PTS	219	-
	TTS	199	-

A dash indicates that the threshold distance was never exceeded.

Based on the modelling, the PTS threshold was not exceeded at Site 1. The maximum TTS distance modelled was 290 m, for high-frequency mammals (porpoises). The maximum TTS distance for the species that are expected to occur in the Op NA-NK trial area is 262 m for low-frequency cetaceans (e.g., bowhead whales).

Marine Mammal Behaviour Response due to TRAPS

The distances to marine mammal disturbance radii in the JASCO report are shown in Table 9. The frequencies considered correspond to the single frequency 1 second continuous wave at 1800 Hz and four representative frequencies of the 10 second LFM that ranges from 2000–2600 Hz. Three isopleth distances were considered: 160, 140, and 120 dB re 1 µPa. The 160 and 120 dB re 1 µPa isopleths are the sound levels for behavioural disturbance in marine mammals for impulsive and continuous sound sources, respectively, as recommended by reference E. The 140 dB re 1 µPa isopleth was included to provide scale/context for the 160 and 120 dB re 1 µPa distances.

Table 9 – Distances to Marine Mammal Disturbance at Site 1 (Source: ref. C)

Modelled frequency (Hz)	Unweighted SPL isopleth (dB re 1 µPa)	R_{Max} (km)	R_{95} (km)
1800	160	0.7	0.7
	140	23.6	23.1
	120	121.6	112.9
2000	160	0.8	0.7
	140	23.6	23.0
	120	110.9	106.1
2200	160	0.8	0.7
	140	23.3	22.8
	120	103.3	99.0
2400	160	0.8	0.8
	140	23.1	21.4
	120	97.0	93.1
2600	160	0.8	0.7
	140	23.1	21.2
	120	91.9	88.3

R_{Max}: the maximum range to the given sound level over all azimuths
R_{95}: the range to the given sound level after the 5% farthest points were excluded

If the threshold SPL of 160 dB re 1 µPa² (non-impulsive) is considered, marine mammals would not be disturbed beyond 800 m, based on the modelling. However, the modelling shows that marine mammals can be disturbed at long distances, when a threshold SPL of 120 dB re 1 µPa² (continuous) is considered. (Note: The 140 dB re 1 µPa isopleth in ref. C was included to provide scale/context for the 160 and 120 dB re 1 µPa distances).

Injury to Fish

JASCO (ref. C) refers to interim guidelines proposed by Popper and Hawkins (ref. F) to estimate injury to fish. The guidelines aim at limiting the impact to fish from anthropogenic activities, such as in this case, LFA sonar. For these guidelines, fish are grouped into five categories described in Table 10. Table 11 provides thresholds for fish mortality, injury and TTS onset.

Reference C does not provide any specific conclusions with respect to fish, however, based on the results shown in Table 9, the distance to TTS for fish is less than 800 m for all frequencies modelled.

Table 10 - Groupings of fish for the purpose of the interim acoustic impact guidelines (ref. C).

Group	Characteristics
1	Fish lacking swim bladders that are sensitive only to sound particle motion and show sensitivity to only a narrow band of frequencies (e.g., flatfishes, Pleuronectiformes; sharks skates and rays, Chondrichthyes).
2	Fish with a swim bladder where that organ does not appear to play a role in hearing. These fish are sensitive only to particle motion and show sensitivity to only a narrow band of frequencies. This group includes salmonids (Salmonidae) and some tunas and mackerels (Scombridae), but many other species are likely to fit into this category as well.
3	Fish with swim bladders that are close, but not intimately connected, to the ear. These fish are sensitive to both particle motion and sound pressure and show a more extended frequency range than groups 1 or 2, extending up to about 500 Hz. This group includes cod fish (Gadidae), eels (Anguillidae), some drums and croakers (Sciaenidae), and perhaps other fish.
4	Fish that have special structures mechanically linking the swim bladder to the ear. These fish are primarily sensitive to sound pressure, although they also detect particle motion. They have a wider frequency range, extending to several kiloHertz and generally show higher sensitivity to sound pressure than fish in groups 1, 2, or 3. The group includes some of the squirrelfishes (Holocentridae), drums and croakers (Sciaenidae), herrings (Clupeidae) and the large group of otophysan fish.
5	Eggs and larvae.

Table 11 - Metrics of the proposed interim guidelines for fish acoustic impact criteria (Ref. C)

Fish group for acoustic impact guidelines	Mortality		Injury		TTS onset
	PK* (dB re 1 µPa)	SEL (dB re 1 µPa²·s)	PK (dB re 1 µPa)	SEL (dB re 1 µPa²·s)	SEL (dB re 1 µPa²·s)
1. No swim bladder (particle motion detection)	>213	>219	>213	>216	>>186
2. Swim bladder not for hearing (particle motion detection)	>207	210	>207	203	>186
3/4. Swim bladder involved in hearing (primarily pressure detection)	>207	207	>207	203	186
5. Eggs and larvae	>207	>210	Near moderate**	Near moderate	Near moderate

*PK – applies to impulsive sources only
**The non-mortal thresholds for Groups 4 and 5 do not have a numerical criterion; the threat is either high or moderate, as indicated, if the sound is nearby.

Operational Mitigations for the TRAPS Trial from the JASCO Report

The following operational mitigations applicable to the 2022 trial are provided in reference C:

1. Visual observation: DRDC and ship's crew on the AOPS should be provided with a sighting training package. They should visually monitor for mammals within the avoidance zone around the source for:
   a. Thirty minutes prior to ramp-up.
   b. Throughout transits between emissions sites.

   If a mammal is observed within the avoidance zone, the next ping sequence will be delayed until no mammals have been observed for 30 minutes.

2. Passive acoustic monitoring should be performed using the TRAPS (300–4300 Hz) during the pre-emission visual survey to alert the visual observers. PAM will not be continued during the transits between emissions. The training package provided to the ship's crew includes typical spectrograms and sounds from the marine mammals in the project area.

3. Ramp-up protocol: The emitted power will be increased prior to the first full power emission. A 1 second long ping at 2200 Hz will be emitted every minute. The source factor will start at 170 dB re 1 µPa²·m² and increased by 10 dB per minute until the full power of 210 dB re 1 µPa²·m² is reached after 5 minutes.

4. Mitigation emissions: The sonar will remain on in a 'mitigation' mode between the 10 km sites with a source level of 190 dB re 1 $\mu Pa^2 \cdot m^2$ (1 second ping every minute).

EMATTs

Modelling of EMATTs was not included in the JASCO TRAPS report (ref. C). The source level of an EMATT is 170 dB re 1 µPa m (ref. G). It is expected that the effects of the EMATTs would be less than that of the TRAPS.

TRAPS and Arctic BRS Trial

TRAPS will be used as an active sonar source to conduct a Marine Mammal Arctic Behavioural Response Study (BRS) in Davis Strait/Baffin Bay 19-21 Aug. The trial will take place 250 km from the east shore of Baffin Island, at latitudes south of Clyde River and north of Pangnirtung. The BRS will involve a Controlled Exposure Experiment (CEE) which will provide information critical for supporting future use of active sonar in the Arctic, and ultimately contribute to improved marine mammal mitigations for the RCN as required by the Species at Risk Act.

This trial will be undertaken in collaboration with Dalhousie University Large Whale Chair. The BRS will look solely at northern bottlenose and sperm whales, and will involve the activities in Table 12. The HDW's rigid hull inflatable boat (RHIB) will be used by DRDC for the tagging and biopsy collection activities. According to the ref. B, approval has been received from the Nunavut Wildlife Management Board to tag and biopsy the northern bottlenose and sperm whales. An animal care application has been submitted to the Dalhousie animal ethics committee (ref. H).

Table 12 – Activities during TRAPS/BRS Trial (Source: ref. I)

Activity	Details
Tagging of Vertebrate Wildlife	Target species: sperm whale (*Physeteridae macrocephalus*) and northern bottlenose whales (*Hyperoodon ampullatus*) Type of manipulation: Equipping individuals with 1) long-term dermally attached satellite-transmitters with time-depth recorders (Wildlife Computers Fast-loc "SPLASH" tags) and 2) short-term suction-cup attached archival tags (Customizable Animal Tracking Solutions tags) with 3-D kinematic sensors and passive acoustic recorders. Number of specimens affected: 20-43 satellite tags and 10-30 archival tags. Tagging is expected to cause minor, short-term disturbance to whale behaviour.

Activity	Details
Biopsy collection of vertebrate wildlife	Target species: sperm whale (*Physeteridae macrocephalus*) and northern bottlenose whales (*Hyperoodon ampullatus*) Type of manipulation: skin and blubber samples will be obtained using a crossbow and biopsy dart. Number of specimens affected: 40-60 biopsy samples. Biopsy collection is expected to cause slight to no disturbance to whale behaviour.
Behavioural response study of vertebrate wildlife	Target species: sperm whale (*Physeteridae macrocephalus*) and northern bottlenose whales (*Hyperoodon ampullatus*) Type of manipulation: tagged whales will be exposed to low to mid amplitude sonar using 1) a calibrated, submersible speaker; and 2) ship-based sonar. For all playbacks, whales will be exposed to one of three noise treatments: 1) control sound (ambient noise/naturally occurring sound): 2) vessel noise: 3) vessel noise and military sonar. Playbacks will be at realistic source levels but at sufficient distance so received levels would not cause hearing damage. Number of specimens affected: 30-73 short and long-term tagged whales are expected to be involved in the behavioural response study.

Ensuring whale safety is a critical component of the study design (ref. J). Being a CEE trial, the sonar level will begin at a level below which any behavioural reaction would be expected, and should not cause any physical harm to the whales. The level will be slowly stepped up over time, with careful observation for any behavioural changes in the whales, always remaining well below the threshold for causing physical harm. This trial follows a similar study design to what has been previously reported in the literature. These previous studies were conducted by USN-funded researchers, as well as Dutch and Norwegian defense researchers. The experiment will be carried out in open water. Many of the past stranding cases have been linked to regions where the shoreline constrains potential escape routes for whales.

Typical marine mammal mitigation procedures will be followed, including ramp-up, the use of a mitigation avoidance zone (MAZ), visual and passive acoustic monitoring, and shut-down procedures in the case that a whale approaches too closely to the vessel. A conservative MAZ of 500 m (546 yards [yds]) will be used, based on the results of the JASCO modelling discussed previously.

Marine mammal scientists from Dalhousie University and/or DFO will be on board to assist with the trial. Their expertise will be critical for monitoring the whales' behavioural state to avoid adversely affecting the whales.

It is intended to supplement typical visual observation techniques with electro-optical/infra-red systems and drone usage to maximize the chances of knowing where the whales are at all times.

1.4.6.2 Maritime Autonomous and Remotely Piloted Systems Trial

This DRDC trial is a demonstration of interoperability between mobile and stationary maritime autonomous and remotely piloted systems for the Above Surface Warfare "hold at risk scenario". A "hold at risk" scenario is the monitoring of a port or transit choke point with the intent of detecting submarines entering or exiting the area. This 2-day trial will be undertaken in shallow water near Pond Inlet, NU on 22-23 August 2022 with the support of MAR. The trial requires a location with depth of water under 100 m. One unmanned surface vessel (USV) will be deployed and recovered using a RHIB from MAR, and one recorder will be deployed prior to the experiment and recovered after completion. A crane will be required for the deployment and recovery of the equipment. The activities are described in Table 13.

The key objectives include:

a. Testing the interoperability between mobile and stationary MARPS to demonstrate an ASW concept of employment in the Arctic environment;
b. Evaluation of alignment performance and quality of a new inertial navigation system (INS), on board an autonomous underwater vehicle (AUV), following stationary and moving calibration at high arctic latitudes;
c. Collection of high-frequency (450 kHz) sonar data from an USV to evaluate the performance characteristics of this sonar in the arctic ocean where the presence of freshwater layers affect the sound velocity profile;
d. Development of safe and efficient procedures for arctic MARPS operation, including deployment and recovery from an RCN platform; and
e. Provide DRDC personnel with Arctic training and experience for MARPS, onboard an RCN platform.

Table 13 – Activities during MARPS Trial (Source: ref. K)

Day	Activity Details
15-17 August 2022	DRDC personnel (1 scientist and 3 technicians) embark on MAR at Nuuk, Greenland (all equipment already onboard from Halifax)
17-21 August 2022	i. MAR transits from Nuuk, Greenland, to Pond Inlet, Nunavut. ii. DRDC personnel perform pre-deployment testing of all instruments iii. DRDC personnel train crew of MAR for instrument deployment iv. Calibration of the INS onboard the AUV is performed while the ship transits (AUV remains onboard Margaret Brook for duration of calibration).
22 August 2022	Deploy one Distributed Underwater Sensor Network (DUSN) node and radio frequency (RF) float at location 72.54094°N, 78.58181°W; perform modem localization; run USV pre-dive sequence and deploy USV; run USV in-water tests

Day	Activity Details
	ii. Test communications between DUSN node and USV iii. Begin running the USV in a "box-pattern" survey path centered on the DUSN node with side lengths of 1000 m each. iv. Deploy the RHIB with automatic identification system transmitter and run a transect through the USV survey box (acting as a target). v. The RHIB target should trigger a request for automatic identification system traffic from USV, which will subsequently communicate this information to the DUSN node. vi. Recover USV at end of operation day vii. Recover the RF float (the DUSN node remains on sea bottom to be recovered the next day pending favorable weather) 10 hour day.
23 August 2022	i. Run USV pre-dive sequence and deploy USV ii. Perform the same set of steps as day before (ii – iv) iii. Perform a shallow water survey with USV and the PingDSP sonar with a simple lawnmower line pattern moving from shallow to increasingly deeper water (approx. 5 m to 50 m water depths). iv. Collect CTD at locations of PingDSP survey v. Recover all instruments and secure for transit 10 hour day.
24 August 2022	DRDC personnel disembark from Margaret Brooke at Pond Inlet, Nunavut.

The technical details of the USV sonar are:

a. located approximately 1 m below the water surface and transmits sound at approximately 45 degrees on either side of the USV;
b. frequency: 450 kHz;
c. sound pressure (source) level: 200dB re 1 μPa @ 1 m typically;
d. pulse length: 0.1ms;
e. repetition rate: 33 ms; and
f. operation duration: 8 hours per day (at most) for 2 days.

At the very high frequencies of this sonar transmitter, there is very strong absorption and attenuation of sound in seawater (ref. L). Due to the rapid absorption of sound above 100 kHz by water, a short MAZ of 100 m (109 yds) has been recommended in the past for similar side-scan sonars above 100 kHz, and no ramp up has been required (ref. M).

The location of the trial is within the soon-to-be-established Tallurutiup Imanga National Marine Conservation Area (NMCA). The Government of Canada and the Qikiqtani Inuit Association signed an Inuit Impact and Benefit Agreement (IIBA) required for the establishment of the Tallurutiup Imanga NMCA on 1 August 2019 (ref. N). The IIBA acknowledges that DND conducts military related research in the Arctic, including Tallurutiup Imanga NMCA. In the agreement, DND commits to providing information to assess the environmental impact of its research programs on Tallurutiup Imanga NMCA, commits to providing unclassified summaries

of the planned research within Tallurutiup Imanga NMCA and, where possible, will provide the information requested in the IIBA for research proposals. Upon completion of DND research, an unclassified summary of the results will be provided. The information is to be provided to the Aulattiqatigiit Board which is a joint Inuit and Canada management board.

According to the IIBA, DND will be involved as appropriate for input to the proposed Tallurutiup Imanga NMCA Research and Monitoring Strategy before it is finalized.

1.4.6.3 Long-Range Underwater Acoustic Communication Trial

This trial will take place with the participation of the GBY that will deploy both transmitter and recorders. The trial will take place 20 – 23 August in the area of Gascoyne Inlet Camp (GIC), which is located within the soon-to-be-established Tallurutiup Imanga NMCA in the Parry Channel (Barrow Strait and Lancaster Sound). More information on this protected area can be found in Annex A.

The key objectives include (ref. O):

a. collection of acoustic and non-acoustic data;
b. experiment new buoyancy and fairings; and
c. achieve 50-to-100 km communication range by testing different communication schemes at relatively low active sonar frequencies.

The trial activities are shown in Table 14:

Table 14 – LRAT Activities (Source: ref. O)

Day	
20 August 2022	1. Pick up personnel at GIC using GBY RHIB. 2. Deploy 2 DUSN receivers, deploy, deploy Conductivity-Temperature-Depth Array and Acoustic Doppler Current Profiler, localization 3. GBY to 1st waypoint and deploy source (DACS acoustic projector), run signal sequence for ~ 1hr, recover source and reposition.
21 August 2022	Repeat above step 3 up to 100 km away from receivers
22 August 2022	Repeat above step 3 by getting closer to receivers
23 August 2022	Recover all gear and drop personnel at GIC. GBY RHIB will be used to recover DUSN nodes and transport personnel.

The equipment will be located per Table 15 and Figure 5. A crane will be required for deployment and recovery of the equipment.

Table 15 – Asset Locations for LRAT (Source: ref. O)

Establishment File #:[Insert Establishment file #]

DND EIA Portal#: 1267-0100-2242

Asset	Latitude	Longitude	Depth (m)	Note
DUSN #1	74°30.125' N	91°18' W	151	Straight south of GIC
DUSN #2	74° 29.0451'N	91°18' W	145	2-km south of DUSN #1
CTD Array	Between DUSN #1 & #2	Between DUSN #1 & #2	~147	
ADCP	Between DUSN #1 & #2	Between DUSN #1 & #2	~147	
GBY 100-km Waypoint	74° 28.0579'N	94°39.7474'	N/A	

N/A: Not available.

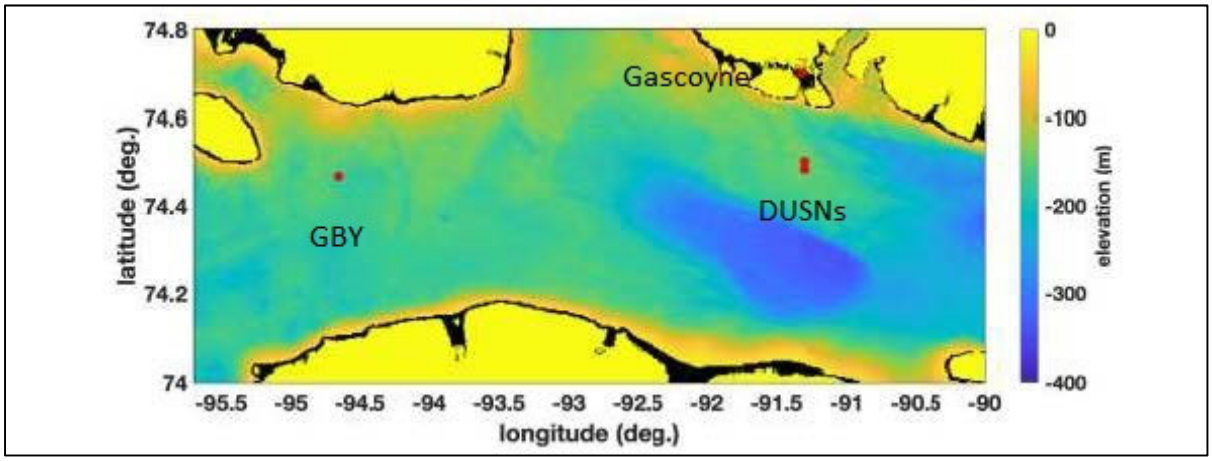

Figure 5 – Asset Locations for LRAT (Source: ref. O)

Source characteristics are provided in Table 15:

Table 15 – Source Characteristics (Source: ref. O)

Source Level	Not to exceed 170 dB rel. 1 µPa @ 1 m. for a tone centered in signal band
Source Depth	Approximately 50 meters
Source Speed	Drifting, therefore low speed
Source Bandwidth	A 10-to-50 Hz band between 150 Hz and 360 Hz
Source Duty Cycle in 24 hours	About 30% (assuming 1-hr transmit, 2-hr for commute and deployment/recovery)

A MAZ of 5 m (5.5 yds) to 100 m (109 yds) has been determined for this trial (ref. O). To be conservative, a MAZ of 100 m is recommended. According to the trial plan, a "whales away" ramp-up procedure will be enforced before every 1-hr long transmission.

The trial will be located within the Tallurutiup Imanga NMCA, and therefore DND must meet their commitments in the IIBA as discussed in section 1.4.6.2.

1.4.6.4 Integrated Surveillance via Layered Arctic Networked Defence Sensors Trial

In this activity three (3) acoustic hydrophone recorders (1 on the bottom, 2 in the water column) will be deployed for period of one year. These are passive recorders, with no surface expression or noise emissions. The recorders contain lithium batteries, and are composed of mainly silicon and metal, encased in a glass sphere. The moorings are composed of plastic and metal. According to the trial project manager, it is unlikely that the recorders or moorings will be dragged away by ice due to their depth (300 m below surface), and the odds are low that the recorders would be accidently released by their moorings (ref. P).

A crane will be required for the deployment and recovery of the recorders. The recorders are expected to be recovered in summer of 2023 (summer 2024 as backup). The recorders will each leave behind about 50 kg of iron anchor weight due to their moorings. These recorders will be located as shown in Table 16 and Figure 6:

Table 16 – Planned AAR Locations (Source: ref. Q)

Recorder	Date of Deployment	Approximate Location	Longitude/ Latitude	Water Depth	Recorder Depth
AAR 1	24 August 2022	Near Arctic Bay	73°49'30.00"N, 84°16'45.00"W	~ 300m	Bottom lander
AAR 2	26 August 2022	Near Pond Inlet	73° 6'00.00"N, 74° 9'22.00"W	~ 900m	Within sound duct
AAR 3	30 August 2022	Near Qikiqtarjuaq	68° 7'52.00"N, 63°20'56.00"W	~ 900m	Within sound duct

Arctic Bay and Pond Inlet are both located within the Tallurutiup Imanga NMCA, and therefore DND must meet their commitments in the IIBA as discussed in section 1.4.6.2.

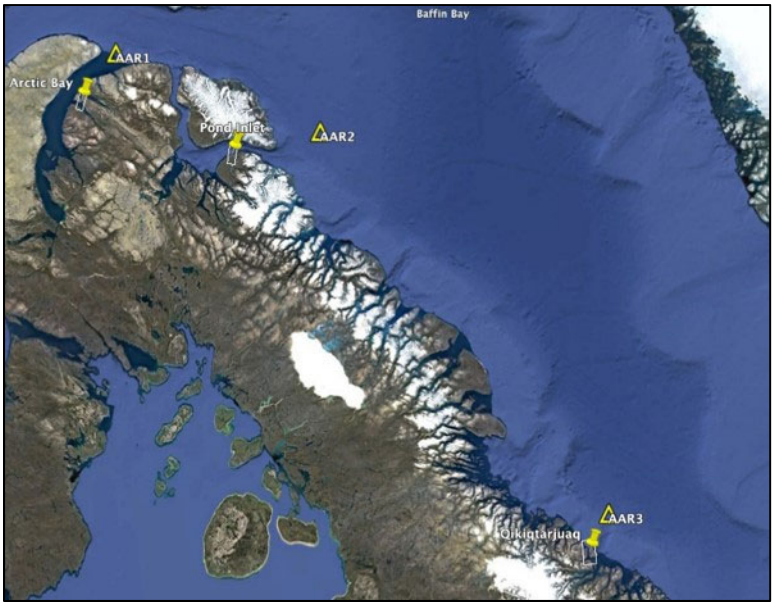

Figure 6 – Proposed locations of AAR (Source: ref. Q)

1.5 Applicability of DND EIA Directive

This activity does not meet the definition of a project in section 81 of the *Impact Assessment Act* (IAA) and therefore sections 82 and 83 of the IAA do not apply. However, according to the DND Environmental Impact Assessment Directive, a determination on the likelihood of adverse environmental effects is required as an exercise of due diligence.

This DDEED report assesses activities carried out during Op NA-TU 2022 and Op NA-NK 2022. Operational controls are included in the Environmental Support Instructions in Annex B.

1.6 EED Start Date

May 2, 2022

1.7 EIA number

The MARLANT MARL SE number is: 1267-0100-2242.

1.8 Territorial, Provincial and Municipal Government Involvement

- Qikiqtani Inuit Association (QIA)
- Kitikmeot Inuit Association (KIA)
- Nunavut Tuungavit, Inc.

1.9 Other Federal Departments or Third Party Groups

- JTFN
- DFO

1.10 Contacts

1.10.1 Establishment Point of Contact:

MARLANT Safety and Environment (SE)

Establishment File #:[Insert Establishment file #]

DND EIA Portal#: 1267-0100-2242

E-mail Address: +N48FormationSafetyandEnvironment@forces.gc.ca

Telephone number: 902-427-1423

1.10.2 Activity OPI:

MARLANT SE

E-mail Address: +N48FormationSafetyandEnvironment@forces.gc.ca

Telephone number: 902-427-1423

1.11 Interviews

No interviews were carried out for this DDEED, however information for this report was received from the following:

- Deanna Brewster, MARLANT SE
- Mr. Sylvain Bernier, Maritime Component Commander/ Future Operations SSE Continental
- Lieutenant Commander (LCdr) Mitchell Lane, SSO Future Operations Continental, Maritime Component Command
  Canadian Armed Forces
- Reza Mir, DRDC
- Carolyn Binder, DRDC
- Stephane Blouin, DRDC
- Sean Pecknold, DRDC
- Sarah Rahmer, Defence Construction Canada (DCC)

Part 2 - Environmental Effects Discussion

2.1 Applicable Legislation, Guidelines, Standards and DND Direction

CAF units are mandated to meet all applicable federal environmental laws, and where appropriate, comply with provincial, municipal, and international standards while ensuring CAF's activities and operations have the minimum adverse effects on the environment. DND strives to meet legislation that does not expressly regulate military activities. Key environmental legislation, guidelines and standards pertaining to Op NA-TU and Op NA-NK are summarized in Annex C.

2.2 Description of Activity Components, Activity Schedule and Activity Site

1. Ship Movements and General Operations

RCN vessels will carry out a number of operational and training activities during Op NA-TU and Op NA-NK. This includes all activities associated with the day-to-day functioning of a vessel when at sea or in transit. Transit will involve surveillance such as radar, visual, radio, and environmental data collection such as temperature. Movements are limited by the ice conditions and icebreaking may be required.

There are numerous environmentally sensitive areas, recreational areas, species at risk habitats, Indigenous territories and commercial fishing (and other economic) areas within the expected Arctic operating area. General movements of the ships and general operations not specifically mentioned elsewhere, could affect these areas negatively unless applicable operational restrictions are put in place. Vessel movements have the potential to cause noise disturbance and/or collisions with aquatic animals and birds. Vessels passing near the shoreline could disturb bird colonies. Ice breaking may have impacts to surface waters and cause destruction of ice habitats, thereby affecting indigenous hunting and transit.

General Ship Environmental Aspects

Pollutants in engine exhaust gases include carbon dioxide (CO_2), carbon monoxide (CO), sulphur oxides (SO_x), nitrogen oxides (NO_x), methane (CH_4), and particulate matter (PM) such as black carbon (BC) and organic carbon.

Ballast water is water carried in ships' ballast tanks to improve stability, balance and trim. It is taken up or discharged when cargo is unloaded or loaded, or when a ship needs extra stability in foul weather. Thousands of aquatic species may be carried in ships' ballast water, including bacteria and other microbes, micro-algae, and various life stages of aquatic plant and animal species. Ballast water has been shown to be an important means of transferring alien invasive species (AIS).

Oily water can include discharges from bilge water and oil systems. Bilge water is a combination of oil, sea water, fresh water and other contaminants produced during vessel operation. When the oil and water are emulsified, treatment is more difficult. Bilge water can contain oil, gasoline, solvents, detergents, other oxygen-demanding materials, and solids such as paint and rust chips, grit, debris, silt, metals and organic material. Oil systems include fuel oil filling and transfer systems, lubricating oil systems, tanks, and other marine systems which are connected with the use of oil or oil mixtures.

Blackwater is mainly wastewater from toilets, which contains fecal coliforms, strains of bacteria, viruses, pathogens and microorganisms. On a ship, blackwater includes discharges through medical and dental drains. Greywater is wastewater which comes from uses other than toilets, such as laundry, sinks and showers. Greywater can contain nutrients, bacteria, viruses and a variety of chemicals, including endocrine disruptors, associated with detergents and personal care products. Process waters include, but are not limited to, interior and exterior wash water and cooling water. These process waters may contain a mixture of suspended solids, heavy metals, oils, glycol, acidic and alkaline wastes, and detergents.

Solid waste that is discharged into the ocean may become marine debris, and can pose a threat to marine organisms, humans, coastal communities and industries that utilize marine waters. Hazardous wastes are classified on the basis of their biological, chemical, and physical properties. These materials are toxic, reactive, ignitable, corrosive, infectious, and/or radioactive. Hazardous wastes require special handling to reduce adverse effects to human health and the environment. Other special waste categories include international waste, electronic waste and biomedical waste.

Radio-frequency energy does not have enough energy to ionize matter like nuclear radiation. High RF levels can heat up live tissue to the extent of causing burns on contact with an antenna. High RF levels can also detonate ammunition or ignite fuel under certain circumstances. RF radiation is present in, and in the vicinity of, some transmitting antennae. This energy can also be induced in other objects, e.g. dressing lines, guardrails, etc. causing them to radiate fields as dangerous as the primary emitting source. RF fields have been shown to disrupt birds' orientation.

A number of hazardous materials are required in a shipping environment, including oils, cleaners, solvents, etc. Fire-fighting substances, such as Aqueous Film Forming Foam (AFFF), contain hazardous chemicals. Hazardous materials are also integrated in ship equipment and structure (e.g. insulation) during construction and operations of boats. Dry chemicals (e.g. sodium chloride, calcium chloride and urea), ethylene, glycol, methanol or other de-icing chemicals may be used for ice accretion during Arctic operations. Electronic equipment contains a number of hazardous materials. Although the hazardous substances in electronic equipment can present risks during recycling or disposal, it should be noted that some of these substances are present in the equipment for the purpose of lowering risks to human health during product use.

Halocarbons are used in refrigeration and air-conditioning systems, as well as fire-fighting systems. Halocarbons which contain chlorine and bromine can have a significant effect on the

destruction of the ozone layer. The international agreement known as the Montreal Protocol has been responsible for the reduction of most of these ODS, especially in Western countries. Halocarbons also function as greenhouse gases since most absorb radiant reflected sunlight. Halocarbons can also have high global warming potential.

Biological fouling (biofouling) is the accumulation of microorganisms, plants, algae or animals on wetted surfaces. Anti-fouling coatings contain leachable hazardous materials to slow the growth and/or facilitate the detachment of fouling organisms. Anti-marine growth systems are fitted to prevent fouling of seawater piping and hard-to-reach hull areas. They can be chemically-based or based on the electrolytic principle. Chemically-based systems generate chlorine, whereas electrolytic systems produce copper ions. Anti-fouling technologies, such as ultrasonic or low-frequency systems, may be utilized for anti-fouling as an alternative or as a complement to traditional anti-fouling systems.

Cleaning an underwater hull of biofouling can decrease the risk of AIS transfer between ports, and may increase energy efficiency due to decreases in emissions and fuel consumption. While vessel hull cleaning in dry dock is the preferred hull cleaning method to minimize the impact of fouling organisms to surface water, in-water hull cleaning may be conducted in the Arctic if repairs are required. In-water hull cleaning has the potential to release AIS in marine biofouling into the water column. There is also potential for biocidal (i.e. copper/zinc) anti-fouling paint chips to be released into the environment. Cleaning with brushes may accelerate and increase the amount of biocidal leachate that the anti-fouling coatings would normally release to the marine environment

Small Boats

Small boats may be used to conduct personnel and material transfers during the following events:

a. MIO/BOARDEX;
b. CROSSPOL;
c. SAREX;
d. Re-supply;
e. TRAPS/EMATT Trial;
f. Fuelling by barge;
g. RECCE;
h. COMREL;
i. LRAT Trial; and
j. FISHPAT.

Small boats may include rigid-hull inflatable boats, multi-rescue boats, enclosed lifeboats, inflatable rescue/diving boats and landing crafts. Proficiency training may take place in the Arctic.

RECCE

During Op NA-NK, RECCE will involve landing on 2 uninhabited islands – Griffith Island and Lowther Island, for a day patrol. The HDW or MAR ATVs may be brought ashore using their landing craft. The number of personnel going ashore ranges from approximately 6 to 10.

Waste Disposal

When other waste disposal methods are not practical (i.e. processed on the ship) and as permitted, ships will land organic and non-organic wastes in Arctic communities as arranged by ship logistics staff in consultation with local authorities (Ref. R). The landings will generally be arranged by barge or boat where no jetties are available. Waste disposal in Arctic communities is rare but there are two communities within the Arctic where waste disposal has occurred in the past - Nuuk, Greenland and Iqaluit, Nunavut.

Unmanned Systems

Unmanned systems include unmanned surface, subsurface and aerial systems. Unmanned systems can be either autonomous (independent and capable of conducting their own tasks without control) or remotely operated under continuous and positive control.

Unmanned systems can be powered using batteries, solar, hydrogen fuel cells, combustion engines, tethered to a power supply or by laser transmitter. Current unmanned surface and subsurface vehicles used by the RCN run on lithium-ion batteries. They are deployed from a vessel by lowering them into the surface waters with the help of a crane or A-frame winch system. They can then transit to their desired depth and location.

Icebreaking

HDW Class will be capable of breaking, passing through and maneuvering in 1 meter thick first year ice with some old inclusions. Icebreaking by HDW Class will be primarily for its own survivability and maneuverability in ice. The CCG Icebreaker will be involved in Op NA-TU for 2 days, south of the Arctic Line at 60^{o}N.

2. Aircraft and Helicopter Movement – Low Flying/Hovering

Aircraft and helicopters carry out operational and training activities to improve interoperability and combat effectiveness. The TRI will be equipped with a helicopter. The helicopter will likely be involved in the following activities:

a. Gunnery;
b. MIO/BOARDEX;
c. ENCOUNTEREX;
d. SAREX; and
e. PHOTOEX.

An RCAF CP-140 Aurora will also be involved in Op NA-TA, specifically to track the VOI during the MIO/BOARDEX.

Aircraft and helicopter operations can increase both noise in the localized area and the occurrence of spills into the Arctic environment.

3. Fuelling Alongside and at Anchor

During Op NA-TU and Op NA-NK, fuelling of the RCN ships will occur either at Nuuk, GL, or via commercial barge in the vicinity of Nanisivik or Cambridge Bay. The port at Nuuk is a commercial port, and has its own regulations which must be followed, unless the RCN's own requirements are stricter. GBY may be fuelled by MAR at Nanisivik.

During barge/ship to ship fuelling, both vessels may be at anchor or simply alongside each other. This type of fuelling is frequently done in the Arctic, and requires both vessels to be boomed 360^{o}. It is standard practice to have a small boat in the water while this type of fuelling takes place to aid in the clean-up if required (ref. R).

Fuelling and transfer of oil in the Arctic can be more difficult than in non-Arctic areas due to cold weather conditions. Spills can occur during fuelling and oil transfer operations, and have the potential to affect the marine and shore environments.

4. Bottom Interaction

The Arctic has limited locations where ships can come alongside, and ships are generally required to anchor off-shore and send personnel ashore using small boats. Anchoring can disturb seafloor habitat and immobile seabed aquatic life and can cause scouring of the seabed.

Bathythermography is used to accurately predict optimal sonar conditions by measuring ocean temperature profiles to determine its sound propagation characteristics. The Bathythermograph buoys and Expendable Bathythermograph probes (XBTs) are launched from an aircraft or ship and radio back their results. Temperatures are recorded as the buoys and probes drop at known rates and they self-scuttle after a period of time. Both Bathythermograph buoys and XBTs use batteries, and are composed of various materials, including plastic and metal.

The EMATT is a torpedo-shaped target that is launched by an aircraft or ship used for the HMS and other sonars. It contains an electronics package and batteries (Ref. R). When deployed, it sinks to a pre-determined depth and executes a pre-programmed path. After three hours, the EMATT self-scuttles.

Mobile targets are used in Gunnery exercises to simulate a moving vessel and are towed behind another vessel, are self-propelled or are radio controlled. Mobile targets used in the Arctic include High Speed Plastic Targets (HSPT) and the Hammerhead remote controlled surface firing target (Figure 7). The towed target is called High Speed Inflatable Towed Target (HSITT). These targets get destroyed and debris sinks to the ocean bottom.

Figure 7 – Hammerhead Unmanned Surface Vehicle Mobile Target

5. Single and Multiple Tow

Single and multiple tow activities will occur during the Gunnery exercise during Op NA-TU, and during the DRDC TRAPS trial with HDW.

The Gunnery exercise includes towing of targets and decoys. The HSITT, which is an inflatable towed target with multiple chambers for maximum life, is used during Surface Fire exercises (Figure 8). TRAPS involves the deployment of a 12 m long sonar array. Towed systems can drag on the ocean bottom, thereby causing damage to the sea floor.

Figure 8 – HSITT Towed Target (Source. Ref. L)

6. Active Sonar

Active sonar includes the transmission and reception of acoustic energy. Passive sonar activities include detecting noises from other objects and do not emit a signal. Active sonar is known to increase localized underwater noise and have negative effects on marine mammals.

Active sonar will be involved in three of the DRDC trials:

a. TRAPS/EMATT and TRAPS/BRS (low frequency);
b. MARPS; and
c. LRAT.

7. Radar Use (Fire Control Only) and Laser

Radar sensors are used to provide air and surface warning capabilities through the use of radio-frequency electro-magnetic radiation to detect and locate airborne or surface targets, and avoid collision. The Allied ships may be fitted with radar to aim and control the surface weapon systems (fire control radar), however HDW Class and KIN Class do not have this capability.

Targets of opportunity (passing vessels or aircraft) may be used to test fire control radars.

8. Missile Fire

This activity will not be carried out during Op NA-TU or Op NA-NK.

9. Inert Torpedo Fire

This activity will not be carried out during Op NA-TU or Op NA-NK.

10. Surface Firing

Surface fire can involve discharge of live ordnance, inert projectiles, smoke flares, and common flares. The Gunnery exercise will be carried out in the MARLOAs. The participating ships are equipped with the following guns:

HDW, MAR: BAE Mk 38 remote controlled 25mm gun and 0.50 caliber (cal) machine guns
GBY: 0.50 cal machine guns
HDMS TRITON: 76mm 62-cal OTO Melara Super Rapid DP, 12.7 mm heavy machine guns, 7.62mm light machine guns
RHO: unknown
BEA: 76mm/62 cal naval gun OTO Melara Mark 75, 0.50 cal machine guns
PRO: 7.62x51mm M134 Miniguns, 7.62mm general-purpose machine guns

11. Underwater Explosion

This activity will not be carried out during Op NA-TU or Op NA-NK.

12. Air-to-Air and Other Air Noise

This activity will not be carried out during Op NA-TU or Op NA-NK.

2.3 Identification of Valued Ecosystem Components (VECs)

The Environmental Effects Matrix (Table 17) is used to identify potential interactions between project components and identified VECs.

Table 17 - Environmental Effects Matrix

	Air Quality	Acoustic Environment (ambient noise, underwater noise)	Marine Water and Sediment Quality	Marine Fish and Invertebrate Resources	Marine Mammals and Sea Turtles	Avifauna	Species at Risk	Special/Protected Areas	Fisheries (commercial, recreational, and Indigenous)	Other Ocean Uses	Indigenous/Traditional Activities
1. Vessel and Submarine Movement	X	X	X	X	X	X	X	X	X	X	X
2. Aircraft and Helicopter Movement	X	X	X	X	X	X	X	X	X	X	X
3. Fuelling Alongside and at Anchor	X		X	X	X	X	X	X	X	X	X
4. Bottom Interaction			X	X				X	X		X
5. Single/Multiple Tow			X	X	X	X	X	X	X	X	X
6. Active Sonar		X		X	X	X	X	X	X	X	X
7. Radar Use (Fire Control Only) and Laser						X	X	X			X
8. Live Missile Fire*											
9. Torpedo Fire (inert)*											
10. Surface Fire		X	X	X	X	X	X	X	X	X	X
11. Underwater Explosion*											
12. Air-to-air Fire and Other Air Noise*											

*Indicates that activity will not take place during Op NA-TU or Op NA-NK and has not been assessed.

