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References:

<i>NTI Research Licence</i>	<i>02 019 23R-M</i>
<i>NPC File No.</i>	<i>150057</i>
<i>NIRB File No.</i>	<i>08DN056</i>

Dear Representative,

Re: DRDC 2023 Annual Report for Northern Watch Technology Demonstration Operations at Nunavut

This letter report is being submitted on behalf of Defence Research and Development Canada (DRDC) and pertains to the activities completed in 2023 as part of DRDC's Northern Watch Technology Demonstration Project (Project).

This letter report provides a summary of the land-use, water-use, and/or research activities completed in 2023 as part of the Project, as required by the applicable land, water, and/or research licences referenced above, as well as an outline of planned activities for the Project in 2024.

This letter report is organized into the following sections:

- Summary of 2023 Activities
- Site Photolog
- Summary of Wildlife Monitoring Activities
- Summary of Planned 2024 Activities

Background

The DRDC Northern Watch Technology Demonstration Project – Canadian Arctic Underwater Sentinel Experimentation (CAUSE) is underway to demonstrate an Arctic maritime surveillance capability to the Department of National Defence and other concerned federal departments.

This multi-year undertaking commenced in 2008 and is based out of Gascoyne Inlet. The surveillance demonstration system is unmanned, semi-autonomous, and remotely controlled through a satellite system connection from one of the DRDC operations centres. Other research and logistical activities are also completed under the Northern Water Technology Demonstration Project in support of CAUSE, such as the collection of directional underwater ambient noise over a one-year period. Some research activities under this permit are also conducted from Royal Canadian Navy (RCN) ships as a separate operation embedded within annual operations organised in the North by the Canadian Armed Forces (CAF).

Summary of 2023 Activities

The following Project activities were completed in 2023:

- Gascoyne Inlet Camp and Northern Array Activities;
- Recovery of the Northern Watch Array;
- Long Range Underwater Acoustic Communications Experiment;
- Maritime Autonomous and Remotely Piloted Systems;

A summary of each Project activity completed in 2023 is provided in the following section.

Gascoyne Inlet Camp and Northern Array Activities

Overall camping activities ran from August 01 to August 31, 2023. There were up to 22 persons at the camp at one time. A map of the camp and nearby points of interest including the local airstrip, observed fuel caches (unrelated to camp activities), and other activities is presented in Figure 1 below:

