

## 2022 NON-TECHNICAL ANNUAL REPORT IQALUIT MARINE INFRASTRUCTURE – NUNAVUT RESEARCH INSTITUTE LICENCE #01-005-21R-M

### 1 Project Overview

Construction of two marine facility infrastructure projects in Iqaluit began in 2018 and construction was substantially completed at the end of the 2022 open water season. Led by the Government of Nunavut (GN) - Community and Government Services (CGS), ownership and responsibility will transfer to the GN - Economic Development and Transportation (EDT) once operational.

Iqaluit is located on southern Baffin Island, Frobisher Bay, Koojesse Inlet (see Figure 1 in Attachment 1). The marine facility infrastructure projects include the Deep Sea Port (DSP) and the Small Craft Harbour (SCH), which occupy both the western and eastern shores of Koojesse Inlet. Along the western shore is the development of a new DSP, and three of the SCH facilities which are: the improvements to the existing causeway, construction of a snowmobile ramp, and a parking area for the causeway. Along the eastern shore, also considered part of the SCH project, there have been improvements to the municipal breakwater, construction of a North breakwater, and two new removable floats for small vessels. Collectively the DSP and SCH Projects are referred to as the Iqaluit Project. Schematics of the DSP and SCH facilities are available on the Nunavut Planning Commission (NPC) or Nunavut Impact Review Board (NIRB) registry.

Field work for the Iqaluit Project, has been permitted through Nunavut Research Institute (NRI) since 2016 (Table 1-1). The initial field program was to support the existing conditions study for the collection of environmental and geotechnical data to support permitting and engineering design. Field programs in support of the offset plan requirements for the Fisheries Act Authorizations (FAAs) issued by Fisheries and Oceans Canada – Fish and Fish Habitat Protection Program (DFO-FFHPP) (termed the Iqaluit Offset Field Program) have been conducted since 2018 and will continue until 2026.

This document provides a summary of the 2022 Iqaluit Offset Field Program and presents the plans for the 2023 field season. Data collected as a part of the Iqaluit Offset Field Program may be shared with interested parties upon request. NRI will be notified of publications resulting from the data collected.

Table 1-1 Nunavut Research Institute Permit History

Year	Program Intention	Activities	Regulatory requirement for field program	NRI Permit No.
2016	Existing Conditions to support permitting and engineering	Environmental and geotechnical study to support baseline report for territorial and federal permitting	Nunavut Planning Commission (NPC) Project application, federal regulators (e.g. DFO); Inform engineering from geotechnical study	01-034-16N-M
2017		No field work	--	--
2018	Offset Plan for FAA	Pre-construction monitoring and Pilot Study Research Program 1 for the DFO FAA	DFO FAA	01-024-18R-M
2019	Offset Plan for FAA	Pilot Study Research Program 1 for the DFO FAA	DFO FAA	01-011-19R-M
2020	Offset Plan for FAA	Pilot Study Research Program 1 for the DFO FAA Preparation for Year 1 of Arctic Char diet study	DFO FAA	01-002-20R-M
2021		No field work	--	01-005-21R-M
2022	Offset Plan for FAA	Year 1 for Intertidal and ROV Subtidal surveys (Monitoring Program)	DFO FAA	01-005-22R-M
		Year 1 for Arctic Char diet study (Research Program 1)		
		Year 1 for seaweed habitat study (Research Program 2)		
2023	Offset Plan for FAA	Year 2 for Arctic Char diet study (Research Program 1) Inuit Qaujimagajatuqangit (IQ) Program (Research Programs 1 and 2)	DFO FAA	TBD
2024	Offset Plan for FAA	Year 3 Continuation of Post-construction monitoring	DFO FAA	TBD
2026	Offset Plan for FAA	Year 5 Continuation of Post-construction monitoring	DFO FAA	TBD

## 2 Program Name

Iqaluit Offset Field Program

## 3 Proponent and Representative Details

Contact information for the proponent and representative are provided in Table 3-1.

Table 3-1 Proponent and Contact Information

Contact Category	Details
<b>Name of Business / Company</b>	Government of Nunavut – Community and Government Services (CGS)
<b>Name of Proponent</b>	Justin McDonell, Project Manager – Capital Projects Division
<b>Proponent Mailing Address</b>	PO Box 1000, Station 200 Iqaluit, Nunavut X0A 0H0 Phone: 867-975-5441 Email: <a href="mailto:JMcDonell@GOV.NU.CA">JMcDonell@GOV.NU.CA</a>
<b>Name of Consultant / Primary Contact</b>	Victoria Burdett-Coutts, Marine Biologist, M.Sc., R.P.Bio.
<b>Consultant Mailing Address</b>	Dynamic Ocean Consulting Ltd 1490 Union Street Port Moody, British Columbia V3H 3X5 Mobile: 778-839-2372 Email: <a href="mailto:victoria@dynamicocean.ca">victoria@dynamicocean.ca</a>

## 4 Field Program

### 4.1 Program Scope

The Iqaluit Offset Field Program consists of a Monitoring Program (MP) and a Research Program (RP). The RP consists of two programs hereafter referred to as RP1 and RP2.

