POND INLET MARINE INFRASTRUCTURE PROJECT

ENVIRONMENTAL MONITORING PLAN

Tower Arctic LTD.

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1 Pond Inlet Marine Infrastructure Project

1.1 Project Description

The Government of Nunavut (GN), through Economic Development and Transportation (EDT) is developing a new small craft harbour (SCH) in the Hamlet of Pond Inlet (the Hamlet) on the north shore of Baffin Island (the Project). The construction of the Project will be managed by Community and Government Services (CGS) on behalf of EDT.

The Hamlet is the northernmost community located on Baffin Island. The community does not currently have an established harbour. The Project will improve marine access for boats and the overall safety of marine activities in the community by providing a protected harbour for recreational users, hunters, fishers and cruise ship tender boats (**Figure 1-1**).

Before the construction activities started, there was a small breakwater that has in-filled with sediment, and a steel boat ramp to facilitate launching and retrieval of boats. A small open area near the boat ramp is currently used as a sealift laydown area. This area becomes congested for several days following the sealift activities, restricting public access to the boat launch ramp and beach. This area is also exposed to high waves and winds and has little protection from storms. The Salmon River, located 4.5 km south west of the Hamlet, is used as a local safe harbour during storm events.

The proposed SCH will include a 2.5 ha inner harbour for the moorage of small local vessels (including three float strings), a fixed wharf for larger vessels, and sealift laydown area and ramp. The facility will be formed by an east and a west breakwater to provide a protected harbour. Construction will require significant amounts of aggregate, which is to be sourced from a new quarry located approximately 5 to 6 km from the construction site via existing and/or new roads (**Figure 1-2** and **Figure 1-3**). The construction has been underway since 2018.

Figure 1-1: SCH General Arrangement (Source: Advisian 2021)

*Figure 1-2: Small Craft Harbour Project Location and Site Plan (**Figure 1-3** provides the detailed haul road and culverts location) (Figure source: CEMP of Advisian 2017)*

1.2 Construction Activities

Construction activities associated with the Pond Inlet Project are outlined in **Table 1-1**. The table also indicates whether activities are on land, near water, in the intertidal zone or in water.

Table 1-1: Pond Inlet Construction Activities

ACTIVITY	POND INLET FACILITY		
	QUARRY	HAUL ROAD	SCH
Drilling for blasting	X		
Blasting	X		
Transport (rock, sediment)	X	X	X
Crushing and screening to produce aggregates	X	X	
Stockpiling (see Figure 8-1 for the stockpiling area)	X	X	X
Infill/earthworks			X
	X	X	X
			X
Dredging			X
Pile driving			X
Land based equipment refuelling	X	X	X
Drainage (ditches, culverts)		X	X
Installation of small craft floats			X
Installation of concrete access stairs			X

Legend:
In water
Out of water (Intertidal)
Land based

1.3 Construction Areas

TA has determined Construction Areas for each of the three project components (Quarry, Haul Road, SCH), which will be used when describing the location of construction activities in weekly and annual reports. These are provided in **Figure 1-3** and **Figure 1-4**.

Figure 1-3: Small Craft Harbour (SCH), Quarry and Haul Road Construction Areas (Source: TA)

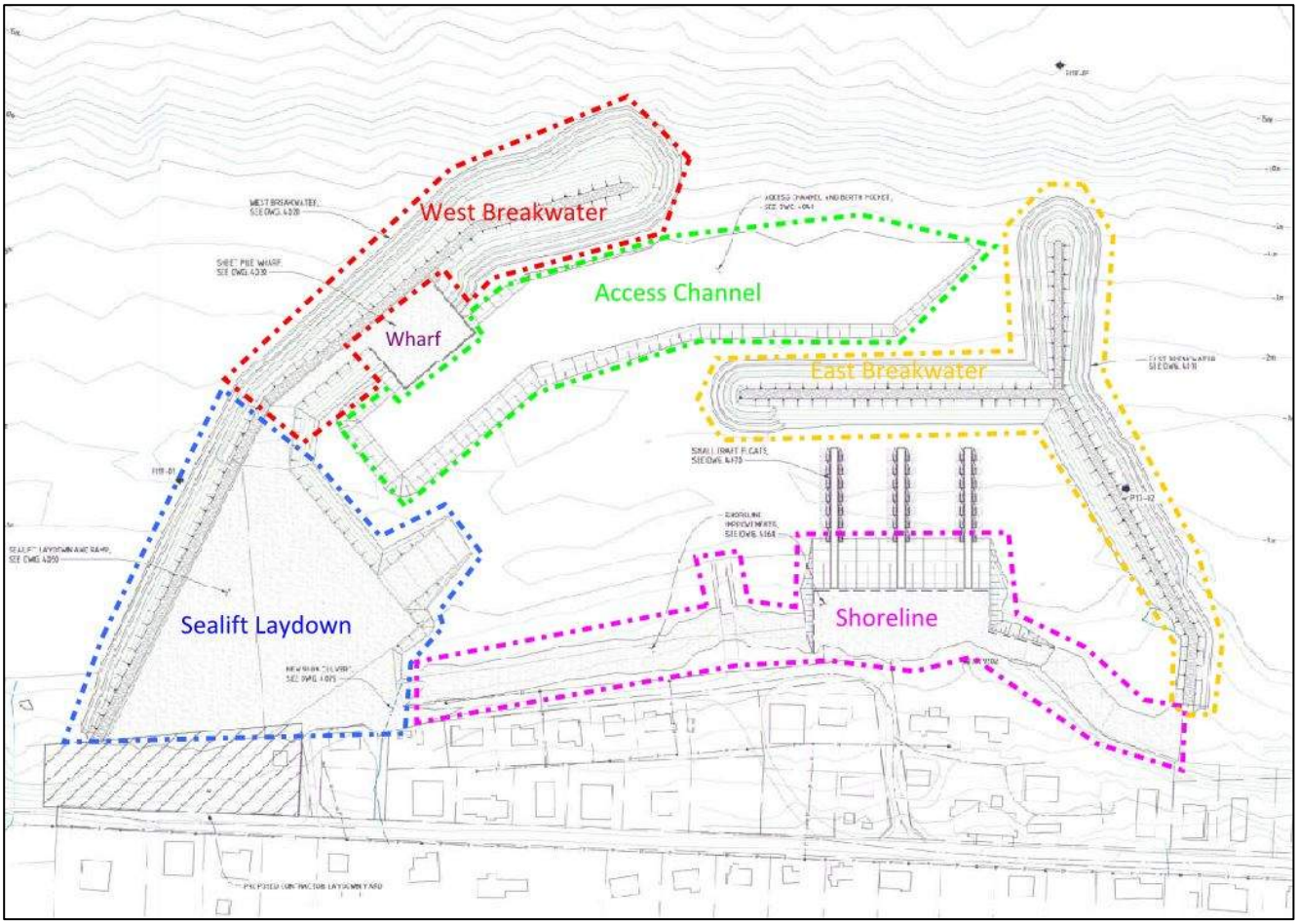


Figure 1-4: SCH Construction Areas (Adapted from General Arrangement drawing from Advisian 2018)

2 Receiving Marine Environment

2.1 Bathymetry

Figure 2-1 shows an excerpt of the marine map for Pond Inlet. Depth ranges between 0 to 40 m (Chart Datum: CD) in a 500 m radius around the SCH. The entire SCH area is located above the chart datum, in the intertidal zone. In consideration of the tide's amplitude, the maximum water column that could be encountered in the vicinity of the SCH should range from approximately 40 m up to 43 m near the West Breakwater.

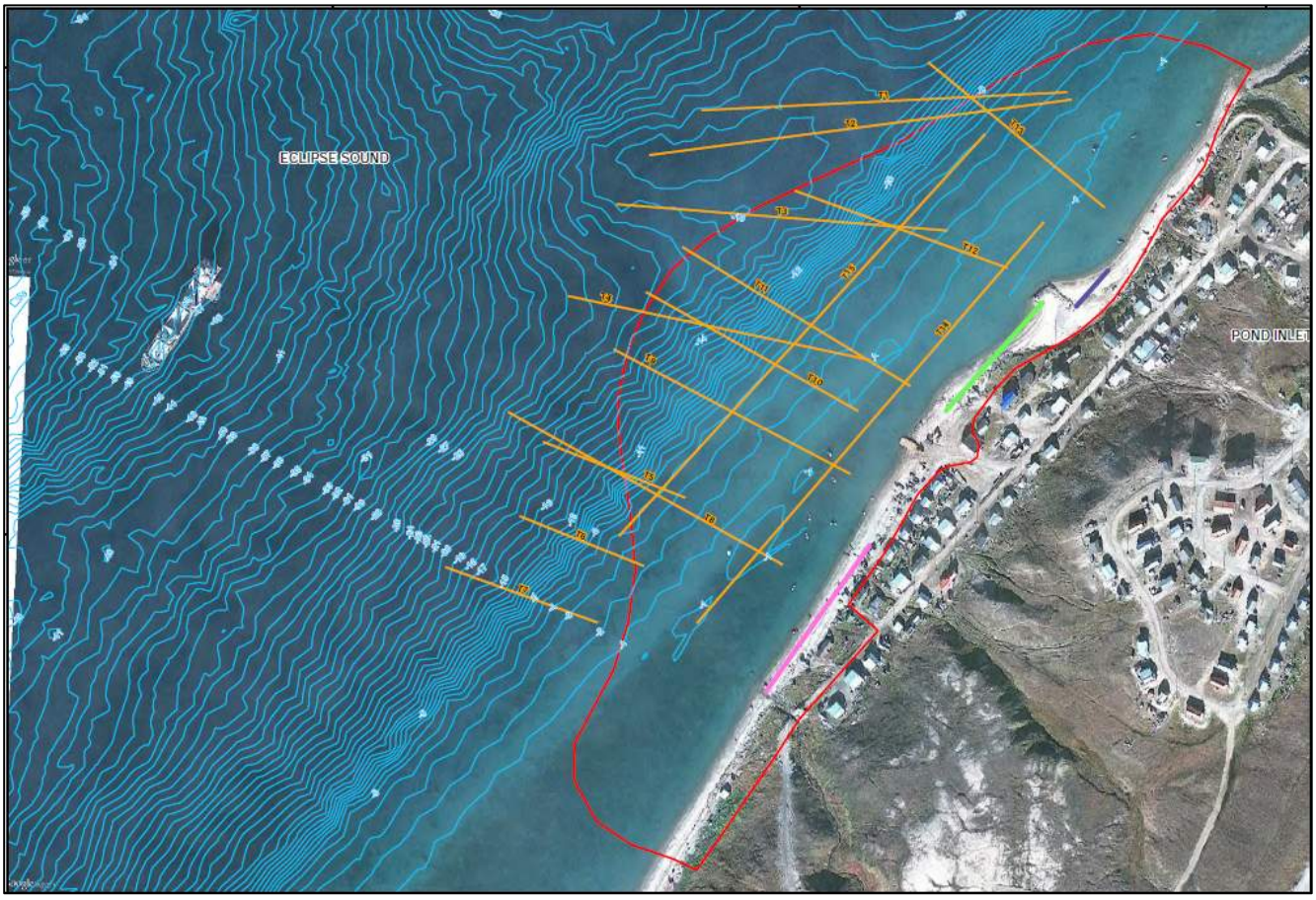


Figure 2-1: Excerpt from map 4-2 of Advisian Baseline Report

2.2 Tides and Currents

At the site, tides are semidiurnal, with two high and two low tides per lunar day (Hsiao, 1992). The closest CHS tide station to the Hamlet is Pond Inlet (site) (#5800). This station provides information only since January 2020. Before this, the station named Pisiktarfik Island (#5795) has been used by the project. The tidal range at Pisiktarfik in 2016 was between 2.2 m to 2.5 m. Sailing directions report tidal currents to run westward when flooding, and eastward when ebbing at a rate of about 1 m/s (2 knots) (CHS, 2014).

When required during monitoring activities, the tidal stage will be recorded according to the tidal prediction (Canadian Hydrographic Services: Pisiktarfik station #5795: http://tides.gc.ca/eng/station?sid=5795).

2.3 Temperature and salinity

The maximum temperature was 2.55°C at the surface. The largest change in temperature from surface to bottom was 0.85°C. Salinity was consistent among locations (ranging between 28.69 psu and 31.07 psu) and remaining constant over depth.

2.4 Fauna

The main fisheries in the area include Arctic char and Arctic cod.

Marine mammals whose range overlaps with Eclipse Sound include cetaceans and pinnipeds. However, the most likely marine mammals in Eclipse Sound are Ringed and Harp seals, which were reported in the area in 2018 by the marine mammal observer charged with monitoring exclusion zones during in-water construction activities.

Table 2-1 shows their status, communication frequencies and dive times.

Table 2-1: Potential Marine mammals in Eclipse Sound

SPECIES	STATUS*	PRESENCE IN ARCTIC WATERS	DIVE TIMES	COMMUNICATION FREQUENCIES
Bearded seal	COSEWIC: data deficient SARA: not applicable	Arctic resident	About five minutes	0.02 to 11 kHz
Beluga whale	COSEWIC: No Status SARA: At-Risk	Arctic resident	About 15 minutes	0.1 – 120 kHz
Bowhead whale	COSEWIC: No Status SARA: At-Risk	Arctic resident	Up to an hour	0.02 to 5 kHz
Narwhal	COSEWIC: special concern SARA: no status	Arctic resident	About 15 minutes	0.3 to 48 kHz
Ringed seal	COSEWIC: not at risk SARA: no status	Arctic resident	Up to 17 min	0.4 to 16 kHz
Walrus	COSEWIC: No status SARA: No Status	Arctic resident	Nearly half an hour	
Harp seal	COSEWIC: Not assessed SARA: no status	Seasonal visitor (July-december)	Less than 15 min	<16 kHz
Hooded Seal	COSEWIC: not at risk SARA: no status	Seasonal visitor (open-water season)	up to 30 minutes	<6 kHz
Killer whale	COSEWIC: special concern SARA: no status	Seasonal visitor (open-water season)	Less than 15 min	0.5 to 75 kHz

*Source : Government of Canada. Species at risk registry. [Online] URL: https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry.html. Consulted in May 2020.

3 Environmental requirements

3.1 Project Permits

All Project permits related to the environment for the Pond Inlet Project are in place and are summarized in **Table 3-1**.

TA will keep copies of the permits at various locations on the site. All permits and license conditions will be kept in a binder at the EM's office. TA will also have a file in its local network at the site with digital copies of the permits.

Table 3-1: Permits – Pond Inlet Marine Infrastructure Project

REGULATORY AUTHORITY	PERMIT TYPE	PERMIT #	EXPIRATION DATE	RELATED FACILITY	PERMIT HOLDER
Transport Canada	Approval (Notice of Works (NoW))	18-3506	-	SCH	GN
NIRB	Screening decision	17XN030	-	SCH	GN
NIRB	Screening decision	17QN015	-	Quarry	GN
NWB	TYPE "B"	8BW-PIM1821	July 22nd, 2021	Haul road	TA
DFO	FAA and Amended FAA	17-HCAA-00551	December 1st, 2021	SCH	GN
DFO	FAA and Amended FAA	19-HCAA-01020	December 1st, 2021	SCH	GN
NR Can	Explosives	U300112/E	June 30th, 2021	Explosive storage area	TA
Municipality of Pond Inlet	Quarry Permit	18-700-001	February 27, 2021	Quarry	TA
Municipality of Pond Inlet	Quarry Permit	04-15-2021-01	December 31, 2021	Quarry	TA
Hamlet of Pond Inlet	Pre-development permit	0711	-	SCH	GN
CIRNAC	Land use permit	N2019X0012	August 14th, 2023	SCH	GN
PSPC	Interim license of occupation and land transfer agreement	-	-	SCH	GN

3.2 Construction Environmental Management Plan

Two Construction Environmental Management Plan (CEMP) were devised, one by the GN during the screening process and the other by TA based on the CEMP prepared by the GN, to describe how environmental obligations stated in the permits would be met. The CEMP prepared by TA is the CEMP to use during the construction process. They outline the measures which have been and will be implemented to avoid, manage or mitigate the impact of construction activities. Regulatory requirements and CEMP measures will collectively be referred to as project commitments.