Legend: [*Blank*] = No Effect ┃ [X] = Potential Significant Adverse Effect

2.4 Description of Valued Ecosystem Components

A detailed description of the valued ecosystem components is located in Annex A.

2.5 Project Effects and Associated Mitigation Measures

Potential activity interactions with each VEC which were identified in Table 17 are described in Annex D. Potential significant adverse effects would be those impacts that could typically diminish environmental quality, natural resources or features, or diminish the existing or potential land use within a study area. Each activity that may produce potential significant adverse effects should be evaluated.

Mitigation Measures

Mitigation measures to eliminate, reduce and respond to the risks to the VECs from the OP NANOOK have been identified in Annex D. General mitigation measures applicable to specific activity-VEC interactions have been provided based on best practices, Ship Class Safety and Environmental Management Systems (SEMS), and previous environmental assessments prepared on behalf of DND.

In addition to the mitigation measures provided in Annex D, the following general recommendations are made:

- navigate and operate in accordance to all applicable legislation;
- mitigation measures provided in this DDEED report should be added to the applicable Class SEMS or other mitigation documents, if not already included and as applicable;
- develop an SOP for ice breaking activities, based on operating procedures and best management practices;
- monitoring and follow-up should be conducted to ensure that proposed mitigation measures are suitable and effective;
- a precautionary approach should be employed whenever appropriate to mitigate potential environmental harm;
- conduct biofouling surveys on vessel hulls and perform hull cleaning, if required, before northern deployments to reduce the risk of invasive species transfer;
- ensure all personnel are properly trained to operate in Arctic environments;
- DND must meet its commitments in the IIBA, including providing a summary of the planned research to the Aulattiqatigiit Board, and providing the Board with an unclassified summary of the results;
- communications with indigenous groups should be undertaken regularly; and
- to date, the priority of RCN policy has been with respect to marine mammals. Consideration should be given to including sea turtles in RCN policy and training:
  a. include sea turtles in identification training;
  b. consider including sea turtles in RCN Noise Strategy;
  c. include mitigation measures for sea turtles in the SEMS;
  d. report sea turtle sightings – Canadian Sea Turtle Network (1-888-729-4667); and
  e. ensure ship staff are aware of sensitive timing windows and where sea turtles are expected to be encountered.

The likely potential for significant adverse effects after the described mitigation measures are implemented have been assessed as Yes or No in Annex D..

Entering **No** indicates that residual adverse effects are not likely to be significant since:

- Potential residual effect(s) may result in a slight decline of the resource in the study area during the life of the Project. Research, monitoring and/or recovery initiatives would not normally be required; or
- Potential residual effect(s) may result in a slight decline of the resource in the study area during construction phase, but the resource should return to baseline levels.

Entering **Yes** indicates that residual adverse effects are likely to be significant since:

- Potential effect(s) could threaten sustainability of the VEC and should be considered a management concern. Research, monitoring and/or recovery initiatives should be considered; or
- Potential effect(s) could result in a decline in the VEC to lower-than-baseline but stable levels in the study area after project closure and into the foreseeable future. Regional management actions such as research, monitoring and/or recovery initiatives may be required.

A summary of mitigation measures for ship staff is provided for each assessed activity in Annex B in the form of Environmental Support Instructions.

Monitoring and Follow-up

Monitoring of the environmental performance of the activities is recommended to ensure that the mitigation measures are adequate. Monitoring should include the review of any environmental incidents and near misses, including leaks, spills, sheens and marine mammal encounters, and determining the causes. Mitigation measures should be updated/improved based on the results of these analyses. Reporting should be done in accordance with the applicable SEMS and/or environmental management plan.

MARL SE should follow up to ensure that DND's commitments in the Tallurutiup Imanga NMCA IIBA have been addressed.

2.6 Effects of the Environment on OP NA-TU and Op NA-NK

The Arctic environment will have various impacts on operations, including limitations on operational area and deployment durations. Sea ice and extreme low temperatures limit the area of operations. Additionally, the Arctic is a pristine environment with various protected areas, critical habitats and species at risk. Operations and exercises will be limited in spatial scope since activities must avoid environmentally sensitive areas. Finally, pingos, or mounds of earth covered in ice, represent a unique Arctic hazard to shipping.

With the exception of the HDW Class, DND vessels are not specifically designed to operate in ice covered areas. Floating sea ice may cause disturbances or delays to vessel movements and operations in the Arctic environment. Blowing snow and foggy conditions may decrease visibility and alter exercise planning. Magnetic compasses may be erratic in the Arctic. Ionospheric disturbances may impact radio communications by reducing ranges and increasing the occurrence of blackouts. Cellular service is also limited. Extremely low temperatures, freezing spray and ice damage may impact the functioning of certain equipment.

Personnel will require appropriate personal protective equipment (PPE) and multiple layers of warm clothing to protect from extreme cold winds. Frost bite, hypothermia, and snow blindness are unique medical threats to personnel operating in Arctic waters. In an emergency, personnel should be prepared to survive between 24 to 48 hours in Arctic waters after evacuating the ship due to the remote nature of Arctic navigation. Lastly, the Arctic's unique 24hr daylight and 24hr darkness cycles may have mental and physical effects on ship staff limiting the operational capacity.

Polar bears, Arctic foxes, wolves, and other northern predators may disrupt and endanger DND employees during shore landings and other activities. It is important to respect and maintain a significant distance from these animals and killings should only be conducted if absolutely necessarily to protect human life. All self-defence kills must be reported to the appropriate authorities.

Climate change has the potential to impact activities in the Arctic. Warming waters can alter currents, wind patterns and the occurrence of snow and ice storms. Warming waters can also change habitats for marine mammals, causing their ranges to be moved or expanded. The increasing temperature in the Arctic Ocean is leading to climate matching with lower latitudes. Invasive species transfer from vessel's hulls into the climate matched Arctic Ocean could have significant impacts to local ecosystems, potentially altering the natural cycles upon which species and local communities rely. Ice falling from large ice formations can cause large, dangerous waves that may put DND vessels at risk. Changes in sea levels may alter shorelines, impacting shore landings. Climate change adaptation is an important consideration for the CAF.

2.7 Safety Issues

Safety hazards have been identified for all RCN vessel classes and associated activities, and safety standard operating procedures for RCN vessels are provided in class SEMS Manuals.

Currently, HDW Class vessels have an increased safety hazard to the crew from falling loads or equipment from the main deck crane (20 tonne capacity). Safety limits have failed and various valves and safety switches are not working properly, or could fail. A risk assessment has been carried out and the results have been communicated to the HDW and MAR crews. The mitigation measures are:

a. no personnel will be lifted with the 20 tonne crane in its current condition;
b. an additional supervisor with communication to the operator will be stationed on the AX mezzanine or flight deck ensuring the following limits are not surpassed, and if they are approaching them, will stop the crane operations:
   i. main / auxilliary hooks are not reeled in passed their anti-two blocks;
   ii. the crane is not slewed passed design intent; and
   iii. five wraps of the main cable remain on the spool; and
c. a trained member will have the pedestal door open when crane is in operations and have communication to the operator - if the cables begin to snag, they are to stop crane operations.

These crane mitigation measures need to be considered for the TRAPS/EMATT and MARPS trials, and other activities carried out by HDW class vessels that use the main deck crane, such as re-supply and deployment/recovery of unmanned systems.

2.8 Indigenous Community Engagement

An assessment using the Assistant Deputy Minister (Infrastructure and Environment) (ADM[IE]) Duty to Consult Determination guided template has been completed and is located in Annex E. Territorial lands have been identified in Annex A.

Community engagement for the Arctic communities is being carried out by JTFN. JTFN is sending out annual notification letters to each of the affected communities and Nunavut Tuungavik, Inc. The first Indigenous Engagement Session took place on 12 May 2022 with representatives of Qikiqtani Inuit Association (QIA) and Kitikmeot Inuit Association (KIA) (ref. S). At that session, JTFN were informed that Pond Inlet will be in open water and prime harvesting season during the time RCN is there. QIA asked for more information regarding the activities at Pond Inlet for this time period, specifically what activities will be undertaken and where (ref. T). Activities at each community/port to be visited during Op NA-TU and Op NA-NK are listed in Table 5.

Community engagement for Nain, NL and Hopedale, NL is being carried out by the CFB Goose Bay Real Property Operations Detachment (ref. U). These communities are part of the Labrador Inuit Land Claims Agreement (LILCA).

As discussed previously, the locations of 3 of the trials are within the soon-to-be-established Tallurutiup Imanga NMCA, and according to the IIBA, information about the trials is to be provided to the Aulattiqatigiit Board which is a joint Inuit and Canada management board.

Written navigational warnings (NAVWARNs) and notices to mariners (NOTMARs) serve to warn vessel operators about training activity timing and location. These notices contain important information about activities which should remain in effect for the duration of the exercise. However, it remains uncertain how effective these systems are in warning Indigenous communities and those who may be undertaking traditional activities.

2.9 Public Participation

No public consultation was undertaken for this DDEED. As mentioned above, written NAVWARNs and NOTMARs serve to warn vessel operators about training activity timings and locations.

2.10 Cumulative Effects

Studies estimate that overall shipping activity in the Arctic will increase over the next 30 years due to melting Arctic ice. Utilizing shipping routes through the Arctic can cut valuable time and save a significant amount of money. Commercial shipping companies are increasingly investing in vessels that can break through first-year ice. As Arctic sea ice continues to deteriorate with climate change, traffic along Arctic shipping pathways will increase and may continue all year round. Additionally, oil and gas exploration and commercial fishing are expected to increase in the Canadian north in the coming years.

Environmental conditions in the Canadian Arctic are relatively understudied, due to its remote location and extreme temperatures. Despite the lack of baseline information, the Arctic is currently considered to be pristine and relatively free from human-caused pollution and destruction. The cumulative impact of an increase in shipping and activity in the Arctic will result in an increase in air, water, and soil pollution. Air pollution, specifically black carbon (causes absorption of solar energy), will continue to reduce the albedo affect (reflecting power of the surface), and speed up sea ice melt. Water pollution and physical debris (plastic, hazardous materials, etc) will impact aquatic life and local fisheries. The RCN will employ appropriate mitigation measures to ensure activities are not significantly impacting the Arctic environment.

As Arctic tourism increases in the coming years, encounters and killings of species at risk may occur. In July 2018, a polar bear was killed when it attacked an Arctic tour guide in Svalbard, Norway (Ref. R). Tourists and foreigners, who lack the traditional knowledge of those living in the Arctic, and just generally increasing foot traffic will lead to an increase in encounters with species at risk, potentially impacting their endangered populations. The RCN will ensure encounters with species at risk are minimal and will be trained in non-fatal escape techniques.

Underwater noise from shipping is expected to cause significant impacts to Arctic marine mammals as shipping increases. Icebreaking vessels are expected to have the biggest increase in noise due to nature of breaking ice, which requires specific maneuvering like backing up and ramming into ice (Ref. R). Marine mammals rely on sound for survival and increased anthropogenic sounds can impact them in numerous ways. The RCN will keep appropriate

distances from marine mammals and conduct marine mammal mitigation techniques to ensure they are not significantly increasing the cumulative impact of underwater noise in the Canadian Arctic.

The cumulative impact of an increased presence of shipping activities in the Canadian Arctic could impact remote northern communities, specifically in the occurrence of bulk supply purchasing and landing of garbage. The RCN conducts appropriate planning for operations to ensure effects on northern remote communities remain minimal.

RCN operations in the Canadian Arctic themselves are not expected to significantly increase cumulative impacts to the Arctic environment. The extent of DND operations are considered to be minimal in comparison to the future shipping activity, oil and gas exploration and commercial fishing expected in the Canadian Arctic.

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Establishment File #:[Insert base file #]

DND EIA #:1267-0100-2242

Part 3 - Environmental Effects Determination

[Parts 1, 2 and a signed Part 3 of the DND DDEED Report must be submitted to ADM(IE) through the Portal.]

On the basis of this DND DDEED Report, it has been determined that the impact of this project on the environment is as follows: [double click on a checkbox to mark it with an X]

☒ Project is not likely to cause significant adverse environmental effects. The Project **can** proceed with application of the mitigation measures specified in the interaction tables in this report.

☐ The Project is likely to cause significant adverse environmental effects that cannot be mitigated. The project must not proceed and must be referred to Governor in Council through the appropriate chain of command before it can potentially proceed in its current state. Otherwise, changes to the project scope (parameters and/or site location) are recommended. This would require a new EDD be submitted through the Portal.

DND DDEED Report Prepared by:

Name: S. Leutheusser **Title: Sr. Engineer, NETE**

_____	_____	
Signature	Date (dd-mm-yyyy)	**OPI Initials to validate information (optional)**

DND DDEED Report Reviewed by:

Name: **Title:**

_____	_____
Signature	Date (dd-mm-yyyy)

DND DDEED Report Accepted and Approved by:

The undersigned accepts the determination and recommendations of this environmental effects determination report. The undersigned also accepts the responsibility to incorporate the recommendations of the report into the Project design and implementation.

Name: **Title:**

_____	_____
Signature	Date (dd-mm-yyyy)

Annex A – Description of Valued Ecosystem Components

Annex A - Description of Valued Ecosystem Components

General Description

The spatial scope of this DDEED focuses on the area used by Op NANOOK –TUUGAALIK and Op NANOOK-NUNAKPUT in 2022. This involves departure from Canadian Forces Base (CFB) Halifax to Cambridge Bay, Nunavut (NU) via the Labrador Sea, Baffin Bay, Davis Strait, Lancaster Sound, Peel Sound or McClintock Channel, Larson Sound, Victoria Strait and Queen Mead Gulf, and return to CFB Halifax.

A.1 AIR QUALITY

EAST COAST OF CANADA

The east coast of Canada is located within the International Convention on the Prevention of Pollution from Ships (MARPOL) North American Emission Control Area (NAECA). In emission control areas, there are limits for nitrogen oxides (NO_x) and sulphur oxides (SO_x) from ship engines. NO_x are formed during the combustion process. Therefore, the basis for the emission standards stems from measurements of NOx in the exhaust stream. This is controlled by engine design. SO_x are formed during combustion from the sulphur present in the vessel's fuel, therefore the standards are set as the percentage of sulphur content in the fuel. A vessel may operate an exhaust gas cleaning system instead of meeting the fuel sulphur content requirements.

Figure A-1 – North American Emission Control Area

EASTERN CANADIAN ARCTIC

This information comes from Reference A.

There are considerable uncertainties between inventories of pollutant concentrations for the Arctic. Most emission estimates have been focused on BC due to its contribution to global warming via snow and ice albedo reduction. Other pollutants such as NOx, SOx, CO, volatile organic compounds (VOC) and PM have received less attention. The 2015 Arctic Monitoring and Assessment Programme (AMAP) report compares emissions from 11 different inventories over several years at different latitude bands and for all seasons. For emissions north of 60°N the ratio between maximum and minimum emissions for inventories in 2010 is 3.1 for BC, 1.5 for NOx, 1.6 for SO_2, and exceeds 2.3 for all other pollutants. For comparison, globally ratios are around 1.2. This means that there are significant differences between inventories of air pollution in the Arctic, particularly for BC, so actual air quality conditions are quite uncertain.

Air pollution consisting of particulate matter and trace gases in the lower Arctic atmosphere, known as Arctic haze, has been an issue since the 1950s. A significant number of studies have found long range transport of air pollution to the Arctic from the south. Pollution gets blown northward because that's the dominant air circulation pattern which moves from lower latitudes towards the poles.

Studies have found that the Arctic is extraordinarily sensitive to air pollution and that particulate matter may spur Arctic cloud formation. These clouds act as a blanket to an already warming Arctic. Clouds in the Arctic are two to eight times more sensitive to air pollution than clouds at lower latitudes. Once in the Arctic, the pollution is trapped under a temperature inversion, where a cap of warm air sits over a pool of cold air, preventing the accumulated polluted air from escaping.

The Canadian Arctic is not located within the MARPOL NAECA.

E.2 ACOUSTIC ENVIRONMENT (AMBIENT NOISE, UNDERWATER NOISE)

EAST COAST OF CANADA

The information in this section was taken from Ref. B.

Natural sources include sounds originating from geophysical events such as wind, waves, sea state, rain, and earthquakes, and biological events like marine mammals, fishes and invertebrates (snapping shrimps). In ice-covered waters, ice motion and ice-air interaction also generate sounds. This ocean noise can be split up in three distinct noise regions in the frequency domain. Ultra-low frequencies (below 10 Hertz (Hz)) are dominated by the noise generated by ocean surface waves, turbulent pressure fluctuations, and seismic events. Marine traffic and seismic survey sounds dominate frequencies ranging from about 10 Hz to 1 kilohertz (kHz). The frequency band 100 Hz - 50 kHz is dominated by wind generated noise with a maximum

between 300 Hz and 1 kHz. The level of natural ambient noise escalates as the wind and sea state rise.

In general, noise created from surf noise can range from 60 to > 100 decibels (dB) re 1 micro Pascal squared per Hertz (μ Pa2/Hz) at low frequencies. Noise levels are usually higher closer to fixed developments and/or sites where there are many forms of mechanization occurring at once.

Several studies have characterized the general ambient noise characteristics of the Scotian Shelf, with the project sponsored by the Environmental Studies Research Fund being the most definitive. These studies have shown that there is considerable spatial and temporal variation in ambient noise levels on the Scotian Shelf. Wind and wave generated noise is typically higher than predicted for average sea states. Studies have also shown that at frequencies dominated by shipping noise (10–100 Hz), ambient noise levels are up to 40 dB higher than noise levels generated by high winds but only in the immediate vicinity of regularly used shipping lanes.

A variety of economic activity occurs in and around the MARLOAs, including shipping and ferry traffic, commercial fishing, oil and gas development, construction, marine research, and tourism. These activities contribute to the ambient noise in the area.

According to reference B, relevant features of the soundscape in the MARLOAs, based on data from a 2018 report are:

a. the sound levels depend on the types of sources nearby, which change in time and space. For example, fin whales were a contributor to the soundscape below 100Hz at a specific station during a specific time period, but not at other locations. Seismic airgun surveys are a moving sound source that can increase the peak sound pressure levels at specific locations;

b. sound pressure levels received at the seabed increase in the winter due to increased wind and wave generated noise but also due to improved propagation conditions for transmitting sound to the seabed;

c. the peak sound pressure levels are 10-20dB higher than the broadband sound pressure lever (10 – 120,000 Hz); and

d. the presence of oil and gas production platforms 35 km away from a specific location increases the received sound pressure levels by 10-15 dB re1 μPa compared to locations without constant human sound sources, and they reduce the variability in the average sound pressure levels.

EASTERN CANADIAN ARCTIC

This information comes from Reference A.

There is limited human activity in the Arctic Ocean which results in a natural soundscape with few or no human sound sources. In the summer the sound pressure levels increase and decrease in response to changes in the wind speed. The difference in average sound pressure levels may vary by 15-20 decibel (dB) re 1 micro pascal (μPa) from calm conditions to storms. The peak frequency for the wind driven sound is ~500 hertz (Hz). The lack of human activity results in very low sound levels in the frequency band of 10-200 Hz compared to most ocean locations. In some summers seismic airgun surveys raise the sound levels by 10-40 dB in the frequency range of 10-1,000 Hz within several hundred kilometres (km) of the survey.

In winter, ice reduces ambient noise dependence on wind-driven surface action and the ambient noise is dominated by ice cracking events. Peak frequencies for thermally-induced ice-crack noise of 100–300 Hz have been reported, and Makris and Dyer (ref. C) found a peak frequency of 300 Hz. Under the ice the sound speed increases with depth. As a result, sound refracts upwards and reflects off the ice. At frequencies below ~100 Hz the sound interacts with the ice as if it were a flat mirror and travels long distances. As the frequency increases it is scattered off the rough underside of the ice and does not travel far from where it was generated.

As a result, the spectrum of the under-ice noise has very little energy above 1 kilohertz (kHz). This effect is decreasing due to the reduced amount of multiyear ice in the Arctic.

Ice further from shore tends to be dynamic and moves in response to currents and wind stresses. Openings, or leads, in the ice allow wind noise to enter the ocean and increase the sound levels close to the leads. Typically, the size of the leads decreases through the winter resulting in the lowest sound levels from April to June. May and June are the mating season for bearded seals which can increase the ambient sound levels in the 200-600 Hz band by 10-15 dB over the mating period.

Sea ice is a key driver in the Arctic's underwater soundscape. As climate change extends the ice-free period in the Artic, the natural noise barrier that ice provides is removed for longer durations. Additionally, Arctic shipping, a source of ambient and underwater noise, is anticipated to increase as a result of these ice-free conditions.

E.3 MARINE WATER AND SEDIMENT QUALITY

EAST COAST OF CANADA

East coast waters are located within the Northwest Atlantic Marine and Atlantic Marine Ecozones. The Northwest Atlantic Marine Ecozone includes the far north, but also the entire Labrador coast, the west and northeast coasts of Newfoundland, and the entire Quebec, New Brunswick, Prince Edward Island and Nova Scotia coasts of the Gulf of St. Lawrence. Offshore, the continental shelf extends to a distance of about 150 km, with water depths ranging from 200 to 300 metres. Within the ecozone, tides range from 9 to 12 metres. In parts of the Gulf of St. Lawrence, tidal action is much smaller, with average fluctuations of less than a metre.

The Northwest Atlantic Marine Ecozone forms a transition between the cold northern waters and the more temperate southern waters. Major ocean currents flow through it - cold arctic waters carried south by the Labrador Current merge near the Grand Banks with the warmer flow of the Gulf Stream. Average temperatures differ by more than 20°C between the arctic waters and the Gulf Stream. In August, surface temperatures vary between 3 and 8°C. Beneath the surface, temperatures remain below 0°C year-round, but sea salt prevents the sub-surface waters from freezing solid. In the Gulf of St. Lawrence, fresh water flowing from the St. Lawrence River keeps the salt levels lower.

With the exception of the Grand Banks and the Scotian Shelf, the Atlantic Marine Ecozone is defined by deep water. Its offshore boundary wanders along the edge of the eastern continental shelf and about half of the ecozone is located well out to sea. It begins in the Davis Strait, follows the Labrador Shelf south around the Flemish Cap seamount, takes in the Grand Banks, and comes ashore at the northeastern tip of Newfoundland's Avalon Peninsula. The inshore boundary encompasses all of Newfoundland's south coast and Nova Scotia's east coast and extends into the Bay of Fundy and south to the Gulf of Maine. Icebergs are not uncommon in this marine ecozone.

The Atlantic Marine Ecozone essentially begins at the edge of the continental shelf and travels east out to sea. East and south off Newfoundland lie the relative shallows of the Grand Banks, the trailing edge of the great North American tectonic plate. Average water depths outside the shelf can reach thousands of metres, with depths on the Grand Banks of less than 150 metres over broad areas. Tidal ranges within the ecozone are normally one to two metres, but the Bay of Fundy is the exception, with its tidal bores topping 15 metres.

The ecozone is generally temperate due to the influence of the massive Gulf Stream. Prevailing winds blowing off the land from the west and southwest also moderate the ocean climate. In August, surface water temperatures can vary between 10 and 23°C. But like the Northwest Atlantic Ecozone, winter and early spring ice can be plentiful along the east coast of the Avalon Peninsula and in the Cabot Strait between Newfoundland and Nova Scotia. Icebergs are a common sight in late winter and spring off the Newfoundland coast and on the Grand Banks. The mainland coast of Nova Scotia (except for its northernmost reaches) and the Bay of Fundy are essentially ice-free. Off Newfoundland, mixing of the warm currents from the south and the Labrador Current from the north produces some of the most famously dense fog banks on the planet.

Temperature and Salinity

The information in this section was taken from Ref. B.

Temperature and salinity are important hydrographic parameters as they determine the density of seawater, which influences oceanic circulation and mixing, and the transmission of underwater noise. Water temperature can influence photosynthesis, species distribution, and metabolic rates. Salinity influences the presence of marine life through species salinity preferences, but also through its effect on stratification, which affects phytoplankton productivity.

Gulf of St. Lawrence and Western Newfoundland

The St. Lawrence River provides an influx of fresh water to the Gulf of St. Lawrence. Water in the Gulf has a distinct characteristic of surface layers with relatively low salinities and seasonally variable thickness. Throughout this region, seasonal changes in water temperature decrease with depth. In the southern Gulf, temperature range decreases with depth and there is little or no seasonal change deeper than 100-150 m. Along the western coast of Newfoundland, beginning near St. John Island, seasonal temperature oscillations are wide and increase slightly as you move south. In the summer, the temperature range decreases with depth in the upper waters due to a cold intermediate layer between 50 and 200 m depth. The Labrador Current brings this cold water through the Strait of Belle Isle. Below 200 m depth, water temperature is between 4-6ºC in the summer. In the winter, the upper layer is nearly homogenously mixed and the temperature is below 0ºC. The Gulf is typically ice covered in winter.

Southern and Eastern Newfoundland

Two distinct regimes make up the near-bottom portion of the water column in the Laurentian Sub basin region. One is influenced by cold, fresh water from the eastern Newfoundland Shelf (includes St. Pierre Bank and areas to the east). Temperatures in this region range from 0-2ºC but are often less than 0ºC. The other is the deeper regions of the Laurentian and Hermitage channels and areas to the west of St Pierre Bank. This region is influenced by warmer water from the shelf slope to the south. Over the St. Pierre Bank, average water temperatures range between 1-2ºC. In deeper waters in the channels and on the continental slope, temperatures range from 2ºC at 125-150 m depths to 5-6ºC near the bottom. The average bottom temperature in April in the Laurentian Channel is approximately 5ºC. On the St. Pierre Bank, bottom temperatures range from 0ºC on the east side to 2-3ºC on the western side of the bank. Isotherms on the bottom tend to follow the bathymetry around the Laurentian Channel and the southwestern Grand Banks. They decrease from 2ºC at 200 m depth to 5ºC deeper than 300 m. In waters off eastern Newfoundland, there is considerable seasonal variability, particularly in the upper part of the water column. Labrador Current salinity ranges between 34 and 36 practical salinity units (psu).

Scotian Shelf and Slope

Temperature and salinity of the marine water in this region tends to increase from northeast to southwest due to cold, less saline water coming from the Gulf of St. Lawrence. Water further offshore tends to be warmer and more saline, resulting in an inshore to offshore gradient of temperature and salinity. There is noticeable seasonal variation in surface temperatures over much of the Scotian Shelf. Some areas of the Scotian Shelf can have temperature ranges of over 15ºC from summer to winter, while others are influenced by regular upwelling of cool bottom waters and maintain a more stable temperature regime (range 5-11ºC).Warm surface temperatures in the summer and fall can result in a high abundance of whales, sea turtles, and some commercial fish species.

Bottom temperatures less than 3ºC are mostly confined to the eastern Scotian Shelf and remain relatively unchanged through the winter. Temperatures on the western Scotian Shelf are typically warmer and more dynamic (spatially and seasonally) than temperatures on the eastern portion of the Shelf. This is due to the influence of the Gulf Stream and results in increased vertical mixing in this region.

Water in the Shelf current is less saline (31-33 psu) than the water in the Gulf Stream and the Labrador Current (34-36 psu). Areas near the coastline are typically less saline than areas of the slope and basins, and surface salinity is variable.

Gulf of Maine and Bay of Fundy

Temperature and salinity in the Gulf of Maine varies greatly depending on locations, season, and water depth. The Labrador Current and the Gulf Stream are large-scale currents that influence oceanographic factors such as temperature and salinity. The Northeast Channel brings warm, saline continental slope water, while the water that comes in from the Scotian Shelf is cool and relatively fresh. The result is a range of salinities at varying depths when incoming water mixes with water already present in the Gulf.

The Bay of Fundy experiences the highest tides in the world, and a high tide can exceed 16 m in the head of the bay. As a result of tides, there is intense vertical mixing in the Bay of Fundy that leads to very little stratification in salinity and temperature.

Sea Ice

Eastern Canada waters are divided into Ice Control Zones (Ref. D) (see Figure A-2). The declaration that an Ice Control Zone is active will depend on a determination by the CCG of the presence or expected presence of ice conditions dangerous to shipping. An active Ice Control Zone will be de-activated when the CCG decides that the risk no longer exists. Active Ice Control Zones are generally in place from November 6 to July 31, but the period may be extended or reduced depending on prevailing ice conditions.

Up to date ice mapping can be obtained from a Government of Canada website (Ref. E).

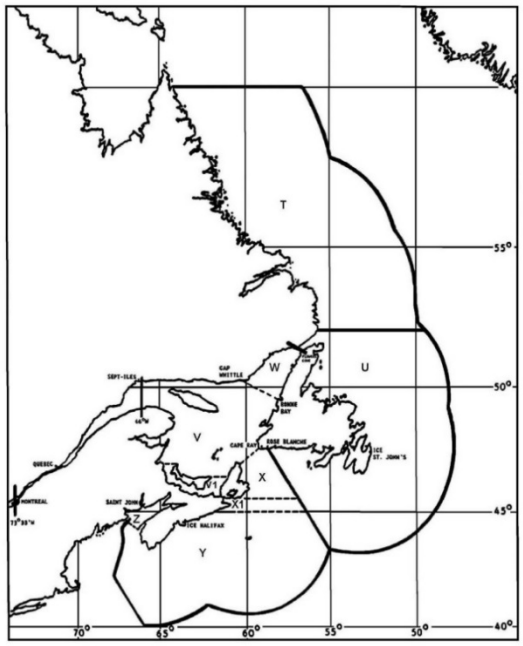

Figure A-2 - Ice Control Zones in Eastern Canada (Ref. E)

Halifax Harbour

Halifax Harbour has historically been subject to contamination entering marine waters through various industrial and domestic sources. Prior to the implementation of the Halifax Harbour Solutions Project in 2007, there were only two (2) wastewater treatment facilities (WWTF) in place, and 80% of the Halifax Harbour sewershed entered the harbour untreated. From 2008, three (3) new WWTFs gradually started operation and by 2010 all 3 (three) new WWTFs were in full operation. Analysis of water quality over the period 2004 to 2010 show that the goals for water quality have been largely met (Ref. F)

Sediment Quality

The information in this section was taken from Ref. B.

Sediments of the Gulf of St. Lawrence, the Bay of Fundy, and portions of the Scotian Shelf/Slope and Grand Banks are classified based on the manner in which they were transported and deposited. Sediments of the Gulf of St. Lawrence are characterized mainly by marine mud and sand and till blanket, with a smaller fraction of lag glaciomarine and fine grained glaciomarine. Sediments of the Bay of Fundy are characterized mainly by marine mud and sand and till blanket. Similarly, the Scotian Shelf/Slope and Grand Banks are mainly comprised of marine mud and sand and till blanket with a smaller fraction of fine grained glaciomarine.

Small craft harbours (SCHs) reside in the nearshore areas of the MARLOAs. Fisheries and Oceans Canada (DFO) routinely samples sediments of managed SCHs and evaluates sediments against Canadian sediment quality guidelines as part of their Marine Sediment Sampling

Program (MSSP). Sediment quality among SCHs if often variable.

Heavy metals represent one of many contaminants which can occur in sediments. Heavy metals can be introduced into marine sediments by both natural and anthropogenic activities. Natural sources of heavy metals include river runoff, atmospheric precipitation, and hydrothermal vents. Human activities, including mining and industrial activities can contribute as a pollution source. The Gulf of the St. Lawrence serves as the main discharge of heavy metals (and fresh water) for the Scotian Shelf. Heavy metals are likely to deposit to finer grained sediments in the deep basins of the shelf. Metals may also be transported offshore via ocean currents.

Sediment quality on the basis of heavy metals has been assessed for offshore sediments of the Scotian Shelf and part of the Bay of Fundy. Specifically, the distribution of dissolved cadmium, dissolved copper, chromium, copper, and zinc was informed by historical surficial sediment sampling efforts. Dissolved cadmium levels were variable across areas of the shelf, with higher concentrations in the northeast, which is deemed a function of the inputs resulting from the Gulf of St. Lawrence. Dissolved copper inputs show a similar trend with higher concentrations in the north east and localized discharges along the eastern area of Nova Scotia. Chromium concentrations are highest in areas with finer sediments, including shelf basins and along the continental slope. Copper, lead, and zinc distributions follow a similar trend, with increased concentrations in areas with finer sediments, including shelf basins and along the continental shelf. Generally, the concentrations of the heavy metals along Scotian Shelf represent background concentrations and commonly fall below Canadian sediment quality guidelines for the protection of aquatic life.

EASTERN CANADIAN ARCTIC

The Canadian Arctic includes the waters of the Arctic Ocean to the north, Beaufort Sea to the west, Baffin Bay and Davis Strait to the east and Hudson Strait and Hudson Bay to the south. The various Arctic islands are separated from each other and the continental mainland by a series of waterways collectively known as the Northwestern Passages.

The Canadian Arctic region encompasses two deep basins – Canada Basin and Baffin Bay – separated by a broad, shallow continental shelf – the Canadian Polar Shelf – which acts as a sill between the Pacific and Arctic (Ref. G). A broad and relatively deep sill in the southeast separates Baffin Bay from a third basin, the Labrador Basin. Hudson Bay and James Bay occupy an appreciable fraction of the Canadian Polar Shelf.

In different areas of the Canadian Arctic, seawater has become more acidic over the last 10-20 years. Lower pH levels can damage the shells of some species, and can create a stressful environment for many fish and invertebrates (Ref. G).

A.4 MARINE FISH AND INVERTEBRATE RESOURCES

Sonar has the potential to elicit TTS in fish with swim bladders involved in hearing. The relevant thresholds are 193 dB re 1 µPa (SPL) and 210 dB re 1 µPa (SPL) for low- and mid-frequency sonar systems, respectively (Ref. J). It is noted that the hearing range of most fish is in the 50-500 Hz range, with some species groups capable of hearing above and below those frequencies (Ref. H).

Fish are anticipated to temporarily avoid the immediate areas subject to vessel traffic, thereby reducing the risk of fish mortality due to vessel strikes or contact with propeller blades. Sharks, specifically the white shark, tend to inhabit waters less than 200 m deep and spend the majority of their time in the top 50 m of the water column. DFO advice for the the Cutlass Fury 2021 exercise notes that although there is little evidence that sharks are hit by ships there is uncertainty due to carcasses sinking (Ref. H).

EAST COAST OF CANADA

Marine Fish

Common fish populations historically included northern cod, redfish, herring, silver hake, the Greenland halibut or turbot, and the northern cod. Due to chronic overfishing by Canada and other nations, commercial harvests of many of these species are no longer sustainable.

Estuaries, where fresh river waters mix with saline sea water, are productive habitats. They serve as nursery areas for juvenile fish and the planktonic larvae of mollusks, crustaceans, and other invertebrates. The estuaries of the Gulf of Maine are thought to be vital to almost three-quarters of the commercially significant fish species in the area.

Invertebrate Species

Conditions are favourable for varieties of phytoplankton, algae, kelp and seaweeds. Coastal intertidal zones are particularly productive and provide shelter and food for a diverse community of marine animals that include such familiar residents as mussels, lobsters and crabs. Other typical benthic invertebrates include sea anemones, sponges, corals, sea stars, sea urchins, worms, and bivalves.

EASTERN CANADIAN ARCTIC

Marine Fish

Large schools of small Arctic cod exist across the Arctic supporting populations of seals, beluga whales and narwhals. It has been estimated that seabirds and marine mammals consume 148,000 tonnes of these fish annually in Lancaster Sound alone. Arctic char is plentiful in the Queen Maud Gulf, shrimp thrive in the south Baffin and Hudson Strait waters.

Invertebrate Species

Typical benthic invertebrates include sea anemones, sponges, corals, sea stars, sea urchins, worms, bivalves, and crabs. These animals adapt to permanently low temperatures such as those found in the Arctic by having low metabolic rates. The Arctic Ocean is characterized by broad, shallow continental shelf areas (average depth around 50m) which are often nutrient-rich and biologically active. Some shelf areas of the North American Arctic are teeming with benthic life such as worms, bivalves and crustaceans, which have been studied extensively. However, we know little about benthic communities at deeper areas of the Arctic Ocean, especially the Canadian Basin with depths around 3000 m (Ref. I).

Cold-water corals (also known as deep-sea corals) and sponges are known to inhabit the eastern Arctic Ocean.

A.5 MARINE MAMMALS AND SEA TURTLES

The efficiency of underwater sound propagation allows marine mammals to use underwater sound as a primary method of communication, navigation, prey detection (i.e., foraging) and predator avoidance. Anthropogenic (i.e., human introduced) noise has gained recognition as an important stressor for marine mammals because of their reliance on underwater hearing for maintenance of these critical biological functions. Underwater noise generated by human activities can often be detected by marine mammals many kilometers from the source. With increasing distance from a noise source, potential acoustic impacts can range from physiological injury, permanent or temporary hearing loss, behavioural changes, and acoustic masking. All the above impacts have the potential to induce stress on marine mammals (Ref. J).

To assess the potential effects of underwater noise on marine mammals, the National Marine Fisheries Service (NMFS) of the National Oceanic and Atmospheric Administration (NOAA) has divided them into functional hearing groups based on measured or estimated functional hearing ranges as shown in Table A-1.

Table A-1 - Generalized Hearing Range of Hearing Groups (Source: Ref. K)

Hearing Group	Generalized Hearing Range
Low-frequency cetaceans (baleen whales)	7 Hz to 35 kHz
Mid-frequency cetaceans (dolphins, toothed whales, beaked whales, bottlenose whales)	150 Hz to 160 kHz
High-frequency cetaceans (true porpoises, Kogia, river dolpins, cephalorhynchid, Lagenorthynchus cruciger & Lagenorthynchus australis)	275 Hz to 160 kHz
Phocid pinnipeds (underwater) (true seals)	50 Hz to 86 kHz
Otariid pinnipeds (underwater)	60 Hz to 39 kHz

Hearing Group	Generalized Hearing Range
(sea lions and fur seals)	

Sea turtles do not appear to vocalize or use sound for communication, but may use sound for navigation, locating prey, avoiding predators, and general environmental awareness (Ref. L). The U.S. Navy groups all sea turtles into one functional hearing group. Sea turtle functional hearing is restricted to relatively low frequencies, below approximately 2 kHz, and they have relatively poor auditory sensitivity (Ref. M).

PTS and TTS thresholds for sea turtles have been defined as 200 dB and 220 dB (weighted) (Ref. M). Sea turtle behavioural criteria for sonar and other transducers was developed by the National Marine Fisheries Service based on exposure to air guns. The received sound level at which sea turtles are expected to actively avoid air gun exposure, 175 dB re 1uPa SPL rms, is used as the expected sound level at which sea turtles would actively avoid exposure to sonar and other transducers (Ref. M).

Sea turtles have been observed avoiding vessels. Speed plays a key role in this as turtles can only swim at certain speeds. An Australian field study examining behavioral effects of vessel speed on green sea turtles demonstrated that the proportion of turtles that fled to avoid the vessel decreased significantly as vessel speed increased, and turtles that fled from moderate (11 km/hour) and fast approaches (19 km/hour) did so at significantly shorter distances from the vessel than turtles that fled from slow (4 km/hour) approaches (Ref. H).

EAST COAST OF CANADA

Marine Mammals

At least 34 species of marine mammal have the potential to occur in the MARLOAs at different times of the year. Common marine mammals include harbour and grey seals, harbour porpoises, and dolphins. Several species of whale are indigenous to or migrate through the MARLOAs, including the northern bottlenose, blue, pilot, beluga, fin, minke, right whale and humpback whale.

Sea Turtles

Sea turtles which have been identified in eastern Canada are:

- Leatherback Sea Turtle;
- Loggerhead Sea Turtle;
- Green Sea Turtle; and
- Kemp’s Ridley Sea Turtle.