The objective of the MP is to assess the performance of the SCH and DSP shoreline protection (rip rap boulders) for how it functions as fish habitat. Rip rap boulders provide multi-dimensional habitat where marine organisms can find refuge in the spaces between them and as an attachment substrate for marine vegetation. Furthermore, it provides foraging habitat for fish such as migrating Arctic char and resident sculpin.

The RP is being undertaken as a collaboration between CGS, Advisian, Dynamic Ocean Consulting Ltd (Dynamic Ocean) and the University of British Columbia (UBC). The objective of RP1 is to understand the diet and habitat preferences of important fish species in Nunavut such as Arctic char and sculpin. The objective of RP2 is to understand the biomass and biodiversity of the seaweed bed fronting Iqaluit. RP1 and RP2 are composed of a scientific study, where a graduate student has been onboarded at UBC, joined

with an Inuit Qaujimagatuqangit study and engagement with the Amaruq Hunters and Trappers Association (HTA). The RPs will be accomplished through a collaboration of science and IQ. The IQ component will be facilitated by Advisian’s engagement lead.

## **4.2 Methods**

An Intertidal survey was conducted on the shoreline each and west shoreline of Koojesse Inlet, and subtidal surveys were conducted surrounding the DSP. A georeferenced map of the 2018 intertidal and subtidal transects was developed in advance of the field program and used in the field using the Avenza Program on an iPad. Methodology and the dates of field activities to support the Iqaluit Offset Field Program are provided in Table 4-1.

Table 4-1 2022 Iqaluit Offset Field Program Components

Component	Activity	Methods	Survey Date 2022
Monitoring Program	Intertidal surveys conducted at low tide in the footprint of the SCH and at a nearby reference site.	<ul style="list-style-type: none"> <li>Intertidal surveys were conducted at low tide, with a Transect Survey and a Quadrat Survey.</li> <li>Transect Survey: Nine transects were conducted</li> <li>Field personnel documented habitat characteristics (substrate, organisms) and took GPS positions for future reference.</li> </ul>	September 9, 11, 12, 13
	Subtidal surveys were conducted at low tide in the footprint of the SCH and at a nearby reference site.	<ul style="list-style-type: none"> <li>A local boat operator was subcontracted. The field team operated a remote operated vehicle (ROV) to provide video documentation of the habitat characteristics.</li> </ul>	September 10, 13
Research Program 1	Ninety-four Arctic char were collected from local harvesters in proximity to the DSP and SCH.	<ul style="list-style-type: none"> <li>There is no field work associated with this component, as fish were purchased from local harvesters.</li> <li>In the laboratory technicians collected biological data from each fish (length, weight, sex, maturity status) and collected biological materials (otoliths, section of white muscle, stomach). The biological material was preserved in an appropriate manner for the analysis required and shipped to Vancouver, British Columbia (BC) for processing.</li> </ul>	July 26 – August 10
Research Program 2	Seaweed was collected during intertidal surveys within the footprint of the SCH and DSP.	<ul style="list-style-type: none"> <li>Seaweed samples were collected by hand during intertidal surveys.</li> <li>In the laboratory, seaweeds were weighed and dried prior to packaging for transport back to Vancouver, BC for further processing.</li> </ul>	September 9 – 13

## 4.3 Results and Summary

### 4.3.1 Monitoring Program

Habitat characteristics within the intertidal zone along the western shore of Koojesse Inlet (DSP and causeway) were variable. On the southern shore of Koojesse Inlet, surrounding the proposed DSP footprint, substrate generally consisted of bedrock, boulder and cobble interspersed with sand. Substrates near the causeway were primarily soft substrates (e.g. sand, mud) interspersed with boulder, cobble and gravel. Various species of seaweed were present throughout the intertidal, but predominantly consisted of rockweed (*Fucus sp.*) in variable densities, which was typically associated with higher densities of benthic invertebrates (amphipods, snails, etc.). No fish were observed during intertidal surveys at the DSP and causeway.

Habitat characteristics within SCH footprint were predominantly soft substrate (e.g., sand and mud). Boulder density was limited as boulder removal was a component of the SCH construction. Marine vegetation consisted primarily of loose rockweed in low density. Invertebrate observations were limited to occasional amphipods, barnacles and snails. Amphipods were observed and associated with higher densities either when structural substrate was present (boulders) or when depressions in the sand allowed for increased inundation relative to the surrounding areas that were 'out of water' at low tide.

Subtidal habitat characteristics surrounding the DSP were primarily sand with boulders occurring in moderate (30% to 50% coverage) density. Boulders were generally covered with a green algae film. Other seaweed observed were primarily kelp species including sugar kelp (*Saccharina latissima*), sieve kelp (*Agarum clathratum*), and ribbon kelp (*Alaria marginata*).