4 Purpose of the monitoring plan

The permits and CEMP refer to monitoring activities required to demonstrate compliance of construction activities with project commitments. Two measures listed in the CEMP refer directly to monitoring plans. They are as follows:

- Measure MC01 states that Monitoring Plan(s) will be prepared for the project. The monitoring plan(s) must describe how allowable levels of total suspended solids/turbidity and marine mammal monitoring activities during excavation, dredging, dredge disposal and in-water placement of fill material will be carried out.
- Measure MC05 refers to the development of a monitoring program for overpressure levels during piling activities in order to ensure the protection of fish.

The purpose of this monitoring plan is to describe how TA will implement the monitoring activities listed in these measures for marine construction activities. It also describes the underwater noise monitoring plan as well as monitoring of the marine environment during piling activities. It is complementary to the CEMP and to TA's other construction work plans, namely those listed in **Table 4-1** below. Those construction work plans are subject to revision from time to time and the most up-to-date revisions should be used on site.

Table 4-1: Construction work plans

CONSTRUCTION WORK PLAN	DOCUMENT NUMBER
Construction Health and Safety	15255-00331-08-TA-GN-CWP-9
Blasting Management Plan	15255-00331-07-TA-GN-CWP-0008
Traffic Management Plan	15255-00331-07-TA-GN-CWP-0006
Spill Prevention and Response Plan	15255-00331-07-TA-GN-CWP-0003
Fuelling Method	15255-00331-07-TA-GN-CWP-0005
CEMP	15255-00331-07-TA-GN-CWP-0007

5 Environmental Monitor

5.1 Role and responsibilities

In compliance with condition 13 of the NIRB screening decision, an environmental monitor will be present full time throughout marine construction activities. The environmental monitor will confirm both land- and marine-based construction activities are compliant with project commitments. The environmental monitor's roles and responsibilities are stated in TA's CEMP. More specifically, the EM's roles and responsibilities with regards to monitoring include:

- Being informed and aware of the construction schedule and activities and advise TA and CGS on modifications required to comply with permits and CEMP as needed
- Attending calls as required to stay informed and to inform CGS and TA of potential issues or mitigation required, and to stay informed of issues resulting from community consultation that may require communication or mitigation
- Ensuring induction of workers and their training with regards to the following are carried out:
    - Project commitments relative to construction activities
    - Specific mitigation measures such as erosion and sediment control, handling of hazardous materials, waste management, fueling, etc.
    - Interactions with wildlife
    - Environmental emergency response procedures
    - Marine mammal observation.
- Inspecting the work site to ensure mitigation measures are in place and project commitments are met
- Carrying out specific monitoring activities and preparing associated databases (wildlife and nesting surveys, turbidity, overpressure and underwater noise)
- Compiling data on marine mammal and wildlife observations
- Suspending non-compliant activities under conditions stated below in the sections regarding the turbidity monitoring, marine mammal observation and acoustic monitoring or if serious harm to the environment is suspected
- Managing and reporting on environmental spills
- Preparing weekly reports.

If the EM is not on site, the monitoring will be conducted by an employee of TA who reviewed the monitoring procedure with the EM. This employee can be for example a supervisor or a local support who will have time in his working schedule to make sure the monitoring is completed, and the environmental commitments are respected. This person will conduct monitoring tasks for the section related to land-based activities (**section 8**) and the sub sections are as follows:

- 8.1 Wildlife monitoring
- 8.2 Sediment and erosion control

TA's management team is accountable for the compliance of construction activities with project commitments. As stated in **section 6.2**, regular meetings between the EM and the site supervisor will be held to discuss work methods and schedules with regards to project commitments and to raise concerns as required to limit the risk of non-compliances.

EM also has the responsibility to engage with the GN ahead of making decisions to prioritize certain compliance requirements over others.

5.2 Experience

The EM will be familiar with the mitigation and monitoring measures provided in the Project CEMP, CWPs, as well as all relevant permit conditions.

6 Communication

6.1 Environmental Support

Individuals who are tasked to assist the EMs, such as marine mammal observers (MMO) will be informed of who the onsite EM is and will be able to contact him by mobile phone or radio. For activities that are being conducted at night, when the EM is off shift, the MMO will be informed to contact the site supervisor directly.

6.2 Site Supervisor

The site supervisor will be in regular communication with the EM throughout the construction season. The site supervisor will be made aware of pertinent activities to remain in compliance with Project commitments. When field decisions are made by the site supervisor, the EM will be engaged to confirm the field decisions do not compromise Project commitment compliance.

A minimum of two meetings will be held per week with the site management team (which includes the site supervisor and the EM). It will allow for the EM to be made aware of upcoming activities and work methods and to discuss relevant project commitments, mitigation measures and concerns. The discussions between the site supervisors and the EM will be documented in the pertinent weekly reports.

A worksite committee will also be held every two weeks. Information and concerns with regards to project commitments or environmental issues will be discussed as needed. Minutes of the meeting will be drafted.

6.3 GN and Environmental Inspector

A kick-off meeting with the Environmental Inspector and GN's Regulatory Advisor will be held at the start of the construction season.

Two weeks after the start of environmental monitoring activities, a meeting will be organized with the Environmental Inspector and GN to ensure reports meet GN requirements. After adjustments have been agreed

upon, GN will contact TA's EMs as required to make additional comments to meet project commitments. TA's EMs will contact TA's Environmental Advisor as required.

CGS and the Environmental inspector will be notified immediately of all major non-compliance issues and spills. Minor issues will be signified through the weekly reports.

6.4 Regulatory Authorities

If the mitigation measures outlined in the CEMP are found to be ineffective, TA will work with the EI and the GN to revise the specific mitigation measure appropriately and ensure that they are deployed in the field. Further engagement with relevant Regulatory Authorities (RAs) will be undertaken as required by the GN.

Other Communications with RAs will be carried out by TA and directly with the RAs regarding all permits. TA shall keep the Engineer of the GN informed of the communication with the RAs through a record of contact with RAs, including key discussion items, and action items. The Engineer should be informed of and invited to attend all calls and meetings with all RAs. A suitable advanced notice should be provided to the Engineer.

6.5 Reporting Frequency

The EMs have to produce a series of reports to confirm compliance with the environmental commitments. The frequency reporting is providing in the reports related sections. The list of reports to produce is as follows:

- Checklists of environmental commitments (**section 9.1**)
- Environmental monitoring databases (**section 9.2**)
- Demonstrative pictures (**section 9.3)**
- Environmental weekly reports (**section 9.4**)

7 Marine Construction

7.1 Turbidity monitoring

7.1.1 Turbidity Natural Condition

The water turbidity through the water column at the SCH area is naturally spatially and timely variable with the salmon's river that propagates toward this area depending on the wind and tide currents. Given the different water density, the river water is initially on the top centimeters of the water column and as its "strike" the coast this turbidity is mixed through the column. This turbidity can then create a visual noise that prevents the EM to check for turbidity compliance visually. The Salmon River's turbidity can reach the construction zone very quickly (see the following pictures). Since the beginning of the season, the different background sampling shows that the turbidity ranged from less 1 NTU up to 80 NTU.

Example of water from the river (very turbid), coming within in the SCH area in a very short period of time		
		
2020-07-30 09 :23	*2020-07-30 09 :30*	*2020-07-30 09 :32*

7.1.2 Training

The EM is responsible for turbidity compliance monitoring during activities below the high-water level. The EM will ensure that the procedure is implemented in the field if the EM does not perform the monitoring.

7.1.3 Procedure

For each construction activity listed in **Table 7-1**, the turbidity monitoring will be performed in three steps.

- An initial sampling campaign, to collect samples of the turbidity generated by a given activity and verify the compliance with the environmental commitments
- The turbidity monitoring will be conducted by visual observation (when the Salmon's isn't in the SCH area) and by confirmatory samplings (minimum 2 times a week depending of the schedules of the construction activities, weather etc.)
- In the event there are concerns/considerations for effects to water quality based on visual monitoring (e.g. observation of a plume who is at more than 100 m from the construction area), compliance sampling will be conducted.

If navigation is compromised by the weather conditions, ice break-up or freeze-up periods, an appropriate sampling location from the shore will be chosen. Visual monitoring as per section 7.1.3.2 will be performed if there is no appropriate sampling location.

During iced condition, sampling locations shall be chosen according to the potential plume location. The potential plume location could be determined depending on the tidal cycles and the direction of the current related to them.

7.1.3.1 Compliance campaign

To make sure a given activity is compliant with the environmental commitments, the EM will conduct an initial sampling campaign at the beginning of each activities listed below even if a plume is observed or not.

The water samples will be collected during the different tide stage, but also trying to catch some different wind conditions to grab the worst-case plume condition (lots of sediment dragged far away from the source). [Note: Wind condition can also generate waves that are not safe for sampling].

For each tidal cycle, this sampling are sets of 3 samples down current (around 100m from the construction activity) and 4 backgrounds (if relevant). The complete measurement method is outlined in **Appendix 1**. The drifting boat direction shall be compiled as an indication of the potential water current direction and confirmation of the downstream direction.

For each activity (see below), the initial campaign will be used to verified that the increase of turbidity generated by the work is compliant with the environmental commitments or if some adjustment in the work method should be made to be compliant. List of activities which the initial compliance campaign is required:

- In water Infill with type 1
- In water Infill with type 2
- Fixed wharf area in water infill with type 1
- Fixed wharf area in water infill with type 2
- Dredging

7.1.4 Confirmatory sampling and visual monitoring

The visual monitoring and the confirmatory sampling will be used for the rest of the activity duration. As the visual monitoring is not possible during night and when the salmon river reaches the SCH area, a confirmatory sampling campaign (minimum of twice a week) is added to the visual monitoring.

7.1.4.1 Visual monitoring

Visual monitoring will be performed during day light condition only and each event of visual monitoring will be photographed with dated stamp pictures. If a plume is observed, the plume behaviour will be described in a turbidity plume monitoring report. The plume may be identified visually, or the EM can drift with the flow from the dredging or infilling location until the 100 m distance is reached. This report is a tool to improve the comprehension of the plumes behaviour and will include:

- Report and observer name
- Date, time and tide levels for the start and the end of the plume event
- Plume duration and approximative size
- Construction activity location
- Brief description of the plume's behaviour
- Picture reference
- If required, turbidity water sampling results and descriptive sketch

As outlined before, the salmon river can hide any plume turbidity generated by the work activities. In this case, the picture will show that no visual monitoring was possible at that time of the day. The EM will then keep track that the work activities are still the same than during the initial sampling campaign.

In order to make sure that the monitoring is complete, and no plume event is missed, visual monitoring schedule has been separated into four sections. The first section is about dredging, in water infill and infill removal who are performed completely in water from the beginning to the end of the activities. The second section is about out of water infill and infill removal who are performed without water but below the high-water level and the water will eventually reach the construction area. The third section is about disposal at sea performed in water and the last section is about erosion event due to weather and/or waves condition.

Dredging and In Water Infill Visual Monitoring Schedule

Visual observation will start no more than an hour after the beginning of dredging and in water infill to establish the presence of a turbid plume. A visual observation will be done at every tide cycle (rising, ebb, high and low) after the beginning of the activity until the end of the activity. Visual observations will usually be made from a high point of land and/or on a boat.

Out of Water Infill Visual Monitoring Schedule

For this activity, the timing of the observation is very important. The plume presence is generally short, and the first visual observation should occur when the water level is above the construction area level until the end of the plume event who is generally around two hours after the water left the area.

Erosion Visual Monitoring Schedule

This part of the visual monitoring is the harder to monitor and to have the good timing to observe the plume behaviour. The observer must be aware of the weather and the wave conditions that can change quickly in addition to know the areas of the project who are at risk of erosion. Generally, the southeast wind condition offers a potential risk of erosion mainly when the south slopes are not protected with armour stones. Further, the waves created by southeast wind does not allow safe water sampling condition and the turbidity generated by the erosion of the slope erosion is mixed with turbidity generated by the erosion of the intertidal area. In those events without water sampling, it's important to increase visual monitoring (e. g. every 2 hours).

7.1.4.2 Compliance Sampling

Compliance sampling will be conducted based on the Canadian Council of Ministers of the Environment (CCME 2007) approved Water Quality Guidelines (WQG). These are as follows:

- CCME: *Turbidity (NTU) Allowance Over Background ("Induced" Turbidity)*: Maximum increase of 8 NTUs from background levels for a short-term exposure (e.g., 24-h period). Maximum average increase of 2 NTUs from background levels for a longer-term exposure (e.g., 30-d period) in all waters during clear flow. Maximum increase of 8 NTUs from background levels at any one-time when background levels are between 8 and 80 NTUs. Should not increase more than 10% of background levels when background is >80 NTUs for high flow or turbid waters.

Background levels of turbidity in Eclipse Sound can be clear and turbid water conditions depending the influence of the Salmon River.

Background

Given the natural variability (in time and space) of turbidity in the area, the background condition will be a compilation of samples (1 m from the surface and 1 m from bottom when water depth higher than 3 m, and one mid-depth when water depth over 40 m) for the different tide stage and at 4 stations. Unless one of them is clearly in the plume of one work activities. Those 4 background stations would remain the same hereafter in order.

This would help to understand what a relevant background is for a given condition (tides, wind etc.…) and to which range of value we can compare with the turbidity created by the work activities.

Compliance sampling procedure

Compliance sampling will be conducted at 3 different locations in the plume which are each at 100 m from the construction activity. When the water depth is greater than 3 m, turbidity will be measured 1 m below the surface and 1 m above the seabed. If the water depth is greater than 40 m, a mid-depth sample will also be collected.

Table 7-1 summarized the background and the compliance location for each activity type.

Table 7-1: Turbidity – zone of influence

	Activity Type		
	In water Infill	**Out of water infill**	**Dredging**
Background site	25 m up-current or at a distance 5 times the size of the plume	25 m up-current or at a distance 5 times the size of the plume	25 m up-current or at a distance 5 times the size of the plume
Compliance Locations	100 m	100 m	100 m
EM location for visual assessment	Appropriate location to confirm compliance: -SCH Breakwater -Sampling boat	Appropriate location to confirm compliance: -SCH Breakwater -Sampling boat	Appropriate location to confirm compliance: -SCH Breakwater -Sampling boat

The measurement method is outlined in **Appendix 1**.

Water sampling will be performed according to the concerns of the EM after the visual monitoring and the characteristics of the turbidity generator. The EM can assess with the kind and duration of the activity that generated turbidity, the aggregates and equipment used, the density, the location and the size of the plume.

For example, 150 cubic metres of out of water infill of medium aggregates (low level of fine particles) with an excavator will generally require one sampling at mid-ebb tide cycle to confirm the compliance of that plume event. Dredging of 1 000 cubic metres of dredged material on 12 hours with an excavator and a dredge barge will require water sampling at ebb and rising tide cycle.

The experience of the EM is important to have the good sampling rate and it should be increased (e.g. double) when a new EM is on site or a new mix of conditions is present.

The EM will document the following at time of measurement within the turbidity monitoring database:

- Facility for which observation is being documented
- Construction activity for which observation is being documented
- Time of initial visual observation
- Tide height of initial visual observation
- Time of compliance measurement
- GPS coordinates of compliance locations

Equipment

A boat will be available to the EM should turbidity compliance monitoring be required. Sampling at different depths in the water column will be carried out using a weighted Van Dorn sampler. The Hanna 98703 turbidity meter will be used to measure turbidity levels. Calibration will be validated every day when measurements are required. Calibration of the turbidity meter will be carried out on a weekly basis when measurements are required. A GPS or smartphone will be used to know geographical locations.

7.1.4.3 Confirmatory Sampling

As long as it is the same work activity, the EM will do a confirmatory water sampling minimum 2 times a week (depending on the schedule, weather, etc.) to confirm the actual compliance of the turbidity plume with the background turbidity. This sampling is 3 samples downstream (100m from the work activities) and up to relevant 4 background locations, the drifting boat direction shall also be compiled.