Leatherback and Loggerhead sea turtles have been designated as a Species at Risk. Leatherback sea turtles occur in Atlantic Canadian waters during the summer and fall to forage on jellyfish.

Loggerhead Sea Turtles occurring in Atlantic Canadian waters are believed to belong almost exclusively to the Northwest Atlantic Ocean DPS. When in Canadian waters during the summer, these turtles typically occur offshore along the continental shelf break and beyond, from Georges Bank to the southern Grand Banks. Their distribution is driven in part by water temperature, with warmer waters being preferred.

Green sea turtles can sometimes be found off Canada's Atlantic coast in the summer. In Canada, the Kemp's Ridley sea turtle is a rare occurrence off Canada's Atlantic coast. (Ref. N)

EASTERN CANADIAN ARCTIC

Marine Mammals (Reference O)

Ringed seals roam throughout the region. Bearded and harp seals are found along the east coast of Ellsemere Island, where open waters promise easy breathing. In winter, the unfrozen North Water Polynya serves as a refuge for marine mammals. In the 19th and early 20th centuries, whalers hunted the bowhead whale almost to extinction. While their numbers have rebounded in western waters, the eastern stock is still severely depleted, and the species is considered endangered. Important but threatened pods of the beluga whale spend their summers along the west coast of Hudson Bay. Belugas have adapted to a changing climate by migrating into Hudson Bay earlier and leaving later. Species occurring in Baffin Bay include bowhead whales, narwahls, belugas, Atlantic walrus, sperm whales, northern bottlenose whales, and ringed seals.

Climate change is significantly impacting marine mammals in the Canadian Arctic. With extremely early ice break up, ringed seals are not able to complete their moult, predisposing the seals to disease. Lastly, reduced sea ice in the Arctic is allowing the killer whale to expand its presence in the eastern Arctic and Hudson Bay, where they prey on and disrupt other marine mammal species (bowhead, narwhal, beluga, seals) (Ref. P).

Since the TRAPS/BRS trial targets sperm whales and northern bottlenose whales, more details for these are provided below.

Sperm whales are the largest of the toothed whales (odonotocetes). Male sperm whales migrate between high-latitude feeding grounds and low-latitude breeding areas. Mature male sperm whales have been observed foraging near the ice edge but do not penetrate inside the ice pack and their distribution would therefore follow the advance and retreat of sea ice. In general, the older the males, the farther north they forage. In the Canadian Arctic, sperm whales have been recorded as far north as the Davis Strait. Acoustic detections off the southern Labrador shelf indicate that this species can be at least locally common from spring to early winter in this area. However, the lack or low number of sightings during aerial surveys off Labrador indicate that abundance is likely low, and increasingly so with increasing latitude. Sperm whales were designated by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as "not at risk" in 1996.

The Davis Strait-Baffin Bay-Labrador Sea population Northern bottlenose whale (beaked whale) population occurs in the Davis Strait, and their distribution falls, at least partly, in Canadian waters. The presumed range of this population based on catches and sightings extends from the northern Flemish Pass up to at least 70°N along the eastern coast of Baffin Island. The size of this population is unknown, but is believed to be larger than the Scotian Shelf population. The main threats to northern bottlenose whales are entanglements in fishing gear and the effects of underwater noise. Northern bottlenose whales have been shown to respond to military sonar. Northern bottlenose whales were designated "special Concern" by COSEWIC in May 2011, and they are under consideration for addition to Schedule 1 of the Species at Risk Act (SARA).

Sea Turtles

Sea turtles are not expected in the Canadian Arctic.

A.6 AVIFAUNA

Birds are generally considered more resistant to auditory damage than mammals. The potential effects of anthropogenic noise to avifauna include auditory system damage, and behavioral responses (Ref. H). No regulatory thresholds or guidelines have been identified with respect to potential underwater sound levels capable of causing auditory injury or behavioural disturbance in marine birds (Ref. B).

Many of the species of seabirds that may be present in the MARLOAs, generally spend less than one minute underwater during a foraging dive, resulting in a short temporal overlap with explosions. Of the marine birds that may be found within the MARLOAs, alcids (*e.g.*, Dovekie, Common Murre, Thick-billed Murre, and Atlantic Puffin) spend the most time underwater during forage dives (Ref. H).

Studies with bird species have shown that birds are sensitive to LF sounds in air. A US Navy environmental assessment on LFAS states that while it is likely that many diving seabirds can hear underwater LF sound, there is no evidence that seabirds use sound underwater (Ref. Q). However, a recent study in Denmark states that since many species of marine birds, such as penguins, auks, and cormorants, find their food underwater where light is often limited, sound detection may play a vital role. Yet, for most marine birds, it is unknown whether they are using, and can thereby be affected by, underwater sound (Ref. R).

Foraging behavior mostly involves taking prey within a half meter of the sea surface. However, some species take prey within 20 m (66 ft) or deeper, feed on dead prey at the surface, or take prey from other birds. Foraging behaviors involve such things as locating physical oceanic features, relying on subsurface predators (marine mammals and large fish) to drive prey to the surface, feeding in flocks, feeding at night, and maximizing surface area surveillance (Ref. Q). None of these foraging behaviors appear to require the use of underwater sound. There are several factors that reduce the exposure of seabirds to LFA when they are diving. First, the free surface effects (reduction of sound levels at the air-water interface) will effectively reduce the LF sound levels near the surface (within 2 m [6.6 ft]) by 20 to 30 dB. Second, the air bubbles that

are created due to the impact will further reduce any potential effects from LFA sound transmissions. Finally, for any possible interaction between a diving seabird and LFA, the animal would need to be at least 2 m (6.6 ft) below the water surface near a transmitting LFA source, even more unlikely given that LFA transmits only 7.5% of the time (active transmission duty cycle based on actual operations). Seabirds are not expected to be impacted by LFA because they are generally shallow divers, spend a small fraction of their time in the water at depths where LFA might affect them, and can rapidly disperse to other areas if disturbed (Ref Q). However, because as stated above possible interaction between seabirds and LFA would be minimal, the possibility of dispersal due to LFA sound exposure should also be considered minimal. For these reasons, significant impacts to seabirds, including those that may be threatened or endangered, are highly unlikely (Ref. Q).

The Denmark study referenced above conducted a series of playback experiments to test whether Alcid seabirds responded to and were disrupted by, underwater sound. Underwater broadband sound bursts and mid-frequency naval 53 C sonar signals were presented to two common murres (Uria aalge) in a quiet pool. The received sound pressure levels varied from 110 to 137 dB re 1 lPa. Both murres showed consistent reactions to sounds of all intensities, as compared to no reactions during control trials. For one of the birds, there was a clearly graded response, so that more responses were found at higher received levels. The authors' findings indicate that common murres may be affected by, and therefore potentially also vulnerable to, underwater noise. The study concludes that the effect of man-made noise on murres, and possibly other marine birds, requires more thorough consideration (Ref. R).

EAST COAST OF CANADA

Significant proportions of the North American or world populations of seabirds live in eastern Canada. Because of the length of coastline in this region, this area also supports a great variety of seabirds like murre, eider, tern and puffin.

Large numbers overwinter on the open ocean off Newfoundland and Nova Scotia, only coming ashore to find mates. Among them are the northern fulmar, greater shearwater, dovekie, and common and thick-billed murres. Breeding colonies for Leach's storm petrel, kittiwakes, puffins, and common murres can be found on Newfoundland's Baccalieu Island and Witless Bay Islands. Cape St. Mary's hosts gannets, kittiwakes and common murres. Machias Seal Island in the Bay of Fundy supports large colonies of puffins and Arctic terns. And there are large populations of shearwaters, eiders and cormorants, and gulls throughout the region. Large colonies of puffins, petrels, cormorants, thick-billed murres, and several varieties of gull also nest in the Gulf of St. Lawrence on Anticosti Island, Bonaventure Island, and the Magdalen Islands.

EASTERN CANADIAN ARCTIC

During the brief arctic summer, dozens of species of migrating birds make use of the unpredictable sections of open water that appear in the ecozone. As the pack ice breaks up, ice edges become vital areas for mammals and seabirds. Taking advantage of the conditions there to feed, stage, and moult are small numbers of tundra swans, loons, geese, ducks, and several species of shorebirds, gulls, jaegers, Arctic terns, alcids, and fulmars.

A.7 SPECIES AT RISK

EAST COAST OF CANADA

Marine Fish

Marine fish which have been identified as at risk in eastern Canada are listed in Table A-2 (Ref. S).

Table A-2 - Marine Fish at Risk (Eastern Canada)

Species	Federal Status under SARA Schedule 1	COSEWIC
Acadian Redfish (Atlantic population)	Under consideration for addition	Threatened
Acadian Redfish (Bonne Bay population)	Under consideration for addition	Special Concern
American Plaice (Maritime population)	Under consideration for addition	Threatened
American Plaice (NL population)	Under consideration for addition	Threatened
Atlantic Bluefin Tuna	No Status	Endangered
Atlantic Cod (Laurentian North population)	Under consideration for addition	Endangered
Atlantic Cod (Laurentian South population)	Under consideration for addition	Endangered
Atlantic Cod (NL population)	Under consideration for addition	Endangered
Atlantic Cod (Southern population)	Under consideration for addition	Endangered
Atlantic Salmon (Eastern Cape Breton population)	Under consideration for addition	Endangered
Atlantic Salmon (Anticosti Island population)	Under consideration for addition	Endangered
Atlantic Salmon (Gaspe – Southern Gulf of St. Lawrence population)	Under consideration for addition	Special Concern
Atlantic Salmon (Inner Bay of Fundy)	Endangered	Endangered
Atlantic Salmon (Inner St. Lawrence population)	Under consideration for addition	Special Concern
Atlantic Salmon (Quebec Eastern North Shore population)	Under consideration for addition	Special Concern
Atlantic Salmon (Quebec Western North Shore population)	Under consideration for addition	Special Concern
Atlantic Salmon (South Newfoundland population)	Under consideration for addition	Threatened

Species	Federal Status under SARA Schedule 1	COSEWIC
Atlantic Salmon (Southern Upland population)	Under consideration for addition	Endangered
Atlantic Sturgeon (Maritimes population)	Under consideration for addition	Threatened
Atlantic Sturgeon (St. Lawrence population)	Under consideration for addition	Threatened
Atlantic Wolffish	Special Concern	Special Concern
Basking Shark (Atlantic population)	Under consideration for addition	Special Concern
Cusk	Under consideration for addition	Endangered
Deepwater Redfish (Gulf of St. Lawrence and Laurentian Channel population)	Under consideration for addition	Endangered
Deepwater Redfish (Northern Population)	Under consideration for addition	Threatened
Lumpfish	Under consideration for addition	Threatened
Northern Wolffish	Threatened	Threatened
Porbeagle Shark	Under consideration for addition	Endangered
Roundnose Grenadier	Under consideration for addition	Endangered
Shortfin Mako	Under consideration for addition	Endangered
Smooth Skate (Funk Island Deep population)	Under consideration for addition	Endangered
Smooth Skate (Laurentian-Scotian population)	Under consideration for addition	Special Concern
Spiny Dogfish (Atlantic population)	Under consideration for addition	Special Concern
Spotted Wolffish	Threatened	Threatened
Striped Bass (Bay of Fundy population)	Under consideration for addition	Endangered
Striped Bass (Southern Gulf of St. Lawrence population)	Under consideration for addition	Special Concern
Striped Bass (St. Lawrence River population)	Endangered	Extinct (does not include re-introduced population)
Thorny Skate	Under consideration for addition	Special Concern

Species	Federal Status under SARA Schedule 1	COSEWIC
White Hake (Atlantic and Northern Gulf of St. Lawrence)	Under consideration for addition	Threatened
White Hake (Southern Gulf of St. Larewnce	Under consideration for addition	Endangered
White Shark (Atlantic Population)	Endangered	Endangered
Winter Skate (Eastern Scotian Shelf – Newfoundland population)	Under consideration for addition	Endangered
Winter Skate (Southern Gulf of St. Lawrence population)	Under consideration for addition	Endangered

Atlantic Salmon Critical Habitat

Atlantic Salmon are anadromous, meaning they spawn in fresh water but spend much of their life at sea. For aquatic species, critical habitat can include areas used for spawning, rearing young, feeding and migration. The inner Bay of Funday (iBoF) population of Atlantic Salmon is considered "endangered". Critical habitat is identified as freshwater areas found below complete natural barriers (e.g. waterfalls) in 10 rivers and their tributaries in Nova Scotia and New Brunswick (Ref. T).

Northern Wolffish

The Northern Wolffish is found offshore in cold, continental shelf waters at depths varying between the surface to 900m, but most often at depths greater than100m. They feed mainly on bottom-living crustaceans and intertebrates. Critical habitat has been identified within the Gulf of St. Lawrence and the edge of the Grand Banks and Labrador Shelf in Newfoundland and Labrador (Ref. U).

Spotted Wolffish

The Spotted Wolffish occurs in cold open continental shelf and slope waters between 50 and 600m deep, over sand or mud bottoms often with big boulders close by. If is a bottom-dwelling predatory fish that feeds mainly on echinoderms such as starfishes, but also crustaceans, molluscs and other fish. Critical habitat has been identified within the Gulf of St. Lawrence and the edge of the Grand Banks and Labrador Shelf in Newfoundland and Labrador (Ref. U).

Marine Mammals

Marine mammals which have been recognized as at risk in and around the study area are listed in Table A-3 (Ref. O and S). To date, not all of the species have status under the SARA, however all have been identified by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC).

Table A-3 - Marine Mammals at Risk (Eastern Canada)

Species	Federal Status under SARA Schedule 1	COSEWIC
Low-frequency Cetacean		
North Atlantic Right Whale	Endangered	Endangered
Blue Whale (Atlantic population)	Endangered	Endangered
Fin Whale (Atlantic)	Special Concern	Special Concern
Sei Whale	Under consideration for addition	Endangered
Mid-frequency Cetacean		
Beluga Whale (St. Lawrence Estuary population)	Endangered	Endangered
Northern Bottlenose Whale (Scotian Shelf population)	Endangered	Endangered
Sowerby's Beaked Whale	Special Concern	Special Concern
Killer Whale (Northwest Atlantic/ Eastern Arctic population)	Under consideration for addition	Special Concern
High-frequency Cetacean		
Harbour Porpoise (Northwest Atlantic population)	No Status	Special Concern
Phocid Pinniped		
Ringed Seal	Under consideration for addition	Special Concern

Critical Habitats

Critical Habitats for marine mammals listed under the SARA have been identified for the study area. The critical habitats include the following:

a. The North Atlantic Right Whale Critical Habitat (Figure A-3):
   i. Grand Manan Basin (not within operating area); and
   ii. Roseway Basin (also adopted by International Maritime Organization (IMO) as a seasonal Area to be Avoided (ATBA) (Ref. V).

b. The Northern Bottlenose Whale Critical Habitat (Figure A-4):
   i. Scotian Shelf.

The North Atlantic right whale is considered to be "endangered" under SARA. The main threats are collision with vessels, entanglement with fishing gear and underwater noise. Measures are in place in both of the right whale critical habitat areas to reduce the chance of vessel collisions. Emergency response networks are available to respond to whale entanglements. DFO is working with partners to develop recovery measures to understand and reduce all threats to the species.

Every year, Transport Canada implements additional measures to help protect North Atlantic right whales in the Gulf of St. Lawrence (Ref. W). The DFO has also identified the Emerald Basin as an important North Atlantic Right Whale Foraging Habitat (Ref. J).

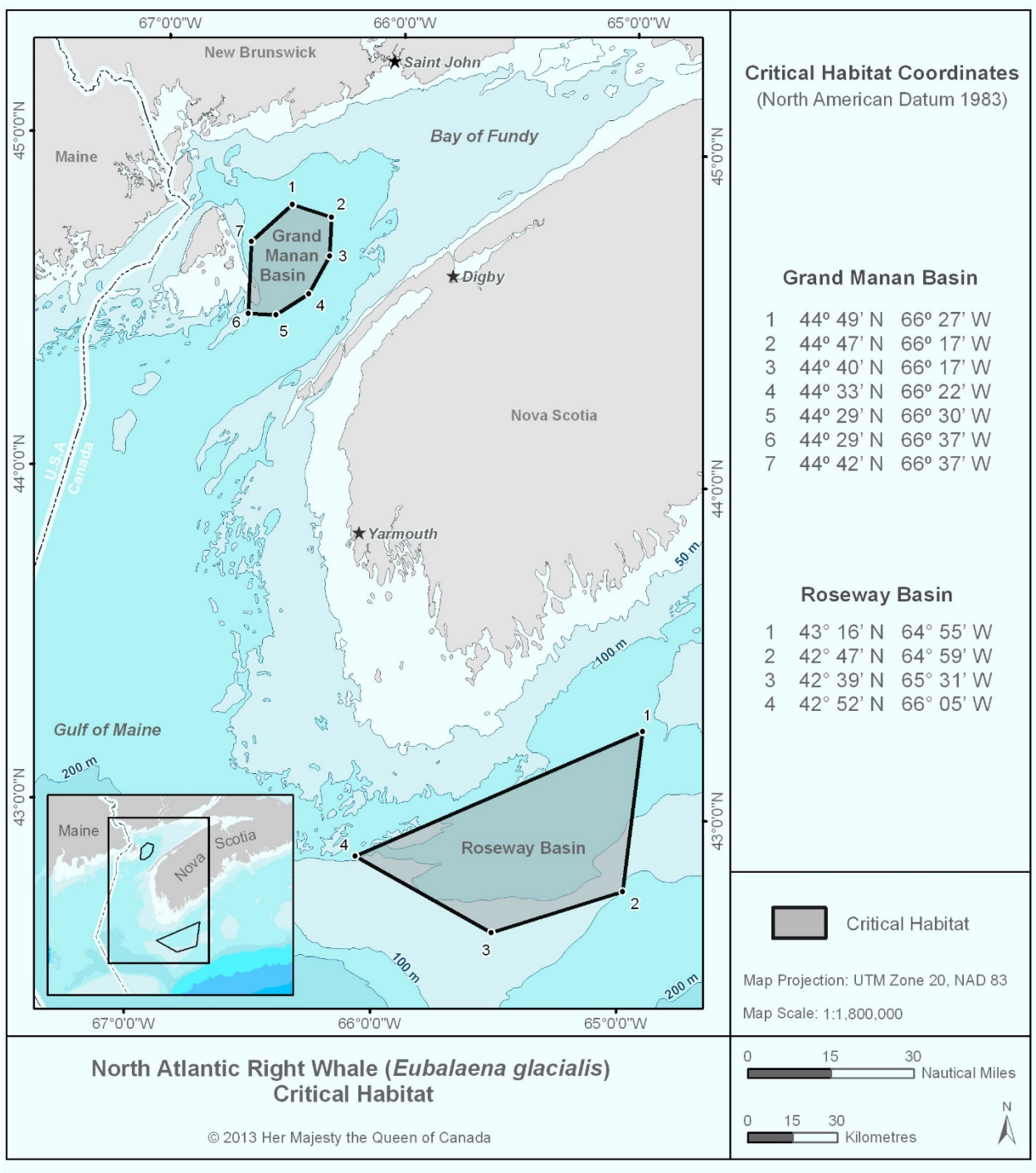

Figure A-3 – North Atlantic Right Whale Critical Habitat (Ref. X)

According to the northern bottlenose whale recovery strategy, the whales regularly transit between the three canyons in Figure A-4 (Ref. Y). These transit areas are thought to also be important for foraging.

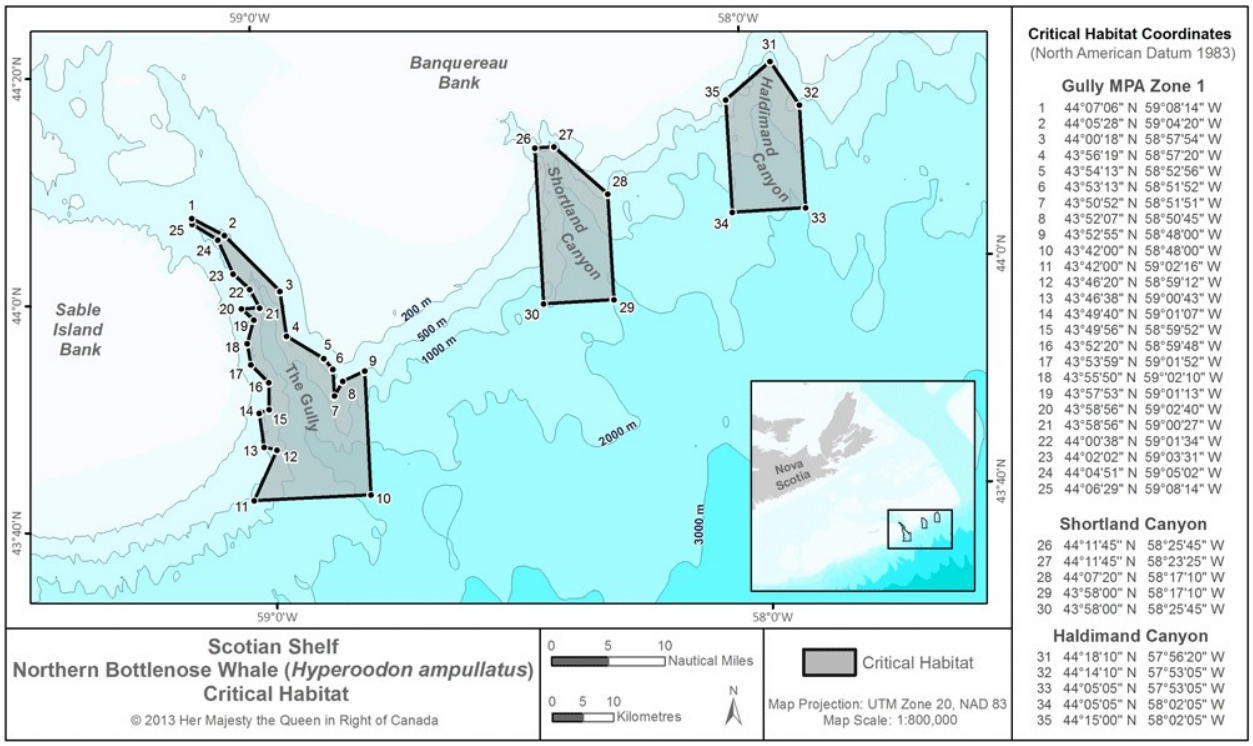

Figure A-4 – Northern Bottlenose Whale Critical Habitat (Ref. Y)

The blue whale population in the Northwest Atlantic was added to the SARA list as an endangered species in January 2005. No critical habitat has been identified to date, however research to identify critical habitat within Canadian waters will focus on blue whale distribution and feeding areas (see Figure A-5).

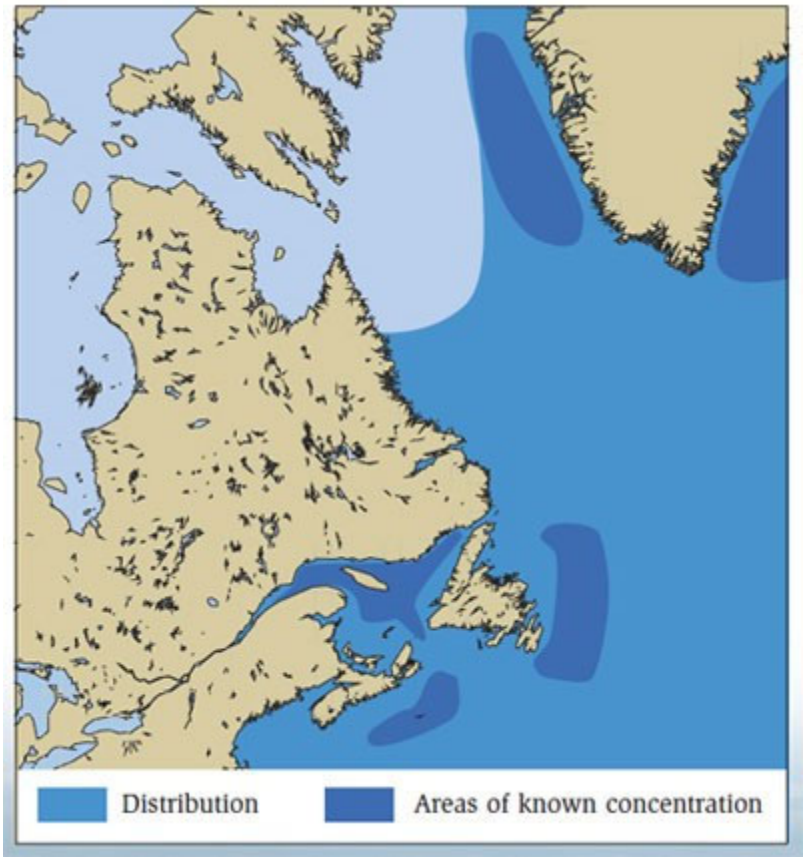

Figure A-5 – Blue Whale Distribution and Areas of Known Concentrations (Ref. Z)

Sea Turtles

Sea turtles which have been identified as at risk in eastern Canada are listed in Table A-4 (Ref. S).

Table A-4 – Sea Turtles at Risk (eastern Canada)

Species	Federal Status under SARA Schedule 1	COSEWIC
Leatherback Sea Turtle	Endangered	Endangered
Loggerhead Sea Turtle	Endangered	Endangered

Leatherback Sea Turtle

A proposed action plan has been developed for the Leatherback Sea Turtle in Atlantic Canada (Ref. AA). The Leatherback Sea Turtle was listed as Endangered under SARA in 2003.

Leatherback sea turtles occur in Atlantic Canadian waters during the summer and fall to forage on jellyfish. According to Ref. AA, critical habitat will be identified to the extent possible in an amended recovery strategy (in development), which will include information about the geographic location of the critical habitat, as well as its biophysical functions, features, and attributes. Three areas have been identified as important habitat for leatherbacks (Ref. B):

a. Georges Bank – waters east and southeast of Georges Bank, including the Northeast Channel near the southwestern boundary of the Canadian EEZ;

b. Gulf of St. Lawrence – the southeastern gulf of St. Lawrence and waters off eastern Cape Breton Island, including Sydney Bight, the Cabot Strait, portions of the Magdalen Shallows and adjacent portions of the Laurentian Channel; and

c. Burin Peninsula – waters south and east of the Burin Peninsula, Newfoundland, including parts of Placentia Bay.

Threats include entanglement, vessel collisions, marine pollution, acoustic disturbance, and climate change (Ref. S). The leatherback sea turtle is able to swim at speeds up to 35.2 km/hour (19 knots) when frightened (Ref. H).

Loggerhead Sea Turtle

The Loggerhead Sea Turtle was listed as endangered under the SARA in 2017 (Ref. S). This species is broadly distributed in the temperate, sub-tropical, and tropical waters of the Atlantic, Pacific, and Indian Oceans (Ref. BB). Loggerhead Sea Turtles occurring in Atlantic Canadian waters are believed to belong almost exclusively to the Northwest Atlantic Ocean DPS. When in Canadian waters during the summer, these turtles typically occur offshore along the continental shelf break and beyond, from Georges Bank to the southern Grand Banks. Their distribution is driven in part by water temperature, with warmer waters being preferred. Threats to Loggerhead Turtles in Canadian waters include bycatch (the threat of greatest concern), underwater noise, marine pollution, entanglement and vessel strikes (Ref. BB).

Avifauna

Marine birds which have been identified as at risk in eastern Canada are listed in Table A-5 (Ref. S).

Table A-5 - Marine Birds at Risk (Eastern Canada)

Species	Federal Status under SARA Schedule 1	COSEWIC
Leach's Storm-Petrel	Under consideration for addition	Threatened
Red-necked Phalarope	Special Concern	Special Concern

EASTERN CANADIAN ARCTIC

Marine Fish

Marine fish at risk are listed in Table A-6 (Ref. S).

Table A-6 – Marine Fish at Risk (Arctic)

Species	Federal Status under SARA Schedule 1	COSEWIC
Acadian Redfish	Under consideration for addition	Threatened
Atlantic Wolffish	Special Concern	Special Concern
Dolly Varden (Western Arctic populations)	Special Concern	Special Concern
Northern Wolffish	Threatened	Threatened
Roundnose Grenadier	Under consideration for addition	Endangered
Spotted Wolffish	Threatened	Threatened
Thorny Skate	Under consideration for addition	Special Concern

Marine Mammals

Arctic marine mammals at risk are listed in Table A-7 (Ref. O and S). To date, not all of the species have status under the federal SARA, however all have been identified by COSEWIC.

Table A-7 –Marine Mammals at Risk (Arctic)

Species	Federal Status under SARA Schedule 1	COSEWIC
Low-frequency Cetacean		
Blue Whale (Atlantic population)	Endangered	Endangered
Fin Whale (Atlantic)	Special Concern	Special Concern
Fin Whale (Pacific population)	Threatened (under consideration for status change)	Special Concern
Bowhead Whale (Bering-Chukchi-Beaufort population)	Special Concern	Special Concern
Bowhead Whale (Eastern Canada-West Greenland population)	Under consideration for addition	Special Concern
Grey Whale (Eastern North Pacific population)	Special Concern	Non-active

Species	Federal Status under SARA Schedule 1	COSEWIC
Mid-frequency Cetacean		
Beluga Whale (Cumberland Sound Population)	Threatened (under consideration for status change)	Endangered
Beluga Whale (Eastern High Arctic – Baffin Bay population)	Under consideration for addition	Special Concern
Beluga Whale (Eastern Hudson Bay population)	Under consideration for addition	Threatened
Beluga Whale (Cumberland Sound population)	Threatened	Endangered
Beluga Whale (Ungava Bay)	Under consideration for addition	Endangered
Killer Whale (Northwest Atlantic/ Eastern Arctic population)	Under consideration for addition	Special Concern
Northern Bottlenose Whale (Davis Strait Baffin Bay – Labrador Sea)	Under consideration for addition	Special Concern
Narwhal	Under consideration for addition	Special Concern
High-frequency Cetacean		
Harbour Porpoise (Pacific Ocean population)	Special Concern	Special Concern
Phocid Pinnipeds		
Ringed Seal	Under consideration for addition	Special Concern
Other		
Atlantic Walrus (Central-Low Arctic)	Under consideration for addition	Special Concern
Atlantic Walrus (High Arctic)	Under consideration for addition	Special Concern

Critical Habitats

No critical habitats for aquatic species listed under the SARA have been officially identified in the Canadian Arctic.

Avifauna

Marine and migratory birds at risk are listed in Table A-8 (Ref. S).

Table A-8 – Marine and Migratory Birds at Risk (Arctic)

Species	Federal Status under SARA Schedule 1	COSEWIC
Harlequin Duck (Eastern population)	Special Concern	
Ivory Gull	Endangered	Endangered
Red-necked Phalarope	Special Concern	Special Concern
Red Knot islandica subspecies	Special Concern (under consideration for status change)	Not at Risk
Red Knot rufa subspecies (Northeastern South America wintering population)	Under consideration for addition	Special Concern
Red Knot rufa subspecies (Southeastern USA/Gulf of Mexico/Caribbean wintering population)	Under consideration for addition	Endangered
Red Knot rufa subspecies	Endangered	Endangered
Ross's Gull	Threatened (under consideration for status change)	Endangered

Critical Habitats

The Ross's gull, whooping crane, and ivory gull have land based critical habitats near the expected operational area.

E.8 Protected Areas

Migratory Bird Sanctuaries

Migratory Bird Sanctuaries (MBSs) are designated under the *Migratory Birds Convention Act*. Although access to most MBSs is not restricted, the primary intent of these sanctuaries is to protect migratory birds, and therefore hunting, as well as disturbing or molesting migratory birds, their eggs, nests or habitat, is prohibited. Rules and prohibitions are prescribed in the *Migratory Bird Sanctuary Regulations*.

EAST COAST OF CANADA

The MBSs close to or within the study area are described below (Ref. CC).

Big Glace Bay Lake MBS was established in 1939 and lies just east of the town of Glace Bay, in Cape Breton County, NS. Big Glace Bay "Lake" is actually a barrier-beach pond adjacent to the open Atlantic Ocean, and thus subject to daily tidal fluctuations. The 240-ha site is protected from the open sea by a 1.5-km sand and gravel beach backed by salt marsh and intertidal flats. The shallow brackish-saline water supports beds of eelgrass and thus is attractive to migrating waterfowl.

Terra Nova MBS is situated in the Bonavista Bay region of northeastern NL, adjacent to Terra Nova National Park. The sanctuary consists of the upper portions of two tidal inlets that are nearly totally enclosed by lands within the Terra Nova National Park. The main species groups are shorebirds, waterfowl and seabirds.

Shepherd Island MBS is a rugged island with bedrock outcrops, located in the District of Strait of Belle Isle in Newfoundland and Labrador. It was established in 1991 to protect common eider in this important nesting area. Together with Île aux Canes Migratory Bird Sanctuary, Shepherd Island is one of the largest breeding sites for the common eider in insular Newfoundland.

Île aux Canes MBS is located in the District of Strait of Belle Isle, off the northeastern coast of Newfoundland. It is a 150-hectare protected area locally known as Green Island. Along with nearby Shepherd Island, this sanctuary is one of the largest breeding sites for the common eider in Newfoundland. These two areas are the only sites where the numbers of breeding common eider have increased in recent years, although predation by fox and polar bear has recently become a problem and may be bringing population numbers down.

Saint-Augustin MBS lies along the south shore of Île de la Grande Passe in the Gulf of St. Lawrence, south of the community of Saint-Augustin on the Lower North Shore. The sanctuary, which covers an area of 5369 ha, was established in 1925 to protect a major seabird nesting site. The MBS supports seven key species of birds: herring gull, common eider, black guillemot, great black-backed gull, ring-billed gull, common tern and Arctic tern.

Gros Mecatina MBS is located on the north shore of the Gulf of St. Lawrence, east of the village of La Tabatière, in the Gros Mécatina group of islands. This 2168 ha protected area was established in 1968 to protect essential seabird nesting sites. The MBS provides important nesting grounds for many colonial birds. In the past, thousands of common murres would nest on the islands of this protected site, however the population has declined markedly. Other species, like the Atlantic puffin, black guillemot, razorbill, herring gull, great black-backed gull, black-legged kittiwake, great and double-crested cormorants may form small colonies of anywhere from a few dozen to a few hundred birds throughout the different islands of the MBS.

Îles Sainte-Marie MBS is located on the North Shore of the Gulf of St. Lawrence, approximately 15 km off the coast from the village of Chevery, and 20 km from the village of Harrington Harbour. The Îles Sainte-Marie MBS is one of the richest nesting sites in the Gulf of St. Lawrence. Of all the sanctuaries of the North Shore, it is in this one that seabirds are the most abundant and diversified. The islands support large populations of common eiders, common murres, Atlantic puffins, razorbills, ring-billed and great black-backed gulls, great and double-crested cormorants, black guillemots, red-throated loons and black-legged kittiwakes.

Baie des Loups MBS is situated on the north coast of the Gulf of St. Lawrence, east of the village of La Romaine and near the hamlet of Wolf Bay (formerly Baie-des-Loups). The three main species that currently nest in this sanctuary are the Atlantic puffin, common eider and razorbill.

Ile à la Brume MBS is located on the north shore of the Gulf of St. Lawrence, east of the village of La Romaine. Species include the common eider, herring gull, great black-backed gull, ring-billed gull, black guillemot, razorbill, red-throated loon, and common and Arctic terns. The Île à la Brume MBS remains the only site in the province where the endangered Caspian Tern regularly nests, albeit more sporadically since the 1990s.

The Bird Rocks MBS is located about 32 km northeast of the Magdalen Islands archipelago. The sanctuary is made up of three rocks - the Rocher aux Oiseaux (one large rock) and Rocher aux Margaulx (two small rocks) support one of the six northern gannet colonies in North America.

EASTERN CANADIAN ARCTIC

The MBSs located close to or within the expected Arctic operational area are described below (Ref. CC).

Bylot Island MBS lies off the northern end of Baffin Island. The island harbours large populations of thick-billed mures, black-legged kittiwakes and greater snow geese.

East Bay (Qaqsauqtuuq) MBS is located on Southampton Island in East Bay, an arm of Hudson Bay. It consists of a large marine area with marine, intertidal, and subtidal components. The sanctuary's habitat consists of dry heath, gravel ridge, intertidal zone, moss carpet, scrub willow, and sedge meadow, which supports a number of notable bird species.

Dewey Soper MBS is located in western Baffin Island. The bird sanctuary supports nearly 30% of the breeding geese in Canada, making it the largest goose colony in the world. Up to two million birds of various species use the area for summer nesting, and it is also habitat for one of Canada's major barren-ground caribou herds.

Harry Gibbons (Ikkattuaq) MBS is located on Southampton Island (as is East Bay MBS discussed earlier). It consists of a small marine area with marine, intertidal, and subtidal components. The sanctuary's habitat consists of dry heath, gravel ridge, intertidal zone, moss carpet, scrub willow, and sedge meadow, which supports a number of notable bird species.

Prince Leopold Island MBS is located near the High Arctic Nunavut communities of Arctic Bay and Resolute. The perimeter of the island is characterized by vertical cliffs of sandstone and limestone that rise in elevation 245 to 265 m above sea level. Other topographic features include scree slopes, numerous ledges where the seabirds nest, and gravel spits. The vegetation is sparse and characterized by mosses, lichens, grasses, and a few dwarf shrubs. Several Inuit archaeological sites are located on the island. Prince Leopold Island supports a major seabird colony that includes the second largest breeding congregation of northern fulmars in Canada.

Queen Maud Gulf (Ahiak) MBS is Canada’s largest federally owned protected area, encompassing 61,765 km^2 of the Arctic Circle coastline. It is the world’s second largest Ramsar site (wetland of international importance). The majority of the park is lowlands and countless streams, ponds and shallow lakes. The land is mainly Arctic tundra and marshes. In 1982,

450,000 geese, including the majority of the world's Ross's geese nested in the sanctuary, one of the largest concentration of geese on Earth.

National Marine Conservation Areas

DFO has an online interactive map displaying the marine protected and conservation areas in Canada (Ref. DD). The map is updated as new areas are designated.

National Marine Conservation Areas (NMCAs) are marine areas managed for sustainable use and that contain smaller zones of high protection. They include the seabed, the water above it and any species which occur there. They may also take in wetlands, estuaries, islands and other coastal lands. Human uses continue within their boundaries; therefore, focus is on ecologically sustainable use, i.e. harmonizing conservation practices with human activities. A National Marine Conservation Area Reserve (NMCAR) is an NMCA where an area or a portion of an area proposed for a NMCA is subject to a claim in respect of indigenous rights and is under negotiation.

The *Canada National Marine Conservation Areas Act* establishes NMCAs, and prohibits unauthorized use, seabed mining, oil and gas exploration and exploitation, and disposal of substances in these areas. It also contains provisions for the mitigation of environmental damage caused by the discharge or deposit of a substance in an NMCA.

EASTERN COAST OF CANADA

The governments of Canada and Quebec are studying the creation of a marine protected area in Îles-de-la-Madeleine in the Gulf of St. Lawrence. The study is being funded by Parks Canada and Quebec's Ministère du Développement durable, de l'Environnement et des Parcs.

EASTERN CANADIAN ARCTIC

Tallurutiup Imanga NMCA is in the process of being established. Tallurutiup Imanga NMCA is located at the eastern entrance to the Northwest Passage in the Parry Channel, and consists of Lancaster Sound and a portion of the Barrow Strait. Pond Inlet, Arctic Bay, Dundas Harbour, Gascoyne, Griffith and Lowther Islands, and Nanisivik are located within this NMCA. It is one of the richest marine mammal areas in the world. Most of the world's narwhal and a third of North America's belugas, as well as the endangered eastern population of bowhead whales, spend the summer in these waters and many of these whales winter in the North Water Polynya in Baffin Bay. Other mammals include ringed and bearded seals, walrus, harp seals and polar bears. About one-third of Eastern Canada's colonial seabirds breed and feed in the Tallurutiup Imanga NMCA. The Tallurutiup Imanga NMCA is the biggest protected area ever established in Canada, with an area of 108,000 km^2 and the first NMCA in the Canadian Arctic (Figure A-6).