Representative photos of the DSP and causeway intertidal, SCH intertidal and ROV subtidal surveys are provided in Photo 4-1, Photo 4-2 and Photo 4-3.



Photo 4-1 Deep Sea Port and Causeway Intertidal Photo Panel: a) Transect 4, Quadrat 1; b) Transect 1; c) Transect 4 Overview



Photo 4-2 Small Craft Harbour Intertidal Photo Panel: a) Transect 4, Quadrat 3; b) Breakwater Transect 7; and c) Transect 5 Overview



Photo 4-3 Deep Sea Port Subtidal Photo Panel: a) Sea Cucumbers, Transect 1b; b) Kelp, Transect 1c; c) Kelp Bed, Transect 8a; and d) Overview, Transect 1

## **4.3.2 Research Program**

### **4.3.2.1 Research Program 1 – Scientific Study**

Ninety-four Arctic char were collected in 2022. Arctic char were purchased from a local harvester and processed in the DFO laboratory in Iqaluit. Fish were assessed for condition and size, and tissue was sampled to test for evidence of consuming the types of prey associated with shallow benthic macroalgal meadows (e.g., amphipods). Tissue samples and stomachs were dissected and shipped to Vancouver, BC for further analysis. Samples have been sent for genetic and gut contents analysis. Results of RP1 are not yet available at the time of this NRI report.

#### **4.3.2.2 Research Program 1 - Inuit Qaujimagatuqangit**

No IQ component was undertaken in 2022. An IQ program is planned for 2023.

#### **4.3.2.3 Research Program 2 – Scientific Study**

Field collections for RP2 were undertaken during the intertidal field surveys for the MP. Seaweed samples were dried, weighed and returned to Vancouver, BC for processing by UBC. Samples collected in 2022 will be identified, along with associated invertebrates, and will be analyzed for carbon content to generate length-weight and length-carbon correlations that will allow for estimation of total biomass and carbon for vegetation in Koojesse Inlet.

A drone survey was conducted by Arctic UAV Inc. on behalf of CGS in September 2022, targeting slack tide. This survey will contribute to the habitat mapping exercise being undertaken by the UBC graduate student for RP2. The drone imagery was not available at the time of this NRI report.

#### **4.3.2.4 Research Program 2 - Inuit Qaujimagatuqangit**

No IQ component was undertaken in 2022. An IQ program is planned for 2023.

## **5 Plans for the 2023 Season**

A 2023 field program is expected to be undertaken. We will confirm that the components of the field program are aligned with the NPC Conformity Determination and will otherwise engage NPC to confirm if the NIRB SDR is aligned with the Scope of Work (SoW). The 2023 field program will likely include:

- Year 2 of RP1 will consist of purchasing and processing 60 Arctic char caught by local harvesters in and around the causeway on the western shore of Koojesse Inlet.
- IQ will be undertaken to support RP1 and RP2.

## 6 Conclusion

We trust that this correspondence provides the necessary details required for our annual summary. To reiterate, any data collected over the course of this program will be available upon request for interested parties. Publications on the subject, as they become available, will be provided to the NRI. If you have any questions or require further details, contact information for Victoria Burdett-Coutts at Dynamic Ocean is provided in Table 3-1.

Prepared by:



**Laura Borden, M.Sc., R.P.Bio**  
**Dynamic Ocean Consulting**  
Marine Biologist and Regulatory Professional

Reviewed by:



**Victoria Burdett-Coutts, M.Sc., R.P.Bio**  
**Dynamic Ocean Consulting**  
Senior Marine Scientist and Regulatory Professional



**Diane Pinto, M.Sc.**  
**Advisian**  
Community Engagement and Indigenous Knowledge Researcher

Approved by:



**Chris Meisl, P.Eng.**  
**Advisian**  
Project Manager

**Transportation, Infrastructure & Logistics**  
**US & Advisian Americas**



**Attachment 1**

**Figure**

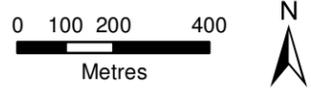
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**Legend**

- Proposed DSP Project
- Proposed SCH Project



Note:  
Coordinate System: NAD 1983 UTM Zone 19N  
Aerial Photo and Basedata from City of Iqaluit, 2016

B SHEET	CUSTOMER:
<b>OneWay</b> to zero harm	
DATE: 04/06/2018	
DRAWN: Y.M.	
EDITED: K.R.	
APPROVED: XX	
*This drawing is prepared for the use of our customer as specified in the accompanying report. WorleyParsons Canada Ltd. assumes no liability to any other party for any representations contained in this drawing.*	

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<b>IQALUIT MARINE INFRASTRUCTURE</b>		
<b>PROJECT LOCATIONS</b>		
WORLEYPARSONS PROJECT No: 307071-01148	FIG No: 1	REV A