7.1.5 Stop Work Conditions

If the compliance values exceed the turbidity threshold criterion of 8 NTU from background levels, the following steps must be taken:

- The supervisors of the construction activity are informed of the situation
- Water sampling will be done on an hourly basis and the distribution of the plume will be documented by visual observations
- If the exceedance lasts longer than 6 hrs, the work rate will be decreased
- If the exceedance lasts longer than 24 hrs, work will be stopped
- The work method may be modified, and the EM will repeat the monitoring to confirm a return to compliant turbidity levels.

Since turbidity monitoring will be conducted during daylight hours only. If an exceedance is observed when the sunset, then the work rate will be decreased until the following morning when monitoring can resume.

7.1.6 Adaptive Management Procedures

If necessary and after consulting the Environmental Inspector of the GN, TA could put in place a compliance monitoring of the turbidity different from what is in the authorization of the regulators. CCME turbidity guidelines are derived from suspended sediment guidelines using a general correlation of 3 to 1. Suspended sediment guidelines are as follows:

- For clear flow, a maximum increase of 25 mg·L-1 from background levels for any short-term exposure (e.g., 24h period) and a maximum average increase of 5 mg·L-1 from background levels for longer term exposures (e.g., inputs lasting between 24h and 30 d). For high flow: Maximum increase of 25 mg·L-1 from background levels at any time when background levels are between 25 and 250 mg·L-1. Should not increase more than 10% of background levels when background is >250 mg·L-1.

Since turbidity guidelines are extrapolated using a general correlation, the CCME recommends that joint analyses of turbidity and suspended solids be carried out in problem areas[1]. Therefore, TA may validate total suspended solid (TSS) concentrations in the event exceedances are measured. In this case, samples will be sent to an accredited laboratory for TSS analysis. Turbidity will be measured on subsamples, prior to the expedition of the samples.

If TSS concentrations are found to be compliant with CCME guidelines, TA may choose to establish a new correlation between turbidity and TSS for the activity causing the exceedance. In order to establish a correlation, samples on which turbidity has been measured on-site will be sent to an accredited laboratory for TSS analysis. Once an acceptable coefficient of determination for linear regressions is established, new turbidity guidelines, which ensure compliance with TSS guidelines, will be established for the site.

If exceedances are observed with regards to turbidity/total suspended solid guidelines, the adjustment of the work method or the implementation of mitigation measures will be used to ensure CCME guidelines are met.

If samples are sent to the laboratory for analysis, the following measures will be taken in order to avoid cross contamination, ensure conservation of the samples until they reach the laboratory and proper identification of the samples. The samples will be taken in clean bottles ensuring enough headspace to allow for mixing in the laboratory. The samples will be marked with indelible ink. Appropriate chain of custody documents will accompany the samples. They will be transported to the laboratory using a cooler containing ice to control temperature to 4C. If the samples cannot be transported on the day they are collected, they will be refrigerated until transport. The samples will be analyzed within the appropriate holding time (7 days).

[1] Canadian Council of Ministers of the Environment, 2002, Canadian water quality guidelines for the protection of aquatic life – Total particulate matter. URL: http://ceqg-rcqe.ccme.ca/download/en/217/

7.2 Marine Mammal Monitoring

Marine mammal observer (MMO) are required for all in water activities. The exclusion zone size and how an MMO will be facilitated is provided in **Table 7-2**.

Table 7-1: Marine Mammal Observer, Exclusion Zone and Activity Type

	ACTIVITY TYPE			
	IN WATER INFILL	OUT OF WATER INFILL	DREDGING	PILE DRIVING
Exclusion Zone	20 m	10 m	20 m	500 m (or as per noise monitoring program)
MMO	Equipment operator	Equipment operator	Dedicated MMO	Dedicated MMO

7.2.1 Training

To ensure that EM can meet the requirements of mitigation measures for marine mammals, MMO will be trained on-site. These observers will be able to carry out other tasks for the realization of the project. For the marine activities such as fill placement under the high-water level, dredging and dredge disposal an MMO will be present.

The marine mammal observer (MMO) will receive a document outlining the characteristics of marine mammals which may potentially be seen near the works. The document also describes the procedure in the event a marine mammal is injured, or a collision has occurred. The EM will review the document with the MMO to ensure its proper application. The training document is provided in **Appendix 2**.

The training document was adjusted in 2019 to include a decisional flow chart and contact information as well as specificities regarding pile driving activities. EM's will accompany the MMO on the field for 60 minutes to ensure procedures are well understood. MMO assigned to the pile driving will be the individuals with the most experience and, if possible, the ones which were most rigorous in 2018.

7.2.2 Procedure

Marine mammal sightings will be recorded in a log, which will include the name of the MMO, the activities to which the MMO was assigned, the distance from the works, a description of the sea conditions, the visibility, the start and end time of observation the species, as well as time at which work was interrupted, if required, and time at which activities resumed. The MMO will note the name of the person to whom the marine mammal information (onsite EM) was relayed to. An MMO daily tracking sheet will be completed by the EM everyday an MMO is on duty. The sheet is provided in **Appendix 2**.

The activities detailed in the following sections will require the presence of an MMO. When such activities take place, they will be reported in the weekly report, as will the names of the MMO, even if no sightings were recorded. The location of MMO is described for each activity listed below and depicted in **Figure 7-1**.

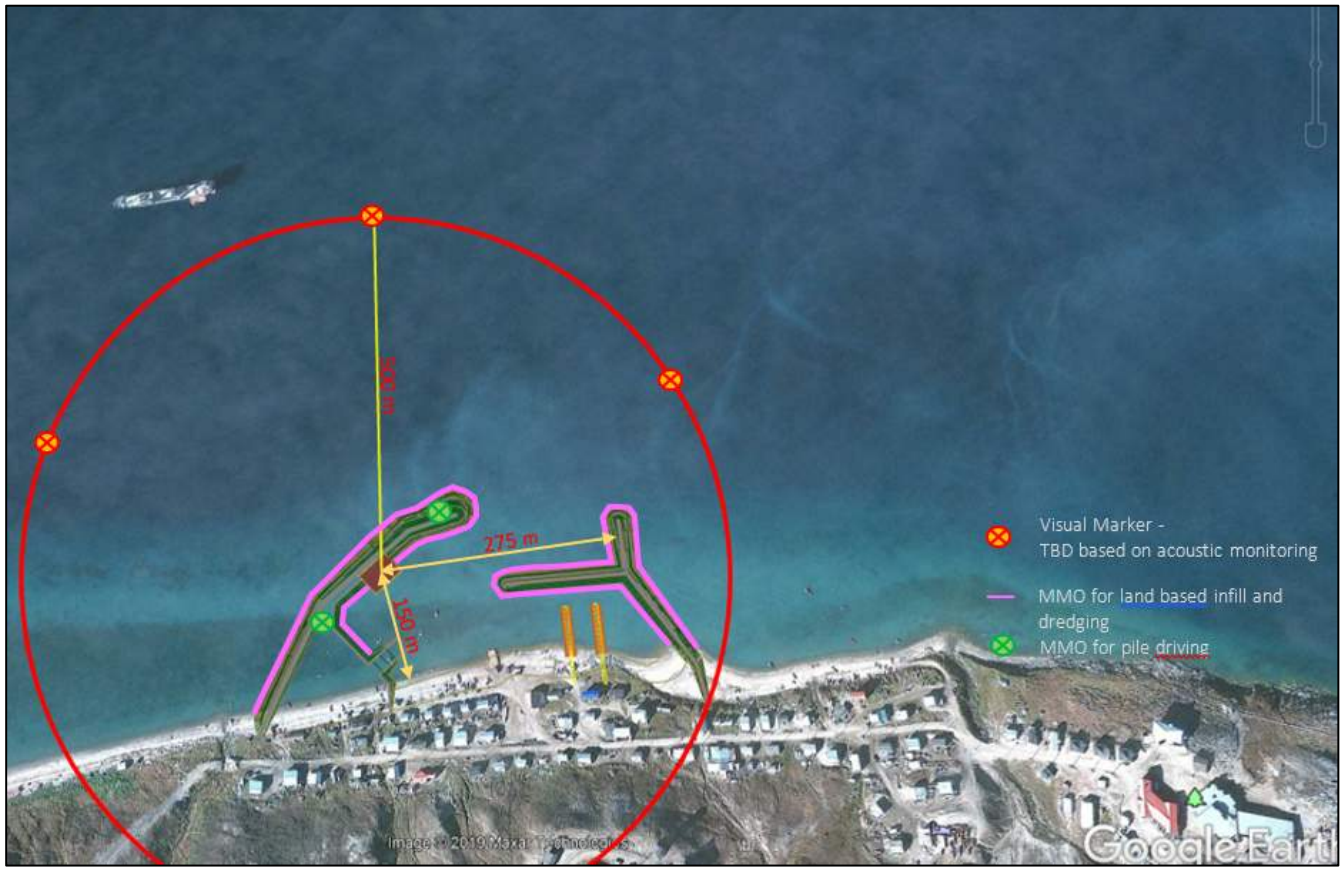


Figure 7-1: Map for Marine Mammal Monitoring (Source: TA)

7.2.2.1 Fill placement below the high water level (HWL)

For the establishment of the East and West breakwaters, the excavator operator and/or the bulldozer operator will be the designated MMO since they are regularly waiting for fill material. In addition, these workers are posted at the end of the infrastructure under construction which allows for a good vantage point to observe the marine environment. If applicable, the MMO will contact the EM using the TA's radio to report on the presence of a marine mammal in the exclusion zone. During the night shift, unless a mammal is injured or exhibiting abnormal behavior, the MMO will contact the superintendent directly.

7.2.2.2 Dredging

For dredging operations, a dedicated MMO will be on one of the two breakwaters depending the construction progress. If applicable, the MMO will contact the EM using the TA radio to report on the presence of a marine mammal in the vicinity of the work site. During the night shift, unless a mammal is injured or exhibiting abnormal behavior, the MMO will contact the superintendent directly.

7.2.2.3 Pile driving

For pile driving operations, an MMO will be posted mainly on the west breakwater. The area to be monitored for this activity will initially be a 500 m exclusion zone around the pile driving works until the exclusion zone has been established through an underwater acoustic monitoring program. The MMO will use binoculars to better identify the presence of marine mammals. If the weather condition (eg. fog, rain, etc.) do not allow good observation conditions, a boat will be available for the MMO. If the exclusion zone is extended at more than 500 m, for the first day and during difficult observation conditions (e.g. iced conditions, low visibility) a second MMO on ice or on boat will confirm the observation of the MMO on land. Buoys will be placed as markers to help identify the limit of the exclusion zone. If applicable, the MMO will contact the EM to signal the presence of a marine mammal in the exclusion zone following the MMO's decision diagram on the training program. During the night shift, the MMO will contact the superintendent directly and will report the observation and/or the work stoppage to the EM at the end of the night shift. No pile driving work is planned in darkness period because the duration of sunshine will be 24h/day when the activity will occur. If necessary, a second MMO can support the other MMO if the observation conditions are not adequate (e.g.: presence of ices in the exclusion zone).

7.2.3 Stop Work Conditions

Work will stop if a marine mammal is injured or is seen within the exclusion zone (refer to Table 7-2). The MMO will immediately inform the EM by cellphone or using the TA radio. The EM will immediately inform the superintendent using the TA radio that the work must be suspended and will immediately proceed to the site to document the event. During the night shift, when the EM is off duty, the MMO will contact the superintendent directly using either a cellular telephone or the TA radio. The species of marine mammal, its distance from the marine works, any sign of injuries, the time and date will be recorded.

For piling activities, work may resume 30 minutes after the mammal has moved outside of the exclusion zone or if it has not been seen within the exclusion zone for at least 30 minutes.

If a marine mammal is injured, the reasons for the injury will be investigated and documented in order to validate if the animal was injured by the construction activity and to produce an incident report. DFO will be informed if dead fish or marine mammal is observed through the DFO'S incident line (1-867-979-8000) and work may only resume once the DFO representative has given his ascent to the EM.

7.2.4 Adaptive Management Procedures

If dead fish, marine mammal injuries or significant behavioural changes are observed, work methods, mitigation measures and distances for suspending the work will be reassessed. New instructions will be given to the MMO to ensure the new procedures are understood. The Monitoring plan will be adjusted accordingly. If the boundary of the exclusion zone changes, the MMO will be notified.

7.3 Acoustic and Overpressure Monitoring for Pile Driving

70 pairs of sheet piles and 20 circular piles of about 15 m long will be driven in the seabed by an impact hammer and a vibratory hammer to construct the Fixed Wharf. **Table 7-3** summarizes the main details of the pile installation as well as the estimated schedule for the pile-driving activities.

Table 7-3: Summary of pile-driving activities

Piles Type	Technical Details	Estimated Start Date	Estimated Finish Date
20 circular piles	406 mm piles will be driven by impact hammer	May 2020	2021 open water season
70 pairs of sheet piles	The sheet piles will be driven by impact hammer and a vibratory hammer		

The depth of the water column at the fixed wharf is estimated to range from 0 m to 6 m. Information about tides and currents are provides in **Section 2.2**.

The Fixed Wharf area is surrounded by a temporary infill and the West Breakwater. Until October 8, 2020, an opening of around 5 m has been present in the infill to allow the free circulation of water between the wharf area and the open sea. Fishes can travel in this opening. Following the authorisation from DFO (amended FAA 19-HCAA-01020), TA closed the opening to enclose the area around the Fixed Wharf (**Figure 1-1** provides a drawing of the enclosing design). The temporary infill and the breakwater are at least 6 m wide and they completely cover the water column where the infill is present.

The FAAs indicates that in-water activities shall be undertaken, such as stated in the application to minimize the potential for stress-related behaviors or death of fish and marine mammals, using the following guidelines:

- Setting a marine mammal exclusion zone (initially set at 500 m)
- Ensuring underwater pressure and noise levels will not exceed 30 kPa at 10 m and 160 dB re 1 µPa for vibratory pile driving, which also defines the outer limit of the exclusion zone.
- If iced-season work occurs, pinnipeds will not be exposed to an in-air level above 100 dB re 20 µPa.

7.3.1 Expected Ice Conditions

Three ice conditions are expected during the construction of the project: Open Water, Thick First-Year Ice and Breakup. The conditions are defining in **Table 7-4** and these definitions are from the Ice Glossary of ECCC.

According to the Marine Baselines Report of the project, the ice conditions at Pond Inlet are summarized and estimated below:

- On average, freeze-up starts in the second or third week of October, and usually is complete in November.

- On average, break-up starts mid-July and normally water is open from the second or third week in August.
- Maximum level first year ice thickness is 1.6 m in an average year, and 2.0 m in more extreme years.
- Ice in this area is almost entirely first-year growth.
- Pond Inlet and Eclipse Sound experience icebergs.

Table 7-4: Definitions of the ice conditions expected at Eclipse Sound

Ice Condition	Definition
Open Water	A large area of freely navigable water in which ice is present in concentrations less than 1/10. No ice of land origin is present.
First-year ice	Sea ice of not more than one winter's growth, developing from young ice; 30 cm or greater. It may be subdivided into: • Thin First-year Ice/White Ice- First Stage: 30-50 cm thick. • Thin First-year Ice/White Ice - Second Stage: 50-70 cm thick. • Medium First-year Ice: 70-120 cm thick. • Thick First-year Ice: Greater than 120 cm thick.
Breakup	This term refers to a particular length of time in which ice disappears in a given area (generally 1 to 2 weeks). However, breakup does not necessarily imply a decay or melt of ice but can also indicate a movement of ice out of a particular area.

It's planned to construct the Fixed Wharf during Thick First-year Ice condition. TA do not expect to drive piles and sheet piles during the breakup period, but it can be possible depending the construction schedule modification.

If it's unsafe for the EM to conduct underwater acoustic monitoring during any ice conditions stated in this section, TA will not conduct pile driving during the unsafe period.

7.3.2 Soft Start Procedure

A soft start procedure for pile driving will be implemented slowly over a 10 minutes period to ensure mammals and fish have enough time to leave the area. Soft start procedures will be implemented every time work has been interrupted for at least 30 minutes and at the start of each day.

7.3.3 Underwater Noise Monitoring

7.3.3.1 EM experience and training

Acoustic monitoring was carried out on-site at the Iqaluit Marine Infrastructure Project in 2019 with two icListen Smart hydrophones from Ocean Sonics. During this period of monitoring, the EM tested and used the hydrophone, the Launch Box and the Lucy software to collect underwater acoustic data during pile driving activities. The same equipment will be used in Pond Inlet for the underwater acoustic monitoring.