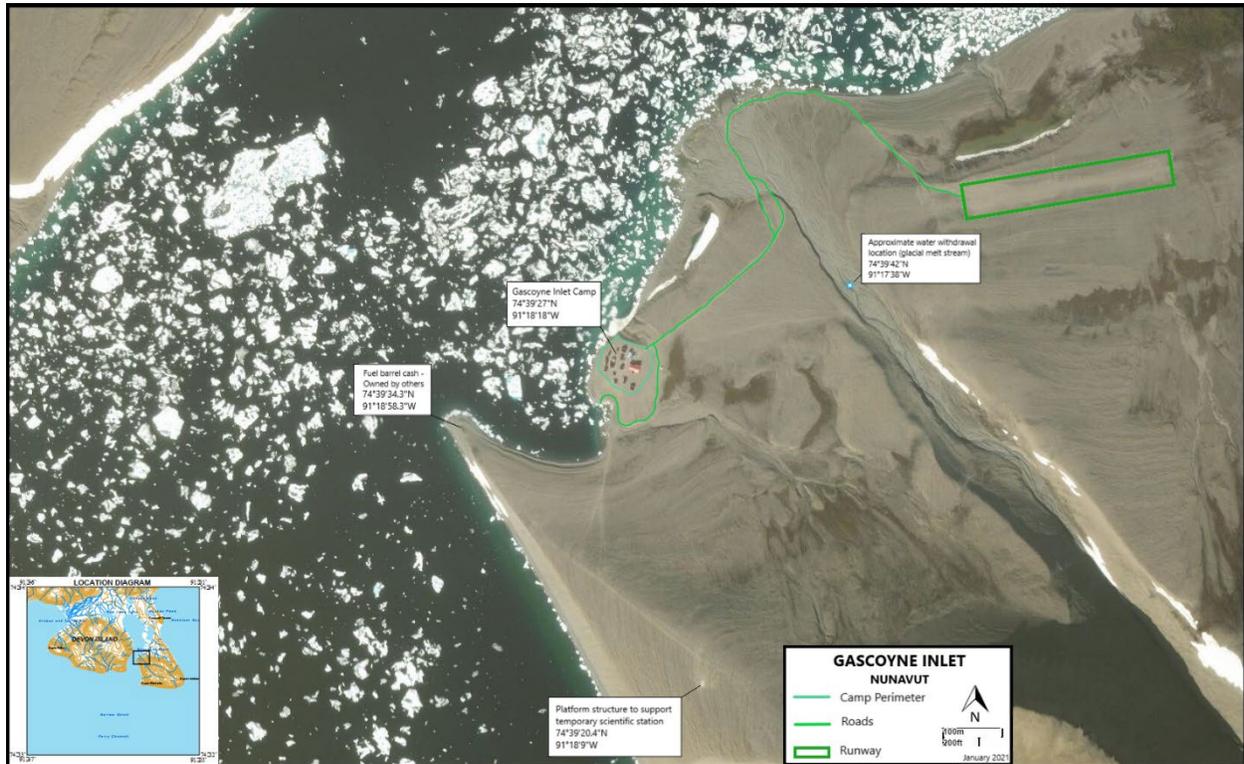


Figure 1 - Location of Gascoyne Inlet Camp and nearby points of interest

Personnel at the camp included DRDC staff, participants from CanmetENERGY (Natural Resources Canada), Omnitech Electronics, and a contracted cook (Jebeaux Catering). Additional logistics support for the camp was coordinated through the Polar Continental Shelf Project (PCSP) based out of Resolute and was not directly retained by DRDC. The pickup of an observer (Gatherers & Hunters Association) from Arctic Bay failed as the contracted at-sea transport was canceled due to ship availability. No other local hires and/or initiatives were completed as part of the Project in 2023.

Camp maintenance activities included the opening and repair/maintenance of the camp's buildings and equipment, performance of a safety inspection, and closing of the camp.

Research activities included refurbishment and reset of green power and energy systems (e.g., wind turbines, solar panels, fuel cells), installation of infrasonic equipment, refurbishment and reset of the onsite camera system, recovery and redeployment of oceanographic sensors in Gascoyne Inlet, and data collection and a system check of the subsea acoustic array cabled to the Gascoyne Inlet Camp. This array is one of two acoustic arrays used as part of the Project.

Recovery of the Northern Watch Array

One of two Project acoustic arrays located on the seabed just outside of Gascoyne Inlet were intended to be recovered by DRDC. These activities were supported by the Canadian Coast Guard (CCG) vessel *Pierre Radisson* using a remotely-operated vehicle (ROV). Approximate bounding coordinates where the activity took place include (latitude and longitude): 74.580278, -86.966389; 74.580278, -88.196667; 74.702222, -86.966389; and 74.702222, -88.196667. Only a partial recovery of approximately 600 metres of array cable was completed due to high winds during the activity period. Recovery activities ran from August 15 to 21 2023.

Long Range Underwater Acoustic Communications Experiment

Two Distributed Underwater Sensor Network (DUSN) listening nodes, two additional recorders, and a transmitting node were deployed in Lancaster sound. The objective of the deployment was to collect acoustic and non-acoustic information regarding long-range noise transmission by a team of up to eight (8) DRDC personnel, as well as CCG support staff. Communications tests were completed up to two (2) kilometres (km) from the nodes using the CCG vessel *Pierre Radisson* and a DRDC support boat. Approximate coordinates where the activity took place are presented in Table 1 below:

Table 1 – DUSN Deployments in 2023

Mooring	Latitude °N	Longitude °W
CTD Array	74.4933	-91.3340
icListen short	74.5019	-91.3673
icListen long	74.4838	-91.3683
DUSN 2/12	74.4842	-91.3002
DUSN 1/7	74.5023	-91.3027

The DUSN nodes all other equipment except the small concrete seabed anchors were recovered after the trial by the CCG vessel *Pierre Radisson*. Research activities ran from August 15 to 21 2023.