Figure A-6 – Boundary of Tallurutiup Imanga NMCA (Ref. EE)

It should be noted that Nanisivik Naval Facility (NNF) is surrounded by the Tallurutiup Imanga NMCA. According to the Inuit Impact and Benefits Agreement (IIBA) (ref. FF), the area adjacent to the NNF is not part of the NMCA:

> *SAVE AND EXCEPT an area adjacent to the Nanisivik Naval Facility in Strathcona Sound - centred on the dock at Nanisivik at approximately, an area extending offshore by 2 km and in each direction along the shore by 2 km.*

M***arine Protected Areas***

Marine Protected Areas (MPAs) are geographically defined areas in the marine environment dedicated and managed for the long-term conservation of nature. MPAs are designated by Fisheries and Oceans Canada under the *Oceans Act* because they are ecologically significant, with species and/or properties that require special consideration. Once designated, a regulatory package is drafted which includes allowable and prohibited activities in the area.

An area of interest (AOI) contains ecologically sensitive land or species that need extra protection. An AOI can be upgraded to an MPA for additional protection.

EAST COAST OF CANADA

There are five (5) MPAs located within the study area: Basin Head, Musquash Estuary, Eastport, St. Anns Bank, the Gully, Gilbert Bay, Laurentian Channel and Banc-des-Américains.

Eastport Peninsula MPA is approximately a three-hour drive from St. John's, NL. Numerous islands found in the area provide habitat for a variety of marine wildlife. The rich, productive waters surrounding the Eastport Peninsula are host to a wide range of groundfish, pelagic fish, shellfish, marine mammals, and aquatic plants. Since early settlement the people of the Eastport Peninsula have relied on the fishery for their economic subsistence. It is an important lobster habitat.

St. Anns Bank MPA is located in an area east of Cape Breton on the Eastern Scotian Shelf. It was designated an MPA on 9 June 2017. The area is high in biodiversity with over 100 species recorded in the area and has a wide variety of habitat types, from the shallow waters of the Bank to the deeper waters of the Laurentian Channel. It is an important habitat for species at risk (e.g., Atlantic wolffish), depleted species (e.g., Atlantic cod), several commercial species that are at low biomass levels (American plaice, white hake, redfish, witch flounder) and serves as a summer foraging area for the endangered leatherback turtle. The area is characterized by sensitive ocean bottom habitats and species, such as corals and sponges.

The Gully MPA is located approximately 200 km off Nova Scotia, to the east of Sable Island, on the edge of the Scotian Shelf. Here, the seafloor suddenly drops away over two and a half km. This large and deep submarine valley or canyon was formed thousands of years ago by erosion when sea levels were much lower. Over 65 km long and 15 km wide, the Gully is one of the most prominent undersea features on the east coast of Canada.

Gilbert Bay MPA is 60 km^2 in size and is located approximately 300 km from Happy Valley-Goose Bay on Labrador's southeast coast. The waters of Gilbert Bay support a wide range of marine resources including several species of shellfish (mussels, scallops, sea urchins, snails, shrimp), cod, pelagic fishes (herring, capelin, salmon, eels, smelt, trout) and aquatic plants (eel grass, kelp). The area is also inhabited by several species of waterfowl including black ducks, geese and mergansers.

Laurentian Channel MPA was originally an AOI and was designated as an MPA in April 2019. It is a deep submarine valley over 1,200 km long. It extends from the intersection of the St. Lawrence and Saguenay Rivers to the edge of the continental shelf off Newfoundland. The Laurentian Channel has been identified as an ecologically and biologically sensitive area. It contains the highest concentration of black dogfish in Canadian waters and is the only place where pupping occurs. It is an important spawning, nursery, and feeding area for a variety of species including porbeagle shark and smooth skate and is a critical migration route for marine mammals moving in and out of the Gulf of St. Lawrence. Two Species at Risk – the northern wolffish and leatherback sea turtle - are also found in this area.

Two (2) AOIs for MPA designation under the OA are located close to, or within, the study area: Shediac Valley, St. Lawrence Estuary, Eastern Shore Islands, Fundian Channel-Browns Bank, and Northern Gulf of St. Lawrence.

Eastern Shore Islands AOI, identified in February 2018, includes the nearshore waters surrounding the dense archipelago on the eastern shore of Nova Scotia. The AOI extends from Clam Bay near Jeddore Harbour to Barren Island near Liscomb Point and extends 25 km from mainland to the Scotian Shelf. It is approximately 2,000 km^2 and was designated to conserve and preserve the ecological integrity, including biodiversity, productivity, ecosystem components and special natural features. The dense archipelago of hundreds of islands has been identified as an Ecologically and Biologically Significant Area (EBSA) that provides important nesting and foraging ground for may colonial seabirds and shorebirds. The area also has rich beds of eelgrass, kelp, and salt marsh that provide important habitats for marine species and estuaries associated with rivers that drain into this site are an important habitat for the endangered Atlantic salmon.

Northern Gulf of St. Lawrence AOI identified in 2019, to increase the protection of cold-water corals and sponges and the ecosystems that support them. Cold-water corals and sponges are fragile species that recover slowly when disturbed. As they grow, many of these species create complex structures that provide areas of refuge, food and growth for many other marine species, thus promoting high biodiversity. Eight areas around Anticosti Island are being studied. Anticosti-East, Gulf-Centre and Magdalen Shallows Slope are three of the AOI locations which are the study area.

EASTERN CANADIAN ARCTIC

There are no MPAs in the area of Op NA-TU and Op NA-NK.

The Southampton Island AOI was identified in May 2019 and encompasses the nearshore waters around Southampton Island and Chesterfield Inlet in the Kivalliq Region of Nunavut (see Figure A-7). Southampton Island is the largest island in Hudson Bay, near the confluence of Hudson Bay and Foxe Basin waters; making it an area of high marine productivity. The area is important for key marine and terrestrial species. It is an important migration pathway for marine mammals (narwhal, beluga whales and bowhead whales), contains walrus haul-out sites, polar bear dens, and habitat for numerous seabird colonies. Marine conservation values within the AOI extend into two MBS: The Harry Gibbons (Ikkattuaq) MBS, and the East Bay (Qaqsauqtuuq) MBS.

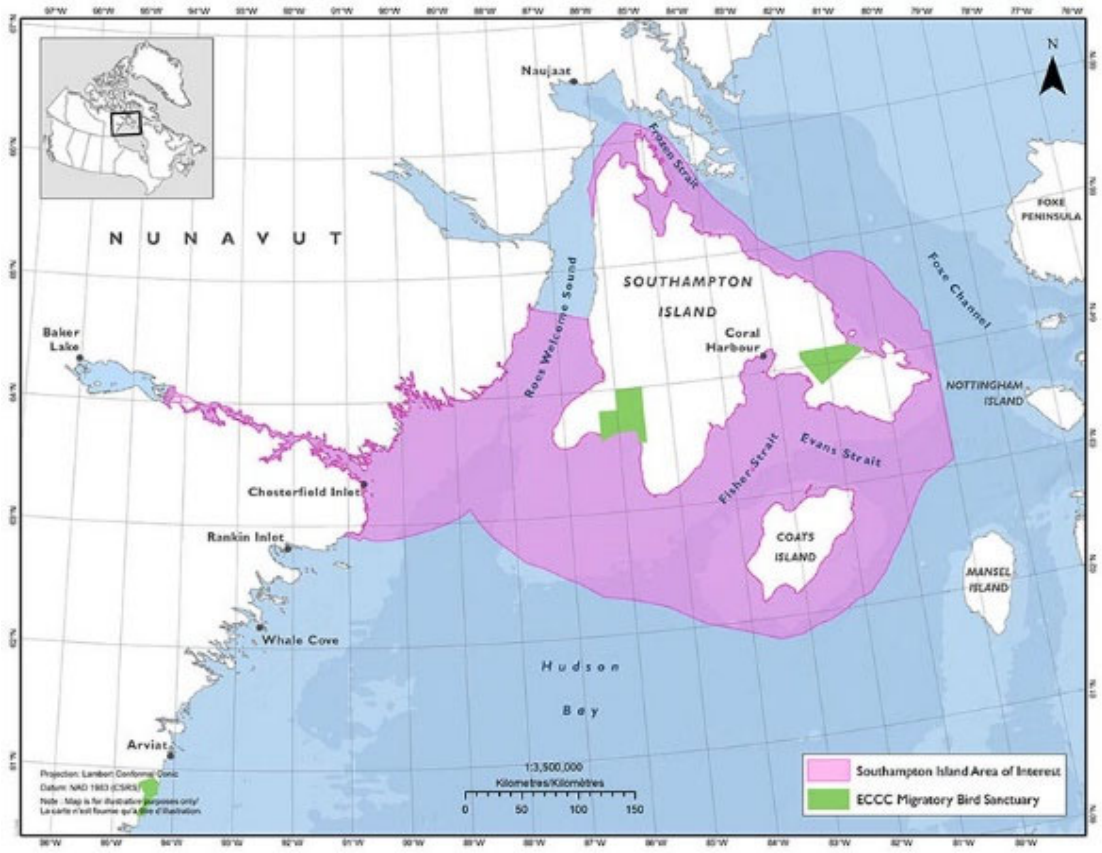

Figure A-7 – Southampton Area of Interest (Ref. GG)

National Wildlife Areas

National Wildlife Areas (NWAs) are protected and managed according to the *Wildlife Area Regulations (WAR)* under the *Canada Wildlife Act*. Although access to NWAs is not restricted, the primary purpose of these areas is to protect and conserve wildlife and their habitats, and therefore most NWAs are not equipped with facilities to accommodate public visitation. Unless otherwise posted, all recreational activities are prohibited within NWAs. General prohibitions according to the WAR include hunting, fishing, agricultural activities, swimming, picnicking, camping, operating a conveyance, commercial or industrial activities, dumping of waste, damaging, destroying or removing plants, etc.

The Minister of Environment can issue a permit to carry out an activity as long as it does not interfere with the conservation of wildlife. It should be noted that any vessel, including those belonging to the GoC, requires a permit from the Canadian Wildlife Service to operate in any northern NWA and some southern NWAs.

EAST COAST OF CANADA

The following NWAs are located in the MARLOAs (Ref. HH).

Pointe de l'Est NWA is located on Grosse-Ile, Quebec. It covers 748 ha for the protection of critical habitats serving as staging areas for shorebirds and other migratory birds, and breeding grounds for SARA species including Piping Plover and Horned Grebe.

EASTERN CANADIAN ARCTIC

In the Nunavut Territory, Nunavut beneficiaries, as per the Nunavut Land Claims Agreement (NLCA), can harvest wildlife (including collecting migratory bird eggs and feathers) for their economic, social and cultural needs in an NWA.

The following NWAs are all located close to or within the study area (Ref. HH).

Akpait NWA was designated in 2010 and comprises a significant marine portion off Baffin Island (see Figure A-8). It contains key habitat supporting numerous seabirds, including one of Canada's largest thick-billed mure colonies. Northern fulmars, black-legged kittiwakes, glaucous gulls and black guillemots breed there, and Atlantic puffins have been known to nest there also. Polar bears, walruses and several seal species also frequent the marine portion of the NWA.

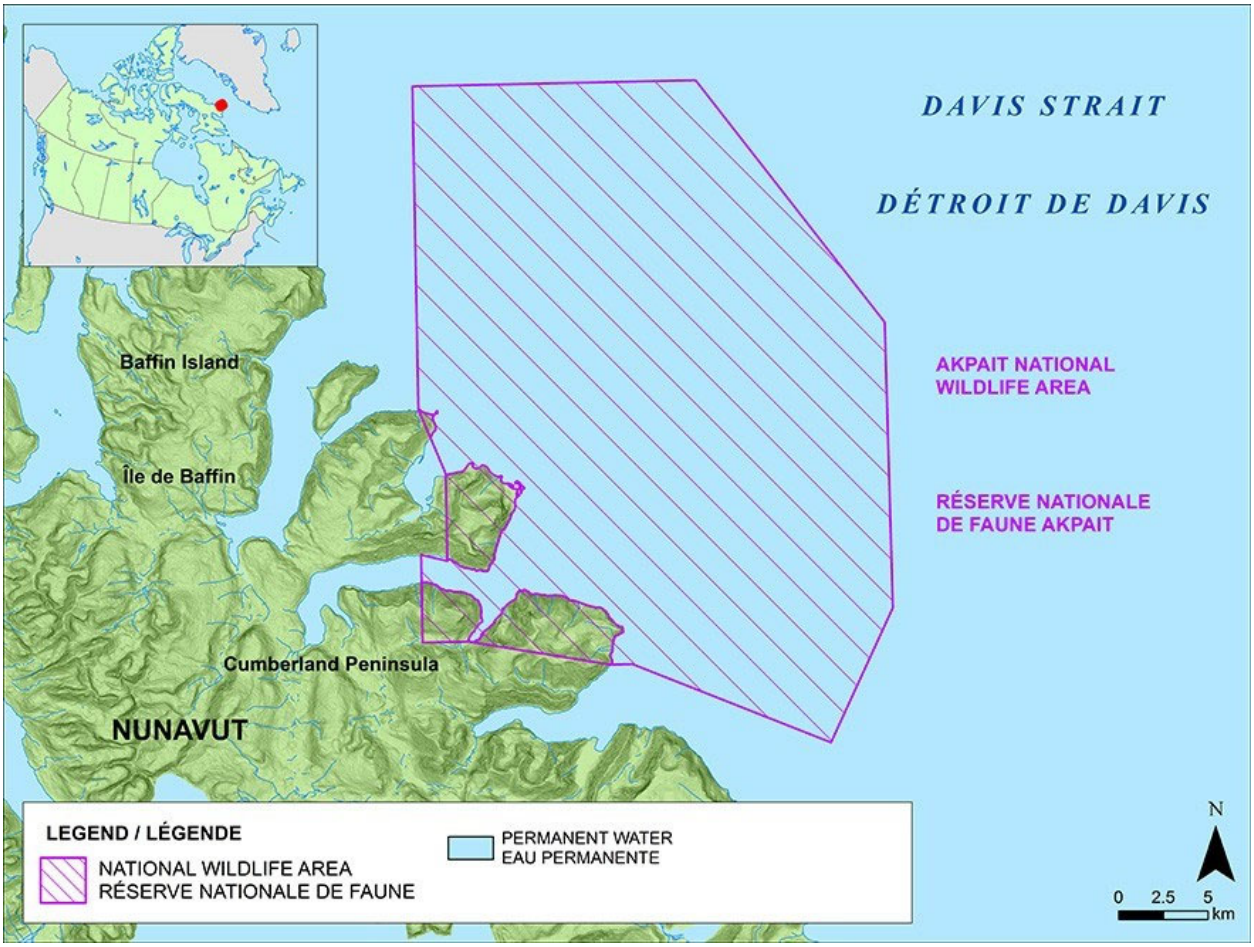

Figure A-8 - Akpait National Wildlife Area (Ref. HH)

Ninginganiq NWA was designated in 2010 and is the largest NWA in Canada measuring over 336,000 ha. The NWA includes the shoreline and islands of Baffin Island's Isabella Bay and adjacent ocean out to 12 nautical miles from shore (see Figure A-9). It contains important marine habitat, creating ideal conditions for bowhead whales. It also supports healthy populations of polar bears, ringed seals, king eiders, long-tailed duck, dovekies, northern fulmars, and narwhal.

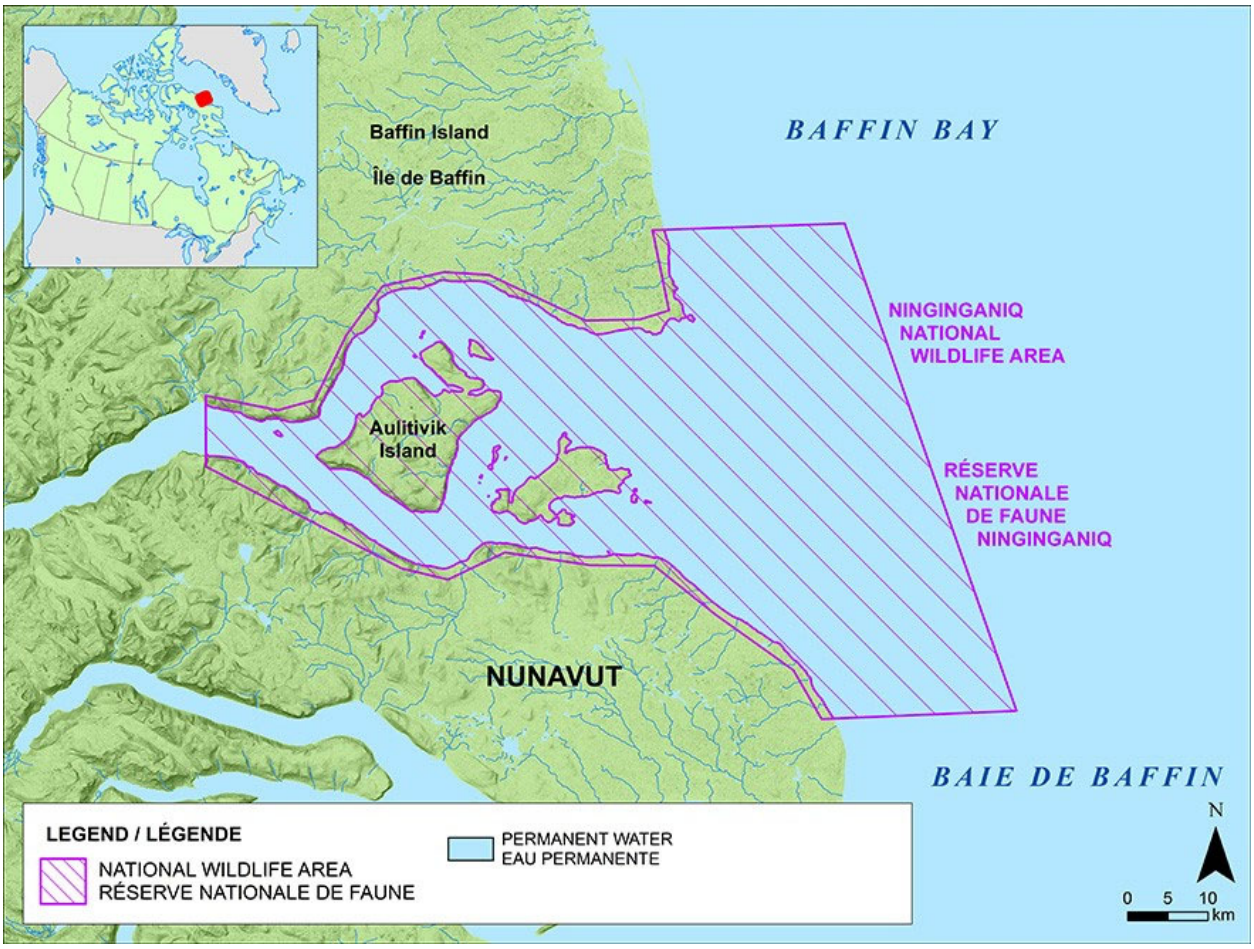

Figure A-9 Ninginganiq National Wildlife Area (Ref. HH)

Ququlluit NWA was established in 2010 and is located off Baffin Island (see Figure A-10). It contains key marine habitat and is exemplified by two huge rock spires that are topped with hardy arctic plants and covered in brilliant orange lichens. There are also several archaeological sites on Qaqulluit Island. Qaqulluit NWA is home to Canada's largest breeding colony of northern fulmars. Other nesting seabirds found in the NWA include black guillemots and various gull species like the glaucous and Iceland gulls. The NWA is also an Important Bird Area (IBA), the nesting birds being sensitive to disturbance and the pollution of their feeding areas. The

marine portion further protects marine mammal populations of walrus and ringed seals that regularly use the waters of the wildlife area.

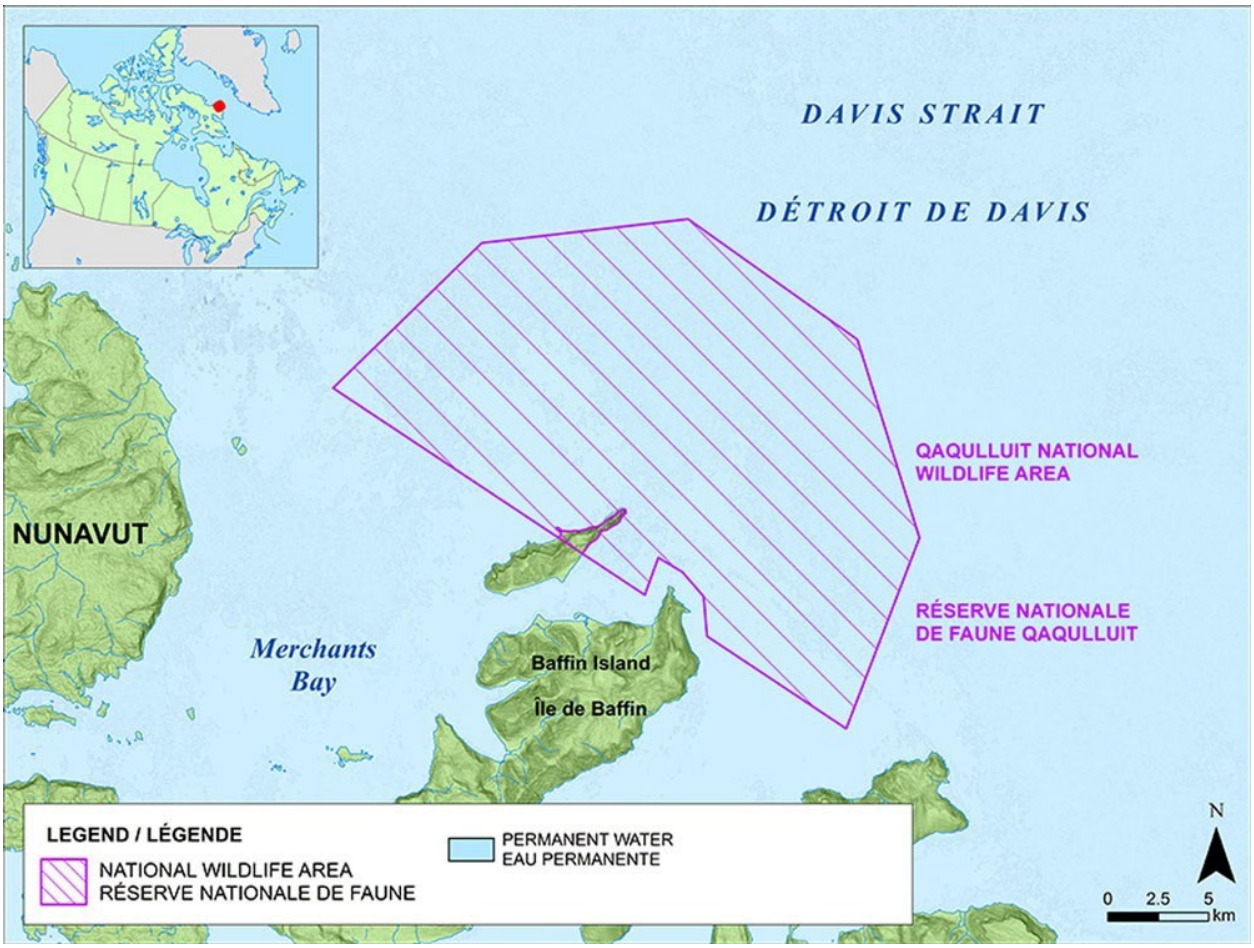

Figure A-10 - Qaqulluit National Wildlife Area (Ref. HH)

Marine Refuges

Fisheries management measure in Canadian waters that qualify as effective area-based conservation areas are listed below. These measures help protect important species and their habitats, including unique and significant aggregations of corals and sponges. These measures are intended to be in place for the long-term, so they will make a lasting contribution to marine conservation.

Coral Conservation Areas (CCAs), Sponge Conservation Areas (SCAs) and Closures are areas that have restrictions on fishing that uses bottom-contact gear, as well as other human activities that are incompatible with the conservation of local species.

EAST COAST OF CANADA

Estuary and Gulf of St. Lawrence Bioregion (Ref. II)

Beaugé Bank SCA contain a high concentration of sponges. Some species in this group may create structure that provide diverse habitat for many other species.

Central Gulf of St. Lawrence CCA features the highest known concentration of the *Anthoptilum grandiflorum* sea pen in the Estuary and Gulf of St. Lawrence bioregion.

East of Anticosti Island SCA features a high concentration of sponges. Some species in this group create structures that provide diverse habitat for many other species.

Eastern Gulf of St. Lawrence CCA has the highest concentration of *Pennatula grandis* sea pens in the Estuary and Fulf of St. Lawrence bioregion, as well as a high concentration of *Anthoptilum grandiflorum* sea pens. These species create structures that provide diverse habitat for many other species.

Slope of Magdalen Shallows CCA has a very high concentration of *Pennatula grandis* sea pens and *Anthoptilum grandiflorum* sea pens. These species create structures that provide diverse habitat for many other species.

South-East of Anticosti Island SCA features a high concentration of sponges, some of which create structures that provide diverse habitat for many other species.

Scotian Shelf Bioregion (Ref. II)

Emerald Basin and Sambro Bank SCA has a significant concentration of *Vazella pourtalesi*, a structure-forming species of glass sponge that is not found in aggregations in other areas where it occurs.

Lophelia CCA, in the area of Cabot Strait, is the only known living *Lophelia pertusa* coral reef in Canada's Atlantic waters. Lophelia reefs are known to be hotspots for biodiversity. This structure-forming species provides habitat for many other species.

Western/Emerald Banks CCA is a significant spawning and nursery ground for haddock.

Newfoundland-Labrador Shelves Bioregion (Ref. II)

Hawke Channel Closure The bottom habitat in this area overlaps an Ecologically and Biologically Significant Area (EBSA) that supports diverse populations of groundfish and other benthic species. For example, the habitat is an important snow crab fishing ground.

Funk Island Deep Closure The bottom habitat in this area overlaps Ecologically and Biologically Significant Areas (EBSAs) that support a high diversity of benthic fish species. For example, the habitat is an important snow crab fishing ground.

Division 30 Coral Closure A high concentration of corals and sponges are found here. The high concentrations of these structure-forming species provides habitat for many other species.

Hopedale Saddle Closure A high concentration of corals and sponges are found here. The high concentrations of these structure-forming species provides habitat for many other species.

Northeast Newfoundland Slope Closure A high concentration of corals and sponges are found here. The high concentrations of these structure-forming species provides habitat for many other species.

EASTERN CANADIAN ARCTIC

Cold-water corals (also known as deep-sea corals) and sponges are known to inhabit the eastern Arctic Ocean (Ref. II). These organisms are being increasingly recognized as important components of benthic or bottom marine ecosystems.

Davis Strait CCA is 17,298km^2 and is an area of importance for corals, sea pens and sponges, which play an important functional role for numerous forms of marine life.

Disko Fan CCA is 7,485 km^2 and is an importance area for Narwhal which is an important species to Nunavut communities for social, cultural and economic purposes. Narwhal is a traditional food source for many Inuit who harvest for subsistence. Additionally, large gorgonian corals are found in this area.

Hatton Basin CCA is 42,459 km^2 and is an area of importance for cold-water corals and sponges, which play an important functional role for numerous forms of marine life.

Voluntary Restrictions

EAST COAST OF CANADA

Due to changing migration patterns of North Atlantic right whales and their increased presence in the Gulf of St. Lawrence, the GoC has set seasonal speed restrictions in specific zones. The required measures are laid out in the Interim Order for the Protection of North Atlantic Right Whales (Eubalaena glacialis) in the Gulf of St. Lawrence, 2022 and is discussed in Annex C.

Additionally, to coincide with the NARW entering and exiting the Gulf of St. Lawrence in large numbers, a trial voluntary slowdown is being put in place for the third year in Cabot Strait from 20 April to 28 June, 2022, and from 28 September to November 15, 2022. This may affect the redeployment of ships to Halifax, if they return via the Cabot Strait at the end of September.

EASTERN CANADIAN ARCTIC

No voluntary restrictions were found for the Canadian Arctic.

Provincially Designated Environmentally Sensitive Areas

There are numerous provincially designated wilderness areas and nature reserves located along the shores within the study areas. Each province and territory has its own method of designating and managing nature reserves, wilderness areas, parks, etc.

Parks and Recreational Areas

EAST COAST OF CANADA

National Parks (NP) are a country-wide system of representative natural areas of Canadian significance. By law, they are protected for public understanding, appreciation and enjoyment, while being maintained in an unimpaired state for future generations. A National Park Reserve (NPR) is a national park where an area or a portion of an area proposed for a park is subject to a claim in respect of Indigenous rights and is under negotiation.

There are six (6) NPs/NPRs within the study area (see Figure A-11):

a. Cape Breton Highlands NP (NS);
b. Sable Island NPR (NS);
c. Akami-Uapishk^{U}-KakKasuak-Mealy Mountains NPR (NL);
d. Gros Morne NP (NL);
e. Terra Nova NP (NL); and
f. Torngat Mountains NP (NL).

Figure A-11 - National Parks and National Park Reserves (Ref. JJ)

There are numerous provincially-designated parks along the coast of the study area.

EASTERN CANADIAN ARCTIC

There are two (2) NPs located in study area (see Figure A-11 and Table A-9 below). The parks are mostly land-based, but often include coastal waters, such as tidal flats.

Table A-9 - Northern National Parks and National Park Reserves

National Park	Territory/ Province	Description
Sirmilik	NU	Located on Bylot Island, along the Lancaster Sound Coast.
Auyuittuq	NU	Located along the east shore of Baffin Island, along the Davis Strait coast.

There are numerous territorial parks close to the operational area. In Nunavut, there are eleven (11) territorial parks and one proposed territorial park, Clyde River. These are planned,

established, maintained, operated and promoted by the Parks and Special Places division of the Department of Environment.

With the exception of beneficiaries of the NLCA, anyone entering the boundaries of a national park in Nunavut, including all marine areas, requires authorization from Parks Canada. Authorization normally occurs through a visitor use permit and/or a business license. All vessels wishing to enter marine areas of national parks in Nunavut must contact the local park office and register prior to entering. Additional permit requirements and restrictions may apply.

National Historic Sites

National Historic Sites (NHS) in Canada include sacred spaces, archaeological sites, battlefields, heritage houses, historic districts, and places of scientific discovery. The Historic Sites and Monuments Board of Canada advises the Ministry of Environment and Climate Change on national historic significance. Parks Canada is responsible to protect and operate over 140 of these sites all over Canada.

EAST COAST OF CANADA

There are numerous NHS in eastern Canada (Ref. KK). The ones described below are those that are located on shore, or close to shore, and which could be affected by military operations, either directly or by restricting access, especially in more rural or remote locations.

Canso Islands NHS is home to the remains of an 18th century fishing settlement and the ruins of a battle-ravaged earthen fort.

Fort McNab NHS is located on McNabs Island in Halifax, NS. Built in the 1880s, Fort McNab was at one time the most powerful guardian of Halifax, thanks to its powerful breech-loading guns. Fort McNab served as an important counter-bombardment battery in the two World Wars before being decommissioned in 1959 and becoming a national historic site in 1965.
Fortress of Louisbourg NHS, located in Louisbourg on Cape Breton Island, NS, demonstrates a living example of a typical 1740s day in the French fortified town.

Georges Island NHS is located in Halifax Harbour on a drumlin created by glacial deposits. It was occupied by military forces for 200 years from 1750, acting as a key fortification protecting access to a key British station. Georges Island was also used as a prison in the early years. Between 1755 and 1763, during the deportation of the Acadians, known as Le Grand Dérangement (The Great Upheaval), the island became a holding area for large numbers of Acadians.

Grassy Island Fort NHS is the remnant of 18th-century British fortifications situated on Grassy Island, one of a group of islands off the eastern tip of mainland Nova Scotia known together as the Canso Islands National Historic Site.

York Redoubt NHS overlooks the entrance to Halifax Harbour. The fortification, constructed in 1793, helped protect the Port of Halifax.

Cape Spear Lighthouse NHS is located on Canada's easternmost point of land. It is the oldest surviving lighthouse in Newfoundland and Labrador, offering a glimpse into the lives of 19th century lighthouse keepers and their families.

L'Anse aux Meadows NHS, located on the tip of the Northern Peninsula in NL, exhibits the first known evidence of European presence in the Americas. This is also a UNESCO World Heritage Site.

Port au Choix NHS on NL's northwestern coast, is an archaeological site of the Dorset people, the Groswater people and the recent indigenous people, from long before the Europeans arrived.

Red Bay NHS is located on the north shore of the Strait of Belle Isle in NL. It is also a UNESCO World Heritage Site. During the mid-16th century, large numbers of right and bowhead whales drew whalers from the Basque region of Spain and France to the Strait of Belle Isle, where they established a major whaling port at Red Bay.

Ryan Premises NHS is comprised of a cluster of white, 19th century clapboard buildings perched on the shore of Bonavista, NL's historic and picturesque harbour.

EASTERN CANADIAN ARCTIC

Wrecks of HMS Erebus and HMS Terror NHS located in Nunavut is the only one located in the expected operational area and the first national historic site to be co-managed by Inuit and Parks Canada. In 1845, explorer Sir John Franklin set sail from England with two ships, Her Majesties Ship (HMS) Erebus and HMS Terror, in search of a Northwest Passage across what is now Canada's Arctic. The ships and crew were last seen by Inuit on King William Island, in the area of Queen Maud Gulf, and never returned to England. Their apparent disappearance prompted a massive search that continued unsuccessfully for nearly 170 years. In September 2014, an expedition led by Parks Canada discovered the wreck of HMS Erebus in an area that had been identified by the Inuit. Two years later the wreck of HMS Terror was located. These areas are currently restricted without written consent from Parks Canada. These restrictions do not affect the right of access by Nunavut Inuit for harvesting as provided in the Nunavut Agreement. The locations of the wrecks are shown in Figure A-12.

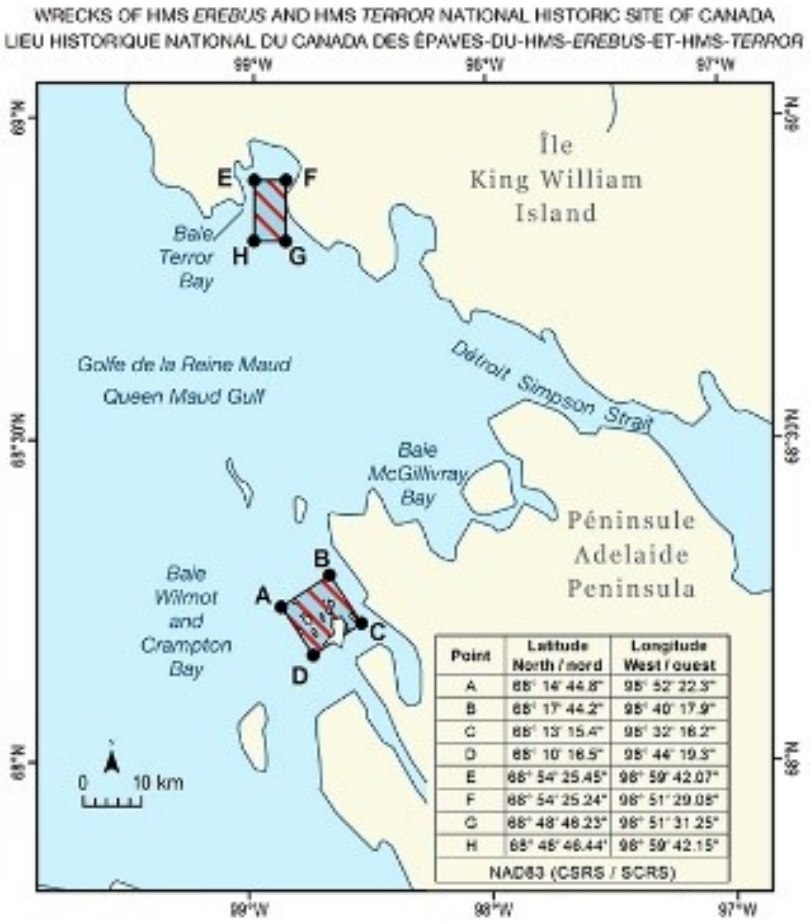

Figure A-12 - Wrecks of the HMS Erebus and HMS Terror (Ref. LL)

UNESCO World Heritage Sites

EAST COAST OF CANADA

UNESCO World Heritage sites located in or near the study area include (Ref. MM):

Mistaken Point is located at the south-eastern tip of NL. It consists of a narrow, 17 km-long strip of rugged coastal cliffs. Of deep marine origin, these cliffs date to the Ediacaran Period (580-560 million years ago), representing the oldest known assemblages of large fossils anywhere.

Gros Morne National Park, situated on the west coast of NL, provides a rare example of the process of continental drift, where deep ocean crust and the rocks of the earth's mantle lie exposed.

EASTERN CANADIAN ARCTIC

There are no UNESCO World Heritage sites in the Canadian Arctic.

Indigenous Protected and Conserved Areas

Under the Canada Nature Fund, Indigenous organizations and governments can apply for funds to support the creation of Indigenous protected and conserved areas (IPCA). IPCAs focus on protecting and conserving ecosystems through laws, governance and knowledge systems.

Establishment projects are expected to establish a protected or conserved area in the near future. The preliminary work projects are capacity-building projects, focused on preliminary efforts for protected and conserved areas in the longer term (5 to 10 years). Although this will not affect Op NANOOK 2022, this is included here for consideration by planners of future Op NANOOK exercises.

An interactive map of IPCAs is available on the Government of Canada website (Ref. NN).

EAST COAST OF CANADA

Potential IPCAs in the area are listed below. Although this will not affect Op NANOOK 2022, this is included here for consideration by planners of future Op NANOOK exercises.

a. Advancing Target 1 in Nova Scotia – A Collaborative Conservation Approach (Establishment) – this project will work to advance a well-connected network of protected and conserved areas in NS;

b. Creating Indigenous Protected Areas within the Traditional Territory of Miawpukek First Nation (Preliminary work) – this project will conduct capacity building activities to support Miawpukete first Nation's ability to make recommendations to the Province on the establishment of new protected and conserved areas on the island of NL, in the Boreal Shield ecozone; and

c. Innu Parks Project/Minashkuau Kanakutuataku (Preliminary Work) - this project will facilitate the building of capacity within Innu Nation to enable it to make recommendations to governments on, and engage with the Province to support, habitat protection for species at risk in Labrador, including the Peregrine Falcon and the Wolverine.

EASTERN CANADIAN ARCTIC

Proposed indigenous protected areas within the operational area include:

a. Proposed Agguttinni Territorial Park (Establishment); - the government of Nunavut will work to create a new protected area in Agguttinni on Inuit owned lands. The new territorial park will protect critical habitat for several species at risk, important wildlife habitats and cultural sites currently valued for harvesting, camping and travel; and

b. Aviqtuuq Inuit Protected and Conserved Area (Preliminary work) - Spence Bay Hunter and Trapper Association will enable collaborative planning and negotiations on a potential Aviqtuuq Inuit Protected and Conserved Area to protect the Boothia Peninsula in the Kitikmeot region of Nunavut.

E.9 FISHERIES (COMMERCIAL, RECREATIONAL, INDIGENOUS)

EAST COAST OF CANADA

Historically, Indigenous peoples began harvesting fish and shellfish in the Atlantic region several thousand years ago whereas commercial fishing started in the mid-1500s. By 1700, Nova Scotia was a large exporter of cod, mackerel and herring. Catches continued to increase until 1973 when total landings of fish on the Scotian Shelf peaked, with catches exceeding 750,000,000 kg (750,000 t) (ref. B). Throughout this period of commercial fishing groundfish landings dominated (mainly gadoids), with 450,000 t landed in 1973, which decreased to less than 15,000 t in 1997. This drastic decrease in landings helped impose the moratorium on fishing, especially for cod, in 1993 (ref. B).