New EM will be trained by the EM who used the equipment in 2019. If equipment problems arise during monitoring activities or to assist with the treatment and interpretation of data collected, Ocean Sonics will be contacted to support the EM.

7.3.3.2 Equipment

The EM will use an Ocean Sonics icListen Smart Hydrophone (model SC2-ETH-X2) specifically designed to monitor pile driving activities.

The model selected will minimally cover the frequency range from 10 Hz to 200 kHz, which encompasses the communication frequencies for marine mammals commonly reported in Eclipse Sound (**Table 2-1** provides the frequencies for each marine mammal). The frequencies associated with pile driving are generally lower than 2 kHz. A range up to 200 kHz is therefore more than sufficient to cover the frequency range for pile driving activities.

The equipment will have been calibrated prior to mobilization by the supplier. The calibration certificate will be available upon request. Since the model which will be used is a smart digital hydrophone, it does not require an on-site calibration.

Two hydrophones will be mobilized on site for the duration of the construction of the Fixed Wharf. Only one hydrophone will be used to conduct the acoustic monitoring. The second hydrophone will be used if necessary and in case of malfunction of the other equipment.

Recordings in .wav and .txt format will be available upon request.

7.3.3.3 Procedure to Monitor Ambient Noise

The ambient noise level will be established before the start of piling. It will be established over a two-day period, at three (3) monitoring stations that will be located at 500 m from the Fixed Wharf. Measures will be taken one day at high tide and the other day at low tide, along three (3) transects radiating away from the Fixed Wharf location: one northbound transect, one northwesterly transect and one southwesterly transect. Overall, six (6) recordings will be made: two (2) recordings at each three (3) monitoring stations. **Figure 7-2** provides the location of the stations to conduct the underwater noise monitoring and **Table 7-5** provides the geographic coordinates of the stations.

The duration of the six (6) recordings will be five (5) minutes each. The average SPL_{RMS} dB (re 1 µPa) noise level will be calculated on each recording. The average SPL_{RMS} will be calculated through the Octave software. Also, the maximum and minimum values will be determined for each of the six (6) recordings.

Figure 7-2: Location of the stations for the underwater noise monitoring (Source: TA)

Table 7-5: Geographic coordinates (Degrees, Minutes, Seconds) of the stations for the underwater noise monitoring

Station Name	Latitude	Longitude
North	72°42'2.12"N	77°58'45.41"W
South West	72°41'36.37"N	77°59'44.83"W
North West	72°41'56.13"N	77°59'48.27"W

7.3.3.4 Procedure to Monitor Pile Driving Noise

The purpose is to confirm the size of the exclusion zone initially set at 500 m. The minimum radius for the exclusion zone will be 50 m for pile driving activities.

The following construction activities will be monitored:

- Circular pile driving using a hammer
- Sheet pile driving using a hammer

MONITORING PERIOD

Measurements will be taken at the beginning of each new activity listed above no matter the ice conditions. The acoustic recording will begin right after the soft start procedure and the recording period will be 5 minutes of continues pile driving noise.

Conformity measurements will be taken once a week at the perimeter of the exclusion zone. Additional conformity measurements will be taken if the work method change or the weather change significantly with respect to the initial measurements.

The start and stop time of pile activities will be recorded by the EM and the start and stop time of acoustic recordings will be documented by the EM.

DEPLOYMENT MECHANISM

During Open Water Period

During open water period, the deployment mechanism will be a vessel-deployed system (**Figure 7-3**) and will be adjusted according to the tide stage to minimize noise[2] due to flow around the hydrophone. The vessel's engine and sonar will be turned off and the crew will be instructed to minimize their movements within the boat in order to limit vessel noise. If possible and in order to reduce the effect of strumming, the measurements will be taken while the hydrophone is adrift. The hydrophone will be set to measure the bottom third of the water column (0.7 to 0.8 times the water depth)[3].

[2] National Physical Laboratory, 2014. "Good practice guide no. 133: Underwater noise measurement". [Online]. URL: https://www.researchgate.net/profile/Stephen_Robinson4/publication/263229365_Good_Practice_Guide_No_133_Underwater_Noise_Measurement/links/02e7e53a307c0ad09a000000/Good-Practice-Guide-No-133-Underwater-Noise-Measurement.pdf?origin=publication_detail. Consulted in May 2019.

[3] National Marine Fisheries Service (NMFS) Northwest Region and Northwest Fisheries Science Center, 2012. "Guidance document: data collection methods to characterize Impact and vibratory pile driving source levels relevant to marine mammals". [Online]. URL: https://webcache.googleusercontent.com/search?q=cache:KhAIxoZjiusJ:https://www.researchgate.net/profile/Scott_Veirs/post/Should_i_use_dBPeak_values_to_determine_underwater_noise_mitigation_for_marine_mammals_ie_safety_zones/attachment/59d6275079197b807798599f/AS%253A325332860194819%25401454576806597/download/pile-driving.pdf+&cd=1&hl=fr&ct=clnk&gl=ca. Consulted in May 2019.

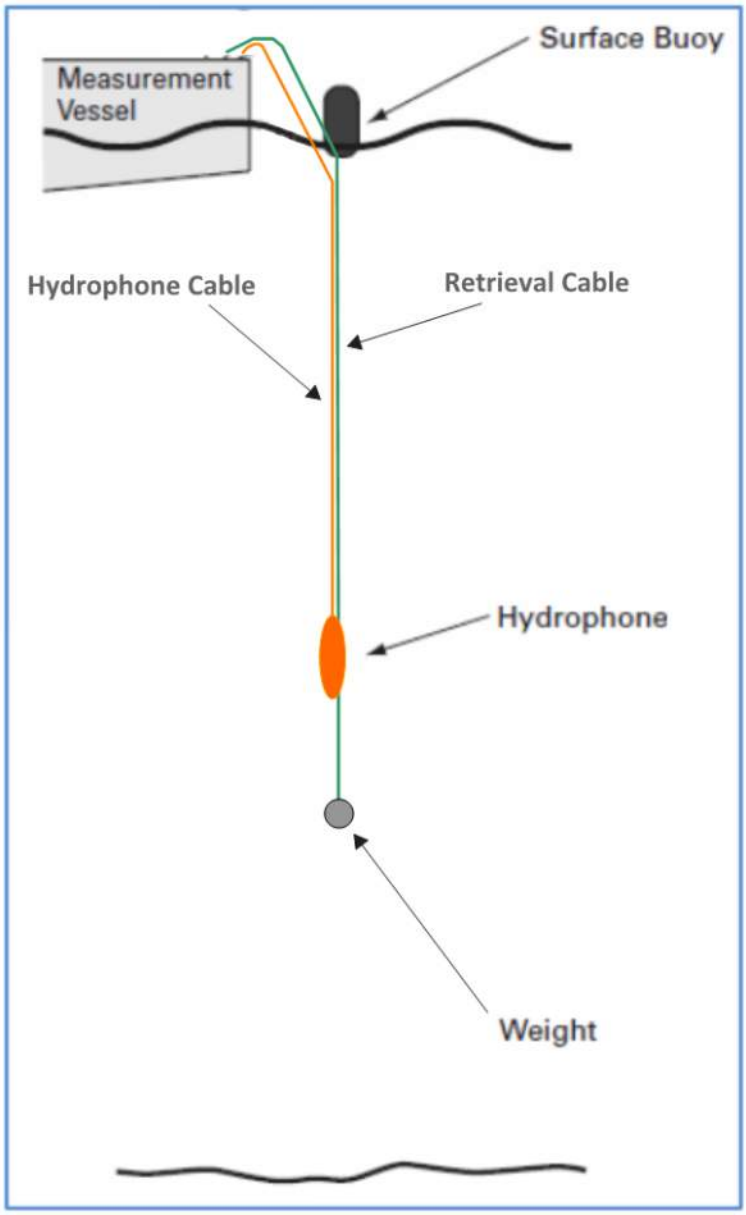


Figure 7-3: Vessel-deployed system (Source: TA)

During Iced Period

During iced period, the monitoring will be conducted on ice by drilling holes with an auger. The deployment system will be the same as for vessel-deployment vessel (**Figure 7-3**) without the surface buoy and it will not possible to let the system drift.

UNDERWATER NOISE RECORDING AND ANALYSIS

Measurements will be carried out starting at a 500 m mark offshore (North West Station) from the Fixed Wharf. Depending on the average SPL_{RMS} results calculated on the five (5) minutes recording of continues pile driving noise, subsequent measurements will be made either further 100 m offshore (> 160 dB re 1µPa) at 500 m) or inshore (< 160 dB re 1µPa) at 500 m) on the transect in order to define the location of the 160 dB re 1µPa threshold. The average SPL_{RMS} will be calculated through the Octave software.

The distance between this location and the Fixed Wharf will be validated with a GPS to define the exclusion zone limit. After defining the limit of the exclusion zone on the transect North West, measurements will be taken on the transect North and South West to confirm the exclusion zone limit. For those transects, the procedure will be the same as for the transect North West.

If the threshold limit is reached and depth is over 200 m, the zone will be specifically tested as noise propagation differs from those depths range. However, according to the Advisian report (2017), depth should be under 100 m in a 500 m radius.

Additional information will be recorded in order to properly interpret the results, namely:

- EM carrying out the recording
- Geographic coordinates
- Water depth
- Nature of work taking place
- Mitigation measures in place during the recording, if used
- Origin of other noises heard during the recording
- Tide conditions and waves
- Weather conditions.
- Maximum and minimum SPLrms values
- Noise exceedance (> 160 dB re 1µPa) and duration

The form used to record the results is presented in **Appendix 3**. SPL_{RMS} will then be transferred to a log to facilitate follow up.

7.3.3.5 Change Management

If necessary and in order to reduce the size of the exclusion zone, additional mitigation measures may include:

- Diminishing the impact energy to drive the piles (reduce the height of hammer or use of a cushion)
- Diminishing the number of impacts per unit of time

7.3.4 Underwater Overpressure Monitoring

7.3.4.1 EM experience and training

An EM monitored overpressure during blasting and pile driving activities at the Iqaluit Marine Infrastructure Project during the 2018 and 2019 construction seasons. If necessary, M. Bédard-Richard, who has sufficient experience with the hydrophone, will train all new EMs on the use of the hydrophone, reporting and data interpretation.

7.3.4.2 Equipment

Overpressure will be measured using the Instantel Minimate Pro with its hydrophone accessory. The equipment will have been calibrated prior to mobilization by the supplier. The calibration certificate will be available upon request. The metrics can be read on the equipment in real time.

7.3.4.3 Procedure to Monitor Overpressure

Pile driving using both an impact and a vibratory hammer will occur. Both of these activities will be subject to overpressure monitoring.

Overpressure monitoring will be carried out in 2 phases as following:

- Phase 1 is to establish the piling conditions and mitigation measures that will allow for overpressure levels to remain below the established threshold of 30 kPa 10 m from the pile driving activities. Whichever comes first, for 2 days or 5 piles, TA will proceed with phase 1 encompassing the start and refusal.
- Phase 2 will consist in a lower frequency overpressure monitoring as long as the piling conditions and mitigation measures established in phase 1 are respected.

If a change in piling procedure or in mitigation measures is proposed, a continuous real time overpressure monitoring will be carried out until it is confirmed that the new piling conditions generate overpressure levels below the established threshold. It will be assumed that the piling conditions are sufficient to reduce the monitoring frequency once 3 piles have been driven using the new piling conditions with no overpressure peaks beyond 25 kPa.

In order to proceed with Phase 2 of the overpressure monitoring, TA will send an email to Advisian detailing the overpressure monitoring activities that have taken place during phase 1 and wait for the confirmation that phase 2 can begin. The following details will be provided:

- Type of pile;
- Number of piles driven during phase 1;
- Mitigation measures applied during phase 1;
- Peak value obtained during phase 1 of monitoring.

Phase 2 will include a real time overpressure monitoring once every 7 days of piling. The monitoring will be conducted for half a day. Monitoring will be extended by another half day if any readings are above 25 kPa or if the cause of the high overpressure readings cannot be determined.

Whether during phase 1 or 2, as a preventative measure, in order to avoid exceedances of the 30 kPa threshold, the construction team will be notified for every overpressure reading beyond 20 kPa. The construction team and the EM will re-examine the conditions such as the depth of the sheet pile, the strength of the strike and mitigation measures, for every reading beyond 25 kPa.

The hydrophone will be positioned 10 m from the pile driving activities. The hydrophone must always remain at least 0.5 m above the seabed.

7.3.4.4 Recording

The hydrophone will be configured to record in waveform all events that are above 0.01 kPa. Peaks of overpressure at 10 m will be recorded directly in the pile driving overpressure log. Data are collected under a .IDFH file that can be provided and read with the Blastware or Thor software.

7.3.5 Change Management

If overpressure is more than the threshold (30 kPa) at 10 m, TA will either change the work method (e.g. reduce the impact strength of the hammer) until the overpressure is and remains below the threshold or add a bubble curtain to further isolated the pile. A fish exclusion zone could also be put in place around the fixed wharf area to reduce the risk of fish exposure to overpressure levels exceeding the threshold.

7.3.6 In-Air Noise Monitoring

7.3.6.1 Equipment

The EM will use a sound level meter (model Reed R8080) which monitors sound levels from 30 to 130 dB re 20 µPa at the accuracy of +/-1.4 dB with a 0.1 dB digital resolution. This data logging sound level meter can record samples on internal memory and keep track of registered readings with a time and date stamp. The R8080 features user selectable sampling rates and the option to track live measurements via the software.

The sound level meter will be calibrated on site with a sound level calibrator (model Reed R8090).

7.3.6.2 Procedure to monitor in-air noise

The monitoring of the in-air noise will be conducted during pile driving activities. Since these activities are planned to occur during iced conditions, the purpose of this procedure is to set the size of the exclusion zone for the presence of pinnipeds exposed to an in-air level above 100 dB re 20 µPa.

The following activities will be monitored:

- Pile driving for the fixed wharf using a hammer
- Sheet pile driving using a hammer

If the Fixed Wharf construction occurs during the open-water season and no ice is present, it's not necessary to conduct the in-air noise monitoring. Measurements will be taken at the beginning of each new activity listed above. Additional measurements will be taken if the work method changes or if conditions such as weather or ice condition change significantly with respect to the initial measurements.

The monitoring will be conducted along two transects radiating away from the fixed wharf location: one transects toward the access channel opening and one transect outside the west breakwater toward the open sea. Using the sound level meter, the first noise level will be measured on both transects at 50 m from the piling activities. At every subsequent 50 m on the transects, the noise level will be measured. The monitoring stop when the measurement presents a noise level under 100 dB re 20 µPa. The distance between the piling activities and the measurement under the threshold will be used to set the exclusion zone size for the presence of pinnipeds exposed to in-air noise.

7.3.6.3 Recording

The sound parameters recorded will be:

- Noise levels in relation to distance from the piling activities
- GPS location

Additional information will be recorded in order to properly interpret the results, namely:

- EM carrying out the recording
- Nature of work taking place
- Mitigation measures in place during the recording, if used
- Origin of other noises heard during the recording
- Weather conditions.

These data will be documented through the supplier software and the weekly report.

7.3.6.4 Change management

The first mitigation measure for the in-air noise level will be to broaden the exclusion zone up to where noise levels are below the threshold. The exclusion zone area will be set in order to ensure noise levels are compliant with the requirements. The new exclusion zone boundary will be communicated to the MMO.

If necessary and in order to reduce the size of the exclusion zone, TA will reduce the impact energy of the hammer.

7.4 De-Fishing of the Enclosed Area

In order to facilitate construction activities and reduce the risk of causing adverse effects on fish as a result of overpressure levels, TA is proposing to extend the southern most dredging access until it reaches the north dredging access (refer to **Figure 1-1**).

According to the Marine Baseline of the project, Arctic char and Arctic cod are two of the main fisheries in the area. It is of note that Arctic Char spawn in freshwater in September-October. Arctic Char is thus unlikely to be in the fixed wharf area at the time of the extension of the dredging access. During the 2020 construction season, schools of Arctic Cods and signs of predation of cods by marine mammals have not been observed in the area of the SCH. Arctic Cod and Arctic Char are unlikely to be entrapped in the closed area. After consulting with locals from the community, namely with the HTO, the most likely species to be caught is the Arctic Sculpin.