Maritime Autonomous and Remotely Pilot Systems

An autonomous underwater vehicle (AUV) and an ROV were deployed in the vicinity of the Gascoyne Inlet Camp by a team of four (4) DRDC personnel. The AUV was deployed to test the effectiveness of inertial navigation systems. Approximate coordinates where the activity took place include (latitude and longitude): 74.65965, -91.307094; all activities took place within the originally planned area. The ROV was used to perform a high frequency (450 kilohertz) side scan sonar sweep to perform a survey of the seabed. The AUV, ROV, and DUSN nodes were recovered after the trial by the CCG vessel *Pierre Radisson* and a DRDC support boat. Research activities ran from August 19 to 26, 2023.

Site Photolog

Photos documenting the site conditions and/or activities involved as part of the 2023 Project activities are provided in the following section.



Photo 1 - Aerial view of Gascoyne Inlet Camp on day of exit



Photo 2 - Additional photo of Gascoyne Inlet camp on day of exit



Photo 3 - Additional photo of Gascoyne Inlet camp on day of exit



Photo 4 - Example of maintenance of camp facilities



Photo 5 - Drone image of a polar bear that spent considerable time around the camp



Photo 6 - Drone image of polar bears near camp



Photo 7 - Drone photo of glacial water source



Photo 8 - View of camp fuel cache and containment



Photo 9 - Relocating structure back from shoreline



Photo 10 – Small (support) work boat for AUV operations



Photo 11 – Bear observed swimming near small work boat (on shore)



Photo 12 – Bear observed swimming near small work boat (on shore)



Photo 13 – Acoustic recorders for the Long Range Acoustic Communication Experiment (yellow/grey box units and blue units in left of frame)



Photo 14 – Acoustic projector being setup for the Long Range Acoustic Communication Experiment

Summary of Wildlife Monitoring Activities

Wildlife spotted near the camp this year generally included multiple polar bears, a muskox, hundreds of seals, a walrus, many beluga, a few ravens, and an arctic hare. Extremely large flocks of fulmar hung around the inlet following schools of arctic cod.

An increase in polar bear activity was also observed near the camp this season. It is difficult to determine how many individual bears were spotted, but it was estimated as seven based on their various sizes. Notably, a mother and cub were observed in the camp area between 2 and 3 August 2023. An apparently juvenile bear returned to the camp on 20 August 2023 and remained for 11 days in the area the mother and cub had been sighted. The camp team guessed this could be the cub, recently parted from the mother, and returning to a site where they had previously visited. The bear spent most nights at a point 800 metres southeast of the camp and kept to itself. DRDC procedures for wildlife mitigation were adhered to and no adverse effects were noted.

Shore-based wildlife watch observations during the Maritime Autonomous and Remotely Pilot Systems noted a juvenile polar bear swimming in the water near the smaller work boat during the AUV operation. As a mitigation measure, the small work boat maintained a large standoff distance. Soon after the sighting the polar bear returned to land; the shore-based wildlife watch informed the small work boat that it was safe to resume AUV operations.

A summary of wildlife observations for 2023 for this Project is provided in Table 2 below. It is emphasized that the scope and resources of the Project do not necessarily provide for explicit monitoring and evaluation of critical life history events (e.g., calving, mating, denning, nesting, migration) for each activity, beyond those observations recorded during the primary research activities or camp operation. Further, the DRDC field team does not generally include a trained or certificate biologist (except as required for a specific research activity) and therefore the observations noted below should be considered descriptive and not definitive.