Management of the commercial fishing activity on the Scotian Shelf by DFO is conducted through the Maritimes Regional offices Many of the major species are fished according to quota systems (*i.e.*, groundfish), while others are fished according to availability (*i.e.*, herring, mackerel and tunas) or specific season lengths (*i.e.*, crab and lobster) (ref. B). Licences and quotas are set by DFO for individual species management areas, Northwest Atlantic Fisheries Organization (NAFO) Divisions and Unit Areas. Atlantic Canadian waters are divided into several Crab Fishing Areas (CFAs) and subareas that generally correspond with one or more NAFO zones. There are a total of 45 distinct Lobster Fishing Areas (LFAs) spanning across the provinces of Quebec, New Brunswick, Nova Scotia, Newfoundland and Labrador, and Prince Edward Island, each with its own season of varying lengths (ref. B).

More details can be found in reference B.

EASTERN CANADIAN ARCTIC

More than 300 stocks of fish and more than 50 stocks of marine mammals are harvested in the Canadian Arctic. More fish species are found in the eastern Arctic Ocean than the western Arctic Ocean. Household fisheries, which include traditional and subsistence fishing by Aboriginal people and licensed domestic fishing by non-Aboriginal northerners, target species such as Arctic char, lake herring, lake trout, whitefish suckers, Arctic grayling, cisco and inconnu. In the eastern Arctic large-scale offshore turbot and shrimp (*Pandalus borealis*) fisheries operate off eastern Baffin Island. Northern shrimp have been fished on Canada's east

coast for more than 40 years and stocks are in good condition due to the decline of its main predators, cod and redfish. Boats used to catch northern shrimp are equipped with trawls or funnel-like nets that are dragged along the ocean bottom. This fishery is active from August to November with peaked activity in August and September (ref. OO)

There is a long history of exploitation by foreign and, most recently, Canadian trawlers of turbot fishing in the Davis Strait. This fishery is active from August to November with peaked activity in August and September. Sport fishing in remote rivers and lakes of the North attracts thousands of anglers and visitors each year. In many communities, tourism is an important economic contributor to local economies (ref. OO).

Fisheries management plans have been developed for the following eastern Arctic marine fish, marine mammals and shrimp species (ref. PP):

a. Atlantic walrus;
b. Cambridge Bay Arctic char;
c. Greenland halibut;
d. narwahl; and
e. northern shrimp and striped shrimp.

Atlantic Walrus

Atlantic walrus are primarily harvested by Inuit, and are highly valued as a traditional source of food and other products. The Inuit hunt provides an opportunity to maintain cultural traditions and for experienced hunters to pass on their skills and knowledge to younger generations. Walrus products also provide a secondary source of income for hunters. Walrus ivory is either sold raw, or carved into fine art pieces such as jewelry or sculptures. Some communities engage in a small-scale sport hunt conducted by non-Inuit hunters. Atlantic walrus are found across most of Nunavut, with the majority of harvests occurring in eastern Nunavut, including Arctic Bay, Pond Inlet, north and central Foxe Basin, and Hudson Bay-Davis Strait. Mating occurs from February to April. Habitat requirements are very specific – they require large areas of shallow (100 m or less), open water that support an abundant clam community. In addition, there must be ice or land nearby to "haul out". Moving pack ice is ideal for this purpose; however, in the summer and fall if ice is scarce, large herds congregate and haul out on low, rocky shores with steep subtidal zones. In Nunavut, Atlantic walrus are harvested year round. Inuit hunters use a combination of modern equipment, such as snowmobiles, boats with outboard motors, and rifles, as well as traditional sleds, harpoons and floats. Typically, walrus are hunted from boats when they are on ice floes or while they are swimming in open water.

Cambridge Bay Arctic Char

The Arctic char commercial fishery occurs on Victoria Island, near the Community of Cambridge Bay. The Paliryuak (Surrey), Halokvik (Thirty-Mile), Palik (Lauchlan), Ekalluktok (Ekalluk) and Jayko (Jayco) rivers are commercially fished for anadromous (searun) Arctic char. The commercial fishery is conducted by local Inuit fishers in conjunction with the operational

support of Kitikmeot Foods Ltd., the local commercial processing plant. Kitikmeot Foods Ltd. currently employs local residents and beneficiaries, including management, seasonal processors and commercial fishers. Arctic char are typically harvested at or near the mouths of the rivers when fish are migrating downstream to marine waters in July, locally known as a spring fishery, or while returning to freshwater in the fall in mid-August through mid-September, locally known as the fall fishery.

Greenland Halibut Fishery

The Greenland Halibut (or Turbot) fishery occurs in Subarea 0. Subarea 0 is divided into a northern region, Division 0A (Baffin Bay) which extends from 78°10'N to 66°15'N, and a southern region, Division 0B (Davis Strait) which extends from 66°15'N to 61°00'N. Fishing occurs outside the Nunavut Settlement Area (NSA) with the exception of the inshore allocation in Division 0A. The boundary between Division 0A and Division 0B coincides with a natural oceanographic boundary between marine ecoregions (Powles et al. 2004) consisting of a colder High Arctic water mass to the north and a warmer North Atlantic water mass to the south. Fishing primarily occurs along the Baffin Island and Greenland shelf slopes in waters 800-1,500m deep. The Subarea 0 fishery is a commercial fishery with the exception of that portion of Division 0A which falls within the NSA. In this area there is an exploratory fishery with a quota for Nunavut inshore fisheries development.

The Division 0A fishing season is dictated by the presence of sea ice but typically begins in June and ends in November. Offshore catches are taken using either bottom otter trawl (single and twin trawl) or bottom set fixed gear (longline, gillnet). Specifically for fixed gear in the offshore, bottom set gillnets have been used almost exclusively since their introduction in 2004. Since about 2015 the gillnets have had bait bags, usually filled with squid, tied at regular intervals along the ground line. Inshore exploratory fishery catches are taken with fixed gear (longline, gillnet or pot). The average number of vessels operating in Division 0A between 2014 and 2018 was 10. The number of vessels using mobile gear varied between 2 and 4 while the number of vessels using fixed gear varied between 5 and 9 during these years.

The fishing season in Division 0B is dependent on ice conditions and usually starts in May and finishes at the end of November. Vessels use bottom set longlines or gillnets, with baited gillnets introduced in approximately 2015. Most vessels have freezing at sea capabilities, while some smaller vessels still operating as wet fish vessels. On average between 2014 and 2018, there were 18 vessels fishing in Division 0B each year. During these years, the number of mobile gear vessels ranged between 4 and 7, while the number of fixed gear vessels ranged between 10 and 16.

Narwahl

Narwahl are currently only hunted by Inuit. Narwhal hunting has been, and still is, integral to Inuit. The annual harvest of narwhal by Inuit represents a unique historical relationship in terms of a continuous utilization of a local marine resource. As such, narwhal and their products have widespread economic, social and cultural importance for Inuit. Narwhal are harvested throughout

Nunavut; the majority of harvests occur in eastern Nunavut, but there have been recent sightings (and harvests) in western Nunavut. Narwhal are hunted during the summer when they aggregate in summering areas, and during spring and fall migration to and from over-wintering areas. Hunting occurs during three phases of ice conditions:

- at the floe edge while the landfast ice is still solid and where narwhal congregate awaiting access to summering areas;
- in ice cracks as the ice conditions deteriorate and where narwhal travel along cracks and under ice from hole to hole; and
- in the open water.

Narwhal are hunted with firearms, and are sometimes harpooned before shot to minimize losses. During the open water season, hunters in boats may cooperate, using several boats to herd narwhal or drive them inshore. Once in shallow water sinking losses are reduced since most sunk whales can be retrieved with a grappling hook and line.

Northern Shrimp and Striped Shrimp

The Northern shrimp fishery commenced in the early 1970s when an exploratory fishing program confirmed the presence of commercial abundances of shrimp stocks (Pandalus Borealis and Pandalus Montagui) in waters stretching southward from Baffin Island to the northeast coast of Newfoundland. It later expanded to include fishing off the east coast of Newfoundland in Shrimp Fishing Area (SFA) 7 and onto the Flemish Cap (Northwest Atlantic Fisheries Organization [NAFO] Division 3M). The shrimp fishery in SFAs 0, 1, 4-7, and Davis Strait West is commercial. The fisheries in the Western Assessment Zone (WAZ) and Davis Strait East, and Nunavut and Nunavik East management units (MUs) are considered to be 'exploratory stage 2' of the New Emerging Fisheries Policy, and are licensed under Section 7 of the Fisheries Act. There is no shrimp fishery for food, social, ceremonial or recreational purposes.

There are three land claims agreements with provisions relating to the management of the Northern shrimp fishery: The Nunavut Land Claims Agreement (NLCA) (1993), the Nunavik Inuit Land Claims Agreement (NILCA) (2005) and the Labrador Inuit Land Claims Agreement (LILCA) (2007). Each of the agreements provides for consideration of Inuit harvesting opportunities related to shrimp.

Nunavut's shrimp resources are fished by individual Nunavut fishing companies. The NWMB provides its decisions and recommendations to the DFO Minister on the sub-allocation of Nunavut shrimp resources to individual Nunavut based fishing companies for a specified number of years. Nunavut sub-allocation recipients may be issued a temporary licence to participate in the fishery. Also, 1.5 of the offshore shrimp licences are held by a Nunavut fishing company, which provides quotas in SFA 0, 1, the EAZ and 4-7.

Pursuant to NILCA, Nunavik Inuit's shrimp allocations are provided to Makivik Corporation (or a Makivik Designated Organization) to fish on their behalf. Makivik also holds a > 100' sector licence which provides shrimp quotas in SFA 0, 1, the EAZ and 4-7, and therefore the issuance of a temporary licence is not necessary.

Allocations in MUs Nunavut East, Nunavik East in the EAZ, and Nunavut West and Nunavik West, located in Hudson Strait in the WAZ, are reserved for Nunavut and Nunavik shrimp harvesters, as the MUs are located inside the Nunavut Settlement Area (NSA) and the Nunavik Marine Region (NMR).

Labrador Inuit allocations are fished via communal commercial licences issued to the Nunatsiavut Government (NG) which can be harvested by either the offshore or inshore fleet. Portions of the EAZ, SFAs 4 and 5 fall both within the Labrador Inuit Settlement Area (LISA) and adjacent waters as described in the LILCA. A portion of SFA 6 also falls within Waters Adjacent to the Zone. Labrador Inuit interests also have 1.5 offshore shrimp licences which provide quotas in SFA 0, 1, the EAZ and 4-7.

Subject to any closures in effect, the fishery occurs off the coast of eastern Canada from 47°15' N (Flemish Cap and the northern edge of the Grand Banks (Division 3M) to 69° N (Baffin Bay). Most fishing occurs between depths of 200m and 600m.

The fishing season for the Northern shrimp >100' sector is from January 1 – December 31 for transboundary and NAFO managed stocks (SFAs 0, 1, 3L (SFA 7) and 3M), and April 1 – March 31 for DFO managed stocks, (SFAs EAZ, WAZ, 4, 5, and 6). The inshore trawlers' season is generally from April 1 – December 31, or until the quota is taken, whichever comes first. The opening of the fishery depends on the TAC being announced and for the inshore trawlers, is also based on the sharing of the inshore quota between the 2J, 3K north, 3K south, 3L and 4R fleets. Fishing seasons are regulated under the authority of the Atlantic Fishery Regulations, 1985.

E.10 OTHER OCEAN USES

EAST COAST OF CANADA

Multiklient Invest AS (MKI) Newfoundland Offshore Seismic Program takes place off the east coast of NL. For 2022, MKI is planning to conduct two simultaneous 3D surveys with the MV *Ramform Titan* and MV *Ramform Atlas*. During 2022, MKI is planning to focus survey efforts in the South Bank survey area, with surveying occurring from late-May to early-September. It is possible that a second MKI seismic vessel may simultaneously conduct a seismic survey in the Orphan Basin survey area from mid-June to early-August. MKI will not survey in Labrador in 2022. If surveying occurs in the Orphan Basin survey area, concurrent surveying within the two survey areas would occur for approximately eight weeks with a closest point of approach (CPA) of about 645 km. Based on a review of the C-NLOPB website, there are currently no indications that other seismic surveys will occur in 2022. (Reference QQ)

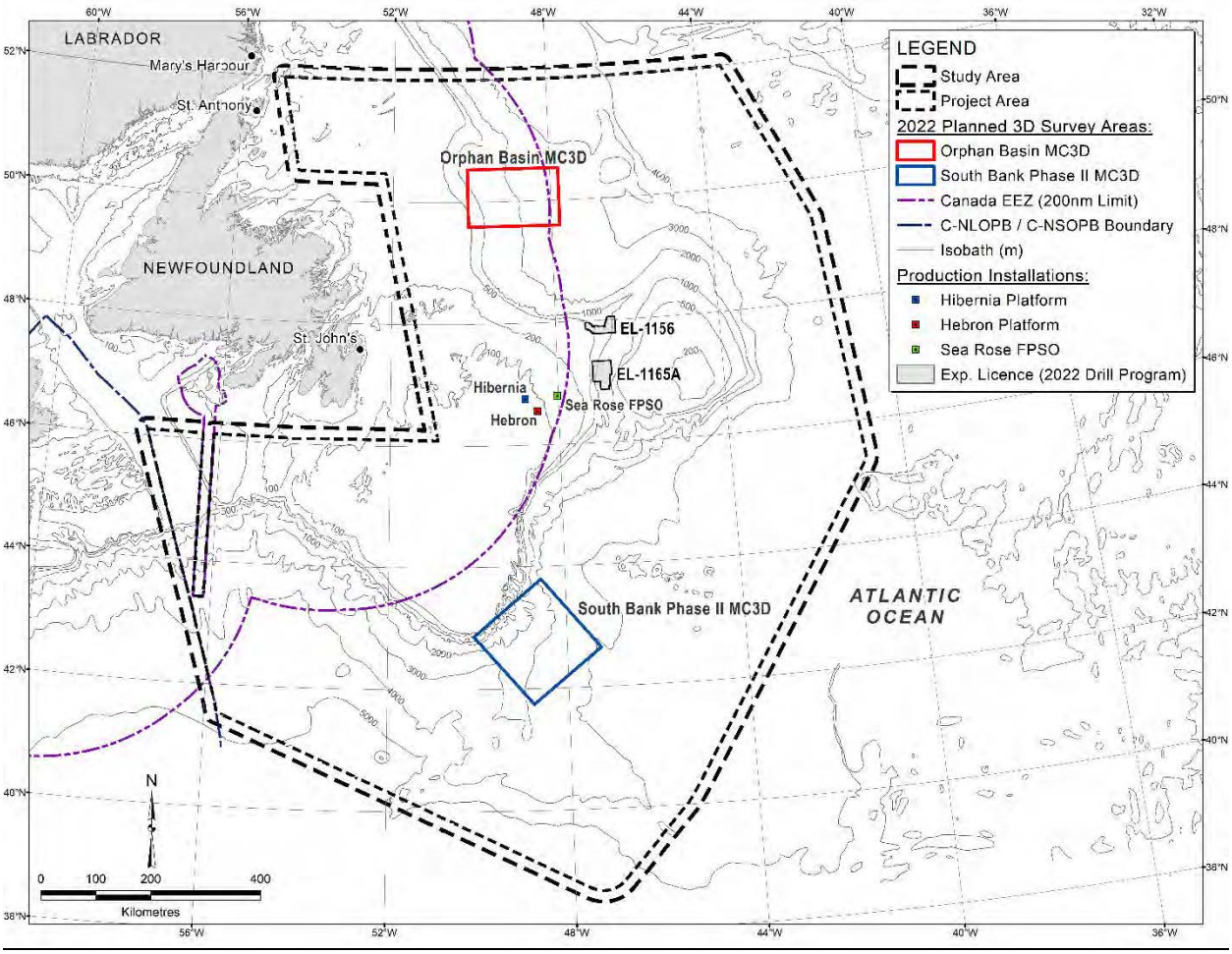

Figure A-13 – Source: ref. QQ

EASTERN CANADIAN ARCTIC

Most of this information comes from reference OO.

Most of the population in the Canadian Arctic lives on the coast and uses the ocean as their main means of transportation (CBCL 2012). Transit can occur on the sea by vessel during ice-free conditions or over the ice in winter.

The majority of commercial vessel traffic in the Canadian Arctic is destination shipping, or voyages to and from Arctic locations. Most industrial support traffic arrives in the summer, however some ice-capable ships arrive year round in parts of the Canadian North to deliver supplies (Ocean North Conservation Society et al. 2018).

Natural resources, fishery and tourism industries are a significant part of the Arctic economy and are dependent on local, regional and international marine transportation (CBCL 2012). Non-perishable goods, fuel, equipment and materials are transported by ship to communities due to high cost of air travel, and lack of transportation alternatives in the north (Ruffilli 2011). In addition to shipping and fishing vessel traffic, various ferry services are operated during the ice-free season to provide local transportation services between northern communities (CBCL 2012).

An examination of temporal shipping patterns in the Canadian Arctic from 1990-2015 by Dawson et al. (2018) illustrated shipping activity (measured in km travelled) has nearly tripled. General cargo vessels and government icebreakers (including research ships) represent that largest proportion of ship traffic. Marine tourism has become rapidly popular with pleasure crafts representing the fastest growing vessel type. Other types of marine traffic include bulk carriers, fishing vessels, oil/ gas exploration, passenger ships, tanker ships and tugs (Dawson et al. 2017). Increase in Arctic marine traffic trends was investigated by Pizzolato et al. (2016). This research illustrated climate change and the lengthening of the Canadian Arctic shipping season is one of many important influencing factors such as; tourism demand, globalization, commodity prices, demographics and societal trends.

Marine transportation in the Canadian Arctic occurs via the Northwest Passage. Vessels travelling from the west coast of Canada would access the western limit of the Northwest Passage by transiting through Bering Strait followed by the Beaufort Sea. Access from the east coast of Canada is via the Davis Strait. There are three routes (eastern, northern, and southern) which comprise the Northwest Passage. The eastern route extends east of Baffin Island to Lancaster Sound via the Hudson Strait, north through Fox Basin, west through Fury-Hecla Strait, and north to Lancaster Sound. This route is not frequently used due to the presence of pack ice. The Wales Strait, and then southwest through Prince of Wales Strait. The southern route extends west from Lancaster Sound past Somerset Island and south through Peel Sound. The route then either travels southwest through Victoria Strait or directly south through the straits Rae and James Ross. The route continues west through Simpson Strait and Queen Maud Gulf, then southwest of Victoria Island (Wilson et al. 2004).

Spatially vessel activity has shifted towards the southern route of the Norwest Passage and areas with active mines. This shift has increased traffic in communities such as; Cambridge Bay, Chesterfield Inlet, Pond Inlet and Baker Lake (Dawson et al. 2018). There are more than 30 ports in the Canadian Arctic including Tuktoyaktuk and Inuvik in the Northwest Territories, and Nanisivik in Nunavut. The majority of ports in the Arctic are very small with limited search and rescue (SAR) resources and port infrastructure (Ruffilli 2011). Additionally, there are no jetty docking facilities and ships may, therefore, need to use anchors, barges, etc. to complete operational activities in the Arctic. The only deep water port in the Canadian Arctic was in Churchill, Manitoba; however, it was taken out of operations in 2016 (RCI 2018), and sold in 2018 (CBC 2018a). Construction off a new deep sea port in Iqaluit, Nunavut began in August 2018. When completed it will allow freighter ships to dock in Iqaluit for the first time without the need of a barge to unload them (CBC 2018a).

The Canadian Arctic is rich in petroleum and mineral resources. Geological resources include minerals (e.g., diamonds, gold, lead, zinc, copper, silver, uranium, iron) and natural gas and petroleum (SCOFO 2010). There have been over 140 offshore wells drilled in the Canadian Arctic since the early 1970s, 92 of which were drilled in the Beaufort Sea region (LTLC Consulting and Salmo Consulting Inc. 2013). In 2016 the Prime Minister issued an indefinite moratorium (to be reviewed every 5 years) on new rights for oil and gas in the Arctic offshore. Existing rights were not affected. As of March 2018, the National Energy Board (NEB) identified 15 offshore oil and gas exploration licenses in the Canadian Arctic; 13 are active and 2 are dormant (NEB 2018). The 13 active operating licenses are held by Canadian companies (Government of Canada 2018c). There are currently no active production licenses (NEB 2018).

Although the area east of James Bay has been developed for hydroelectric projects, most energy needs in the eastern Arctic are met by imported diesel fuel (CBCL 2012). In response, the ecoENERGY for Aboriginal and Northern Affairs Program was created to develop renewable energies and sustainable energy practices focused exclusively on providing Aboriginal and northern communities with funding support for clean energy (CBCL 2012). This program ended in 2016; in its place the Government of Canada pledged to invest $10.7 M over a two-year period to implement renewable energy projects in off-grid Indigenous and northern communities (INAC 2016). In 2017, the Government of Canada further budgeted $53.5 M over a ten-year period to begin investments in northern renewable energy projects stating in 2018-2019 (INAC 2017). Other projects include mining and mineral exploration projects (e.g. diamonds, gold, lead, zinc, copper, silver, uranium, iron) and range from drilling and exploration to mining facilities across Nunavut, NWT, Yukon, and northern Quebec.

Baffinland's Mary River Mine is located near Pond Inlet, NU. Shipping from the mine takes place via Milne Inlet and through Eclipse Sound. According to reference RR, the latest data show summer narwhal numbers in Eclipse Sound are in a steady decline. Reasons for the decline have been attributed to the shipping from the mine, but other factors may include increased traffic from cruise ships, icebreaking and anthropogenic development.

E.11 INDIGENOUS/TRADITIONAL ACTIVITIES

Treaty and Land Claims Information

The treaty and land claims information presented in the next paragraphs was found in the GoC Aboriginal and Treaty Rights Information System (ATRIS) (Ref. SS). Figure A-14 shows the extent of the Modern Treaty Territories in Canada.

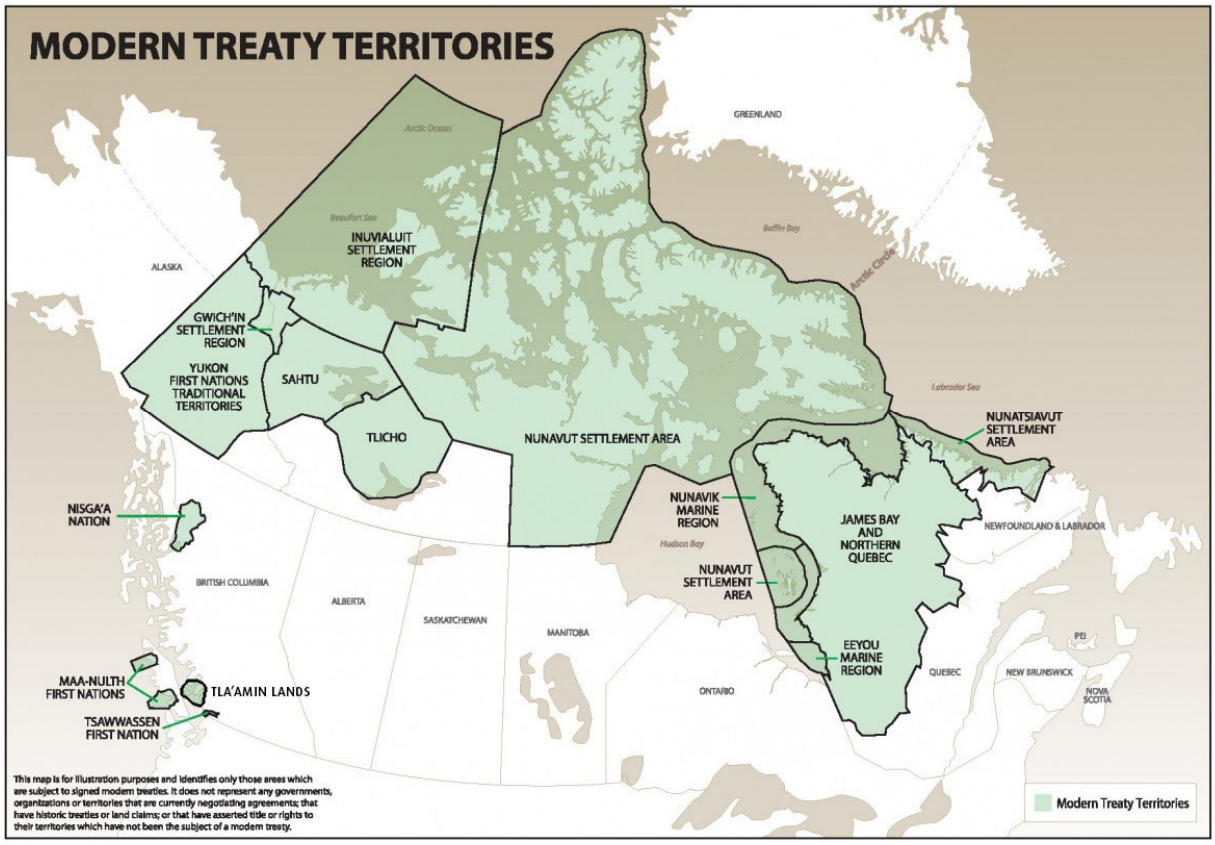

Figure A-14 – Modern Treaty Territories in Canada (Ref. SS)

EAST COAST OF CANADA

Under the Labrador Inuit Land Claims Agreement (LILCA), land is distinguished into two areas – "Labrador Inuit Settlement Area" and "Labrador Inuit Lands" (see Figure A-15). The Settlement Area is approximately 72,520 km^2 of land and 4 km^2 of the Atlantic Ocean. The Labrador Inuit Lands are 15,800 km^2 of land where Inuit have exclusive rights to traditional harvesting of resources. The Nunatsiavut Government is a regional government representing the Labrador Inuit and is responsible for the administration and oversight of the land claim area.

The LILCA includes the following clauses:

> *4.15.24 Canadian Forces personnel may enter, cross or remain on Labrador Inuit Lands to carry out activities related to national defence and security in accordance with the National Defence Act. Canada shall provide the Nunatsiavut Government with advance notice of any activities related to national defence and security in the Labrador Inuit Settlement Area, when it is reasonable to do so.*

4.15.25 Notwithstanding section 4.15.24:

(a) the Department of National Defence and Canadian Forces personnel have no greater rights to conduct military manoeuvres on Labrador Inuit Lands than they have with respect to other privately owned lands under Laws of General Application; and

(b) access to Labrador Inuit Lands for manoeuvres other than those under section 257 of the National Defence Act shall occur only after the conclusion of an agreement with the Nunatsiavut Government respecting timing, notice to Persons in the area affected, compensation for damages and other matters relating to the manoeuvres.

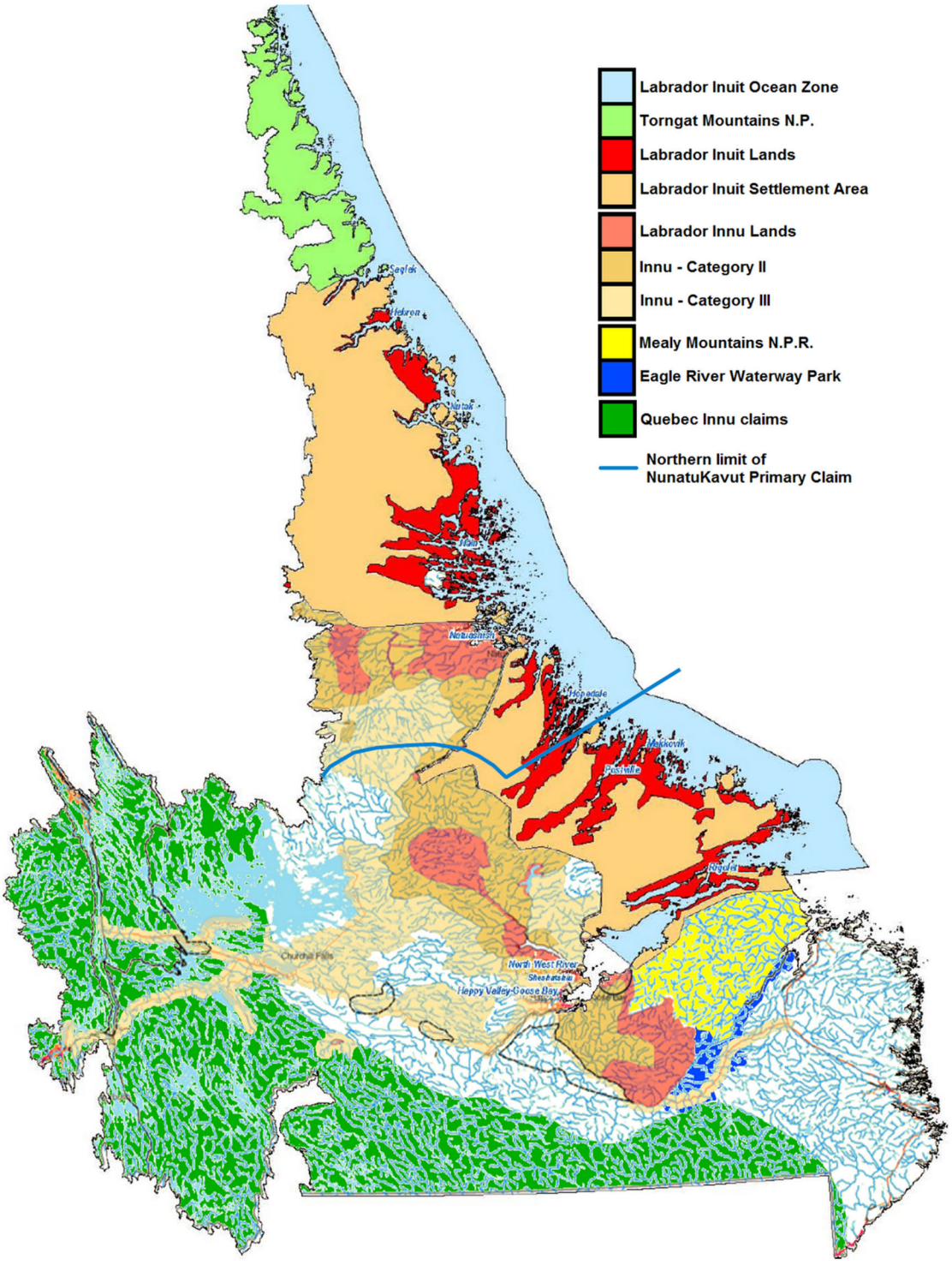

Figure A-15 – Labrador Lands and Ocean Area (Ref. TT)

EASTERN CANADIAN ARCTIC

The modern treaty territories in the Arctic are shown in Figure A-14.

Nunavut Land Claims Agreement (1993)

The Nunavut Land Claim Agreement was signed on May 25, 1993, in Iqaluit, by representatives of the Tunngavik Federation of Nunavut, the GoC and the Government of the Northwest Territories. The agreement covers the area referred to as Nunavut Settlement Area shown in Figure A-14. The agreement includes the following clauses:

> *21.5.11 The Minister of National Defence may authorize access to Inuit Owned Lands and water on Inuit Owned Lands for the execution of manoeuvres by the Canadian Forces pursuant to Section 257 of the National Defence Act and with the exception of Section 21.5.10 nothing in this Article applies to or affects such access authorized by the Minister of National Defence.*
>
> *21.5.12 Other than access for those manoeuvres referred to in Section 21.5.11, access onto and across Inuit Owned Lands and water on Inuit Owned Lands for each manoeuvre shall only occur after the negotiation and conclusion of an agreement with the DIO dealing with contact persons, consultation mechanisms and timing thereof and compensation for damages, which agreement may be amended from time to time. Land use fees shall not be charged.*

Nunavik Inuit Land Claims Agreement

The Nunavik Inuit Land Claims Agreement came into effect on July 10, 2007. The agreement settles unresolved issues stemming from the James Bay and Northern Quebec Agreement. The Nunavik Inuit Settlement Area is comprised of two areas: the Nunavik Marine Region (NMR) (see Figure A-16), and the Labrador portion of the Nunavik Settlement Area. The NMR covers the Nunavut offshore islands adjacent to Quebec, the intervening waters, and the offshore islands including the ice that separates them. The NMR is an area of over 250,000 km^2, has no full-time residents and is totally within the jurisdiction of Canada and Nunavut. The Labrador portion of the Nunavik settlement area covers an offshore area adjacent to Labrador from Killinik Island to north of Hebron and an onshore portion of northern Labrador (see Figure A-16).

According to the agreement:

> *12.3.8 The Department of National Defence (DND) shall have no greater rights to conduct military manoeuvres, including exercises and movements, on Nunavik Inuit Lands than it has with respect to other non-public lands under generally applicable legislation. For greater certainty, this section shall prevail over sections 12.3.9 and 12.3.10.*
>
> *12.3.9 The Minister of National Defence may authorize access to Nunavik Inuit Lands for the execution of manoeuvres by the Canadian Forces pursuant to s. 257 of the National*

Defence Act and with the exception of section 12.3.8 nothing in Part 12.3 applies to or affects such access authorized by the Minister of National Defence.

12.3.10 Other than access for those manoeuvres referred to in section 12.3.9, access and across Nunavik Inuit Lands for each manoeuvre shall only occur after the negotiation and conclusion of an agreement with the MDO respecting contact persons, consultation mechanisms and timing thereof and compensation for damages, which agreement may be amended from time to time. Land use fees shall not be charged.

According to reference OO, Indigenous communities in the Arctic depend on sea ice for, traveling, hunting, fishing, building igloo camps and transporting goods. Food obtained from hunting on the ice is critical to the Inuit way of life. Gill nets are typically set under the ice as soon as the ice is safe to walk on. In addition, Inuit hunt ringed seals and polar bears whose key habitats are on first-year ice. Inuit often have to travel long distances over ice to hunt desired migratory mammals such as caribou and polar bear. These excursions require building igloo camps on the ice for shelter. Furthermore, Inuit use ice as a means to travel between Arctic communities and islands.

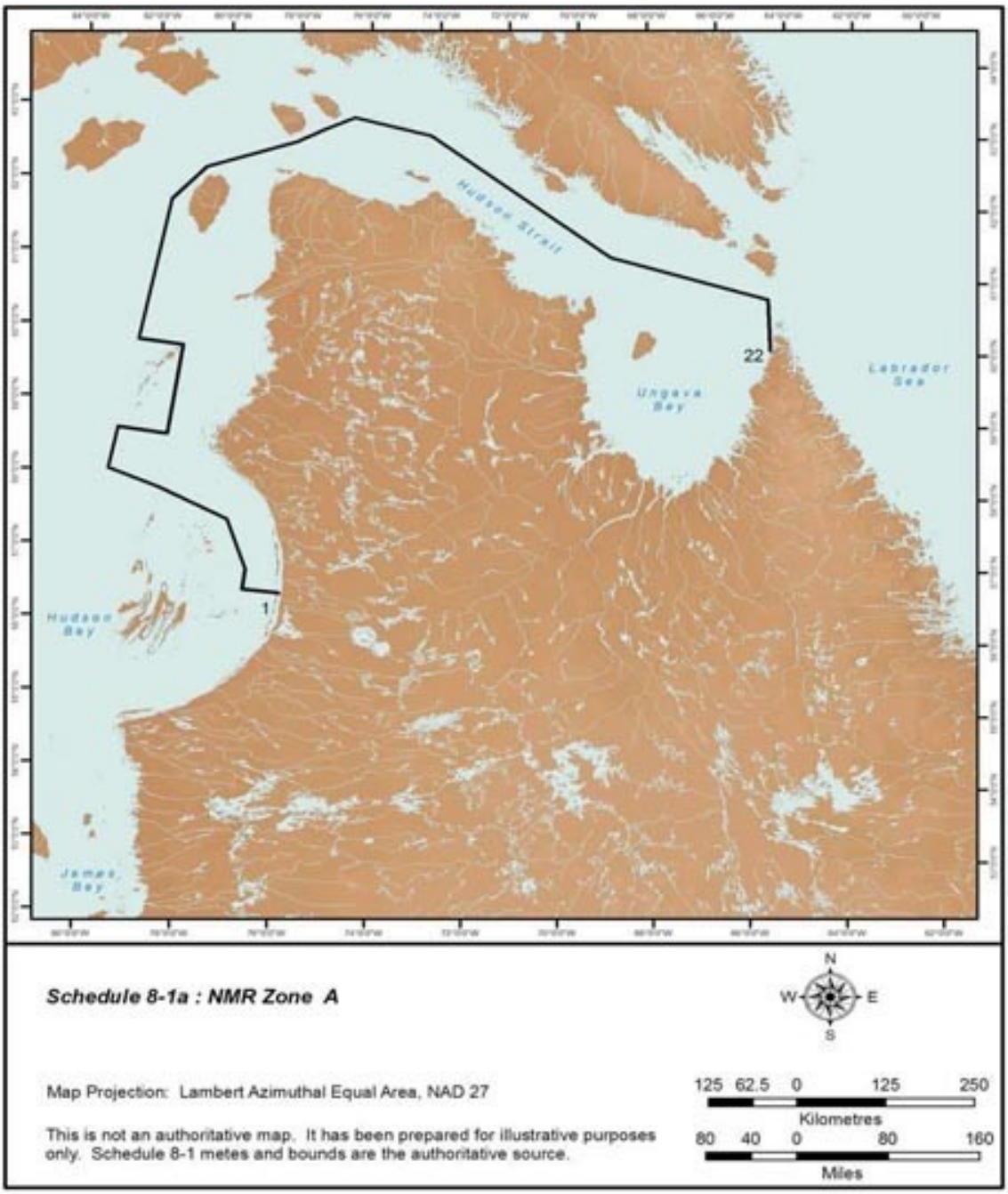

Figure A-16 – Nunavik Marine Region (Ref. UU)

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Establishment File #:[Insert base file #]

DND EIA #:1267-0100-2242

Annex B – Environmental Support Instructions

M1: Vessel Movements and General Operations

Potential Effects

Vessel and submarine movements include incidental discharges (oily water, blackwater, grey water, air emissions, etc.), fuelling, anti-fouling activities, anchoring, de-icing, breaking of first year ice (HDW Class), as well as management of hazardous materials, wastes and halocarbons.

Operations such as shore landings (including the use of vehicles), search and rescue (SAR), and the use of unmanned systems are general operations.