In addition, the presence of construction activities the fixed wharf area is likely to repel fish, reducing the potential presence of fish in the proposed enclosure.

Before closing the area, TA will post on the Pond Inlet News Facebook group a notice to inform the Pond Inlet community about the operation of de-fishing. The following information will be provided in the notice:

- A map showing the location of the operation
- Summary of the de-fishing method (e.g. schedule and equipment used)
- Contact information

Once the fixed wharf is enclosed, TA will proceed with fishing inside the exclusion zone to collect fish which may be trapped in the enclosure. The following parameters will be recorded during fishing activities:

- Species of fish caught;
- The number of fish caught for each species;
- Number of live captures vs dead captures;
- How many were released, offered to the community or disposed of.

Pictures of the fishing activities will be taken in order to document the process.

Two local harvesters will fish in the enclosure with rods and reels for a minimum of 2 consecutive days. Both harvesters will use lures to harvest Arctic Sculpin (e.g. jig). If fishes are harvested, the harvesters will continue the operation until no fish is harvested for a period of 6 hours. After this period of 6 hours, TA will consider the enclosed area as de-fished and will start the in-water activities in the enclosed area.

Any live captures will be released outside of the enclosure. If captures are not alive, they will be offered to the harvesters if there is any interest. Subsequent captures could be offered to the community if there is any interest.

8 Land-based Activities

8.1 Wildlife Monitoring

Wildlife (including migratory and marine birds) are protected under federal (Migratory Birds Convention Act [MBCA 1994] and the Species at Risk Act [SARA 2002]) and territorial legislation (Nunavut Wildlife Act 2003). Under the federal MBCA and its regulations, "…no person shall disturb, destroy, or take a nest, egg, nest shelter, eider duck shelter or duck box of a migratory bird". Additional protection is afforded to at-risk species. Under Section 32(1) of SARA, it is an offence to "kill, harm, harass, capture, or take an individual of a wildlife species that is listed". Similarly, under Section 33, it is an offence to "damage or destroy the residence…of a wildlife species that is listed". Under the Nunavut Wildlife Act, is an offence to "injure, molest, or destroy the nest of a bird" or "engage in any activity…likely to result in significant disturbance" or "destroy or damage any abode".

The Nunavut Impact Review Board Screening Decision Report requires that activities be minimized in sensitive seasons and that precautions be undertaken to avoid interaction or disturbance to nesting birds by establishing buffers and avoiding the area until nesting is complete and young have left the nest. To comply with legislation and project approval, commitments were made (**Table 8-1**) to conduct pre-construction wildlife and migratory bird and nest surveys to find and protect sensitive wildlife features (e.g. nests and dens). This document outlines the methods that will be implemented to find, protect, and monitor wildlife

Before the beginning of a construction season, TA will conduct a pre-construction wildlife survey. According to the information collected during the survey, the EM will determine the mitigation measures to put in place in order to respect the project environmental commitments listed in **Table 8-1**. If specific mitigation measures are necessary, these measures will be monitored and reported through the weekly reports.

Table 8-1: Wildlife Requirements

CEMP #	Overpressure recording period
BR01	Activities and infrastructure will be sited away from nests and roosts that will be protected by prohibited entry buffers based upon government or biologist recommended setback distances. Any nest that is disturbed will result in immediate notification to ECCC and the Government of Nunavut
BR02	Construction activities will not begin until the area has been surveyed for migratory birds and nests (in a non-intrusive manner).
BR03	Nest monitoring may be periodically required to determine efficacy of setbacks and buffers.
BL01	Construction should be initiated prior to the arrival of migratory birds (breeding season mid-May to mid-August) such that the quarry and surrounding area becomes unattractive for nesting. A pre-construction survey shall be conducted by the EM to identify all sensitive wildlife features, e.g. active bird nests, wildlife dens and wildlife foraging or traveling nests, if blasting commences within this window.
BL04	Buffers or exclusion zones shall be implemented, in the event a sensitive species or feature (e.g. nest) is identified, to ensure wildlife are not disturbed.
WL10	Appropriate mitigation measures will be implemented in the event large congregations of wildlife and birds occur in the Project Area.
WL11	A pre-construction wildlife sweep shall be conducted to identify all sensitive wildlife features, e.g. active bird nests, wildlife dens and wildlife foraging or traveling.
WL12	Work site boundaries shall be flagged to prevent inadvertent loss or alteration of habitat outside of the designated Project footprint.

During the construction, wildlife observation made by the workers of TA will be recorded on a wildlife sighting form (including recording the time, date, location, activity, and proximity to workers). Wildlife sightings will be tracked in order to respond appropriately to emerging trends. Construction workers will be trained in relation to the wildlife observation expected to occur in the area as well as on measure to protect wildlife, through site induction and toolbox meetings.

8.1.1 Pre-Construction Wildlife Survey

One or two weeks before, a wildlife observer will conduct the pre-construction wildlife survey necessary to identify the sensitive wildlife features which are potentially present in and around the area of the project facilities. The sensitive wildlife features include:

- Active bird nests
- Concentration of migratory birds or seabirds
- Wildlife dens and foraging or travelling

8.1.1.1 Pre-Construction Wildlife Survey Procedure

The project marine and terrestrial environmental baselines will be consulted before conducting the pre-construction wildlife survey. Additional to that, the Ecodistrict of Eclipse Sound nesting calendar (**Figure 8-1**) will be consulted, in order to know which bird species are potentially nesting during the survey. To obtain additional information and if necessary, Mittimatalik Hunters and Trappers Organization can be consulted on recent wildlife sighting. Following that, a list of potential terrestrial and marine species to focus on will be dressed by the EM and the wildlife observer.

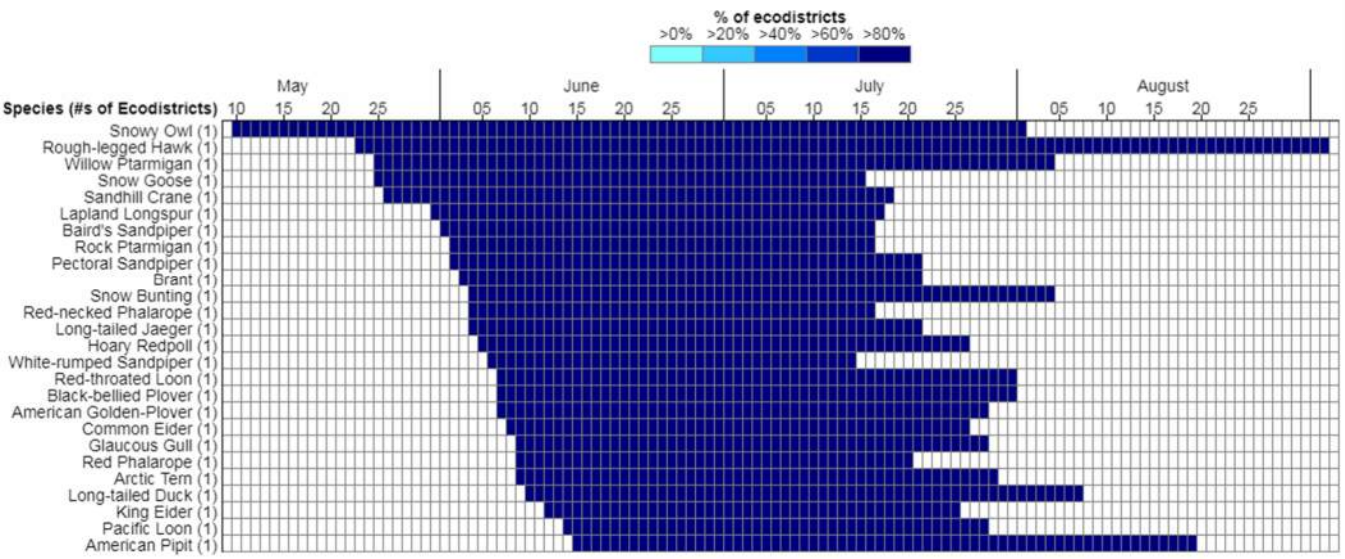


Figure 8-1: Ecodistrict of Eclipse Sound Nesting Calendar[4]

Additional to the SCH, Quarry and Haul Road areas, **Table 8-2** identify the minimum buffer areas that TA will survey at the different project facilities. 100 % of the project facilities plus the buffer area shall be surveyed. The buffer area has been established by TA according to the construction activities disruption level, the environmental commitments of the project and the following references:

- GN: Table 2 Migratory Bird Setbacks from the Nunavut Land Use Plan. https://www.nunavut.ca/sites/default/files/table_2_-_migratory_bird_setbacks_0.pdf
- ECCC: Guidelines to reduce risk to migratory birds. https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds/reduce-risk-migratory-birds.html#toc5
- ECCC: Incidental take of migratory birds in Canada. https://iaac-aeic.gc.ca/050/documents/p80054/121249E.pdf

[4]Nestling calendar is provided by *Birds Canada* web site : https://www.birdscanada.org/apps/rnest/index.jsp?lang=EN

Table 8-2: Buffer area to survey according to the sensitive wildlife features and facilities

Facilities	Small Craft Harbour	Haul Road	Quarry
Active birds nest	100 m	100 m	250 m
Migratory birds and seabirds	300 m	300 m	300 m
Terrestrial wildlife	100 m	100 m	500 m
Marine mammals	500 m	-	-

A field methodology has been prepared by TA and the methodology is provided in **Appendix 4**. Wildlife, Migration Birds and Nests Survey Report detailing wildlife features observed during the survey and compliance with mitigation measures will be provided to CGS. If necessary, a local support can be hired to conduct the survey with the Wildlife Observer.

8.1.2 Mitigation Measures to Protect Sensitive Wildlife Features

According to the pre-construction wildlife survey, mitigation measures may be required to avoid disturbance of wildlife. The mitigation measures can be as follows:

- Monitor a wildlife exclusion zone
- Establish a sensitive feature setback distance and marking around the nest or avoidance for a specific period
- Reduce the construction activity disruption

TA will apply the setback distance provided by the GN and/or ECCC. If TA is not able to respect the GN and/or ECCC setback distance, TA will consult a wildlife biologist to fix a new setback distance and discuss with the GN and/or ECCC.

The EM will notify the site supervisors of TA about the mitigation measures to implement. Mitigation measures will be monitored by TA during the construction period and report in the weekly reports.

Polar bear sighting will be reported immediately to the EM and CA/EI so that appropriate actions are taken. A follow-up of the taken actions will be reported through the weekly report.

In the event caribou are sighted, protection measures implemented will follow those outlined in Appendix I of the North Baffin Regional Land Use Plan. Protection measures will be directed by a wildlife biologist and will be reported to the GN through the weekly report.

8.2 Sediment and Erosion Control

The EM will monitor land-based activities to confirm if any Sediment and Erosion Control (SEC) measures are required. Primary areas to be monitored are the stockpile and rock crushing areas as identified in **Figure 8-2**. The Haul Road will be surveyed on a weekly basis to raise any erosion or runoff problem.

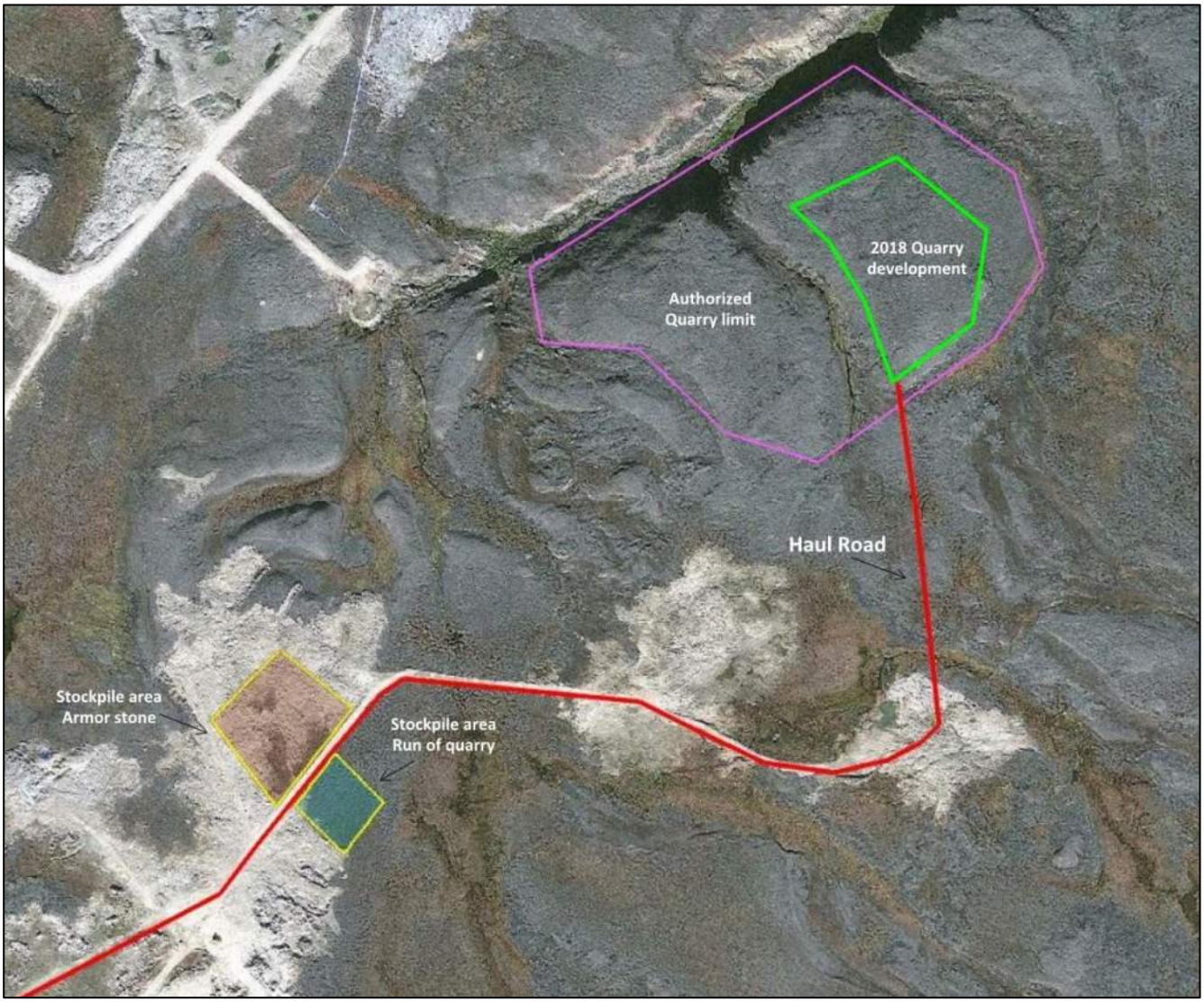


Figure 8-2: Stockpiling areas (Source: TA)

8.2.1 Water Crossing Monitoring

The Water Crossing Monitoring is related to the Nunavut Water Board License (conditions: B1a, B1c, B3, E7, I2, I6, and I9) which authorized the installation and the using of the water crossing (culverts) in the Haul Road during the SCH construction process.

Seven (7) culverts have been placed on the road to cross the creeks. Refer to **Figure 8-3** to locate the road and the culverts. Table 1 provides culverts GPS coordinates and diameter.

Figure 8-3: Map of the pond inlet haul road culvert location (Source: TA)

Table 8-3: Culverts GPS coordinates and diameter

Culvert identification	X	Y	Diameter (mm)
CS01	72°41'25.26"N	77°52'52.44"W	900
CS02	72°41'22.52"N	77°53'8.12"W	900
CS03	72°41'4.32"N	77°55'18.96"W	600
CS04	72°40'55.74"N	77°55'43.05"W	1200
CS05	72°40'49.61"N	77°56'13.95"W	600
CS06	72°40'37.00"N	77°58'40.61"W	600
CS07	72°41'38.15"N	77°58'57.96"W	1200

The water crossing monitoring plan has been updated following the receipt of the NWB Technical Review of the 2018 Annual Report. TA and NWB agreed on the stability condition and the water quality monitoring methods and TA adjusted the monitoring methods accordingly.