Table 2 - Summary of Wildlife Observations in 2023

Date	Wildlife and Quantity	Location
01-Aug-2023	1 Beluga	Radstock Bay
02-Aug-2023	2 Polar bears (female and cub)	Headed E past camp, spent night 800m SE of camp
03-Aug-2023	2 Polar bears (female and cub)	Headed SW into water
04-Aug-2023	1 Bumblebee	
05-Aug-2023	1 Polar bear 1 Seal	Around camp Gascoyne Inlet
11-Aug-2023	13 Beluga 1 Seal	Gascoyne Inlet
13-Aug-2023	1 Seal	Gascoyne Inlet
14-Aug-2023	1 Polar bear	Headed SE of camp over hills
15-Aug-2023	1 Polar bear	NW corner of camp perimeter
18-Aug-2023	1 Musk ox	Radstock Bay
19-Aug-2023	1 Polar bear 50 Beluga Many seals	Gascoyne Inlet
20-Aug-2023	Many arctic hare Many seals 1 Polar bear ~15 Beluga	Around camp Gascoyne Inlet
21-Aug-2023	~20 Beluga 1 Seal 1 Walrus	Gascoyne Inlet
22-Aug-2023	1 Polar bear 1 Seal	Gascoyne Inlet
23-Aug-2023	1 Polar bear 6 Beluga 3 Seal	Around camp, later wandering around hill 800m SE of camp. Gascoyne inlet
24-Aug-2023	1 Polar bear 1 Seal 1 Musk ox	Around camp
25-Aug-2023	1 Polar bear	Sleeping around camp
26-Aug-2023	1 Polar bear	Around camp
27-Aug-2023	2 Polar bears (adult and adolescent) 2 Seals 1 Beluga	Gascoyne Inlet
28-Aug-2023	1 Polar bears 1 Beluga	Around camp
29-Aug-2023	1 Polar bears ~40 Seals Schools of arctic cod	Around camp Gascoyne Inlet Around camp
30-Aug-2023	2 Beluga (adult and yearling) Schools of arctic cod 1000's of Fulmar (seabirds) ~200 Seals 1 Polar bear	Around camp (shore) Around camp (shore) Gascoyne Inlet Gascoyne Inlet Around camp
31-Aug-2023	~100 Seals 1 Beluga 1 Polar bear	Gascoyne Inlet Gascoyne Inlet Around camp

Impact Assessment

In several instances, polar bears were identified approaching the camp and which required use of deterrents. Specific causes for animal encroachment were not identified beyond simple curiosity or a return to previously-visited areas. Deterrents including electric fences and/or scare cartridges (i.e., “bear bangers”) were used to deter the animals from approaching any further. Visual observations of the bears did not indicate any obvious health concerns.

The Project stakeholders have endeavored to comply with all the terms and conditions required by applicable permits and Acts, Regulations and Guidelines. Specific procedures and mitigation measures used to minimize or mitigate potential impacts from Project activities included:

- briefing DRDC staff on all the terms and conditions of licencing including the archaeological and palaeontology requirements;
- forbidding hunting or fishing without a Nunavut fishing licence;
- managing and securing all food and food waste to mitigate detection and access by local wildlife;
- ensuring vehicle refueling and lubrication processes were handled with care, including use of drip trays as appropriate;
- stacking all camp building materials neatly at the conclusion of the activities;
- identification and communication of observed wildlife and making efforts to avoid those areas where possible;
- limiting use and areas of travel for vehicles;
- providing pre-travel training to camp team leads on wildlife interactions (notably for bears); and
- following a safety plan for polar bears sighted close to camp; plan details included verification and maintenance of bear fences and other deterrence to ensure they are in good condition, procedures to cease work and/or bring staff indoors, and procedures for use and escalation of deterrence methods to be used, if any and as appropriate.