Specific Applicable Regulations

- **Fisheries Act**
- **Marine Mammal Regulations**
- **Species at Risk Act**
- **Migratory Birds Convention Act**
- **Canada Shipping Act 2001**
- **Arctic Shipping Safety and Pollution Prevention Regulations**
- **Ballast Water Regulations**
- **Vessel Pollution and Dangerous Chemicals Regulations**
- **Federal Halocarbon Regulations 2022**

DND Mitigation Documents

- **Op NA-TU and Op NA-NK DDEED Report, 2022**
- **Routine EED Report: Routine Exercises in the Canadian Arctic, April 2021**
- **MARLOAs Exercise EED Update, 31 March 2021**
- **RCN Arctic Operations Manual**
- **MARCORD G-19 Halocarbon Management**
- **Ship Class SEMS Manual SOP E1 *Fuelling***
- **Ship Class SEMS Manual SOP E2 *Liquid Effluent Management***
- **Ship Class SEMS Manual SOP E3 *Halocarbon Management***
- **Ship Class SEMS Manual SOP E4 *Solid Waste Management***
- **Ship Class SEMS Manual SOP E5 *Marine Mammal Impact Mitigation Procedures***
- **Ship Class SEMS Manual SOP E6 *External Ship's Husbandry***
- **Ship Class SEMS Manual SOP E8 *Small Boat Operations***
- **Ship Class SEMS Manual SOP E10 *Arctic Waters Considerations***
- **Ship Class SEMS Manual SOP S9 *Radio-Frequency Hazard Safety***
- **Ship Class SEMS Manual SOP S11 *Radiation Safety***
- **Ship Class SEMS Manual SOP SE1 *Hazardous Materials/Hazardous Waste Management***
- **Ship Class SEMS Plan 1 *Spill Response***
- **Ship's Ballast Water Management Plan (If Available)**
- **Ship's Biofouling Management Plan (if Available)**

- **Ship's Energy Efficiency Management Plan (If Available)**
- **Ship's Garbage Management Plan (If Available)**
- **DAOD 3014-0: Fuels and Lubricants**
- **DAOD 3014-1: Management of Fuels and Lubricants**
- **DAOD 3026-0: Radio-Frequency Safety**
- **DAOD 3026-1: Radio-Frequency Safety Program**
- **DAOD 4003-0: Environmental Protection and Stewardship**
- **DAOD 4003-1: Hazardous Materials Management**
- **C-55-040-001/TS-001 Radio-Frequency Safety Program**
- **A-GG-040-004/AG-001 General Safety Program, Hazardous Materials Safety and Management Manual**
- **RCN SEMS Directive S9 – RCN Radio-Frequency Safety Program**

General Mitigation Measures

- **Ship and scientific staff should be cognizant of their potential impact on shore and marine environments**
- **Ship and scientific staff should be aware of and avoid areas with sensitive environmental areas**
- **Vessels should use low sulphur fuel**
- **When operating in the North America Emissions Control Area, use Tier 3 emissions equipment**
- **Any port specific requirements pertaining to air emissions, e.g. use of incinerators, use of shore power, etc., should be followed**
- **Avoid operation of whistles, sirens, general or chemical alarms**
- **Any vessel, including those belonging to the Government of Canada, requires a permit from the Canadian Wildlife Service to operate in any northern National Wildlife Area**
- **A permit may be required to enter National Parks in Nunavut - contact the local Parks Canada office for more information.**
- **Be aware of which species at risk/endangered species may be present and strictly avoid them**
- **Review ECCC "latest ice conditions" maps and forecasts (https://www.canada.ca/en/environment-climate-change/services/ice-forecasts-observations/latest-conditions.html)**
- **Minimize drastic changes to speed or direction and reduce speed gradually when in proximity to aquatic wildlife**
- **Wildlife concentrations should be avoided**
- **Lookouts for aquatic wildlife should be posted**
- **When approaching whales from behind, move in parallel to the whales**
- **Maintain a 200 m distance from marine animals and specifically, 100 m from whales**

- **Travel at steady speeds when close to seabird and waterbird colonies, moving parallel to the shore, rather than approaching the colony directly**
- **Whenever possible, stay 3km from bird colonies, concentrations of birds and known bird colonies**
- **If an injured or stranded bird is found on the deck of a vessel, document with photographs if possible, and report to MARL SE through SitRep, Incident Report or Daily Report by email to: +N48FormationSafetyandEnvironment@forces.gc.ca**
- **Report all sightings of marine mammals in accordance with SOP E5**
- **Report sea turtle sightings to MARL SE**
- **Excess noise and lighting should be kept to a minimum**
- **Keep topside speaker use to a minimum**
- **Issue NOTMARs/NAVWARNs for exercises**
- **Operate and maintain equipment in accordance with manufacturers' requirements, CFTOs and applicable SOPs to mitigate excess noise and incidental leaks**
- **When available, follow ship management plans wrt to ballast water management, biofouling management, energy efficiency management and garbage management**
- **As much as possible, operations should be planned during daylight hours and the duration should be limited**
- **Wake should be reduced as much as possible, particularly in shallow areas, narrow channels, and when approaching the shoreline**
- **Restrict shore approaches, other than harbour entrances or approaches to wharves, to periods outside bird breeding and migratory events**
- **Ships should bring all of the supplies they need for Arctic deployments**
- **Coordinate with Arctic communities about planned hunts, fishing or other activities on the ice**
- **Avoid known areas used for hunting or fishing by the local communities**
- **Reduce speed when possible to conserve fuel and decrease emissions**
- **Take presence of indigenous communities and hunting and fishing groups into consideration when radiating**
- **Seasonal protection measures for the North Atlantic right whale should be followed**

Discharges and Spills

- **Treated or untreated discharges should not be conducted while at anchor and should be avoided as much as possible**
- **Ballast water should be held, exchanged or treated in accordance with appropriate legislation**
- **Sediments should not be discharged at sea unless it can be confirmed that all sediments result from ballast water from the same area**
- **If unable to discharge sediments at sea, they should be disposed of in a reception facility**

- **Bilge water must be contained and treated or disposed of in accordance with local regulations**
- **Ships should keep and maintain an oil record book**
- **The amount of oily bilge water generated in machinery spaces should be minimized**
- **Oil and oily water in any concentration cannot be discharged in Arctic waters or any MARPOL Annex I special area, except in cases of emergency**
- **AFFF or other fire-fighting substances should not be discharged into the bilge or the greywater system**
- **During training exercises precautionary measures should be taken to ensure that AFFF or other toxic substances are not discharged overboard**
- **FM-200 discharges from fire-fighting equipment on small boats should be avoided as much as possible, except for emergencies**
- **Ship staff handling hazardous materials should receive Workplace Hazardous Materials Information Systems (WHMIS 2015) and dangerous goods training**
- **Safety Data Sheets should be available to ship staff for all hazardous materials**
- **Ship staff should have all the necessary information, training and supervision to manage hazardous materials**
- **Products with the least environmental impact should be used**
- **Hazardous materials should be stored, used and handled in accordance with best management practices, Safety Data Sheets and applicable legislation**
- **Hazardous materials should be stored in appropriately sized hazmat lockers in accordance with chemical compatibility**
- **Follow RCN procedures for radio-frequency, including operating at the minimum power necessary and not transmitting in environmental sensitive areas or near indigenous communities or hunting/fishing areas**
- **Personnel should consider using "environmentally friendly" personal care items**
- **Before using chemicals, try hot water to melt ice or manually chip the ice**
- **Use isophobic coatings, fitted covers on exposed equipment, monitor ice build up and alter course and speed to avoid ice accretion**
- **At every instance of discharge a visual test should be conducted by observing the surface of the surrounding water for the presence of a sheen or solids**
- **Any sheen or spill should be reported to MARL SE through SitRep, Incident Report or Daily Report by email to: +N48FormationSafetyandEnvironment@forces.gc.ca**

Hazardous Materials and Waste Management

- **Prior to leaving home port, dispose of all packaging material**
- **Source reduction should be employed to reduce the amount of waste generated**
- **Waste shall be loaded into canvas bags with floatation devices and is not to be loaded above gunwhales**

- **Recover any waste that goes overboard**
- **Ashes from incineration cannot be thrown overboard**
- **Do not incinerate glass, metals, ceramics, electronic equipment, batteries, aerosols, explosive materials or hazardous wastes**
- **Hazardous wastes, international waste and electronic waste should be segregated from regular solid waste**
- **Hazardous wastes should be stored taking the incompatibility of different wastes into account**
- **Biomedical waste should be separated from other hazardous waste and labeled as containing biomedical waste**
- **Oily rags and absorbent materials should be stored in self-closing fireproof storage bins**
- **Handle ammunition appropriately**
- **Halocarbons should be managed in accordance with the *Federal Halocarbon Regulations 2003***
- **Procedures should be available for equipment containing radioactive materials and radiation emitting equipment**
- **Ship staff using equipment containing a radioactive source or emitting radiation should be aware of the hazards inherent with such equipment and adhere to procedures**
- **Do not dispose of radioactive materials anywhere other than home port**
- **Adequate number of spill kits appropriate for the hazmat in each area should be available**
- **Spills or leaks should be cleaned up immediately**
- **Personnel trained in the use of spill response equipment should be available**
- **Spill containment procedures and equipment should be in place during pump outs**
- **Any sheen or spill should be reported to MARL SE through SitRep, Incident Report or Daily Report by email to: +N48FormationSafetyandEnvironment@forces.gc.ca**

Ice Breaking

- **Limit ice breaking activities as much as possible**
- **Keep records of ice breaking activities and marine mammal sightings**
- **Avoid breaking ice in polar bear hunting areas, known migration routes of caribou and areas used for over-ice transport**

Shore Landings

- **Clean cargo, equipment and supplies before offloading to avoid the transfer of terrestrial invasive species**

- **Beach small boats and landing crafts only at locations that have been determined in consultation with local authorities to avoid damaging environmentally sensitive areas or areas of special interest**
- **ATVs and vehicles should only be used at locations that have been determined in consultation with local officials and ships logistics to avoid damaging areas of special interest**
- **Fuel small boats, landing crafts ATVs and vehicles on ship or at a designated fuelling area on land**
- **Designated fuelling area should have spill containment and spill kits available**
- **Well-travelled areas should be used where they exist**
- **Minimize passes over areas of permafrost**
- **Avoid bird nesting sites and seal haul out areas**
- **Avoid caribou calving grounds, key migration routes and summer and winter concentration areas**
- **Avoid polar bear concentration and denning areas**
- **If an animal is encountered, use warning shots, flares and bear spray before lethal actions**
- **Report any self-defence kills of animals to the appropriate authorities**
- **Eliminate any odors of food, garbage and personal odors while ashore**
- **No refuse should be left on site**
- **Avoid unloading waste into northern communities, unless absolutely required**
- **Arrangements must be made through MARL SE for waste disposal in Arctic communities**
- **Avoid shore landings on indigenous territories unless agreed upon through appropriate consultation**
- **Unless it is an emergency, waste should not be disposed of in remote indigenous communities**

Anti-fouling Activities

- **In-water inspections using divers should be carried out periodically to determine the condition of anti-fouling systems and the biofouling status of the ship**
- **Hull surveys, and when necessary cleaning, should be performed before Arctic deployments**
- **In-water hull cleaning should be avoided in Arctic waters and only conducted when absolutely necessary for repairs**
- **Clean small boat hulls and unmanned systems of biofouling before placing them into ocean or harbour waters**
- **Ship staff should be aware of local requirements regarding the management of biofouling**

- **The amount of chlorine generated by the anti-marine growth system should be balanced with the amount of chlorine required for adequate anti-fouling**
- **Anti-marine growth systems should be turned off in sensitive areas**
- **Fouling organisms removed during cleaning inboard of the hull isolation valves should not be discharged into a harbour**

M2: Aircraft and Helicopter Movements

Potential Effects

- **Air emissions from aircrafts, helicopters and unmanned aerial vehicles (UAVs) may contribute to overall air quality problems by introducing gaseous and particulate pollutants into the atmosphere**
- **Activities such as fuelling and deck washing can cause negative impacts to surrounding surface water and aquatic animals if these discharges are allowed directly into the sea**
- **Aircraft, helicopter and UAV operations have the potential to increase noise above ambient in the area of operation, thereby affecting recreational activities, local populations and commercial fisheries**
- **Increased noise due to aircraft, helicopter and UAV operations may affect the behaviour of aquatic species and birds**

Specific Applicable Regulations

- **Fisheries Act and Marine Mammal Regulations**
- **Species at Risk Act**
- **Migratory Birds Convention Act**

DND Mitigation Documents

- **Op NA-TU and Op NA-NK DDEED Report, 2022**
- **Routine EED Report: Routine Exercises in the Canadian Arctic, April 2021**
- **MARLOAs Exercise EED Update, 31 March 2021**
- **RCN Arctic Operations Manual**
- **Ship Class SEMS Manual SOP E1 *Fuelling***
- **Ship Class SEMS Manual SOP E5 *Marine Mammal Mitigation Procedures***
- **Ship Class SEMS Manual SOP SE1 *Hazardous Materials/Hazardous Waste Management***
- **Ship Class SEMS Plan 1 *Spill Response***
- **DAOD 4003-0: Environmental Protection and Stewardship**
- **MARCORD MS-03 Shipboard Aviation Fuel Management**
- **C-12-124-A00/MB-000 Shipborne Helicopter Operating Procedures**
- **C-39-006-001/MS-000 JP5 Shipboard Handling and Storage**
- **National Defence Flying Orders B-GA-100 Flight Ops Manual**
- ***RCAF Flight Operations Manual***

General Mitigation Measures

- **Ship staff should be cognizant of their potential impact on shore and marine environments**

- **Ship staff should be aware of and avoid all environmentally sensitive, recreational, cultural and commercially important areas within their area of operation such as Marine Protected Areas, National Parks, etc.**
- **Maintain equipment as per manufacturer's recommendations and Canadian Forces Technical Orders (CFTOs) and other applicable Standard Operating Procedures (SOPs)**
- **Discharges from fire-fighting systems should be avoided as much as possible, except for emergencies**
- **Fuelling and deck washing should be avoided in environmentally sensitive areas**
- **Wash water with detergents or other cleaners should be captured**
- **Excessive noise should be kept to a minimum**
- **Be aware of which species at risk/endangered species may be present and strictly avoid them**
- **Whenever possible, stay 3km from bird colonies, concentrations of birds and known bird concentration areas**
- **Avoid low-level flying over land and in the vicinity of wildlife concentrations or bird nesting areas**
- **Maintain a minimum altitude of 660 m over bird colonies**
- **If birds are encountered during a flight path, climb above them while maintaining a safe speed**
- **Avoid repeated overflights of animal and bird concentrations, colonies or important habitats**
- **Report Sea Turtle sightings to MARL SE**
- **Be aware of sensitive timing windows and where sea turtles may be expected**
- **Avoid low-altitude flying over parks and recreational areas, populated areas, commercial fishing and tourism areas**
- **Do not land or take off in parks or recreational areas**
- **Avoid operations near indigenous communities**
- **NOTAMs are required prior to exercises**
- **Personnel trained in use of spill response equipment should be available**
- **Spill kits should be available adjacent to fuelling areas**
- **Any sheen or spill should be reported to MARL SE through SitRep, Incident Report or Daily Report by email to: +N48FormationSafetyandEnvironment@forces.gc.ca**

M3: Fuelling Alongside and At Anchor

Potential Effects

- **Fuelling activities may contribute to overall air quality problems by introducing volatile pollutants into the atmosphere**
- **Spills and leaks can occur during RAS operations and have the potential to impact surrounding surface water, aquatic animals and their habitats, birds, recreational areas and commercial fisheries**
- **Fuelling activities may contribute to health issues with the lessening of air quality resulting from the introduction of volatile pollutants into the atmosphere**

Specific Applicable Regulations

- **Fisheries Act and Marine Mammal Regulations**
- **Species at Risk Act**
- **Migratory Birds Convention Act**

DND Mitigation Documents

- **Op NA-TU and Op NA-NK DDEED Report, 2022**
- **Routine EED Report: Routine Exercises in the Canadian Arctic, April 2021**
- **MARLOAs Exercise EED Update, 31 March 2021**
- **Ship Class SEMS Manual SOP E1 *Fuelling***
- **Ship Class SEMS Manual SOP E5 *Marine Mammal Mitigation Procedures***
- **Ship Class SEMS Manual SOP E10 *Canadian Arctic Waters Considerations***
- **Ship Class SEMS Plan 1 *Spill Response***
- **DAOD 4003-0: Environmental Protection and Stewardship**

General Mitigation Measures

- **Ship staff should be cognizant of their potential impact on shore and marine environments**
- **Ship staff should be aware of and avoid all environmentally sensitive, recreational, cultural and commercially important areas within their area of operation such as Marine Protected Areas, National Parks, etc.**
- **Follow port requirements when at Nuuk, GL**
- **When not in Nuuk, only fuel in areas that have been set aside for DND (e.g. Nanisivik Naval Facility) or that have been agreed to by the local representatives (NOTE: Nanisivik Naval Facility is not included in the Tallurutiup Imanga National Marine Conservation Area)**
- **When fuelling by barge or another ship, booms should be place 360º around ships**
- **Be aware of which species at risk may be present, their seasonal occurrence, and likelihood of encounter**

- **Fuelling should be performed during daylight hours**
- **Oil and oily water in any concentration cannot be discharged in Arctic waters, except in cases of emergency**
- **In the Arctic, oil transfers should be carried out considering Transport Canada Transport Publication TP10783: Arctic Waters Oil Transfer Guidelines**
- **Appropriate SOPs, checklists and training for fuel transfers and spill reporting should be provided to ship staff involved in these operations**
- **Scuppers should be plugged during fuelling and cargo loading and unloading operations to prevent the discharge of oil into surrounding waters**
- **Due to extremely low ambient temperatures in winter months, it is recommended that loading practice should specify an upper limit to the temperature of cargo being loaded in order to minimize the effect of thermal shock to the ships' structure**
- **Personnel trained in use of spill response equipment should be available**
- **Spill kits should be available close to fuelling operations**
- **Any spilled fuel or oil should be cleaned up immediately**
- **After every instance of fuelling operations a visual sheen test should be conducted by observing the surface of the surrounding water for the presence of an oily sheen**
- **Any sheen or spill should be reported to MARLANT SE through SitRep, Incident Report or Daily Report by email to: +N48FormationSafetyandEnvironment@forces.gc.ca**

Associated Environmental Support Instructions

- **M4: Bottom Interaction**

M4: Bottom Interaction

Potential Effects

- **Bathys and targets that settle to the ocean floor will degrade over time, thereby releasing integrated hazardous materials**
- **Scientific trials involve placing equipment on the ocean floor for short periods of time**
- **One scientific trial involves moorings for recorders – mooring weights will be left behind on ocean floor**
- **The TRAPS array may settle on the ocean floor if the ship stops, potentially causing damage to the ocean floor, however the likelihood is low since the TRAPS is relatively short compared to RCN operational towed arrays and it will not be used in shallow water**
- **Anchoring of ships and small boats can disturb seafloor habitat and immobile seabed aquatic life, and can cause scouring of the seabed**
- **Bottom interactions may affect sensitive benthic environments, including corals and sponges which recover slowly when disturbed**
- **Mud and sediments on bottomed equipment can cause translocation of invasive species**
- **Bottom interactions may affect existing infrastructure and fishing equipment**

Specific Applicable Regulations

- **Fisheries Act and Marine Mammal Regulations**
- **Species at Risk Act**

DND Mitigation Documents

- **Op NA-TU and Op NA-NK DDEED Report, 2022**
- **Routine EED Report: Routine Exercises in the Canadian Arctic, April 2021**
- **MARLOAs Exercise EED Update, 31 March 2021**
- **Ship Class SEMS Manual SOP-E08 Small Boat and Maritime Unmanned Systems Operations**
- **DAOD 4003-0: Environmental Protection and Stewardship**
- **NAVORD 3137-1, Canadian Towed Array Sonar and NIXIE Towing and Operating Instructions**
- **NAVORD 3275-2, Oceanographic Reporting Procedures and Information Services for HMC Ships**
- **NAVORD 10002-0, RCN Targets Management**

General Mitigation Measures

- **Ship and scientific staff should be cognizant of their potential impact on shore and marine environments**

- **Ship and scientific staff should be aware of and avoid areas with sensitive benthic environments, such as coral and sponge conservation areas and bottom fishing closure areas**
- **When using TRAPS, avoid ship speeds less than 7 knots**
- **If ship stops and TRAPS array settles on bottom, recover sufficient cable prior to making way such that the array is clear of the bottom**
- **Anchoring should be done where designated anchorage areas exist**
- **Anchoring and placement of scientific equipment and moorings on the ocean floor should be done in consultation with the local indigenous community/government and MARL SE**
- **Issue appropriate warnings for exercises (NOTMAR, NAVWARN) which involve bottom interactions**
- **When possible, recover equipment during testing, trials, training and exercise activities e.g. use a recoverable target**
- **Track and record where bottoming occurs (targets, anchoring etc.), and provide this information to MARL SE**
- **Avoid the use of HSPT in the Arctic to reduce plastic waste**
- **Clean equipment, moorings and anchors of all mud, sediment and marine life before storage or use at another location to prevent the translocation of invasive species**

Associated Environmental Support Instructions

M3: Fuelling Alongside and At Anchor
M4: Bottom Interaction
M6: Active Sonar
M10: Surface Fire

M5: Single and Multiple Tow

Potential Effects

- **Towed gear has the potential to collide or entangle marine life**
- **The TRAPS array has a potential to spill buoyancy fluid if it is damaged, e.g. caught in propeller, or dragged and damaged on ocean floor**
- **Towed gear may collide with or disrupt commercial or indigenous vessels or fishing equipment**

Specific Applicable Regulations

- **Fisheries Act and Marine Mammal Regulations**
- **Species at Risk Act**
- **Migratory Birds Convention Act**

DND Mitigation Documents

- **Op NA-TU and Op NA-NK DDEED Report, 2022**
- **Routine EED Report: Routine Exercises in the Canadian Arctic, April 2021**
- **MARLOAs Exercise EED Update, 31 March 2021**
- **Ship Class SEMS Manual SOP E5 *Marine Mammal Impact Mitigation Procedures***
- **Ship Class SEMS Manual SOP E10 *Arctic Waters Considerations***
- **Ship Class SEMS Manual SOP SE1 *Hazardous Materials/Hazardous Waste Management***
- **Ship Class SEMS Plan 1 *Spill Response***
- **DAOD 4003-0: Environmental Protection and Stewardship**
- **DAOD 4003-1: Hazardous Materials Management**
- **NAVORD 3137-S: Canadian Towed Array Sonar and NIXIE Towing and Operating Instructions**
- **NAVORD 10002-0, RCN Targets Management**
- **MARLANTORD 3000-1, Fishing Zones – Halifax and Local Area**
- **A-GG-040-004/AG-001 General Safety Program, Hazardous Materials Safety and Management Manual**

General Mitigation Measures

- **Ship and scientific staff should be cognizant of their potential impact on shore and marine environments**
- **Ship and scientific staff should be aware of and avoid all environmentally sensitive, recreational, cultural and commercially important areas within their area of operation such as Marine Protected Areas, National Parks, etc.**
- **When using TRAPS, avoid ship speeds less than 7 knots**
- **If ship stops and TRAPS array settles on bottom, recover sufficient cable prior to making way such that the array is clear of the bottom**

- **Avoid operations near indigenous communities, boats and fishing gear**
- **Be aware of which species at risk may be present, their seasonal occurrence, and likelihood of encounter**
- **Avoid towing in protected areas and critical habitats**
- **Avoid areas with complicated shorelines/bays/estuaries**
- **Avoid known restricted fishing zones**
- **Track and record where bottoming occurs, and provide this information to MARL SE**
- **As much as possible, operations should be planned during daylight hours**
- **Issue appropriate warnings for exercises (NOTMARs/NAVWARNs)**
- **Ensure SDSs for TRAPS fill fluid are available to the ship staff**
- **Spill kits and personnel trained in use of spill response equipment should be available**
- **Use trained marine mammal lookouts**
- **If RCAF is involved in exercise, use planes to look out for concentrations of marine life**
- **Report sightings of marine mammals and sea turtles to MARL SE**
- **Any sheen or spill should be reported to MARL SE through SitRep, Incident Report or Daily Report by email to: +N48FormationSafetyandEnvironment@forces.gc.ca**

Associated Environmental Support Instructions

M4: Bottom Interaction
M6: Active Sonar

M6: Active Sonar

Potential Effects

- **The TRAPS and LRAT trials involve the use of low frequency active sonar**
- **The MARPS trial involves the use of high frequency active sonar**
- **The TRAPS trial will be carried out in Baffin Bay/Davis Strait**
- **The MARPS and LRAT trials will be carried out within the Tallurutiup Imanga NMCA**
- **Active sonar temporarily increases underwater noise above ambient in the local operating area**
- **Active sonar operations have the potential to result in biological, physiological and behaviour effects on marine wildlife and may interfere with typical wildlife activities such as foraging and migration**
- **It is possible for active sonar to alter the acoustic environment of a critical habitat to the extent that destruction of critical habitat occurs**

Specific Applicable Regulations

- **Fisheries Act and Marine Mammal Regulations**
- **Species at Risk Act**
- **Canada National Marine Conservation Areas Act**
- **Inuit Impact and Benefit Agreement for Tallurutiup Imanga NMCA**

DND Mitigation Documents

- **Op NA-TU and Op NA-NK DDEED Report, 2022**
- **Routine EED Report: Routine Exercises in the Canadian Arctic, April 2021**
- **MARLOAs Exercise EED Update, 31 March 2021**
- **Ship Class SEMS Manual SOP E5 *Marine Mammal Impact Mitigation Procedures***
- **DAOD 4003-0: Environmental Protection and Stewardship**
- **NAVORD 4003-6: Marine Mammal Mitigation Procedures for Active Sonar Use**

General Mitigation Measures

- **LRAT and MARP scientific trials will be conducted in the Tallurutip Imanga National Marine Conservation Area and required permissions have been obtained**
- **Ship and scientific staff should be cognizant of their potential impact on shore and marine environments**
- **Ship staff should be sufficiently trained and be aware of which species at risk may be present, their seasonal occurrence, and likelihood of encounter**
- **Issue appropriate warnings for exercises (NOTMAR, NAVWARN)**
- **Limit duration of scientific trials as much as possible and only use the appropriate amount of power necessary for the activity**
- **Conduct exercises during daylight hours as much as possible**

- **Use ramp-up capability for TRAPS and LRAT trials**
- **Use trained marine mammal lookouts to perform pre-emission visual surveys for 30 minutes prior to emission**
- **If RCAF is involved in exercises, use planes to look out for marine mammals**
- **Report sightings of marine mammals in accordance with the Ship Class SEMS SOP E5**
- **If a mammal is observed within the MAZ, delay the next emission until no mammal has been observed for 30 minutes:**
  TRAPS 500 m (546 yds)
  LRAT 100 m (109 yds)
  MARPS 100m (109 yds)

Mitigations Measures Specific to TRAPS/EMATT Trial

- **Perform visual surveys between emission sites**
- **Carry out passive acoustic monitoring using the TRAPS during the pre-emission visual survey at each emission site**
- **Leave sonar on mitigation mode between emission sites, with a reduced source level**

Associated Environmental Support Instructions

M4: Bottom Interaction
M5: Single and Multiple Tow

M7: Radar Use (Fire Control Only) and Laser

Potential Effects

- **The operation of radar equipment and laser may disturb the orientation of marine birds**
- **HDW and KIN Class ships are not equipped with fire control radar**
- **HDW Class has 3 low power lasers**
- **KIN Class has no lasers**
- **Allied ships may be equipped with fire control radar and lasers**

Specific Applicable Regulations

- **Species at Risk Act**
- **Migratory Birds Convention Act**

DND Mitigation Documents

- **Op NA-TU and Op NA-NK DDEED Report, 2022**
- **Routine EED Report: Routine Exercises in the Canadian Arctic, April 2021**
- **MARLOAs Exercise EED Update, 31 March 2021**
- **DAOD 4003-0: Environmental Protection and Stewardship**

General Mitigation Measures

- **Allied ships to ask for permission from RCN before training activities**
- **Ship staff should be cognizant of their potential impact on shore and marine environments**
- **Ship staff should be aware of and avoid all environmentally sensitive, recreational, cultural and commercially important areas within their area of operation such as Marine Protected Areas, National Parks, etc.**
- **Staff should be aware of all migratory bird sanctuaries within their area of operation**
- **Be aware of which species at risk/endangered species may be present and strictly avoid them**
- **Avoid concentrations of marine birds**
- **Avoid special/protected areas**
- **As much as possible, operations should be planned during daylight hours**
- **Do not aim fire control radar and laser at birds or use it to track birds**
- **Training activities involving radar or laser should be conducted at least 20km from shorelines if possible**
- **An approach distance of 500 m for large vessels and 300 m for small vessels shall be maintained from bird colonies, concentrations of birds, or known bird concentration areas**
- **NOTMARs/NOTAMs/NAVWARNs must be issued to warn pilots of training activities**
- **Avoid conducting exercises near indigenous communities and known areas used for hunting or fishing**

- **Utilize optical tracking to check for birds along firing bearing prior to activation**
- **As much as possible, operations should be planned during daylight hours**

M10: Surface Fire

Potential Effects

- **Surface fire exercise to take place within MARLOAs**
- **Ammunition contains hazardous materials, will sink and is unrecoverable, thereby impacting aquatic habitats**
- **Target debris may float**
- **Surface firing has the potential to increase underwater and above water noise above ambient in the area of operation**
- **Surface firing has the potential to disturb or harm aquatic animals and birds**
- **Surface firing can impact tourism, transportation and commercial activities**

Specific Applicable Regulations

- **Fisheries Act and Marine Mammal Regulations**
- **Species at Risk Act**
- **Migratory Birds Convention Act**

DND Mitigation Documents

- **Op NA-TU and Op NA-NK DDEED Report, 2022**
- **Routine EED Report: Routine Exercises in the Canadian Arctic, April 2021**
- **MARLOAs Exercise EED Update, 31 March 2021**
- **Ship Class SEMS Manual SOP E5 *Marine Mammal Impact Mitigation Procedures***
- **DAOD 4003-0: Environmental Protection and Stewardship**
- **NAVORD 4995-0 Safety Firing Orders for HMC Ships**
- **NAVORD 4995-3 Small Arms Training**

General Mitigation Measures

- **Ship staff should be cognizant of their potential impact on shore and marine environments**
- **Ship staff should be aware of and avoid all environmentally sensitive, recreational, cultural and commercially important areas within their area of operation such as Marine Protected Areas, National Parks, etc.**
- **Debris should be minimized, picked up, or sunk as quickly as possible**
- **Spent casing on deck should be recovered and not dumped overboard**
- **If targets require anchoring, follow mitigation measures for anchoring (M1)**
- **All surface firing activities must be done in accordance with RCN SOPs**
- **Firing shall not involve training rounds that produce any underwater explosions**
- **Surface firing should be conducted at least 20km from land and the direction of fire should be away from land**
- **Wildlife concentrations and bird nesting areas should be avoided**

- **Stay 3km from bird colonies, concentrations of birds and known bird concentration areas**
- **Be aware of which species at risk may be present, their seasonal occurrence, and likelihood of encounter**
- **Do not direct fire towards unidentified large object in the water, including icebergs**
- **When firing live ammunition, establish a 4.8 km avoidance zone and post a lookout for marine mammals**
- **Post lookouts for marine mammals and aquatic wildlife 30 minutes prior to exercises, if a marine mammal is sighted, allow 10 minutes after the last sighting in the area**
- **Report turtle sightings to MARL SE**
- **Issue appropriate NOTMARs/NOTAMs/NAVWARNs for exercises**
- **As much as possible, operations should be planned during daylight hours**

Associated Environmental Support Instructions

M4: Bottom Interaction

Annex C – Legislation, Guidelines, Standards, and Key DND Direction

Annex C – Legislation, Guidelines, Standards and Key DND Direction

C.1 Federal Legislation

Canada Shipping Act, 2001: Principal legislation for shipping and safety of marine transportation and recreational boating in Canada.

- *Arctic Shipping Safety and Pollution Prevention Regulations [Statutory Orders and Regulations (SOR)]/2017-286:* Establish and enforce the Polar Code in Canada, including having a valid Polar Ship Certificate. Maintains the Arctic Ice Regime Shipping System and the Zone Date System. The zero-discharge policy prohibits pollution from any vessel operating in Arctic waters.

- *Ballast Water Management Regulations (SOR/2021-120)*

- *Vessel Pollution and Dangerous Chemicals Regulations (SOR/2012-69)*

- Transport Canada Management Measures to Protect North Atlantic Right Whales (NARW) – includes the annual issuance of interim orders for the protection of North Atlantic Right Whales in the Gulf of St. Lawrence

Oceans Act: Established to conserve and protect Canada's oceans and resources, including fish, marine mammals, and their habitats, as well as areas of high productivity or biological diversity. Includes the development and implementation of an integrated management, with Marine Protected Areas (MPAs) and regulations to protect the MPAs. MPA regulations prohibit activities that disturb, damage or destroy the MPA or that results in the removal of any living organism or part of its habitat from the MPA. It should be noted that activities carried out for the purpose of public safety or national defence are exempt.

- *Anguniaqvia Niqiqyuam MPAs Regulations, SOR/2016-280*

- *Banc-Des-Americains MPAs Regulations, SOR/2019-50*

- *Basin Head MPAs Regulations, SOR/2005-293*

- *Bowie Seamount MPAs Regulations, SOR/2008-124*

- *East Port MPAs Regulations, SOR/2005-294*

- *Endeavour Hydrothermal Vents MPAs Regulations, SOR/2003-87*

- *Gilbert Bay MPAs Regulations, SOR/2005-295*

- *Gully MPAs Regulations, SOR/2004-112*

- *Hecate Strait and Queens Charlotte Sound Glass Sponge Reefs MPAs Regulations, SOR/2017-15*

- *Laurentian Channel MPAs Regulations, SOR/2019-105*

- *Musquash Estuary MPAs Regulations, SOR/2006-354*

- *Order Designating the Tuvaijuittuq Marine Protected Area, SOR/1019-282:* Designated for interim protections by ministerial order on 29 July 2019.

- *St. Annes Bank MPAs Regulations, SOR/2017-106*

- *Tarium Niryutait MPAs Regulations, SOR/2010-190*

Impact Assessment Act: Outlines a process for assessing the environmental, social and economic impacts of major projects and projects carried out on federal lands or outside of Canada. The purpose of the Act is to foster sustainability and respect the rights of indigenous people. The act addresses and mitigates impacts to social, health and economic factors from projects.

Canadian Navigable Waters Act: Depositing or permitting the disposal of materials which may interfere with navigation is prohibited under Sections 21-22.

Canadian Environmental Protection Act (CEPA), 1999: Key piece of Canadian federal legislation which aims to prevent pollution and protect the environment and human health. Prohibits the disposal of wastes and other matter by ships in Canadian waters.

- *Federal Halocarbon Regulations 2022, SOR/2022-110*

Fisheries Act: Prohibits any work, undertaking or activity that results in serious harm to a commercial, recreational or indigenous fishery or to fish that support such a fishery in all fishing zones, territorial seas and inland waters of Canada. Deposition of a deleterious substance (any substance that if added to water would degrade that water so it is rendered or is likely to be rendered deleterious to fish or fish habitat or to the use by man of fish that frequent that water) into a waterbody is strictly prohibited. On 21 June 2019, the *Fisheries Act* was amended to restore protections for fish and fish habitat, enhanced marine protection and habitat restoration and strengthen Indigenous role in project reviews, monitoring and policy development.

- *Marine Mammal Regulations SOR/93-56:* Outlines prohibitions regarding marine mammals, including governing disturbance, fishing, and killing of marine mammals. Disturbance includes moving, trapping or separating a marine mammal. Includes minimum approach distance for marine mammals (100m for most whales, dolphins and porpoises and 200m from killer whales in the Pacific Ocean) and provisions for underwater vessel noise. It should be noted that DND employees are not prohibited from disturbing marine mammals while performing their duties and functions.

Canada National Parks Act: Protects designated areas of Canada's natural environment and the wildlife within them while providing public awareness and enjoyment. National parks and natural park reserves are located throughout Canada, including parks in Yukon, Northwest Territories (NWT) and Nunavut. The ecological integrity of these parks are protected through the development of provisions for resource protection and restoration, zoning, land usage, hunting or possession of wildlife. Section 32(1) states that "Where a substance that is capable of degrading the natural environment, injuring fauna, flora or cultural resources or endangering human health is discharged or deposited in a park, any person who has charge, management or control of the substance shall take reasonable measures to prevent any degradation of the natural environment and any danger to the fauna, flora or cultural resources or to persons that may result from the discharge or deposit." Offences and punishment for any contraventions under the Act are also outlined within the Act.

Canada National Marine Conservation Areas (NMCAs) Act: Established to protect marine ecosystems biological diversity. NMCAs, established under the Act, maintain healthy marine ecosystems in Canada by zoning, stating that ecologically sustainable use of marine resources must occur and protecting special or ecologically sensitive features. The disposal of waste in an NMCA is prohibited.

Inuit Impact and Benefit Agreement (IIBA) for Tallurutiup Imanga NMCA: The Government of Canada and the Qikiqtani Inuit Association signed an Inuit Impact and Benefit Agreement (IIBA) required for the establishment of the Tallurutiup Imanga NMCA on 1 August 2019. This NMCA will be managed by Aulattiqatigiit Board which is a joint Inuit and Canada management board.

Canada Wildlife Act: Conserve and protect habitat used by a variety of wildlife, including migratory birds and species at risk.

- *Wildlife Area Regulations, C.R.C, c. 1609:* Define wildlife areas in Canada. Outline general prohibitions within any wildlife area, which includes dumping or disposition of any waste material or substance which would alter or degrade the quality of environment in a wildlife area.

Species at Risk Act (SARA): To protect species of concern in Canada from extinction and to protect and concern species at risk through the development of recovery plans. It is prohibited to kill, harm, harass, capture or take a species listed as threatened, endangered or extirpated in Canada. It is also prohibited to damage or destroy the residence of a species listed as extirpated, threatened or endangered.

Migratory Birds Convention Act, 1994: To protect migratory birds and their nests. It is prohibited to possess a migratory bird or nest or buy, sell or trade a migratory bird or nest. A person or vessel is prohibited from depositing or permitting the deposit of a harmful substance into waters or an area frequented by migratory birds.

- *Migratory Bird Sanctuary (MBS) Regulations, C.R.C, c. 1036:* To protect and conserve habitat for migratory birds by establishing and managing MBSs and outlining prohibited

and permitted activities within these MBSs. Any activity which results in harm to migratory birds, their eggs or nests is prohibited.

Hazardous Products Act: Implements the alignment of Workplace Hazardous Materials Information System (WHMIS) to Globally Harmonized System of Classification and Labelling of Chemicals (GHS).

- *Hazardous Product Regulations SOR/2015-17:* Implements the alignment of WHMIS to GHS.

WHMIS, 2015*:* A comprehensive system for providing health and safety information on the safe use of hazardous products used in Canadian workplaces.

C.2 Territorial and Provincial Laws and Regulations

This section includes territorial laws and regulations for NWT, Nunavut and Yukon, and provincial laws and regulations for British Columbia, Manitoba, New Brunswick, Newfoundland and Labrador, Nova Scotia, Ontario, Prince Edward Island and Quebec.

Newfoundland and Labrador

Endangered Species Act: Responsible for protecting species at risk in Newfoundland and Labrador.

Provincial Parks Act: Establishes and contains regulations for provincial parks, conservation and recreational areas in Newfoundland and Labrador.

Wildlife Act: Responsible for protecting wildlife Newfoundland and Labrador.

Nunavut

Nunavut Land Claims Agreement Act (see "Treaty and Land Claims" below)

- *Nunavut Waters Regulation SOR/2013-69:* States that a license to discharge waste is not required as long as the deposit is not prohibited under Part 9 of the *Canada Shipping Act 2001*, and as long as it does not substantially affect the quality, quantity or flow of the waters flowing through Inuit-owned land.

Environmental Protection Act: Aims to prevent pollution and protect the environment and human health in Nunavut.

- *Environmental Guideline for the General Management of Hazardous Waste, 2:* According to the guideline, is a contravention of the *Environmental Protection Act* for hazardous waste to be abandoned or disposed of on land or into water in Nunavut.

- *Contingency Planning and Spill Reporting Regulations, 1993:* Include requirements to report stills of contaminants in excess of specific quantities.

Nunavut Planning and Project Assessment Act: Defines how resource development will be managed in Nunavut. Establishes the Nunavut Impact Review Board (NIRB) as the agency responsible for assessing the potential impacts of proposed projects. The mission of the review board is to protect and promote the well-being of the Environment and Nunavummiut through the impact assessment process. A public consultation period is mandatory.

C.3 Guidelines and Standards

Guidelines for the Operation of Passenger Vessels in Canadian Arctic Waters (TP13670): Guidelines for operating in the Canadian Arctic, including for underwater noise. These guidelines highly recommended that a publication entitled "Marine Environmental Handbook", published by the Department of Fisheries and Oceans (DFO) in 1999, which gives detailed information relating to Arctic marine environmental issues and concerns specifically in the Northwest Passage, be carried on board all vessels navigating in Arctic waters.

Oceans Protection Plan, 2016: Strategy to protect Canadian coasts and waterways. Through the protection plan, goals have been set to improve marine safety and responsible shipping, providing economic opportunities to Canadians, develop new possibilities for Indigenous and coastal communities, and protect the marine environment over a set five-year period. The Plan expired in 2021, however consultations have been launched to shape the next phase of the plan.

The Oceans Protection Plan specifically addresses protections for 3 species of whales – southern resident killer whales pods, belugas, and norther right whales. His includes work to better establish baselines for noise and consideration of options to mitigate these effects.