The water crossing monitoring plan include the stability condition (**Section 8.2.1.1**) and the water quality monitoring method (**Section 8.2.1.2**). Both monitoring will be initiate during the haul road use by Tower Arctic (TA) including hauling of aggregates and road repairs.

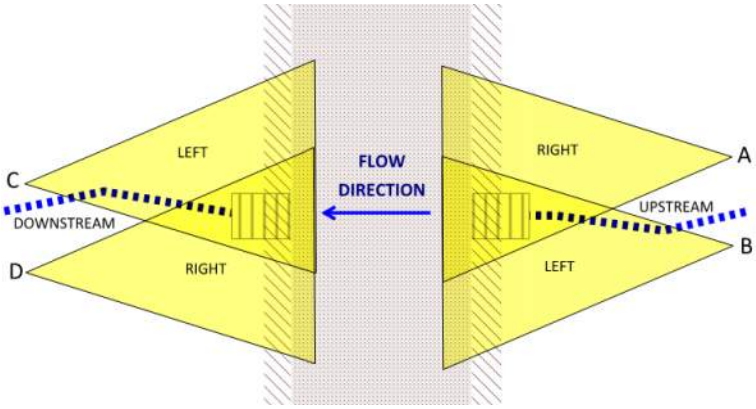
8.2.1.1 Water Crossing Stability Monitoring

The water crossings stability monitoring shall be conducted twice a year, once at the beginning of a new construction season and once at the beginning of the freeze-up season. Also, the monitoring must be conduct prior to and during freshet and after major precipitation. If the EM are not on site, the monitoring will be conducted by an employee of TA who reviewed the monitoring procedure with an EM.

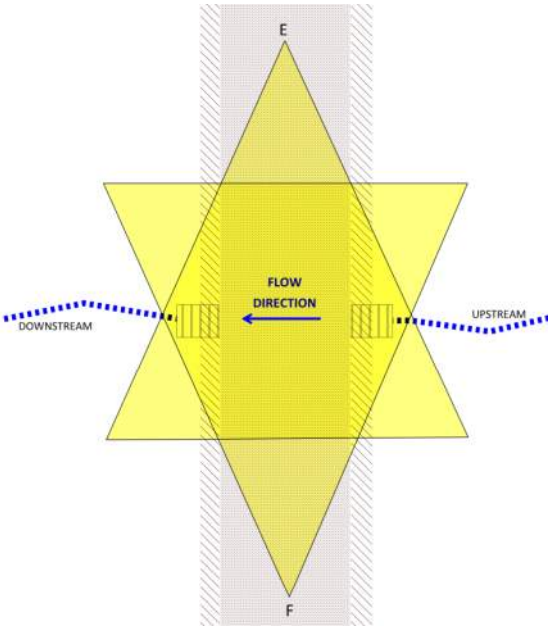
VISUAL MONITORING

For each culvert in **Table 8-3**, the monitoring steps as following:

1) Stand from 5 m to 10 m from the culvert and photograph:
   A. Upstream side, culvert right side
   B. Upstream side, culvert left side
   C. Downstream side, culvert left side
   D. Downstream side, culvert right side



2) Stand in the middle of the road at about 20 m from the culvert and photograph the road where the culvert is located. Photograph twice, one of each side of the culvert (E and F).



3) If erosion or slope collapse is present, it's required to photograph with detail the condition of the culvert and/or the road where the erosion or slope collapse is present.
4) Transmit the pictures to the EM after renaming them using the following structure:

CULVERT NAME_FLOW SIDE_CULVERT SIDE_DATE (e.g.: CS01_DOWNSTREAM_RIGHT_190716)

The EM will review the pictures and prepare a report summarizing the water crossing stability condition. The report template is provided in **Appendix 5**.

Stability Improvement Measures

If erosion and/or slope collapse are observed which has or could result in water course runoff discharge, the EM will recommend to the superintendent temporary and/or permanent stability improvement measures.

The measures should be as following:

Temporary measure

- Silt fence installation

Permanent measure

- Redirecting flow into vegetation
- Rip rap placement
- Localize re-grading of the road

Following the improvement measures, the water crossing site will be photographed again to allow the EM to evaluate the efficiency of the measures. A summary of the evaluation will be added to the visual monitoring report.

8.2.1.2 Water Quality Monitoring

The water quality monitoring must be conducted according to **Table 8-4**. If the EM are not on site, the monitoring will be conducted by an employee of TA who reviewed the monitoring procedure with an EM. The monitoring is to be conducted during the haul road use by TA including hauling of aggregates and road repairs.

TABLE 8-4: MONITORING FREQUENCY ACCORDING TO THE PERIOD

Period	Monitoring frequency
Melting and summer condition	Once a week and after precipitation
Winter condition (Frozen watercourse)	Not required

VISUAL MONITORING

For each culvert in **Table 8-3**, the monitoring step are the following:

1) Reach the culvert site and observe the water course upstream and downstream. Observe if there's a presence of turbidity in the clear water. If yes, investigate the origin of the turbidity.
2) If the turbidity comes from a runoff discharge from the road proceed immediately to the water sampling and analysis.
3) Collect information on the duration and the origin of the runoff discharge. Photograph the origin and any factor which can influence the runoff discharge.

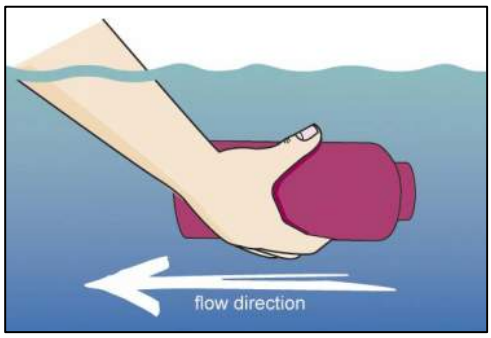
WATER SAMPLING AND ANALYSIS[5]

The method chosen to sample water in the watercourse is near the surface "Grab sampling" using a 500 ml bottle. The sampler shall collect one (1) sample 10 m upstream of the turbidity generated by the runoff discharge (use for background levels) and one (1) sample 10 m downstream of the runoff discharge (use as compliance samples). The steps to collect water samples are as follow:

1) Before sample collection, rinse all sampling equipment (if necessary) in the body of water to be sampled. Dispose of all rinse water downstream of the site, or in such a way that it does not contaminate or disturb the site to be sampled.
2) Start sampling in areas of lowest turbidity, followed by areas of highest turbidity. This reduces the potential for cross contamination of samples. As the watercourse to be sampled are not deep (< 30 cm), the sampler must make sure the bottle does not disturb the watercourse bed to prevent sediment entering in the bottle. All samples must be taken while the opening is facing upstream.
3) Plunge the bottle, neck downward, below the surface and immediately turn the bottle until the neck points slightly upwards with the mouth directed into the current (**Figure 8-4**). Hold the bottle facing upstream at arm's length while it fills. Fill all bottles with the sample water to approximately 0.5 cm from the top and cap

[5] Adapted from *Northern Waters: A Guide to Designing and Conducting Water Quality Monitoring in Northern Canada.*

each bottle immediately after filling. Identify the bottle according to the type of site sampled (background or compliance) and the location (e.g. culvert name) of the sampling.



Note: Be sure not to touch the cap liner, or the inside of the bottles. Touching may result in contamination of the sample. Remove all jewelry and watches. Roll up sleeves to avoid sample contamination, or wear gauntlet gloves. Don't smoke while taking or handling the samples. During sampling by hand don't use insect repellent, as this may cause sample contamination.

Figure 8-4: Grab Sampling

4) Photograph the location of the sampling sites and rename the pictures according to **Section 8.2.1.1** step 4. The pictures must be transmitted to the EM with the turbidity and pH measurement report.
5) Immediately after collecting both water samplings and site pictures, turbidity and pH measurement shall be conducted and compared to the Water Quality Limit (**Table 8-5)**

TURBIDITY MEASUREMENT[6]

For each water compliance and background samples, turbidity is measured in nephelometric turbidity units (NTU) using a turbidimeter and the procedure is as follow:

1) Verify the turbidimeter calibration using the calibration standard of 15 NTU and if necessary, adjust the calibration using the calibration standard.
2) Fill a cuvette with shaken field water sample to the line marked on the cuvette.
3) Dry the cuvette with a clean, lint-free, laboratory-grade paper towel.
4) Place the cuvette, with the orientation mark facing forward, in the chamber.

Note: Handle cuvette with care and do not touch the area of the cuvette below the line. Keep the cuvettes absolutely clean.

5) Measure the turbidity of the sample. Rinse the cuvette with deionized water before storage.
6) Note the measurement results and details in the field report (**Appendix 6** provides the report frame).

For additional information on the turbidimeter use, refer to the manufacturer's user manual.

[6] Adapted from *CCME: Protocols manual for water quality sampling in Canada.*

pH Measurement[7]

For each water compliance sample, pH is measured using a pH meter and the procedure is as follows:

1) Adjust the temperature reading (if needed) to the temperature of the field sample.
2) Shake the sample and rinse the electrode with sample.
3) Place the electrode in the sample.
4) Select pH measurement mode.
5) Swirl the sample and measure the pH. Allow sufficient time for the meter to stabilize.

Note: Be sure to rinse the electrode with deionized water before storage. Store the electrode in a potassium Chloride (KCl) storage solution according to the manufacturer's instructions. pH electrode sensors should be kept wet with sample water or tap water, and not in a standard solution, at all times during storage.

6) Note the measurement results and details in the field report (**Appendix 6** provides the report frame).

For additional information on the pH meter use, refer to the manufacturer's user manual.

Water Quality Limit

Each water samples must be compliant with the criteria provided in **Table 8-5**.

TABLE 8-5: WATER QUALITY CRITERIA LIMIT

Parameter	Criteria
Turbidity	Maximum increase of 100 mg·L-1 or 33 NTU from background levels[8]
Oil and Grease	No visible sheen[9]
pH	Between 6.0 and 9.5[10]

If a sample is not compliant with the water quality criteria, immediately runoff control measures must be put in place to stop the runoff discharge. The measures should be the same as indicated in **Section 8.1.1.2** *Stability Improvement Measures*.

Until the control measures are in place, the water quality shall be monitoring twice a day (**Section 8.1.1.2**). After the measure's placement, the efficiency must be photographed and sampled to confirm compliance. The pictures and data shall be transmitted to the EM with all turbidity and pH measurement report.

[7] Adapted from *CCME: Protocols manual for water quality sampling in Canada.*
[8] According to the NWB Licence No. 8PW-PIM1821 and *Canadian Water Quality Guidelines for the Protection of Aquatic Life: Total Particulate Matter*
[9] According to the NWB Licence No. 8PW-PIM1821
[10] According to the NWB Licence No. 8PW-PIM1821

8.3 Dust Control

TA will be transporting rock material from the Quarry to Pond Inlet to support construction of the SCH. The Haul Road will be used to do so as shown in **Figure 1-3**.

The EM will monitor if additional dust control measures are required. If any additional measures are required, this information will be provided in the appropriate weekly report.

8.4 Laydown of Tower Arctic

TA has established a Garage Site approximately 1 km south from the project site (Refer to **Figure 1-3** to know the location of the garage area). The purpose of the Garage Site is to: a) provide a parking area for construction equipment and vehicles and b) provide a storage area for dangerous goods, and c) provide an area for fuel storage.

Measures for appropriate fuel storage are provided in the Spill Response Plan of TA, however, if any spills occur during refuelling this will be reported in the appropriate weekly report.

8.5 Storage of Dangerous Goods

A storage area for dangerous goods (DG) was established south-west from the project site (**Figure 8-5**), where items were stored in designated shipping containers. Explosives for blasting will be stored in an area approximately 3 km south of Pond Inlet as permitted by NRCan and the City (**Figure 8-6**). Items planned to be stored in both locations are provided in **Table 8-6**.

Table 8-6: Items for Dangerous Goods and Explosives Storage

DANGEROUS GOOD	VOLUME	STORAGE SITE
Diesel	20,000 L	Garage site
Gasoline	150 L	Garage site
Propane	5 m^3	Garage site
Lubricants and oils	1,000 L	Garage site
Oxy/Acetylene	5 m^3	Garage site
Paint	5 L	Garage site
Explosives	25 kg	Explosives storage area

The arrival of DG and explosives will be documented by the onsite EM, and the storage areas will be inspected weekly to confirm appropriate storage is occurring.

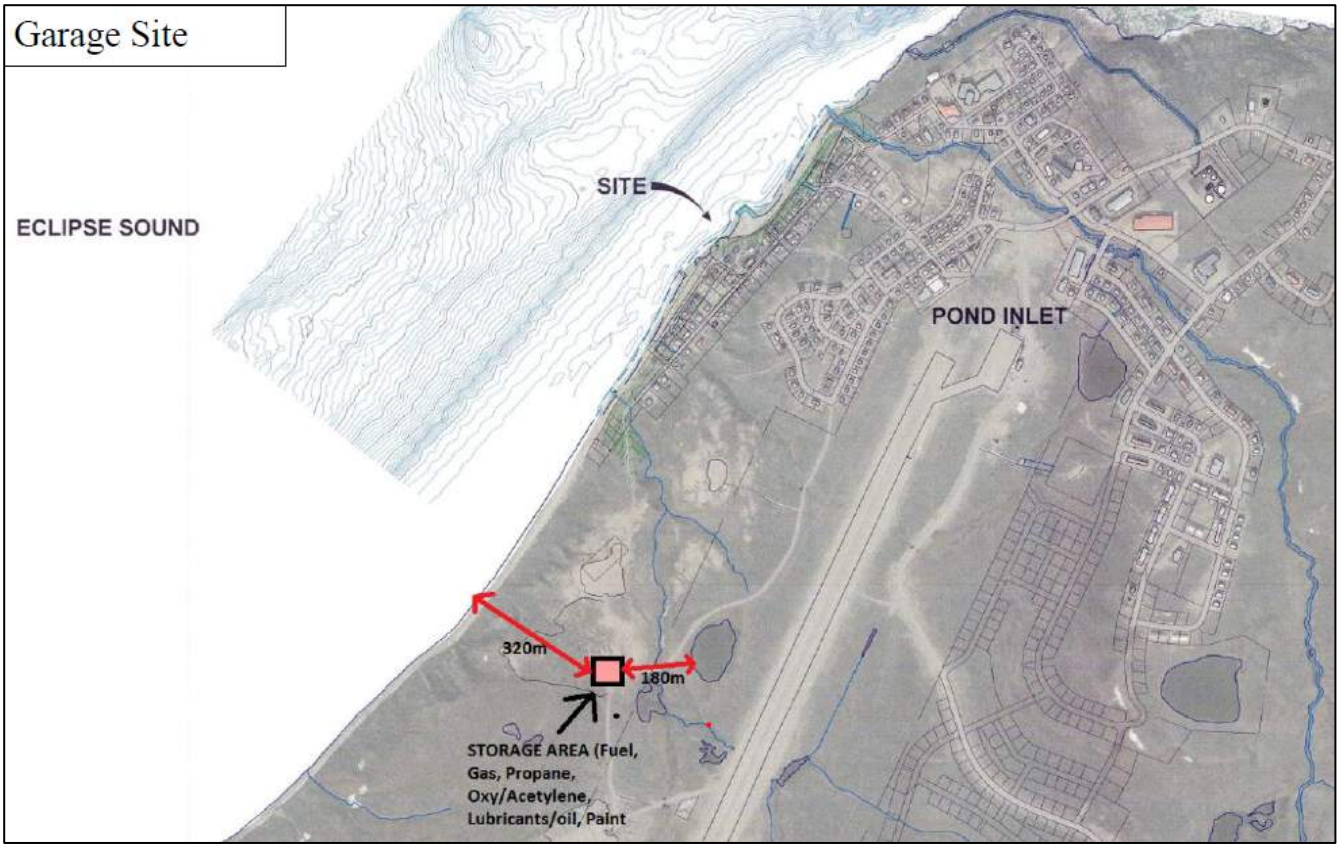


Figure 8-5: Dangerous goods storage area (Source: TA)