Overall mitigation measures described above are understood to have been reasonably effective in 2023 and will be included, and refined, as part of future camping planning activities.

Summary of Planned 2024 Activities

The following Project activities are planned for 2024:

- Gascoyne Inlet Camp and Northern Array Activities
- Recovery of Northern Watch Array
- Seabed Survey of Gascoyne Inlet for Long-Term Arctic Infrastructure
- Sonobuoys Deployment
- Oceans Network Canada Ocean Observatory Upgrade

A summary of each Project activity planned for completion in 2024 is provided in the following section.

Gascoyne Inlet Camp

Description: This work is a continuation of the work under research licence 02 019 23R-M. Planned logistical activities include opening and repair/maintenance of the camp’s buildings and equipment, performance of a safety inspection, and closing of the camp. Planned research activities include setting up camp and research continued through Canadian Coast Guard Vessel Supported Activities.

Location: Gascoyne Inlet Camp.

Duration: 5 weeks.

Support Platform: Gascoyne Inlet Camp, supported by Resolute Bay.

Environmental Assessment: Completed in 2023 and being reviewed for 2024.

Recovery Of Northern Watch Array

Description: In 2024, Under the Northern Watch Project, two acoustic arrays were deployed on the seabed outside Gascoyne Inlet. The two arrays are cabled back to the Gascoyne Inlet Camp. One of these arrays is planned to be recovered in 2024. The recovery will be supported by a CCG vessel, potentially using a ROV.

Location: Lancaster Sound, with bounding coordinates as follows (latitude and longitude):

74.580278, -86.966389; 74.580278, -88.196667; 74.702222, -86.966389; and 74.702222, -88.196667

Duration: Estimated 4-5 Days.

Support Platform: Gascoyne Inlet Camp, CCG Support Vessel.

Environmental Assessment: Completed in 2023 and updated in 2024.

Seabed Survey of Gascoyne Inlet for Long-Term Arctic Infrastructure Monitoring

Description: DRDC will be operating an autonomous underwater vehicle (AUV) and potentially a remotely piloted vehicle (ROV) in the area around Gascoyne Inlet Camp. The seabed survey will be done using a side scan sonar and passive magnetic measurements of the seafloor will be collected. Two seafloor objects will be deployed and will remain on the seafloor for approximately four years, with a scheduled recovery in August 2028.

Location: Gascoyne Inlet, coordinates as follows (latitude and longitude):

74.659594, -91.330392

Duration: 12 days

Support Platform: Small boat, Gascoyne Inlet camp, Canadian Coast Guard Vessel

Environmental Assessment: Completed in 2023 and updated in 2024.

Sonobuoys Deployment

Description: The main objective is to assess how this environment is amenable to conducting multi-static anti-submarine warfare operations/exercises. This activity will consist of deploying one active (565) sonobuoy in a field of passive (53F) sonobuoys with a passive reflector (Passive Acoustic Target System [PATS]).

Location: Lancaster Sound, with bounding coordinates as follows (latitude and longitude):

74.580278, -86.966389; 74.580278, -88.196667; 74.702222, -86.966389; and 74.702222, -88.196667

Duration: 1 day.

Support Platform: Canadian coast guard vessel, Gascoyne Inlet Camp

Environmental Assessment: Completed in 2023 and updated in 2024.

Oceans Network Canada Ocean Observatory Upgrade

Description: The existing ocean mini-observatory previously deployed by Oceans Network Canada approximately 8 years ago will be recovered for the purposes of upgrading the unit.

Location: Gascoyne Inlet, coordinates as follows (latitude and longitude):

74.659883, -91.3104

Duration: 2-3 days.

Support Platform: Potentially a CCG barge, support work boat, and land equipment (Gascoyne Inlet Camp).

Environmental Assessment: Completed in 2024.

We trust the information provided is sufficient for your records. Please feel free to contact the undersigned if you have any questions or comments.

Sincerely,

Patrick Sangster

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