Whales Initiative, 2018: Aims to protect and support the recovery of the South resident killer whale, the North Atlantic right whale and the St. Lawrence Estuary beluga whale.

Guidelines to Avoid Disturbance to Seabird and Waterbird Colonies in Canada, Environment and Climate Change Canada (ECCC): These guidelines are located on ECCC's website (https://www.ec.gc.ca/paom-itmb/default.asp?lang=En&n=E3167D46-1).

Notices to Mariners (NOTMAR): Promulgate information required by the master, pilot or person in charge of the navigation of a vessel. These provide important navigational safety matters affecting Canadian waters. This includes information on locations of environmentally sensitive areas and fishing activities, and marine mammal guidelines.

Vessel Traffic Reporting Arctic Canada Traffic Zone (NORDREG): Reporting procedures for vessels entering the waters of Arctic Canada.

Navigational Warnings (NAVWARNs): Contain information for boaters about changes to navigational aids and current marine activities or hazards, such as: defects and dredging.

C.4 Key DND Direction and Procedural Requirements

Defense Administration Orders and Directives (DAOD) 2051-1 Range Safety: Establishes the Chief of Naval Staff as the authority for maritime ranges.

DAOD 4003-0 Environmental Protection and Stewardship: Requirement of DND to exhibit environmental protection and stewardship.

DAOD 8007-0, Notification of DND and Canadian Forces (CF) Activities within the Joint Task Force (North) Area of Responsibility: Requirement of DND organizations or Canadian Armed Forces (CAF) command, formation, unit or element intending to conduct an activity in the north to inform JTFN Headquarters (HQ) at the earliest opportunity in the planning process.

Naval Orders (NAVORD) 1002-0– RCN Safety and Environmental Program Management: A management system used by members of the CAF and DND employees working with RCN for the purposes of developing and implementing organizational environmental and safety policies as well as managing environmental aspects and safety hazards.

NAVORD 3136-5 Sonobuoys – Control, Issues, Care and Reporting Procedures: Provides direction for management of sonobuoys.

NAVORD 3137-1 Canadian Towed Array Sonar and NIXIE Towing and Operating Instructions: Provides instructions for the towing and operation of the CANTASS and NIXIE, including responsibilities, towing and operational restrictions, and procedures.

NAVORD 3275-2 Oceanographic Reporting Procedures and Information Services for HMC Ships: This order prescribes the procedures to be used in the making and reporting of oceanographic observations, and describes the oceanographic information services available to HMC Ships.

NAVORD 4003-6 Marine Mammal Mitigation Procedures for Active Sonar Use: Provides overarching direction for conducting exercises, trials, maintenance and operations that involve the use of Active Sonar Systems that may disturb, harass or harm marine mammals.

NAVORD 10002-0 RCN Target Management: The purpose of this NAVORD is to describe the process by which RCN targets are managed from procurement to expenditure and the governance to support this process.

Assistant Deputy Minister (Infrastructure and Environment) (ADM [IE]) Directive Regarding Environmental Impact Assessment 2020: latest direction on performing Environmental Impact Assessments.

ADM (IE) Environmental Impact Assessment Manual 2017: guidance on performing Environmental Impact Assessments.

MARLANT Safety and Environmental Management System (SEMS) Directive E3, June 2020 – Environmental Impact Assessment: Provides direction on when and how to complete an environmental assessment or a due diligence environmental effects determination.

Maritime Forces Pacific (MARPAC) SEMS Directive E1 - Environmental Impact Assessments: Provides direction on when and how to complete an environmental assessment or a due diligence environmental effects determination.

MARPAC Marine Mitigation Cards, Appendix G of the Environmental Effects Determination of Military Activities in Maritime Forces Pacific Operation Areas: Provides detailed descriptions of specific activities, the effects that these activities may have on the environment and incudes mitigation measures that units shall take into account when planning or conducting operations.

Halifax Class SEMS Manual: The purpose of the Halifax Class SEMS is to facilitate the implementation of the MARL SE Policy. This is achieved by ensuring compliance with relevant safety and environmental legislation, regulations, policies, procedures and directives, and by monitoring and continually improving performance.

Directorate General Maritime Equipment Program Management (DGMEPM) EMS Hazardous Materials Directive: Provides direction for management of hazardous materials within DGMEPM's materiel acquisition and support activities.

Defence Environment and Energy Strategy (DEES): Demonstrates the DND and the CAF recognition of the importance of responsible energy and environmental stewardship. Provides a common vision and goals to help DND and the CAF become leaders in contributing to sustainable development goals of Canada through the effective and innovative integration of energy and environmental considerations into activities supporting the defence mandate.

Establishment File #:[Insert base file #]

DND EIA #:1267-0100-2242

Annex D – Impact Assessment and Mitigation Measures

Table D-1: Potential Effects of the Activity on each Valued Ecosystem Component with Mitigation Measures

Activity Component	VEC	Description of Effects	Mitigation Measures	Are residual significant adverse effects likely?
1. Vessel Movement and General Operations	**Air Quality**	<u>General</u> Air emissions from ships and small boats may contribute to overall air quality problems by introducing gaseous and particulate pollutants into the atmosphere. Pollutants in exhaust gases have climate effects and cause adverse local and regional environmental impacts. <u>Shore Landings</u> Emissions in a localized area will increase due to forklifts and other equipment required to move supplies from ship to shore and vice versa.	• Vessels should use low sulphur fuel. • When operating in the North American Emissions Control Area, use Tier 3 emissions equipment. • Ships should use shore power in port, when available. • Any port specific requirements pertaining to air emissions, e.g. use of incinerators, use of shore power, etc. should be followed. • Maintain equipment as per manufacturer's recommendations and Canadian Forces Technical Orders (CFTOs) and other applicable Standard Operating Procedures (SOPs). • Reduce speed when and where possible to conserve fuel and therefore decrease emissions.	NO
1. Vessel Movement and General Operations	**Acoustic Environment**	<u>General</u> Vessel movements (including small boats) have potential to increase underwater and above water noise above ambient in the local area through machinery vibrations, cavitation and outboard motor noise. <u>Ice Breaking</u>	• Avoid environmentally sensitive areas and concentrations of marine animals. • Keep excess noise to a minimum. • Minimize drastic changes to speed or direction. • Keep equipment maintained to avoid excessive vibration. • Noise levels should be reduced wherever possible in port.	NO

Activity Component	VEC	Description of Effects	Mitigation Measures	Are residual significant adverse effects likely?
		Ice breaking is expected to increase the ambient above water and underwater noise over short and intermittent periods. Shore Landings The landing craft has the potential to increase underwater and above water noise above ambient in the local area. Localized increase in noise from forklifts and other equipment required to move supplies from ship to shore. Unmanned Systems Unmanned vehicles have the potential to increase above water or underwater ambient noise in the area of operation due to engines and acoustic pingers.	• Avoid operation of whistles, sirens, general or chemical alarms. • Keep topside speaker use to minimum. • Review ECCC "latest ice conditions" maps and forecasts (https://www.canada.ca/en/environment-climatechange/ services/ice-forecasts-observations/latestconditions. html). • Develop an SOP for ice breaking activities, based on operating procedures and best management practices. • Limit ice breaking activities as much as possible.	
1. Vessel Movement and General Operations	**Marine Water and Sediment Quality**	General Operations and movements of vessels have the potential to impact surrounding surface water due to the occurrence of incidental and accidental discharges. Shore Landings Incidental leaks and spills from the small boats may affect the surrounding waters.	• Vessels should operate in accordance with their Ship Class SEMS Manual SOPs and Spill Response Plans, for RCN vessels specifically: - SOP E1 Fuelling; - SOP E2 Liquid Effluent Management; - SOP E3 Halocarbon Management; - SOP E4 Solid Waste Management; - SOP E8 Small Boat Operations; - SOP E10 Arctic Waters Considerations - SOP SE1 Hazmat/Hazardous Waste	NO

Activity Component	VEC	Description of Effects	Mitigation Measures	Are residual significant adverse effects likely?
		Spills and leaks from forklifts and other equipment required to move supplies from ship to shore. Landing ATVs and vehicles may impact surface water. There is a potential for leakage from batteries during operation. There is a potential for leakage from engines during operation or fuelling which may affect surface water. <u>Unmanned Systems</u> There is a potential for leakage from batteries during operation. There is a potential for leakage from combustion engines during operation or fuelling which may affect surface water quality.	Management; - Plan 1 Spill Response • When available, vessels should follow their environmental management plans wrt garbage management, ship energy efficiency and ballast water.	
1. Vessel Movement and General Operations	**Marine Fish and Invertebrate Resources**	<u>General</u> Vessel movements (including small boats) have the potential to result in biological, physiological and behavior effects on marine wildlife and may interfere with typical wildlife activities such as foraging and migration. Marine mammals and sea turtles are at risk of colliding with vessels. Vessels can carry invasive species between regions of operation.	• Ship staff should be aware of all environmentally sensitive areas within their area of operation. • Permits are required to operate in any northern National Wildlife Area and an authorization from Parks Canada is required to enter National Parks in Nunavut. • Ship staff should be aware of their potential impact on shore and marine environments. • Wildlife concentrations should be avoided. • Speed should be reduced in areas of known wildlife concentrations and gradually reduced when in proximity to marine mammals.	NO

Activity Component	VEC	Description of Effects	Mitigation Measures	Are residual significant adverse effects likely?
		<u>Ice Breaking</u> Ice breaking may result in localized changes to habitat as larger sheets of floating ice are broken down into smaller sizes. According to Ref. D this is not considered as destroying or diminishing ice habitat because the relative amount of ice that is broken up is small. <u>Unmanned Systems</u> Aquatic animals may be physically disturbed by unmanned vehicle activities, leading to distress and group fragmentation. <u>Incidental Emissions and Discharges</u> The introduction of invasive species through ballast water has the potential to impact native aquatic animals and their habitats. Invasive species can reduce the natural biodiversity and populations of native species through predation, parasitism or competition and through degradation or destruction of ecosystems or habitat. The degree of impact depends	• Wake should be reduced as much as possible, particularly in shallow areas, narrow channels, and when approaching the shoreline. • Avoid abrupt course changes. • Maintain a 200 m distance from marine animals and specifically, 100 m from whales. • An approach distance of 500 m for large vessels and 300 m for small vessels shall be maintained from bird colonies, concentrations of birds, or known bird concentration areas. • Lookouts for marine mammals and other aquatic wildlife should be posted and sightings reported to appropriate authorities. • It is prohibited to disturb, kill, follow, disperse, drive, herd and/or encircle whales. • Avoid approaching whales from behind, move in parallel to whales. • Seasonal protection measures for the North Atlantic right whale should be followed. • As much as possible, operations should be planned during daylight hours. • Marine mammal sightings must be reported in accordance with SOP E5 to MARL SE. • Keep records of ice breaking activities.	

Activity Component	VEC	Description of Effects	Mitigation Measures	Are residual significant adverse effects likely?
		on the origin of the alien organisms and the location of the point of discharge. Bilge water, blackwater, greywater, process water and hazmat introduced into the ocean has the potential to impact aquatic animals and habitats due to its chemical composition. Aquatic animals are negatively impacted by waste discharged into the ocean. Solid waste and other debris within their habitat present entanglement hazards. Hazmats released into the ocean through waste have the potential to impact aquatic animals.	• All attempts should be made to prevent the introduction of alien or invasive species to each port or area visited. • Hull surveys, and when necessary cleaning, should be performed before Arctic deployments. • Clean small boat hulls of biofouling, while collecting wash water to be disposed of properly, before placing them into ocean or harbour waters. • Clean cargo, equipment and supplies before offloading to avoid the transfer of terrestrial invasive species. • Rinse unmanned systems after each use. • Clean anchor and chain after use to avoid translocation of potential invasive species. • Anchoring activities should only be conducted in established or previously disturbed areas and should be avoided in environmentally or culturally sensitive areas. • Anchorage is prohibited in DFO conservation areas. • Move ROVs slowly in the presence of marine mammals. • Keep noise and light levels to a minimum.	

Activity Component	VEC	Description of Effects	Mitigation Measures	Are residual significant adverse effects likely?
1. Vessel Movement and General Operations	**Marine Mammals and Sea Turtles**	<u>General</u> Vessel movements (including small boats) have the potential to result in biological, physiological and behavior effects on marine wildlife and may interfere with typical wildlife activities such as foraging and migration. Marine mammals and sea turtles are at risk of colliding with vessels. Vessels can carry invasive species between regions of operation. <u>Ice Breaking</u> Ice breaking may result in localized changes to habitat as larger sheets of floating ice are broken down into smaller sizes. According to Ref. D this is not considered as destroying or diminishing ice habitat because the relative amount of ice that is broken up is small. It is unlikely that ice breaking would cause animal strikes or harm since the noise from the activity would cause the	Refer to **Marine Water and Sediment Quality** Refer to **Marine Fish and Invertebrate Resources** • Follow ship class SEMS SOP SE5 Marine Mammal Impact Mitigation Procedures • Follow Transport Canada Management Measures to Protect North Atlantic Right Whales (NARW) • report sea turtle sightings to MARL SE	NO

Activity Component	VEC	Description of Effects	Mitigation Measures	Are residual significant adverse effects likely?
		animal to swim away or avoid the area for a short time (Ref. D). <u>Unmanned Systems</u> Aquatic animals may be physically disturbed by unmanned vehicle activities, leading to distress and group fragmentation. <u>Incidental Emissions and Discharges</u> The introduction of invasive species through ballast water has the potential to impact native aquatic animals and their habitats. Invasive species can reduce the natural biodiversity and populations of native species through predation, parasitism or competition and through degradation or destruction of ecosystems or habitat. The degree of impact depends on the origin of the alien organisms and the location of the point of discharge. Bilge water, blackwater, greywater, process water and hazmat introduced into the ocean has the potential to impact aquatic animals and habitats due to its chemical composition.		

Activity Component	VEC	Description of Effects	Mitigation Measures	Are residual significant adverse effects likely?
		Aquatic animals are negatively impacted by waste discharged into the ocean. Solid waste and other debris within their habitat present entanglement hazards. Hazmats released into the ocean through waste have the potential to impact aquatic animals.		
1. Vessel Movement and General Operations	**Avifauna**	Seabirds are highly visually oriented and can become disoriented at night in the presence of artificial light.	Refer to **Marine Water and Sediment Quality** Refer to **Marine Fish and Invertebrate Resources**	NO
1. Vessel Movement and General Operations	**Species at Risk**	Species at Risk have been identified in the areas of operation.	Refer to **Marine Water and Sediment Quality** Refer to **Marine Fish and Invertebrate Resources** Refer to **Marine Mammals and Sea Turtles**	NO
1. Vessel Movement and General Operations	**Special/ Protected Areas**	A number of special/protected areas have been identified in the areas of operation.	Refer to **Air Quality** Refer to **Acoustic Environment** Refer to **Marine Water and Sediment Quality** Refer to **Marine Fish and Invertebrate Resources** Refer to **Marine Mammals and Sea Turtles** • DND must meet its commitments in the IIBA, including providing a summary of the	NO

Activity Component	VEC	Description of Effects	Mitigation Measures	Are residual significant adverse effects likely?
			planned research to the Aulattiqatigiit Board, and providing the Board with an unclassified summary of the results. • MARL SE must follow-up to ensure commitments are addressed.	
1. Vessel Movement and General Operations	**Fisheries (commercial, recreational, and indigenous)**	Vessel movements and general operations may interfere with fisheries activities.	• Issue appropriate warnings for exercises (NOTMAR, NAVWARN). • Avoid conducting exercises in known fishing areas.	NO
1. Vessel Movement and General Operations	**Other Ocean Uses**	Vessel movements and general operations may interfere with other ocean uses.	• Issue appropriate warnings for exercises (NOTMAR, NAVWARN).	NO
1. Vessel Movement and General Operations	**Indigenous/ Traditional Activities**	Vessel movements and general operations may interfere with indigenous/traditional activities.	• Issue appropriate warnings for exercises (NOTMAR, NAVWARN). • Communications with Indigenous groups should be undertaken regularly. • Avoid areas of Indigenous/Traditional Activities.	NO
2. Aircraft and Helicopter Movement	**Air Quality**	Air emissions from aircraft/helicopters/AUVs may contribute to overall air quality problems by introducing gaseous and particulate pollutants into the atmosphere.	• Maintain equipment as per manufacturer's recommendations and CFTOs and other applicable SOPs.	NO

Activity Component	VEC	Description of Effects	Mitigation Measures	Are residual significant adverse effects likely?
2. Aircraft and Helicopter Movement	**Acoustic Environment**	Aircraft/helicopter/AUV operations have the potential to increase noise above ambient in the area of operation.	• Excess noise should be kept to a minimum. • Equipment should be maintained according to manufacturer requirements.	NO
2. Aircraft and Helicopter Movement	**Marine Water and Sediment Quality**	Activities such as fuelling and deck washing associated with helicopters can cause negative impacts to surrounding surface water if these discharges are allowed directly into the marine environment.	• Spill kits should be available adjacent to helicopter fuelling areas. • Helicopter fuelling staff should be trained in spill prevention and control. • Wash water with detergents or other cleaners should be captured. • Helicopter fuelling and deck washing should be avoided in environmentally sensitive areas. • Personnel trained in use of spill response equipment should be available. • Any sheen or spill should be reported to MARL SE.	NO
2. Aircraft and Helicopter Movement	**Marine Fish and Invertebrate Resources**	Activities such as fuelling and washing associated with helicopters can cause negative impacts to aquatic animals if these discharges are allowed directly into the sea. The increase in noise due to aircraft/helicopter/AUV operation may affect the behaviour of aquatic animals.	Refer to **Marine Water and Sediment Quality**	NO

Activity Component	VEC	Description of Effects	Mitigation Measures	Are residual significant adverse effects likely?
2. Aircraft and Helicopter Movement	**Marine Mammals and Sea Turtles**	Activities such as fuelling and washing associated with helicopters can cause negative impacts to aquatic animals if these discharges are allowed directly into the sea. The increase in noise due to aircraft/helicopter/AUV operation may affect the behaviour of aquatic animals.	Refer to **Marine Water and Sediment Quality** • Avoid flying over concentrations of marine mammals • Report sea turtle sightings to MARL SE	NO
2. Aircraft and Helicopter Movement	**Avifauna**	Aircraft/helicopter operations have the potential to result in biological, physiological and behavior effects on migratory birds, and may interfere with typical wildlife activities such as foraging and migration	Refer to **Acoustic Environment** • Avoid low-level flying over land and in the vicinity of wildlife concentrations or bird nesting areas. • Maintain a minimum altitude of 660 m over bird colonies. • Whenever possible, stay 3km from bird colonies, concentrations of birds and known bird concentration areas. • Avoid repeated overflights of bird concentrations, colonies or important bird habitats.	NO
2. Aircraft and Helicopter Movement	**Species at Risk**	Activities such as fuelling and washing associated with helicopters can cause negative impacts to species at risk and their critical habitats if these discharges are allowed directly into the sea.	Refer to **Acoustic Environment** Refer to **Marine Fish and Invertebrate Resources** Refer to **Marine Mammals and Sea Turtles** Refer to **Avifauna**	NO

Activity Component	VEC	Description of Effects	Mitigation Measures	Are residual significant adverse effects likely?
		Aircraft/helicopter operations have the potential to result in biological, physiological and behavior effects on species at risk, and may interfere with typical wildlife activities such as foraging and migration.		
2. Aircraft and Helicopter Movement	**Special/ Protected Areas**	A number of special/protected areas have been identified in the areas of operation.	Refer to **Acoustic Environment** Refer to **Marine Fish and Invertebrate Resources** Refer to **Marine Mammals and Sea Turtles** Refer to **Avifauna**	NO
2. Aircraft and Helicopter Movement	**Fisheries (commercial, recreational, and indigenous)**	Aircraft/helicopter movements may interfere with fisheries activities.	Refer to **Acoustic Environment** Refer to **Marine Fish and Invertebrate Resources** Refer to **Marine Mammals and Sea Turtles** Refer to **Avifauna** • Issue appropriate warnings for exercises (NOTMAR, NAVWARN).	NO
2. Aircraft and Helicopter Movement	**Other Ocean Uses**	Aircraft/helicopter movements may interfere with other ocean uses.	Refer to **Acoustic Environment** Refer to **Marine Fish and Invertebrate Resources** Refer to **Marine Mammals and Sea Turtles** Refer to **Avifauna** • Issue appropriate warnings for exercises (NOTMAR, NAVWARN).	NO

Activity Component	VEC	Description of Effects	Mitigation Measures	Are residual significant adverse effects likely?
2. Aircraft and Helicopter Movement	**Indigenous/ Traditional Activities**	Aircraft/helicopter movements may interfere with indigenous/traditional activities.	Refer to **Acoustic Environment** Refer to **Marine Fish and Invertebrate Resources** Refer to **Marine Mammals and Sea Turtles** Refer to **Avifauna** • Issue appropriate warnings for exercises (NOTMAR, NAVWARN). • Communications with Indigenous groups should be undertaken regularly.	NO
3. Fuelling Alongside and in Harbour	**Air Quality**	Fuelling activities may contribute to overall air quality problems by introducing volatile pollutants into the atmosphere, especially in the case of a spill.	• Follow RCN SOPs • Follow port requirements at Nuuk, GL • Any spilled fuel or oil should be cleaned up immediately. • Spill kits should be available close to fuelling operations. • Scuppers should be plugged during fuelling and cargo loading and unloading operations to prevent the discharge of oil into surrounding waters. • Appropriate SOPs, checklists and training for fuelling and oil transfers and spill reporting should be provided to ship staff involved in these operations. • After every instance of loading or unloading operations a visual sheen test should be conducted by observing the surface of the	NO

Activity Component	VEC	Description of Effects	Mitigation Measures	Are residual significant adverse effects likely?
			surrounding water for the presence of an oily sheen. • Any sheen or spill should be reported to MARL SE. • Personnel trained in use of spill response equipment should be available. • Fuel transfers should be performed during daylight hours. • Oil transfers should be carried out in accordance with Transport Canada Transport Publication TP10783: Arctic Waters Oil Transfer Guidelines. • Due to extremely low ambient temperatures in winter months, it is recommended that loading practice should specify an upper limit to the temperature of cargo being loaded in order to minimize the effect of thermal shock to the ships' structure. • During fuelling from barge or another vessel, vessels should be boomed 360°.	
3. Fuelling Alongside and in Harbour	**Marine Water and Sediment Quality**	Spills during fuelling can impact surrounding marine water and sediments.	Refer to **Air Quality**	NO
3. Fuelling Alongside and in Harbour	**Marine Fish and Invertebrate Resources**	Spills during fuelling can impact marine fish, invertebrate resources, and their habitats. Oil in even minute amounts can kill fish or have other sub-lethal chronic effects.	Refer to **Air Quality**	NO

Activity Component	VEC	Description of Effects	Mitigation Measures	Are residual significant adverse effects likely?
3. Fuelling Alongside and in Harbour	**Marine Mammals and Sea Turtles**	Spills during fuelling can impact marine mammals, sea turtles, and their habitats.	Refer to **Air Quality**	NO
3. Fuelling Alongside and in Harbour	**Avifauna**	Spills during fuelling can impact avifauna.	Refer to **Air Quality**	NO
3. Fuelling Alongside and in Harbour	**Species at Risk**	Spills during fuelling can impact species at risk and critical habitats.	Refer to **Air Quality**	NO
3. Fuelling Alongside and in Harbour	**Special/ Protected Areas**	Spills during fuelling can impact the characteristics of special/protected areas.	Do not fuel in special/ protected areas. NOTE: The area around Nanisivik is excluded from the Tallurutiup Imanga NMCA.	NO
3. Fuelling Alongside and in Harbour	**Fisheries (commercial, recreational, indigenous)**	Spills during fuelling can impact the fisheries in the area, due to pollution and to clean-up operations.	Refer to **Air Quality** Refer to **Special/Protected Areas**	NO
3. Fuelling Alongside and in Harbour	**Other Ocean Uses**	Spills during fuelling can impact other ocean uses, due to pollution and to clean-up operations.	Refer to **Air Quality** Refer to **Special/Protected Areas**	NO
3. Fuelling Alongside and in Harbour	**Indigenous/ Traditional Activities**	Spills during fuelling can impact the fisheries in the area, due to pollution and to clean-up operations.	Refer to **Air Quality** Refer to **Special/Protected Areas** • Only fuel in areas that have been set aside for DND (e.g. Nanisivik Naval Facility) or that have been agreed to by the local representatives.	NO

Activity Component	VEC	Description of Effects	Mitigation Measures	Are residual significant adverse effects likely?
4. Bottom Interaction	**Marine Water and Sediment Quality**	XBTs and targets that settle to the ocean floor will degrade over time, thereby releasing integrated hazardous materials e.g. from batteries. Arrays generally contain a fill fluid for buoyancy. Damage to the array by dragging on the bottom, causing spillage of fill fluid may occur if the ship stops.	• When possible, recover equipment during training and exercise activities e.g. use a recoverable target. • Ship staff should send locations of expended bathys, targets, etc. to MARL SE • In order to reduce plastic waste, avoid using HSPT targets in the Arctic • MARL SE should keep a database of expended bathy, target etc. locations. • Avoid special/protected areas.	NO
4. Bottom Interaction	**Marine Fish and Invertebrate Resources**	Anchoring, scuttling of targets, bottom landing of equipment, and moorings may affect sensitive benthic environments, including corals and sponges which recover slowly when disturbed. The TRAPS array could settle on the ocean floor if the ship stops, potentially causing damage to the ocean floor. Fish spawning grounds can be affected by activities that interact with the ocean bottom. The AAR trial intends to leave behind the mooring weights, since they will be too deep for divers to retrieve them.	Refer to **Marine Water and Sediment Quality** • Avoid Coral Conservation Areas, Sponge Conservation Areas and Bottom Fishing Closure areas • Anchor only in approved areas • DRDC should send locations of mooring weights left behind to MARL SE • MARL SE should keep a database of mooring weights left behind after research activities	NO
4. Bottom Interaction	**Special/ Protected Areas**	Anchoring, scuttling of targets and bottom landing of equipment may affect sensitive benthic environments, including	Refer to **Marine Fish and Invertebrate Resources**	NO

Activity Component	VEC	Description of Effects	Mitigation Measures	Are residual significant adverse effects likely?
		corals and sponges which recover slowly when disturbed. Fish spawning grounds can be affected by activities that interact with the ocean bottom.	• Avoid wreck and bottom legacy sites.	
4. Bottom Interaction	**Fisheries (commercial, recreational, indigenous)**	Hazardous materials have the potential to negatively impact waters used for commercial fishing through self-scuttling equipment.	• Issue appropriate warnings for exercises (NOTMAR, NAVWARN). • Avoid conducting exercises in known fishing areas.	NO
4. Bottom Interaction	**Indigenous/ Traditional Activities**	Anchoring, scuttling of targets and bottom landing of equipment may affect sensitive benthic environments, including corals and sponges which recover slowly when disturbed. Fish spawning grounds can be affected by activities that interact with the ocean bottom.	Refer to **Marine Water and Sediment Quality** Refer to **Marine Fish and Invertebrate Resources** • Local representatives should be informed of any moorings left behind after research activities.	NO
5. Single/ Multiple Tow	**Marine Water and Sediment Quality**	Arrays generally contain a fill fluid for buoyancy. This has a potential to spill if it is damaged, e.g. caught in propeller.	• When using TRAPS, avoid ship speeds less than 7 knots • If ship stops and TRAPS array settles on bottom, recover sufficient cable prior to making way such that the array is clear of the bottom. • Avoid areas with complicated shorelines/bays/estuaries.	NO

Activity Component	VEC	Description of Effects	Mitigation Measures	Are residual significant adverse effects likely?
			• Follow Class Spill Response plans in the event of a spill. • Any visible sheen should be reported to MARL SE. • Spill kits and personnel trained to contain spills should be present during exercises. • Avoid protected areas. • Ensure fill fluid SDSs are available to ship staff. • Track and record where bottoming occurs, and provide this information to MARL SE • As much as possible, operations should be planned during daylight hours • Issue appropriate warnings for exercises (NOTMARs/NAVWARNs)	
5. Single/ Multiple Tow	**Marine Fish and Invertebrate Resources**	Towed targets and arrays have the potential to cause collisions with or entangle marine fish, who can sustain lethal injuries. Generally fish are expected to temporarily avoid the immediate area around a ship. No interaction between the TRAPS array, or targets while being towed, is expected with invertebrate resources.	• Avoid fish critical habitats and recovery conservation areas.	NO

Activity Component	VEC	Description of Effects	Mitigation Measures	Are residual significant adverse effects likely?
5. Single/ Multiple Tow	**Marine Mammals and Sea Turtles**	Towed targets and arrays have the potential to cause collisions with or entangle marine mammals and sea turtles, who can drown or sustain lethal injuries.	• Follow direction in NAVORD 4003-6 and Class SEMS, as applicable. • Conduct exercises during daylight hours as much as possible. • Use trained marine mammal lookouts. • If RCAF is involved in exercises, use planes to look out for marine mammals. • Avoid sensitive environmental areas, critical habitats, and concentrations of marine mammals and sea turtles while conducting exercises. • Continue to collect information on distribution and abundance of marine mammals and sea turtles, and report to MARL SE after each exercise. • Report sightings of marine mammals in accordance with the Halifax SEMS SOP E5. • Report sea turtle sightings to MARL SE	NO
5. Single/ Multiple Tow	**Avifauna**	Towed targets and arrays have the potential to cause collisions with or entangle marine birds if they dive during foraging activities.	• Avoid sensitive environmental areas, critical habitats, and concentrations of marine birds while conducting exercises.	NO
5. Single/ Multiple Tow	**Species at Risk**	Towed targets and arrays have the potential to cause collisions with or entangle species at risk.	• Avoid critical habitats.	NO

Activity Component	VEC	Description of Effects	Mitigation Measures	Are residual significant adverse effects likely?
5. Single/ Multiple Tow	**Special/ Protected Areas**	Towed targets and arrays have the potential to cause collisions with or entangle marine animals in protected areas.	• Avoid protected areas and critical habitats.	NO
5. Single/ Multiple Tow	**Fisheries (commercial, recreational, and indigenous)**	Towed targets and arrays have the potential to cause disruption to fisheries.	• Issue appropriate warnings for exercises (NOTMAR, NAVWARN). • Avoid conducting exercises in known fishing areas.	NO
5. Single/ Multiple Tow	**Other Ocean Uses**	Towed targets and arrays have the potential to cause disruption to tourism, and passenger and commercial shipping vessel's schedules causing delay and distress.	• Issue appropriate warnings for exercises (NOTMAR, NAVWARN). • Avoid conducting exercises in known commercial areas, shipping routes and ferry routes. • Avoid restricted fishing zones.	NO
5. Single/ Multiple Tow	**Indigenous/ Traditional Activities**	Towed targets and arrays have the potential to cause collisions with aquatic species of cultural importance. Hazardous materials have the potential to negatively impact waters used by indigenous peoples through spills.	• Issue appropriate warnings for exercises (NOTMAR, NAVWARN). • Communications with Indigenous groups should be undertaken regularly. • Avoid areas of Indigenous/Traditional Activities.	NO
6. Active Sonar	**Acoustic Environment**	TRAPS and LRAT will involve low frequency active sonar. MARPS will involve high frequency active sonar. Active sonar temporarily increases underwater noise above ambient in the local operating area.	• Follow direction in NAVORD 4003-6 and Class SEMS, as applicable. • Issue appropriate warnings for exercises (NOTMAR, NAVWARN). • Limit duration of operations and only use the appropriate amount of power necessary for the activity.	NO

Activity Component	VEC	Description of Effects	Mitigation Measures	Are residual significant adverse effects likely?
			• Use ramp-up capability. • Ship staff should be sufficiently trained to identify mammals to be expected in the area. • Use trained marine mammal lookouts to perform pre-emission visual surveys for 30 minutes prior to emission • If a mammal is observed within the MAZ, delay the next emission until no mammal has been observed for 30 minutes • If RCAF is involved in trial, use planes to look out for marine mammals. • Minimize the duration of trials as much as possible. • Report sightings of marine mammals in accordance with the Class SEMS SOP E5. • Stop trial if a marine mammal is within the MAZ: TRAPS 500 m (546 yds). LRAT 100 m (109 yds) MARPS 100 m (109 yds). • For TRAPS/EMATT trial specifically : -visual surveys should take place between emission sites -passive acoustic monitoring should be performed using the TRAPS during the pre-emission visual survey	

Activity Component	VEC	Description of Effects	Mitigation Measures	Are residual significant adverse effects likely?
			-a ramp-up protocol has been provided in ref. C of the main report -leave sonar on mitigation mode between ping sites, with a reduced source level (ref. C in main report)	
6. Active Sonar	**Marine Fish and Invertebrate Resources**	Through modelling, it was found that fish may experience TTS at distances less than 20 m from the current Halifax Class hull mounted sonar.	Refer to **Acoustic Environment** • Avoid fish critical habitats and recovery conservation areas.	NO
6. Active Sonar	**Marine Mammals and Sea Turtles**	Active sonar temporarily increases underwater noise above ambient in the local operating area, potentially impacting marine mammals. Active sonar operations have the potential to result in biological, physiological and behaviour effects on marine mammals and may interfere with typical wildlife activities such as foraging and migration. Sea Turtles do not inhabit the area where the TRAPS, LRAT and MARPS trials will take place.	Refer to **Acoustic Environment** • Avoid critical habitats and concentrations of marine mammals.	NO
6. Active Sonar	**Avifauna**	Little information is available regarding the susceptibility of marine birds to underwater active sonar underwater, however impact is considered unlikely due to the limited amount of time birds	Refer to **Acoustic Environment** • Avoid sensitive environmental areas, critical habitats, and concentrations of marine birds while conducting exercises.	NO

Activity Component	VEC	Description of Effects	Mitigation Measures	Are residual significant adverse effects likely?
		will spend in the water.		
6. Active Sonar	**Species at Risk**	Active sonar temporarily increases underwater noise above ambient in the local operating area, potentially impacting species at risk.	Refer to **Acoustic Environment** • Avoid environmentally sensitive areas and critical habitats.	NO
6. Active Sonar	**Special/ Protected Areas**	It is possible for active sonar to alter the acoustic environment of a critical habitat to the extent that destruction of critical habitat occurs. Activities that prevent the function of critical habitat from being available when needed by the species would be considered to have destroyed critical habitat, even if the effect is temporary. The LRAT will be carried out in the Tallurutiup Imanga NMCA near the DRDC Gascoyne Inlet Camp. Based on information provided, TTS and PTS injury is not expected since the source level will be lower than the thresholds for TTS and PTS for mammals known to inhabit the area. The MARPS will be carried out in the Tallurutiup Imanga NMCA near pond	Refer to **Acoustic Environment** • DND must meet its commitments in the IIBA, including providing a summary of the planned research to the Aulattiqatigiit Board, and providing the Board with an unclassified summary of the results. • MARL SE should follow-up to ensure commitments are addressed.	NO

Activity Component	VEC	Description of Effects	Mitigation Measures	Are residual significant adverse effects likely?
		Inlet. This involves high frequency sonar, and very strong absorption and attenuation of sound in the seawater is expected. It is not expected that the sound will be carried for great distances.		
6. Active Sonar	**Fisheries (commercial, recreational, indigenous)**	Sonar activities could interrupt local fisheries activities.	Refer to **Acoustic Environment** • Issue appropriate warnings for the trials (NOTMAR, NAVWARN).	NO
6. Active Sonar	**Indigenous/ Traditional Activities**	Active sonar temporarily increases underwater noise above ambient in the local operating area, potentially impacting marine species that are culturally important or used for subsistence harvest.	Refer to **Acoustic Environment** • Issue appropriate warnings for exercises (NOTMAR, NAVWARN). • Communications with Indigenous groups should be undertaken regularly.	NO
7. Radar Use (Fire Control Only) and Laser	**Avifauna**	Fire control radar or laser can kill or injure birds that fly into the beam.	• Allied ships to ask for permission from RCN before training activities • NOTMARs/NOTAMs/NAVWARNs must be issued before training activities. • Avoid concentrations of birds. • Training activities involving radar or laser should be conducted at least 20km from shorelines. • An approach distance of 500 m for large vessels and 300 m for small vessels shall be maintained from bird colonies,	NO

Activity Component	VEC	Description of Effects	Mitigation Measures	Are residual significant adverse effects likely?
			concentrations of birds, or known bird concentration areas. • Do not aim systems at birds, or track birds. • Utilize optical tracking to check for birds along firing bearing prior to activation. • As much as possible, operations should be planned during daylight hours.	
7. Radar Use (Fire Control Only) and Laser	**Species at Risk**	Fire control radar or laser can kill or injure birds that fly into the beam.	Refer **to Avifauna** • Be aware of which species at risk may be present, their seasonal occurrence, and likelihood of encounter.	NO
7. Radar Use (Fire Control Only) and Laser	**Special/ Protected Areas**	Fire control radar or laser can kill or injure birds that fly into the beam.	Avoid special/protected areas.	NO
7. Radar Use (Fire Control Only) and Laser	**Indigenous/ Traditional Activities**	Fire control radar or laser can disturb indigenous communities and activities.	• Avoid conducting exercises using fire control radar and laser near indigenous communities and in the areas of fishing and hunting.	NO
10. Surface Fire	**Acoustic Environment**	Surface firing operations have the potential to increase noise above ambient in the area of operation.	• All surface firing activities should be done in accordance with RCN SOPs. • Follow NAVORD 4995-0: Safety Fire Orders for HMC Ships • Surface firing should be conducted at least 20 km from land and the direction of fire should be away from land	NO

Activity Component	VEC	Description of Effects	Mitigation Measures	Are residual significant adverse effects likely?
			• Firing shall not involve training rounds that produce any underwater explosions.	
10. Surface Fire	**Marine Water and Sediment Quality**	Surface fire exercises are carried out using live ammunition against a stationary or towed surface target. Ammunition contains hazmat and will sink and be unrecoverable. Target debris may float. The surface water may be impacted due to hazmat incorporated within the ammunition.	• Spent casings on deck should be recovered and not dumped overboard. • Debris should be minimized, picked up, or sunk as quickly as possible. • Ship staff should send locations and amounts of expended ammunition to MARL SE • MARL SE should keep records of where surface fire exercises are carried out and the amount of ammunition expended.	NO
10. Surface Fire	**Marine Fish and Invertebrate Resources**	Hazmat and target debris resulting from surface firing may negatively impact marine fish and invertebrate resources.	Refer to **Acoustic Environment** Refer to **Marine Water and Sediment Quality**	NO
10. Surface Fire	**Marine Mammals and Sea Turtles**	Surface firing has the potential to result in biological, physiological and behavior effects on marine mammals and sea turtles, and may interfere with typical wildlife activities such as foraging and migration.	Refer to **Acoustic Environment** Refer to **Marine Water and Sediment Quality** • Follow NAVORD 4003-6: Marine Mammal Mitigation Procedures, as applicable. • Avoid wildlife concentrations. • Consider DFO sensitive timing windows when conducting surface fire exercises.	NO

Activity Component	VEC	Description of Effects	Mitigation Measures	Are residual significant adverse effects likely?
			• Post lookouts for marine mammals and other aquatic wildlife. Lookouts must conduct a visual observation for marine mammals for 30 minutes before commencing an exercise. • If marine mammals are sighted, allow 10 minutes until they are not sighted again in the area. • Do not direct fire towards unidentified large objects in the water, including icebergs. • When firing live ammunition, establish a 4.8 km avoidance zone and post a lookout for marine mammals and sea turtles. • Report sea turtle sightings to MARL SE	
10. Surface Fire	**Avifauna**	Surface firing has the potential to impact birds by getting caught in the line of fire.	Refer to **Acoustic Environment** Refer to **Marine Water and Sediment Quality** Refer to **Marine Mammals and Sea Turtles**	NO
10. Surface Fire	**Species at Risk**	Surface firing has the potential to impact species at risk.	Refer to **Acoustic Environment** Refer to **Marine Water and Sediment Quality** Refer to **Marine Mammals and Sea Turtles** • Be aware of which species at risk may be present, their seasonal occurrence, and likelihood of encounter.	NO
10. Surface Fire	**Special/ Protected Areas**	Surface firing has the potential to impact Special/ Protected Areas.	• Do not carry out Surface Fire exercises in Special/ Protected Areas.	NO

Activity Component	VEC	Description of Effects	Mitigation Measures	Are residual significant adverse effects likely?
10. Surface Fire	**Fisheries (commercial, recreational, and Indigenous)**	Surface firing has the potential to impact Fisheries.	Refer to **Acoustic Environment** Refer to **Marine Water and Sediment Quality** Refer to **Marine Mammals and Sea Turtles** Refer to **Species at Risk** • NOTMARs/NOTAMs/NAVWARNs must be issued before training activities.	NO
10. Surface Fire	**Other Ocean Uses**	Surface firing has the potential to impact other ocean uses.	Refer to **Acoustic Environment** Refer to **Marine Water and Sediment Quality** Refer to **Marine Mammals and Sea Turtles** Refer to **Species at Risk** • NOTMARs/NOTAMs/NAVWARNs must be issued before training activities.	NO
10. Surface Fire	**Indigenous/ Traditional Activities**	The surface fire exercise will be carried out in the MARLOAs, so Indigenous/ Traditional Activities are not expected to be affected.	Refer to **Acoustic Environment** Refer to **Marine Water and Sediment Quality** Refer to **Marine Mammals and Sea Turtles** Refer to **Species at Risk** • NOTMARs/NOTAMs/NAVWARNs must be issued before training activities.	NO

Establishment File #:[Insert base file #]

DND EIA #:1267-0100-2242

Annex E –ADM(IE) Duty to Consult Determination

Guided Template - Duty to Consult Determination (DTCD)

CONTEXT

The Government of Canada has a legal duty to consult with Indigenous peoples when it contemplates conduct that might adversely impact potential or established Aboriginal or treaty rights protected under section 35 of the *Constitution Act, 1982*. In addition to the common law duty to consult, the Government of Canada consults with Indigenous peoples for statutory reasons and for sound policy development and decision-making.