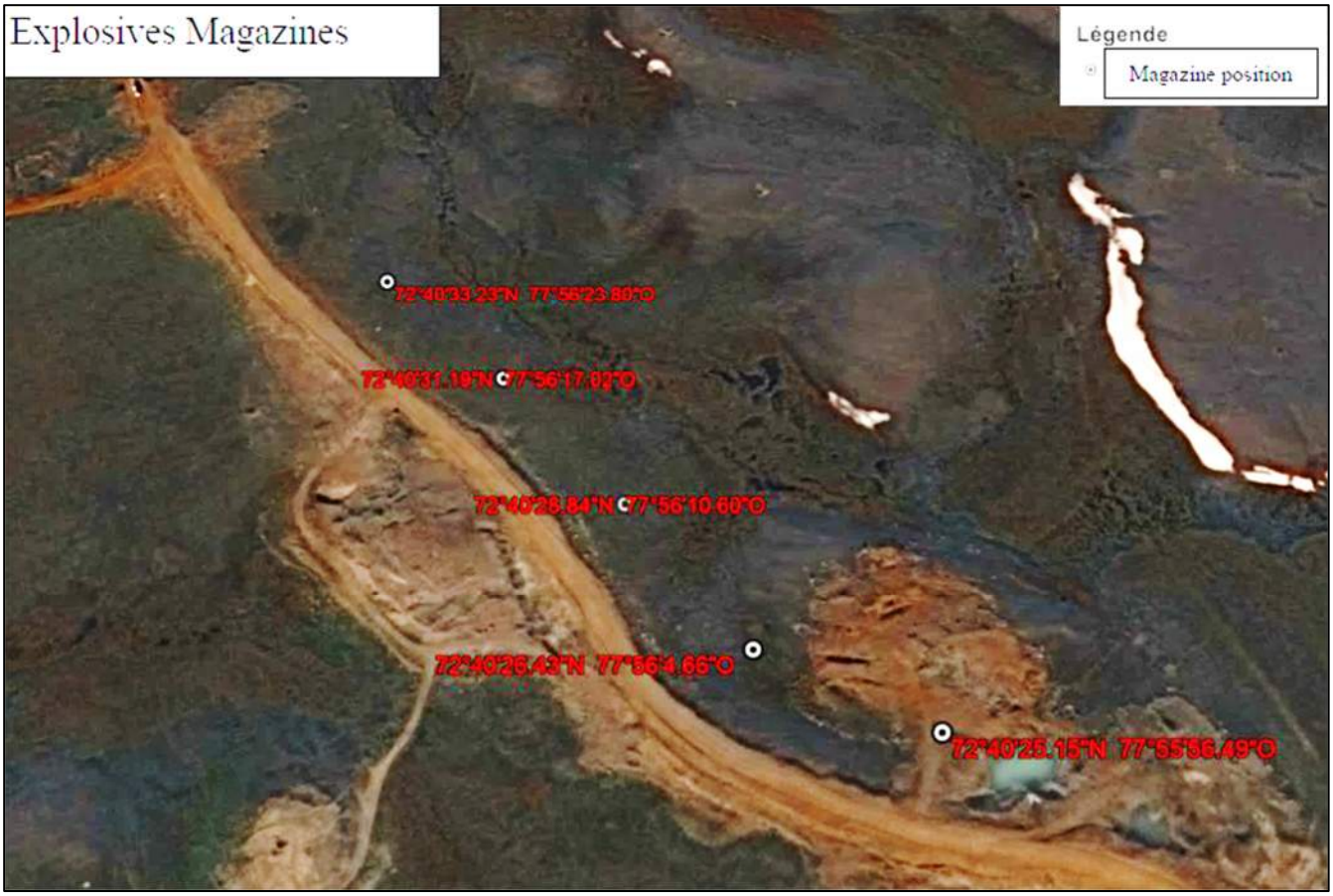


Figure 8-6: Explosive Storage Area (Source: TA)

9 Reporting

9.1 Check Lists

In order to ensure compliance with the terms and conditions of the various project permits as well as with the CEMP, the environmental monitors will document their surveillance activities within two documents:

- A Commitment Register which summarizes mitigation, monitoring, and permit conditions was developed. It has been transformed into a checklist which will be used once at the onset of the construction season and again towards the end of the work season (**Appendix 7**)
- An abridged checklist which includes regular environmental conditions to be monitored weekly (**Appendix 8**).

The EM will always use the previous checklist as a guide in order to ensure a follow up of main environmental concerns.

9.2 Databases

Databases will also be used for monitoring of the following activities:

- Staff training
- Turbidity monitoring
- Underwater noise and overpressure monitoring
- Marine mammal sightings
- Hazardous materials delivered to the site
- Non compliance
- Accidental spills
- Local hires.

Databases will be available to CGS upon request and presented in weekly reports when relevant.

9.3 Pictures

A few relevant dated pictures with descriptive captions will be included in the weekly reports. Other site pictures will be saved per date in a file on the e-builder.

9.4 Weekly Reports

Since EM rotations will begin and end on a Wednesday, weekly reports will be produced by TA with a week that runs from Wednesday to Tuesday. Reports will be submitted to CGS no later than the Tuesday following a construction week. A demonstrative weekly report format is provided in **Appendix 9**.

9.5 Regulator Reporting

Several regulators have reporting requirements in their permit conditions that are due either annually subsequent to the construction season, once a specific construction activity is complete or subsequent to facility construction. These requirements are outlined in **Table 9-1**. Weekly reports will be used to prepare reports and substantiate statements made in annual reports.

Annual reports will include a tracking table listing conditions stated in the permits and the section of the report where these conditions are addressed.

Table 9-1: Regulator Reporting Requirements

Authority	Permit	Permit No	Condition No	Detail	Reporting Frequency	Due Date
DFO	FAA -	17-HCAA-00961/64	3.1	Monitoring of avoidance and mitigation measures: The Proponent shall monitor the implementation of avoidance and mitigation measures referred to in section 2 of this authorization and provide an annual report to DFO, by January 31, 2019, 2020, and 2021, and summarizing whether the measures and standards to avoid and mitigate serious harm to fish were conducted according to the conditions of this authorization. This shall be done, by:	Annual	January 31, 2019, 2020, 2021
			3.1.1	Demonstration of effective implementation and functioning: Providing dated photographs and monitoring reports to demonstrate effective implementation and functioning of mitigation measures and standards described above to limit the serious harm to fish to what is covered by this authorization.		
			3.1.2	Contingency measures: Providing details of any contingency measures that were followed to prevent impacts greater than those covered by this authorization in the event that mitigation measures did not function as described.		

Authority	Permit	Permit No	Condition No	Detail	Reporting Frequency	Due Date
NIRB	Screening decision	17QN015 (Quarry) 17XN030 (SCH)		Prior to the start of construction activities, provide the final Construction Environmental Management Plan including an updated Spill Contingency and Emergency Management Plans. Submit a comprehensive final report at the completion of construction activities and prior to operations. This report must contain the following information: a) A summary of activities undertaken during the construction phase, b) A log of wildlife observed in or near the project site, especially marine mammals, c) Description of any fuel spills and response measures undertaken to contain or clean up the spill, d) A summary of how the Proponent has complied with terms and conditions	At completion of construction	Tentatively year end 2020
NWB	TYPE "B"	8BW-PIM1821		File an Annual Report on the Appurtenant Undertaking with the Board no later than the 31st of March of the year following the calendar year being reported, containing the a summary report of all construction activities, acid rock drainage and metal leaching characterization of the borrow material to be used for construction, all monitoring information required under Part H of the Licence, a list of unauthorized discharges and a summary of follow-up action taken, a summary of any abandonment and restoration work completed during the year and an outlined of any work anticipated for the next year, any revision to approved plans and manuals, a	Annual	31st of March

Authority	Permit	Permit No	Condition No	Detail	Reporting Frequency	Due Date
				summary of any studies or reports requested by the Board that relate to the use of water and the deposit of Waste, or restoration, and a brief description of any future studies planned; and any other details on water use or Waste disposal requested by the Board by the 1st of November of the year being reported.		
Pond Inlet Hamlet	Quarry		31	Immediately report all spills of petroleum products and hazardous chemicals in accordance with the Government Spill Report to the twenty-four (24) hour spill report line (867) 920-8130.		
			32	Report in writing to the authorized Departmental representative the location and quantity of all petroleum fuel cache within ten (10) days after the establishment of any such caches.		

9.6 Non-Compliance

Any non-compliances will be reported to GN and the Environmental inspector within 24h. Other concerns will be discussed with GN and the EI as they arise to engage relevant RAs before non-compliances arise.

9.7 Reportable Incidents

Measures to be taken in the event of a spill are described in TA Spill Response Plan. Details on reportable incidents will be provided in the appropriate weekly report.

Additional to the details requested in the spill report form, TA will add those details to the reports when they will be transmitted to the spill line:

- Picture of the spill event;
- If the spill is near water (≤ 30 m from the most recent HWL), the distance between the spill and the most recent HWL will be provided;
- If the spill occurred below the most recent HWL (intertidal area), this information shall be noted.

9.8 Regulators Inspections

As soon as an on-site person hears of the planning of an inspection by a Regulator, an email will be sent to the GN's on-site representative and project manager. The name of the inspection, agency, date, and objective of the visit will be provided to the GN.

The TA's construction sites are compliant whether an inspection is planned or not, but TA will inform his site supervisors of the planned inspection in order to make sure there is no safety issue during the inspection.

A summary report will be sent to GN following the inspection (e.g. within 48 hours) providing dates, names, agencies, objectives of the visit, comments from the inspector, and follow-up needed.

The inspection will be addressed in the Weekly Report under the Environmental Inspection section, with a subsection titled Environmental Inspection by Regulator. The summary report will be appended to the weekly report.

Appendix 1: Turbidity sampling procedure

Procedure for turbidity monitoring

Turbidity monitoring for construction activities will be conducted by visual monitoring. Compliance monitoring will be conducted when visual turbidity monitoring has been observed outside of the zone of influence described in **Table 7-1** of the monitoring program.

Equipment list:

1- Boat
2- Boat safety equipment
3- Life jacket and/or isothermal suit
4- GPS with depth sampler
5- Sampling pole
6- Weighted Van Dorn sampler
7- Clean sampling bottles
8- Turbidity meter
9- Log/field notebook with pen/pencil
10- If samples to be sent to the laboratory:
    a. Cooler and ice pack
    b. Indelible ink pen/marker
    c. Clean bottles
    d. Chain of custody document

Basic sampling steps are as follows:

1. On land prior to departure – calibration as per instruction manual:
    a. Calibrate the turbidity meter if it hasn't been done a month, or;
    b. Validate calibration
2. Ensure safety equipment is placed in the boat, personal protection gear and perform a safety check as required in TA's safety plan
3. Sampling locations:
    a. Sample background site first (either 25 m up-current from plume or at slack tide at a distance equivalent to 5X the size of the plume)
    b. Compliance locations to be sampled will be at 3 different location in the plume and 100 m down-current from the turbidity generating activity
    c. If the plume is discontinuous, use 3 locations within the plus at 100 m down-current instead of just one
    d. Validation location to be sampled will be in the plume 300 m down-current from the turbidity generating activity
4. Find sampling locations using GPS coordinates.
5. Use a boat to reach sampling locations.
6. Measure the height of the water column using the GPS system:
    a. If water column is <3 m, only take a surface sample using the pole
    b. If the water column is >3m and <40 m, take a surface sample using the pole or the Van

Dorn sampler (at least 30 cm below the surface but aim for 1 m below the surface) and a sample 1 m above the seabed using the Van Dorn sampler

c. If the water column is >40 m, take a surface sample using the pole or the Van Dorn sampler (at least 30 cm below the surface but aim for 1 m below the surface), a sample at mid-height of the water column and a sample 1 m above the seabed using the Van Dorn sampler

7. Prior to sampling, stop the boat at the sampling location and wait until the boat is completely immobile. If tide is flowing, it may be required to keep the engine running. In this case, ensure that the samples are taken from the front of the boat, away from the motor.
8. Rinse the bottle or sampler twice at the site before beginning the sampling.
9. For a surface water sample, with the help of the pole submerge the 500ml bottle previously attached to the end of the 2m pole quickly and vertically. The bottle must be lowered quickly into the water so that the air stays in the bottle and the water starts to enter the bottle at least 30 cm deep. Wait until the bottle is completely filled before surfacing.
10. For a sample lower in the water column, use the Van Dorn sampler:
    a. In the presence of current, ensure the sampler is properly weighted.
    b. Ensure that faucets on either end of the sampler are closed.
    c. Every meter along the length of the rope will have been previously marked so estimate the depth required.
    d. Lower the sample to the desired depth and activate the trigger.
11. Shake the bottle and immediately fill a sample vial with the collected water.
12. If a 500 ml bottle is required for the laboratory analysis:
    a. Ensure the bottle is properly identified with indelible ink prior to filling it
    b. Take a subsample in the vial to measure turbidity with the turbidity meter
    c. Stir the sampler again after filling half of the bottle to ensure particulate matter has not settled out of the water
    d. Leave enough head space for mixing at the laboratory (fill until the bottle's "elbow")
    e. Place the bottle inside of the cooler
    f. Ensure cooler contains the chain of custody documents in a Ziploc bag
13. Read the turbidity level (refer to the turbidimeter instruction manual).
14. Note on the notebook the:
    a. Date and time
    b. Facility and activity
    c. Current phase
    d. Current height
    e. Turbidity level in NTU measured by the turbidimeter
    f. Specific observations (mitigation measures in place, duration of the plume, weather).
15. Repeat steps 6 to 14 at each location.

Appendix 2: MMO Training Program

Tower Arctic Ltd. – Marine Mammal Observer Training Program

1. Training program schedule
2. Project location and construction sites
3. MMO roles and responsibilities
4. Marine mammal (species and description)
5. Marine mammal signs of distress
6. What to do in case of sighting a marine mammal
7. MMO report

1. Training program schedule

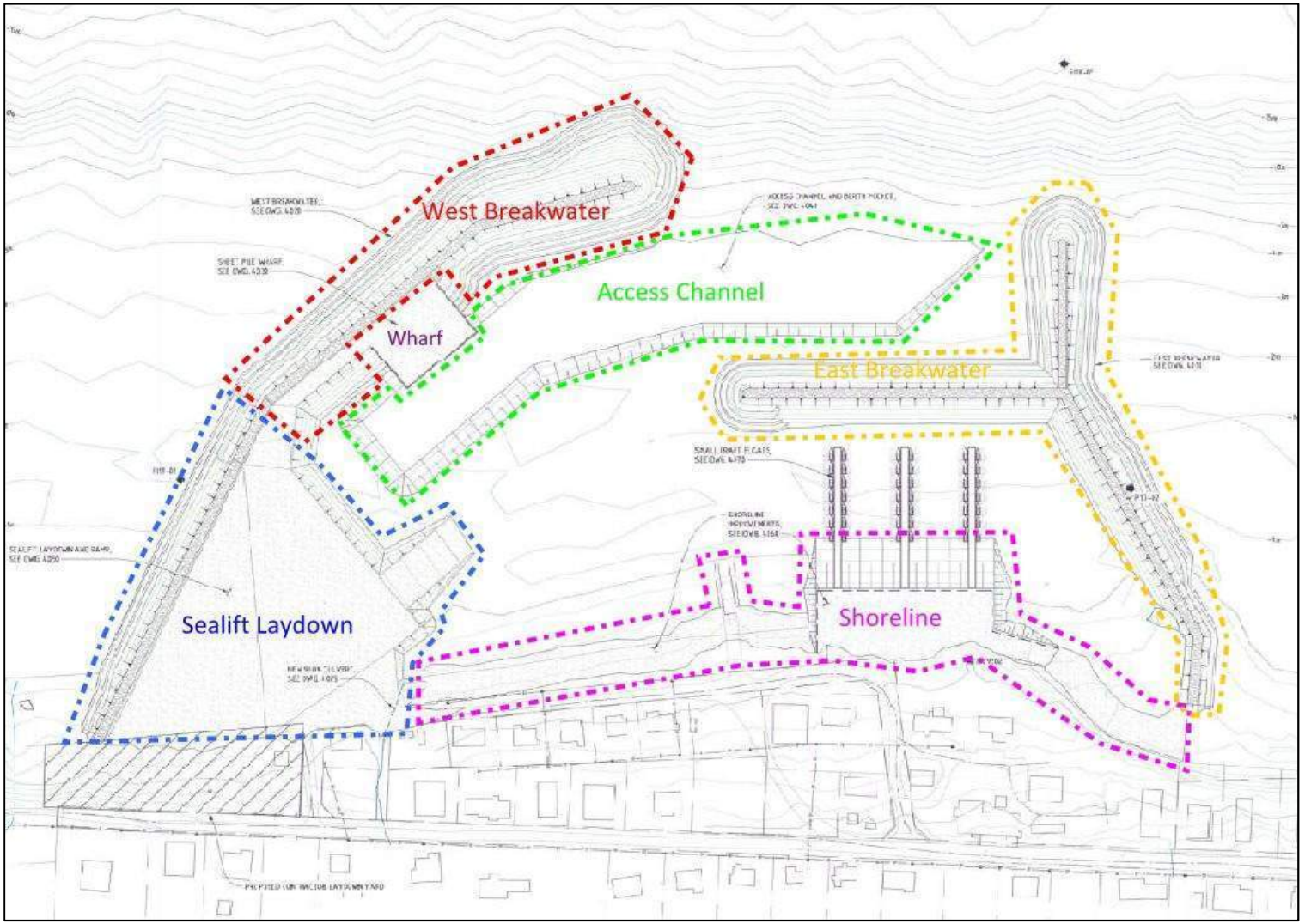
A. Class training (2 hour)
   I. Project Security Induction
   II. Review of the training program with the Environmental Monitor

B. Field training (2 hours)
   I. Visit of the construction site
   II. Presentation of the construction team involved in the activities to monitor
   III. Job safety analysis
   IV. Access to the observation sites

2. Project location and construction sites

Figure 2-1: Map of the construction site

Figure 2-2: SCH site areas



3. MMO roles and responsibilities

What is a marine mammal observer or MMO?