The Supreme Court of Canada has held that the Crown has a legal duty to consult when three elements are present:

A) Contemplated Crown conduct;

B) Potential or established Aboriginal or Treaty rights; and

C) Potential adverse impact on those Aboriginal or Treaty rights.

The *Aboriginal Consultation and Accommodation Updated Guidelines for Federal Officials to Fulfill the Duty to Consult, March 2011*, was developed as a step towards greater consistency in federal practices and approaches. That said, the *Updated Guidelines* is not intended to be a one-size fits all approach. Differences in the history, geography, demographics, governance and other circumstances of Indigenous groups are considered to determine how to approach consultation with a specific group. In addition, departmental best practices in carrying out consultation better inform department-specific policies and guidelines.

As case law and federal policy continue to evolve, combined with best practices from within and outside the federal government, the content of the *Updated Guidelines* will evolve too. As part of this ongoing process, the Department of National Defence and the Canadian Armed Forces (DND/CAF) will need to continue to review its consultation and accommodation approach to ensure consistency and alignment with evolving legal and policy developments.

PURPOSE

The *Updated Guidelines* provides a detailed step-by-step guide to consultation and accommodation that includes four phases: pre-consultation analysis and planning; Crown consultation process; accommodation; implementation, monitoring and follow-up.

This **National Defence Guided Template – Duty to Consult Determination** focuses on the pre-consultation analysis only. On the basis of this initial assessment and analysis, as the DND/CAF Activity OPI, you will be able to determine whether:

- **It is unlikely that a legal duty to consult will be triggered**; OR
- **A legal duty to consult does exist or likely exists**.

To clarify, the DND/CAF Activity OPI is the person responsible for conducting activities led by DND or by a third party.

If the initial assessment indicates there are Indigenous communities or organizations who may experience potential adverse impacts on their potential or established Aboriginal or Treaty rights from the conduct of the DND/CAF Activity, DND/CAF, the OPI likely has a legal duty to consult with those communities or organizations. Activity OPIs are encouraged to begin consultation early in the Activity planning process. It

will be very important to keep detailed consultation records from the outset. More tools and guidance will follow on all phases of consultation and accommodation with Indigenous peoples.

What are some examples of Activities that could trigger a legal duty to consult?

- Disposal and acquisition of land
- Major projects
- Significant digging or excavation which could involve archaeological findings
- Activities affecting wildlife movement, supply, and access
- Construction projects on DND lands, coastal and marine areas
- Projects or activities that have a potential of polluting the environment Activities that may affect flora or animal populations
- Policy changes that may restrict land/water use
- Regulatory assessments (to modify them)
- Approving and permitting of third-party projects on DND lands, particularly multi-stage projects
- Providing contribution funding to projects
- Military training or exercises on or over Crown, provincial, marine or treaty lands or areas
- Decisions regarding the lifecycle of land management
- Decisions regarding the use or supply of natural resources
- Construction projects

It is important to note that for many projects, it will be difficult to conclusively determine that there is not a legal duty to consult at a pre-consultation analysis stage. The analysis may change as the project develops and consultations or engagements with Indigenous groups take place the duty to consult may resurface. Independently of the duty to consult, keep communities engaged and informed as the project progresses. In case of doubt, a legal opinion may be sought.

REQUESTING LEGAL GUIDANCE

This section is intended to help you decide whether legal advice **should or must be** sought from the Department of Justice, Office of the Legal Advisor to the Department of National Defence and the Canadian Forces (DND/CF LA) regarding the proposed DND/CAF Activity.

There are certain circumstances in which a legal opinion or ongoing advice from DND/CF LA counsel may be necessary or recommended following completion of the **Guided Template - Duty to Consult Determination** – regardless of the conclusion you have reached in your analysis. When legal advice or involvement is required or expected, engaging DND/CF LA at the outset of the planning phase for the Activity is important to ensure DND/CAF meets all requirements of the legal duty to consult.

Certain DND/CAF <u>Activities</u> will necessitate DND/CF LA engagement, while others will depend on a case-by-case analysis. In addition, DND/CAF may decide to consult for good governance/policy reasons, e.g., make informed and appropriate decisions, create and improve working relations and address new business and policy developments (see Updated Guidelines for Federal Officials to Fulfill the Duty to Consult - March 2011).

Regardless of the outcome of your duty to consult determination, if any of the factors in the list or chart below are present for the proposed DND/CAF Activity, seek legal advice early in your timeline.

Activities Requiring Legal Advice:

It is always recommended to conduct a preliminary analysis using the **Guided Template – Duty to Consult Determination** and avoid seeking legal advice directly.

1. Land disposal
2. Acquisition of land where change to the land use is anticipated
3. Major projects on DND land/Defence establishments
4. Multi-stage (complex) projects involving approval and permitting of DND or third-parties (e.g., statutory requirements such as federal impact assessment or provincial environmental assessment processes, etc.). Examples: Meaford file (proposed hydro storage project by third party proponent, TC Energy – a "designated project" under the Impact Assessment Act) with many federal authorities involved (DND, ISC, ECCC) among other levels of government; Future Fighter Fleet at the Cold Lake Air Weapons Range (DND intends to purchase new fighters in the future and is undertaking a number of projects to prepare for the acquisition and use of the new fleet, i.e., infrastructure).

Other Activities – Should Legal Advice be Sought?

If any of the following factors are present, legal advice may be required.

Factor*	**Present**
Is there a real or actual prospect of litigation in the relevant area?	
Is there any past or present access to the relevant area by Indigenous groups? Will the Activity change land use or access to the relevant area?	
Is the Activity multi-phase and/or complex? *(Consider: Activity size and expense, timelines, statutory requirements such as impact and environmental assessments, etc.)*	
Are ongoing consultations with Indigenous groups taking place in relation to other DND/CAF Activities in the relevant area?	
Are there any current negotiations taking place with an Indigenous group in the relevant area? *(For example: RIRSD Tables, Comprehensive Claim and Self-Government Agreement negotiations, etc.)*	
Are there any treaties in place in the relevant area?	Yes
Are there any other types of agreements in place in the relevant area? *(For example: Self-Government Agreement, Treaty Land Entitlement Agreements, Access Agreements, Consultation Agreements or Protocols)*	

* If you require assistance in completing this chart, please contact DGIA.

STEP 1: CONTEMPLATING CROWN CONDUCT

Proposed Activity Description

*ALL NUMBERED QUESTIONS ARE MANDATORY

1. Activity Information

Name of Activity: Op NANOOK-TUUGAALIK and Op NANOOK-NUNAKPUt 2022

Lead Directorate, Base, Unit: Maritime Forces Atlantic (MARLANT), Canadian Forces Base (CFB) Halifax

Location of Activity:
Maritime activities:

a. MARLANT Local Operating Areas (MARLOAs);
b. Labrador Sea;
c. Davis Strait;
d. Hudson Strait;
e. Frobisher Bay;
f. Baffin Bay;
g. Lancaster Sound; and
h. Sagleck Bay.

Province:

Communitites to be visited:

a. Pond Inlet, Nunavut (NU) (community);
b. Nanisivik, NU (future DND fuelling facility);
c. Arctic Bay, NU (community);
d. Cambridge Bay, NU (community);
e. Griffin Inlet, NU (uninhabited);
f. Lowther Island, NU (uninhabited);
g. Gascoyne, NU (DND camp);
h. Dundas Harbour, NU (community);
i. Qikiqtarquaq, NU (community);
j. Iqaluit, NU (community):
k. Nain, Newfoundland and Labrador (NL) (community);
l. Hopedale, NL (community);
m. Goose Bay, NL (community); and
n. St. John's, NL (community).

Defence Establishment (specify): MARLANT

Latitude and Longitude Coordinates of Activity: See below

If outside a Defence establishment, attach Map(s) with Activity boundaries and other information or Satellite views See figures 1 – 3 in report: Due Diligence Environmental Effects Determination Report,Project: Operation NANOOK-TUUGAALIK(NA-TU) and NANOOK-NUNAKPUT (NA-NK) 2022, NETE, 30 June 2022 (Op NANOOK 2022 DDEED).

Activity OPI

a) Name, rank, title: MARLANT Safety and Environment

- **Email address:** +N48FormationSafetyandEnvironment@forces.gc.ca

b) Phone: 902-427-1423

c) Cell phone:

Schedule: Activity Start Date: 2 August 2022

Activity End Date: 29 or 30 September 2022

2. Nature of the proposed Activity

What is the nature of the proposed Crown conduct? Consider the following examples (this list is not exhaustive):

- *Military training or exercises on or over provincial Crown land, marine environment, treaty settlement land, or treaty settlement area*
- *Land disposal*
- *Acquisition of land*
- *Resource project on DND land/Defence establishments*
- *Digging or excavation which could involve archaeological findings*
- *Activity affecting wildlife movement, supply, and access*
- *Project on DND lands, coastal and marine areas involving approval and permitting of DND or third-parties (e.g. statutory requirements such as federal impact assessment or provincial environmental assessment processes, etc.)*
- *Decision regarding pollution from construction*
- *Activity that may affect flora or animal populations*
- *Policy change that may restrict land/water use*
- *Regulatory assessment*
- *Providing contribution funding to a project*
- *Decision regarding the lifecycle of land management*
- *Decision regarding the use or supply of natural resources*

Response: Military training and exercises in the marine environment, including visits to communities in treaty settlement areas.

3. Description and Purpose of the Activity

Consider the following questions to guide you in formulating your response:

- *What is the purpose of the Activity?*
- *What are the details of the Activity?*
- *What is the Activity's geographic scope? Include a description of what area is affected.*
- *Identify the steps or stages or components of the Activity.*
- *Is there more information that is needed to fully understand the Activity?*
- *Where the proponent is a third party, has the proponent provided a detailed description of the Activity?*

Response: The mission of Op NA-TU and Op NA-NK 2022 is to conduct operations in the MARLOAs, the north Atlantic and Canada's North with Allies and other partners to ensure the Canadian Armed Forces' (CAF) readiness to operate in the North and improve interoperability with mission partners. The Operational Objectives are:

- Increase interoperability in the North with Joint Task Force North (JTFN);
- Overcome logistical challenges of the Northern operational area;
- Increased interoperability with allies (dealing with a common threat); and
- Support whole of government effort by supporting other governmental departments (OGD) and research and development (R & D).

A full description of the activity can be found in section 1.4 of the Op NANOOK 2022 DDEED.

4. Roles and Responsibilities

Consider the following questions to guide you in formulating your response:

- *Clarify DND's role in the Activity. For example, is DND the proponent of the Activity or is it a third party? If a third party, what is DND's role? Will DND provide contribution funding?*
- *Does the Activity involve (an)other federal department(s),? If so, what are the roles and responsibilities of each department?*
- *Does the Activity involve a provincial and/or territorial government? If so, what are their roles?*

Response:

DND is the proponent of the activity.

The Department of Fisheries and Oceans (DFO) is involved as Ice Observers and Marine Mammal Lookouts. DFO personnel will be involved in the Fish Patrol (FISHPAT) to be carried out by HMCS GOOSE BAY in Davis Strait. DFO personnel may also be onboard for the Marine Mammal Arctic Behavioural Response Study (BRS) to be conducted from HMCS Harry Dewolf in Baffin Bay . A Canadian Coast Guard (CCG) Icebreaker will be involved in Op NA-TU for 2 days, south of the Arctic Line at 60°N.

The Royal Canadian Mounted Police (RCMP) will join one of the RCN vessels and visit the communities.

5. Who owns the land?

Who owns the land where the Activity is planned to take place? Depending on the range of the Activity, there may be more than one.

Response (indicate in **bold and underline** all that apply) :

- **Federal Crown** (e.g. DND, Other Government Department) – Nanisivik Naval Facility is operated by MARLANT, Gascoyne Inlet Camp is a Defence Research and Development Canada (DRDC) research station
- Provincial Crown
- Territorial Crown
- First Nation reserve
- Other (specify) : **Most of the exercise area is under Land Claims Agreements**

A. Contemplated Crown Conduct:

A proposal to conduct an Activity on DND land or a DND Activity on non-DND land is sufficient to demonstrate contemplated Crown conduct. *Proceed to Step 2.* If no DND conduct is contemplated, proceed to Step 4.

STEP 2: POTENTIAL OR ESTABLISHED ABORIGINAL OR TREATY RIGHTS

Aboriginal or Treaty rights

***ALL NUMBERED QUESTIONS ARE MANDATORY – INDICATE N/A IF NOT APPLICABLE**

Aboriginal and Treaty rights are recognized and affirmed by Section 35 of the *Constitution Act, 1982*.

Aboriginal rights are the collective rights of distinct Indigenous communities which flow from their use and occupation of lands prior to the arrival of the Europeans.

The Constitution does not define Aboriginal rights. Some examples are:

- Aboriginal title (a right to the land itself),
- rights to use lands and resources, such as hunting, trapping and fishing rights, and
- cultural practices.

Treaty rights are the rights set out in historic or modern treaties between the Government of Canada and Indigenous groups, and often provinces and territories that define the ongoing rights and obligations of each party.

Potential rights include rights that have been asserted but not yet confirmed by a court or a treaty.

Established rights may either be defined in a Treaty or the result of a court decision.

Instructions: Access Aboriginal and Treaty Rights Information System (ATRIS) to identify the Indigenous groups in the area of the proposed Activity and the basis for their potential or established Aboriginal or Treaty rights. Consultation and Information Service (CIS) regional subject experts are available to assist if you require additional information or have questions about ATRIS content.

1. Indigenous Communities or Indigenous Governing Bodies

Answer all of the following:

a) Specify the date ATRIS was accessed for this preliminary research.

b) Specify the radius used in the search. The nature of the Activity will change the radius you will want to consider. For example, will the Activity have any effects only on the immediate area or will it impact a larger radius i.e. affects flowing water and an entire watershed? (This may help to determine the ATRIS radius to consider. For example, is it a water treatment facility that will impact surrounding waterways? (50-100k) Removing a swatch of untouched land that is currently used by migratory species? (50-100k) Is it small building construction project on base that won't have any impacts outside of the base? (5-10k)

c) Are there Indigenous communities and/or Indigenous Governing Bodies in the area of proposed Activity.

d) If yes, list them and continue with Step 2. If the answer is no, proceed to Step 4.

***Note:** There may be alternative spellings or different names for an Indigenous group. For example, the Sliammon First Nation of BC is now known as the Tla'amin First Nation.*

Response:

a) Date of ATRIS search: May 2022

b) Radius used: Searched by Key Word

c) Yes

d) Labrador Inuit Land Claims Agreement – Nunatsiavut Government
Nunavut Land Claims Agreement – Nunavut Tunngavik Inc., Kitikmeot Inuit Association (KIA) and Qikiqtani Inuit Assocation (QIA). Also, Aulattiqatigiit Board of the Inuit Impact and Benefit

	Agreement (IIBA) for soon-to-be-established Tallurutiup Imanga National Marine Conservation Area (NMCA). Nunavik Inuit Land Claims Agreement – MAKIVIK Corporation; Nunavik Marine Region Impact Review Board

2. Potential or Established Rights

The preliminarty ATRIS research may have indicated potential and/or established Aboriginal or Treaty rights in the immediate and surrounding area of the proposed DND/CAF Activity. *In addition to searching on ATRIS, provincial, territorial and community websites may provide additional information.*

From your understanding of the preliminary research, what is the basis of the established or potential rights?

If you are uncertain, contact Director General Indigenous Affairs, a local knowledgeable DND subject matter expert on Indigenous rights and interests, or regional subject matter experts of Consultation and Information Service (CIS).

Response (indicate in **bold and underline** all that apply) :

- Historic Treaty
- **Modern Treaty**
- Land Claims Agreement
- Self-Government Agreement
- Treaty Land Entitlement Agreements
- Access Agreements
- Consultation Agreements or Protocols
- Recognition of Indigenous Rights and Self-Determination (RIRSD) discussion tables
- Comprehensive Claim and Self-Government Agreement negotiations
- Claims or assertions, including overlapping claims by multiple Indigenous groups (For example: two or more First Nations may claim to have Aboriginal title over the same area; a Métis group may claim to have Aboriginal rights in an area where several First Nations also have established Treaty rights.)
- There is uncertainty about the legal status of a known or potential rights-holding group or individuals claiming Aboriginal or Treaty rights in the relevant area
- Other (specify):

B. Potential or Established Aboriginal or Treaty rights:

	There are **no** Indigenous communities that have potential or established Aboriginal or Treaty rights in the area of proposed conduct as per information provided by ATRIS, Consultation and Information Service (CIS), the Updated Guidelines for Federal Officials to Fulfill the Duty to Consult - March 2011, or Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC). *If the answer is NO, proceed to Step 4.*
X	There are Indigenous communities that have potential or established Aboriginal or Treaty rights in the area of proposed conduct as per information provided by ATRIS or Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC). *Proceed to Step 3.*

STEP 3: POTENTIAL ADVERSE IMPACTS OF CROWN CONDUCT

Potential Adverse Impact

***ALL NUMBERED QUESTIONS ARE MANDATORY – INDICATE N/A IF NOT APPLICABLE**

In general, adverse impacts can be anything that may limit or negatively affect the exercise of an Aboriginal or Treaty right or an Aboriginal claim. This can include both immediate or future impacts on the land, (including coastal and marine areas), water, airand resources. However, impacts are not restricted to physical impacts and can include any adverse effect on the ability of Indigenous peoples to exercise their rights, protected under s.35 of the Constitution.

A variety of factors will be relevant to this determination, including the scope and size of the Activity, the environmental and/or socioeconomic effects, and whether the impact(s) are permanent or temporary.

Instructions: Identify the likely or potential adverse impact of the proposed Activity.

1. Change to the current condition or use of land (including coastal and marine areas), air, water and resources

What is the likely or potential impact of the proposed Activity on the land (including coastal and marine areas), air, water and resources? If there are any impacts, what changes to the current condition or use of lands, air, water or resources are likely to occur as a result of the Activity? Are these changes significant?

Consider the following questions to guide you in formulating your response:

- *Is the Activity multi-phase and/or complex? (Consider: Activity size and expense, timelines, statutory requirements such as impact and environmental assessments, etc.)*
- *Are the potential adverse impacts likely to be of a temporary or permanent nature? If permanent, could there be any barriers to remediation? How so?*
- *What kind of land is being used – previously untouched? Building on previously excavated/developed land?*
- *Is there any past or present access to the relevant area by Indigenous groups? Will the Activity change land use or access to the relevant area? If so, explain.*
- *Are there any aspects of the proposed Activity that could have an impact on any structure, site or thing that is of historical, archaeological, paleontological or architectural significance? If so, explain.*
- *Are there any other Activities occurring in the same area? Is this Activity likely to have any cumulative effects in combination with other Activities in the same or surrounding area?*
- *Have any environmental or other assessments of the proposed Activity or for similar activities in the vicinity of the proposed Activity been carried out? If so, what adverse impacts on rights are revealed, if any, by these assessments?*

Response: There are no expected permanent changes to the current condition or use of land (including coastal and marine area), air, water and resources. The exercises are temporary, and will only be taking place for a few days at each location.

There are no expected significant adverse effects on air, land or water due to Op NA-TU 2022 and Op NA-NK 2022 after proposed mitigation measures are in place.

2. Other factors indicating potential impacts on rights

If only for broader awareness at this pre-consultation stage, consider the following questions to guide you in formulating your response:

- *Is there any active litigation in which an Indigenous group claims Aboriginal rights, title or Treaty rights with respect to the relevant area?*
- *Is there a real or actual prospect of litigation in the relevant area?*
- *Are ongoing consultations with Indigenous groups taking place in relation to other DND/CAF Activities in the relevant area?*
- *Are you aware of any consultation processes underway involving the same Indigenous group about another Crown Activity or one where the Crown is engaged?*
- *Are you aware of how the consultation is proceeding, i.e., is the relationship between DND/OGDs and the Indigenous group positive, strained, or adversarial?*

***Note:** If you are uncertain, contact Director General Indigenous Affairs, a local knowledgeable DND subject matter expert on Indigenous rights and interests, or regional subject matter experts of Consultation and Information Service (CIS).*

Response: Consultation wrt DND activities for the annual Op NANOOK exercise is carried out by Joint Task Force North (JTFN). Consultation with indigenous communities for 2022 is ongoing. The first Indigenous Engagement Session took place on 12 May 2022 with representatives of QIA and KIA. At that session, JTFN were informed that Pond Inlet will be in open water and prime harvesting season during the time RCN is there. QIA asked for more information regarding the activities at Pond Inlet for this time period, specifically what activities will be undertaken and where.

Consultation with communities within the LILCA is being carried out by the CFB Goose Bay Real Property Operations Detachment.

C: Potential Adverse Impacts:

X	Based on the Activity as planned, there are likely **no potential adverse impacts** on the potential or established Aboriginal or Treaty rights. *Proceed to Step 4*.
	Based on the Activity as planned, **there are likely potential adverse impacts** on the potential or established Aboriginal or Treaty rights. *Proceed to Step 4*.

STEP 4: DUTY TO CONSULT DETERMINATION

On the basis of this initial analysis and research, it has been determined that: *[Select one of the following]*

	Unlikely that a duty to consult will be triggered. For example, no adverse impact is anticipated. (NOTE: Even if this is the determination, DND will have to reassess as the project moves forward in case the situation changes).
X	**A duty to consult does exist or likely exists**: the Contemplated Crown conduct, as planned, may adversely impact potential or established Aboriginal or Treaty rights.

SIGNATURE BLOCKS (OPTIONAL)

Duty to Consult Determination Prepared by Activity OPI:

Name: **Title:**

_____ _____

Signature Date (dd-mm-yyyy)

Duty to Consult Determination Reviewed by DGIA Consultation Analyst:

Name: **Title:**

_____ _____

Signature Date (dd-mm-yyyy)

Duty to Consult Determination Accepted and Approved by Decision-maker of Activity:

Name: **Title:**

_____ _____

Signature Date (dd-mm-yyyy)

TERMINOLOGY

Aboriginal vs **Indigenous**: The term "**Indigenous**" is now commonly used throughout government when referring to First Nations, Inuit, and Métis peoples. It is a term used to encompass a variety of Indigenous groups with international and global recognition. The term "**Aboriginal**" continues to be used in the Canadian context, however, particularly when referring to legal concepts such as rights, because many Canadian laws, including the *Constitution Act, 1982*, refer to the "aboriginal peoples of Canada" and "aboriginal rights".

Aboriginal rights: Practices, traditions and customs integral to the distinctive culture of the Indigenous group claiming the right that existed prior to contact with the Europeans. In the context of Métis groups, Aboriginal rights means practices, traditions and customs integral to the distinctive culture of the Métis group that existed prior to effective European control, that is, prior to the time when Europeans effectively established political and legal control in the claimed area. Generally, these rights are fact and site specific.

Aboriginal title: An Aboriginal right to the exclusive use and occupation of land. It is possible that two or more Indigenous groups may be able to establish Aboriginal title to the same land.

Activity (see also Crown conduct): any Crown or proponent undertaking, application, proposal, project, regulatory, policy or other initiative or decision that is contemplated. This also includes strategic and higher-level decisions.

Capacity: It is the ability of Indigenous groups to understand the nature of the Activity the Crown or proponent is contemplating and how that Activity might adversely impact their potential or established Aboriginal or Treaty rights.

Comprehensive land claim: Comprehensive land claims are a type of modern treaty that deal with the unfinished business of treaty-making in Canada through a negotiation process. These claims arise in areas of Canada where Aboriginal land rights have not been dealt with by past treaties or through other legal means. In these areas, forward-looking modern treaties are negotiated between the Indigenous group, Canada and the province or territory. Comprehensive land claim negotiations address concerns raised by Indigenous peoples, governments and third parties about who has the legal right to own or use the lands and resources in areas under claim.

Consultation Protocol: Consultation protocols set out a process for Indigenous groups and governments to follow when the Crown has a legal duty to consult with the Indigenous group. They may also be used to facilitate engagement on other matters of interest and concern to communities. Protocols promote relationship building and clarify the roles and responsibilities between governments and Indigenous communities for future consultation. There are currently consultation protocols in place with a number of Indigenous groups across Canada. Copies of these consultation protocols are publically available on the Aboriginal and Treaty Rights Information System (ATRIS).

Crown: Refers to all government departments, ministries (both federal, provincial and territorial) and Crown agencies.

Crown conduct: Means the exercise of the Crown's jurisdiction and authority whether the Crown may be in charge of the Activity or may be approving an Activity through permits and authorizations. In either context, its actions would constitute Crown conduct.

Crown knowledge: The Supreme Court of Canada stated that the duty to consult arises when the Crown contemplates conduct that might adversely impact potential or established Aboriginal or Treaty rights of which the Crown has real or constructive knowledge.

Cumulative Environmental Effects: The concept of cumulative environmental effects recognizes that the environmental effects of individual human activities can combine and interact with each other to cause aggregate effects that may be different in nature or extent from the effects of the individual activities. Cumulative environmental effects can be characterized as the effect on the environment of a proposed

project when combined with those of other past, existing and imminent projects and activities, and which may occur over a certain period of time and distance.

Duty to Consult: The duty to consult is a constitutional obligation that the government as a whole has towards Indigenous peoples. The Supreme Court of Canada held that provincial and federal governments have a legal obligation to consult when the Crown contemplates conduct that might adversely impact potential or established Aboriginal or Treaty rights.

Engagement: Examples of engagement include discussion groups and formal or informal dialogue, sharing knowledge and seeking input on activities such as policy, legislation, program development or renewal.

Existing Aboriginal and Treaty rights: "Existing" includes potential or established Aboriginal or Treaty rights.

First Nation: A term that came into common usage in the 1970s to replace the word "Indian" which some people found offensive. Although the term First Nation is widely used, no legal definition of it exists. Among its uses, the term "First Nations peoples" refers to the “Indian” peoples in Canada, both Status and non-Status. Some “Indian” peoples have also adopted the term "First Nation" to replace the word "band" in the name of their community.

Indigenous governing body: A council, government or other entity that is authorized to act on behalf of an Indigenous group, community or people that holds rights recognized and affirmed by section 35 of the *Constitution Act, 1982*. *(Source: Indigenous Languages Act* and the *Impact Assessment Act)*

Indigenous group: A community of First Nations, Inuit or Métis people that holds or may hold Aboriginal and Treaty rights under section 35 of the *Constitution Act, 1982*.

Inuit: An Indigenous people in Northern Canada, who live in Nunavut, Northwest Territories, Northern Quebec and Northern Labrador. The word means "people" in the Inuit language, Inuktitut. The singular of Inuit is Inuk.

Métis: For purposes of section 35 rights, the term Métis refers to distinctive peoples who, in addition to their mixed First Nation, Inuit and European ancestry, developed their own customs, and recognizable group identity separate from their First Nation or Inuit and European forebears. A Métis community is a group of Métis with a distinctive collective identity, living together in the same geographical area and sharing a common way of life.

Modern Treaties: Any treaties that have been signed after 1975, called modern treaties or comprehensive land claim agreements between Indigenous groups and Canada. Some modern treaties include provisions setting out applicable consultation processes. If a modern treaty includes a consultation process, those must be followed. If a modern treaty does not include a consultation process, the duty to consult will still apply if the Crown activity could adversely affect Treaty rights.

Proponent: In the Updated Guidelines, proponent refers to industry, foreign governments or any other parties which initiate or propose an Activity.

Reserve: As defined in the *Indian Act*, a tract of land, the legal title to which is vested in Her Majesty the Queen in Right of Canada and that has been set apart by Her Majesty for the use and benefit of a First Nation.

Traditional territory: Any designated lands and boundaries to which First Nations, Métis and Inuit communities claim or have established traditional use or occupation.

Treaty rights: Rights that are defined by the terms of a historic Treaty, rights set out in a modern land claims agreement or certain aspects of some self-government agreements. In general, Treaties (historic and modern) are characterized by the intention to create obligations, the presence of mutually binding obligations and a measure of solemnity. A treaty right may be an expressed term in a Treaty, an implied term or reasonably incidental to the expressed Treaty right. The scope of Treaty rights will be determined by their wording, which must be interpreted in accordance with the principles enunciated by the Supreme Court of Canada.

Where the parties disagree on the scope of obligations or what rights are provided for, a number of principles unique to Treaty interpretation apply. For example, Treaties should be liberally construed; ambiguities ought to be resolved in favour of the signatories in the context of historic Treaties; the goal of Treaty interpretation is to find the common intention and the result that best reconciles the interests of both parties at the time the Treaty was signed; the integrity and Honour of the Crown is presumed in such interpretations; the courts cannot alter the terms of the Treaty and Treaty rights cannot be interpreted in a rigid or static way as they must be updated to provide for modern exercise.

Trigger: The duty to consult is triggered when all three elements that are necessary for duty to consult are present. Specifically, a contemplated Crown conduct, a potential or established Aboriginal or Treaty right, and a potential adverse impact on those rights..

With or Without Prejudice: Describes the nature of communications, either written or verbal. To designate a communication as "without prejudice" is to declare that the party does not waive its right to non-disclosure of the communication. Such communications may be referred to as being "off- the-record". This term is often used during negotiations and litigation. Should there be a request that consultations be without prejudice or off-the-record discussion, advice from legal counsel should be sought.

In the context of consultation, if agreements or protocols are being entered into for the purposes of meeting Crown obligations to consult, it is recommended that the agreement and any communications taking place with the Indigenous group be "with prejudice". With prejudice means that the Crown can use this documentation and the communications in court as evidence that it has fulfilled its duty to consult, and that the Indigenous group may use the documentation in relation to its legal positions. Such communications may be referred to as being "on-the-record".

Terminology Sources: Except where indicated, the main source is *Aboriginal Consultation and Accommodation Updated Guidelines for Federal Officials to Fulfill the Duty to Consult, March 2011,* which was revised and updated January 2021 by Department of Justice, Office of the Legal Advisor to the Department of National Defence and the Canadian Forces (DND/CF LA) for the purposes of the Guided Template – Duty to Consult Determination.

RESOURCES

Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) and the duty to consult

Government of Canada departments and agencies are responsible for understanding how and when their activities could have an adverse impact on Aboriginal and treaty rights. The department (CIRNAC) coordinates and advises federal officials on the duty to consult by:

- providing policy direction on consultation practices
- sharing information on Indigenous groups, agreements, claims and more through the Aboriginal and Treaty Rights Information System (ATRIS) and the Consultation Information Service (CIS)
- developing partnerships with Indigenous groups and organizations
- supporting coordination with provinces, territories and industry partners
- delivering training and guidelines to federal officials on the legal duty to consult

Aboriginal and Treaty Rights Information System (ATRIS)

Provides users with information on treaties or agreements and claims processes and associates it with geographic locations or Indigenous groups on a map, increasing the accessibility of up-to-date, site-specific information on the established or potential rights of Indigenous groups.

Consultation and Information Service (CIS)

Provides information to federal officials and other interested parties on the location and nature of established and potential Aboriginal and Treaty rights.

CIS regional subject experts are available to assist federal employees and other stakeholders who require additional information or have questions about ATRIS content.

Aboriginal Consultation and Accommodation - Updated Guidelines for Federal Officials to Fulfill the Duty to Consult - March 2011.

Part C provides a detailed step-by-step guide to the four phases of consultation and accommodation.

Director General Indigenous Affairs (DGIA)
Provides DND/CAF- specific policy advice on consultation and accommodation. For advice, please contact Director General Indigenous Affairs (DGIA): IndigenousAffairs-AffairesAutochtones@forces.gc.ca

Department of Justice, Office of the Legal Advisor to the Department of National Defence and the Canadian Forces (DND/CF LA)
DND/CF LA is part of the Department of Justice. DND/CF LA provides legal advice on the legal duty to consult to DND/CAF. Requests for legal advice regarding the legal duty to consult for your project or Activity should be directed to AboriginalLaw-DroitAutochtone@forces.gc.ca. Please include the completed Guided Template analysis, any guidance received from the Director General of Indigenous Affairs (DGIA) in ADM(IE) if applicable, and inform or copy DGIA IndigenousAffairs-AffairesAutochtones@forces.gc.ca on your request.

Annex F – Acronyms

Acronyms

AAR	Arctic Acoustic Recorder
ADM(IE)	Assistant Deputy Minister (Infrastructure and Environment)
AFFF	Aqueous Film Forming Foam
AIS	Alien Invasive Species
ATRIS	Aboriginal and Treaty Rights Information System
ATV	All-terrain vehicle
AUV	Autonomous Underwater Vehicle
AWPPA	Arctic Waters Pollution Prevention Act
BEA	USCG BEAR
BC	Black Carbon
BRS	Behavioural Response Study
C	Cargo
CA	Conservation Area
CAF	Canadian Armed Forces
CCG	Canadian Coast Guard
CEE	Controlled Exposure Experiment
CEPA 1999	Canadian Environmental Protection Act, 1999
CFB	Canadian Forces Base
CFCs	Chlorofluorocarbons
CH	Canadian Helicopter
CH_4	Methane
CO	Carbon monoxide
CO_2	Carbon dioxide
COMREL	Community Relations
CP	Canadian Patrol
C.R.C	Consolidated Regulations of Canada
CTG	Command Task Group
DAOD	Defense Administration Orders and Directives
DCC	Defence Construction Canada
dB	Decibel
DDEED	Due Diligence Environmental Effects Determination
DEES	Defence Environment and Energy Strategy
DFO	Department of Fisheries and Oceans
DHC	Defence Helicopter Command
DND	Department of National Defense
DRDC	Defence Research and Development Canada
DUSN	Distributed Underwater Sensor Network
EA	Environmental Assessment
ECCC	Environment and Climate Change Canada
EED	Environmental Effects Determination
EMATT	Expendable mobile anti-submarine warfare training target
ESUS	Electronic Signal Underwater System
FDU	Fleet Diving Unit
FOL	Forward Operating Locations

FS	French Ship
GBY	HMCS GOOSE BAY
GHS	Globally Harmonized System of Classification and Labelling of Chemicals
GIS	Gascoyne Inlet Camp
GL	Greenland
GoC	Government of Canada
HBFCs	Hydrobromofluorocarbons
HCFCs	Hydrochlorofluorocarbons
HDMS	His Danish Majesty's Ship
HDW	HMCS HARRY DEWOLF
HELRAS	Helicopter Long Range Active Sonar
HFX	Halifax
HIFR	Helicopter Inflight Refuelling
HMS	Her Majesty's Ship
HQ	Headquarters
HSITT	High Speed Inflatable Towed Target
HSPT	High Speed Plastic Target
IAA	Impact Assessment Act
IIBA	Inuit Impact and Benefit Agreement
IMO	International Maritime Organization
IMOEX	Maritime Interdiction Operations Exercise
INS	Inertial navigation system
IRS	Ionizing Radiant Sources
ISLANDS	Integrated Surveillance via Layered Arctic Networked Defence Sensors
JBNQA	James Bay and Northern Quebec Agreement
JRCC	Joint Rescue Coordination Centre
JSS	Joint Support Ship
JTFA	Joint Task Force Atlantic
JTFN	Joint Task Force North
KIN	Kingston
LCdr	Lieutenant Commander
LOTS	Logistics-over-the-shore
LRAT	Long-Range Underwater Acoustic Communication Trial
MAR	HMCS MARGARET BROOKE
MARLANT	Maritime Forces Atlantic
MARLOAs	Maritime Local Operating Areas
MARL SE	Maritime Forces Atlantic Safety and Environment
MARPAC	Maritime Forces Pacific
MARPS	Maritime Autonomous and Remotely Piloted Systems
MAZ	Mitigation Avoidance Zone
MBS	Migratory Bird Sanctuary
MCDV	Maritime Coastal Defence Vessel
ME	Maritime Evaluation
MEPC	Marine Environmental Protection Committee
MGPA	Marine Growth Prevention Systems
MH	Maritime Helicopter

MPA	Marine Protected Area
NA	NANOOK
NAVORD	Naval Orders
NAVWARN	Navigational Warning
NIRB	Nunavut Impact Review Board
NL	Newfoundland and Labrador
NLCA	Nunavut Land Claims Agreement
NMCA	National Marine Conservation Area
NMCM	Naval Mine Countermeasures
NMR	Nunavik Marine Region
NNF	Nanisivik Naval Facility
NORAD	North American Aerospace Defence Command
NORDREG	Vessel Traffic Reporting Arctic Canada Traffic Zone
NOx	Nitrogen oxide
NOTAM	Notice to Airmen
NOTMAR	Notice to Mariners
NMFS	National Marine Fisheries Service
NS	Nova Scotia
NU	Nunavut
NWP	Northwest Passage
NWT	Northwest Territories
ODS	Ozone depleting substances
Op	Operations
OGD	Other government department
OPAREAS	Operation Areas
PM	Particulate matter
Pa	Pascal
PPE	Personal protective equipment
PRO	HMS PROTECTOR
PTS	Permanent Threshold Shift
R&D	Research & Development
RCN	Royal Canadian Navy
RCMP	Royal Canadian Mounted Police
RF	Radio Frequency
RHIB	Rigid hull inflatable boat
RHO	FS RHONE
ROV	Remote operated vehicle
SEMS	Safety and Environmental Management System
SAR	Search and Rescue
SARA	Species at Risk Act
SEEMP	Ship Energy Efficiency Management Plan
SEL	Sound Exposure Level
SOP	Standard Operating Procedure
SOR	Statutory Orders and Regulations
SO_x	Sulphur Oxide
TRAPS	Towed Reelable Active Passive Sonar

TRI	HDMS TRITON
TTS	Temporary Threshold Shift
TU	TUUGAALIK
UAV	Unmanned aerial vehicles
US	United States
USCG	United States Coast Guard
USV	Unmanned surface vessel
UWW	Underwater warfare
VEC	Valued Ecosystem Component
VIC	Victoria
VPDCR	Vessel Pollution and Dangerous Chemicals Regulation
VOC	Volatile organic compounds
WHMIS	Workplace Hazardous Materials Information