An MMO carries out visual detection of marine mammals during surveys associated with marine projects. The latter is primarily associated with mitigating the potential impacts of anthropogenic sound on marine mammals by implementing a suite of real-time mitigation measures.

In this case, MMOs are required to monitor the presence and behavior of marine wildlife during pile-driving and during the use of explosives (e.g. blasting for excavation)

The use of an MMO is mandatory during all in water or near water activities that may generate underwater sounds.

The role of an MMO includes visually monitoring marine mammals (and other marine fauna) at sea using binoculars, completing the necessary effort, sighting and operational data forms, implementing the required mitigation measures (described below), reporting to the Environmental Monitor (EM) and/or site superintendent, and providing general advice and guidance on minimizing impacts on marine mammals.

The MMO has a serious responsibility and has the power to stop work whenever set conditions are not met.

Why do we need a marine mammal observer?

Apply the law associated to the observation of the whale, beluga, and other protected species and the impact of construction works in the area on those species.

Be compliant to meet the requirements of our permits.

What are the activities that needs to be monitored by an MMO?

The activities that need to be monitored by an MMO will be mostly those of the DSP construction and include; in water infill, dredging, disposal at sea, pile driving and blasting.

What does it take?

Have received training;

Understand the impacts (under water noise pollution, turbidity, risk of equipment working in water) of construction work on the ecosystem;

Be meticulous and patient;

Take thorough and clear field notes;

Be prepared for the right weather;

Good at evaluating distances;

Understand the chain of communication

Immediately communicate to the EM or field superintendent any sighting that is located within the exclusion zone and confirm that the work has stopped;

Document all sightings;

How to be respectful on the local fauna?

Keep a mindful distance from wildlife while operating vessels;

Keep the noise to a low level or establish an exclusion zone and monitor it;

Do not harass, feed, or get close to wildlife;

Communicate clearly and politely with people when you see improper behavior.

What is the exclusion zone?

The exclusion zone is an area where no marine mammals shall be present when a specific work is being performed. The distance between the work and the boundary of the exclusion zone will be different based on the nature of the work.

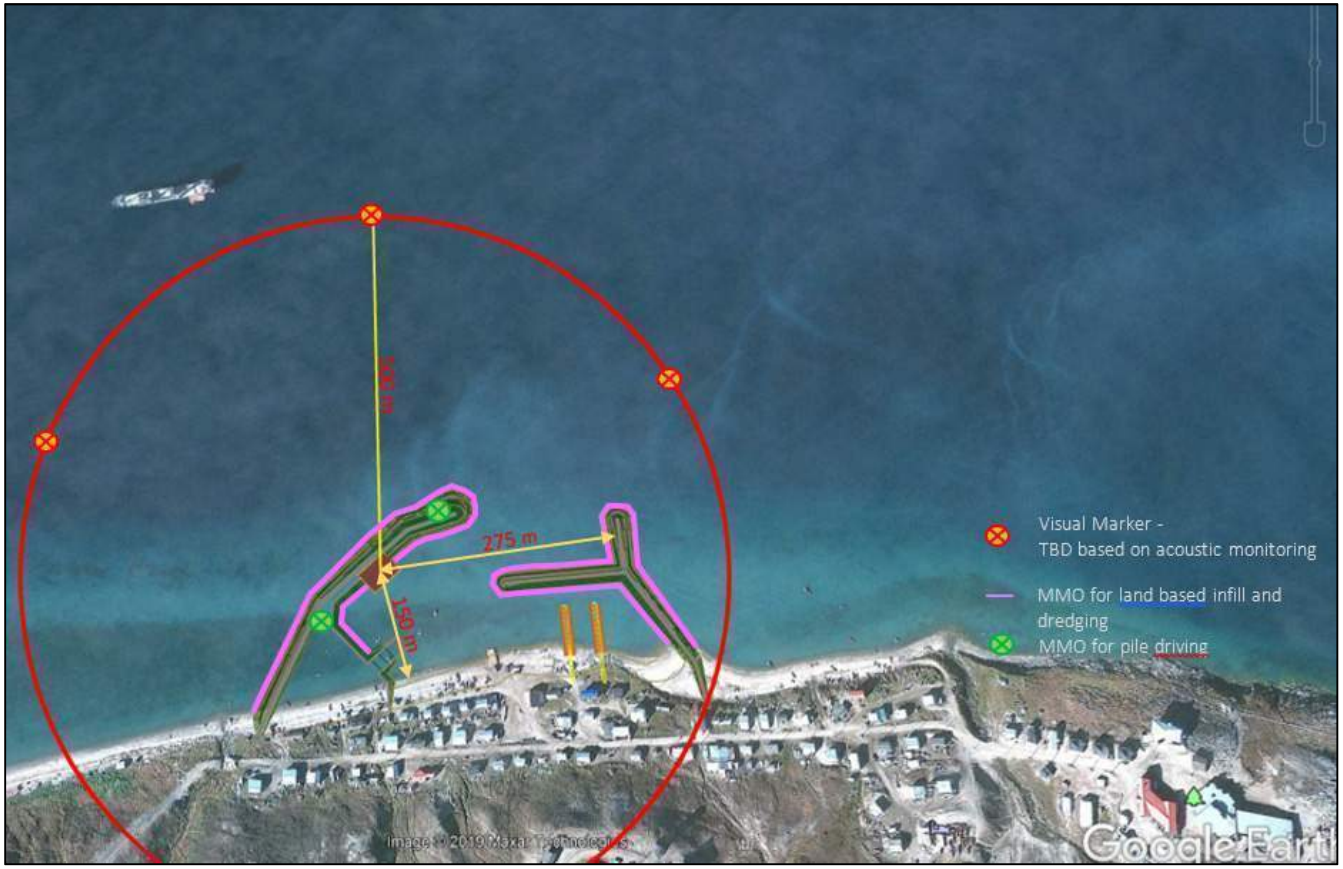
Exclusion zone visual markers; some buoys might be installed in the water with a known distance from work.

Table 3-1: Construction activities and exclusion zone

	ACTIVITY TYPE			
	IN WATER INFILL	OUT OF WATER INFILL	DREDGING	PILE DRIVING
Exclusion Zone	20 m	10 m	20 m	500 m (or as per noise monitoring program)

Where the MMO can observe the exclusion zone?

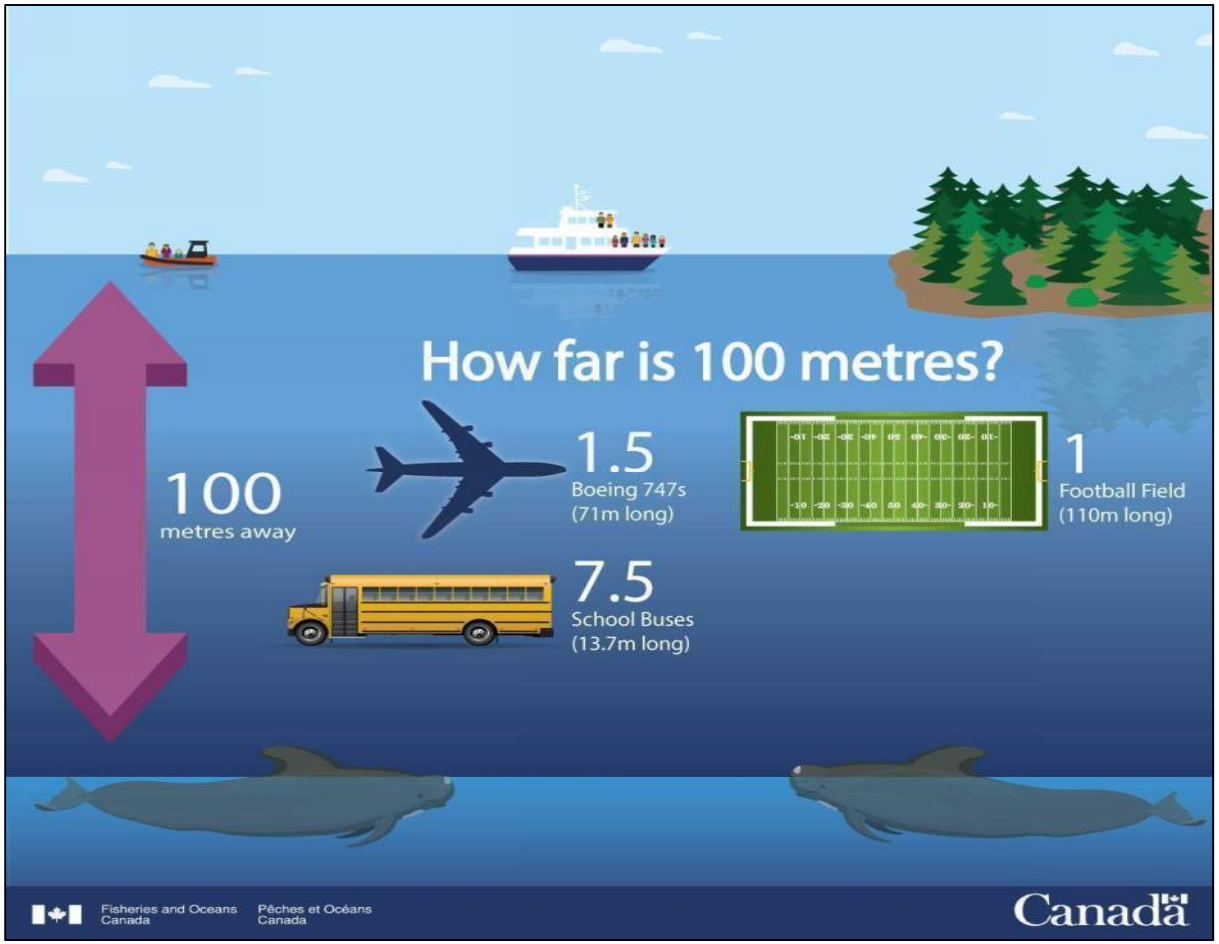
Figure 3-1: MMO observation sites



Without visual marker, how an MMO can evaluate a distance?

- Range stick
- Distance evaluation

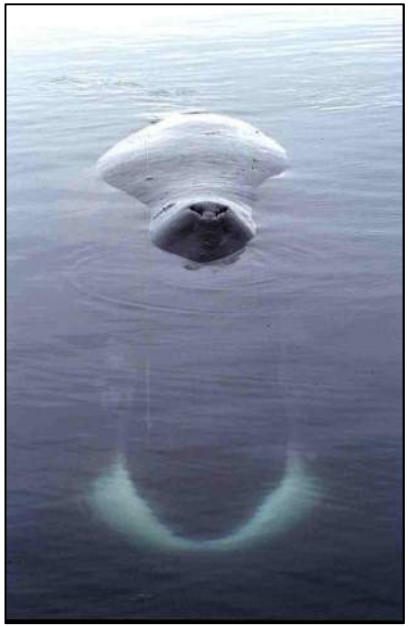
Figure 3-2: DFO distance evaluation



4. Marine mammals (species and description)

Bowhead whale

A stocky dark-colored whale without a dorsal fin, it can grow 14 to 18 m (46 to 59 ft) in length. This thick-bodied species can weigh from 75 to 100 tones.



Fin whale

The fin whale is usually distinguished by its tall spout, long back, prominent dorsal fin, and asymmetrical coloration. The average size of adult males and females is about 18.5 and 20 meters (61 and 66 ft), respectively, averaging 38.5 and 50.5 tones.



Sei whale

The whale's body is typically a dark steel grey with irregular light grey to white markings on the ventral surface, or towards the front of the lower body. Adult males average 14 m (46 ft) and adult females 14.5 m (48 ft), weighing 15.5 and 17 tones.



Blue whale

The blue whale has a long tapering body that appears stretched in comparison with the stockier build of other whales. At up to 29.9 meters (98 ft) in length and with a maximum recorded weight of 173 tones, it is the largest animal known to have ever existed. Long and slender, the blue whale's body can be various shades of bluish-grey dorsally and somewhat lighter underneath.

Harp Seal

Male and female harp seals are similar in size with adults averaging 1.6 m in length and weighing 130-150 kg.

Ringed Seal

The smallest species in the seal family, Ringed seals average about 1.5m in length and weigh between 50–70 kg.

Walrus

Walruses have huge bodies and relatively small heads with no external ears. They have broad, bristled muzzles; and enormously elongated upper canine teeth forming heavy tusks. Walruses can turn their rear flippers forward and use all four limbs when moving onto shore.

Beluga

Belugas have the following characteristics and distinguishing features: Adults range in total length from 2.6 to 4.5 m and weigh up to 1,900 kg; Adult females are about 80% the length of males. Adults are pure white in color; newborns are born a dark grey, sometimes with mottling, and lighten as they mature.

Killer whale

The Killer Whale is a member of the dolphin family. Killer Whales are found in all of the world's oceans. It is easily recognized by its distinct black and white patterns. The Killer Whale is known as ''Aarluk'' in Inuktitut and has the following characteristics: Tall, uniquely-shaped dorsal fin on individual whales; usual length for male 6.70m to 8.50m and female 5.50m to 7.30m

Narwhal

Narwhals, also known as sea unicorns, are toothed whales Narwhals have the following characteristics: Medium-sized whale with no dorsal fin. Adult males can reach 5.4 m in length and about 1,935 kg in weight; females 4.9 m and about 1,552 kg. Females with a tusk, males with no tusk, and two tusks are rare occurrences.

5. Marine mammal behaviors

List of normal behaviors:

1- Feeding
2- Migrating
3- Resting
4- Breeding
5- Feeding
6- Diving
7- Surfacing

During the construction, marine mammals can be exposed to stressors that can change their behavior. The next page presents a list of signs of behaviors related to stress.

Signs of behaviors related to stress

Stops or changes its activities, including:

- Feeding
- Migrating
- Resting
- Breeding
- Feeding
- Diving
- Surfacing

Begins or stops behaviors like:

- breaching, where a whale leaps headfirst from the water
- lobtailing, where a whale repeatedly slaps the surface of the water with its tail
- flippering, where a whale slaps the surface with one or both of the fins directly behind its head
- continually changes its swimming speed or direction
- Rapid swimming away or escape quickly from an area
- Change in surfacing, breading and diving patterns

Change in group composition

6. What to do in case of sighting a marine mammal

Figure 6-1: MMO's decision diagram

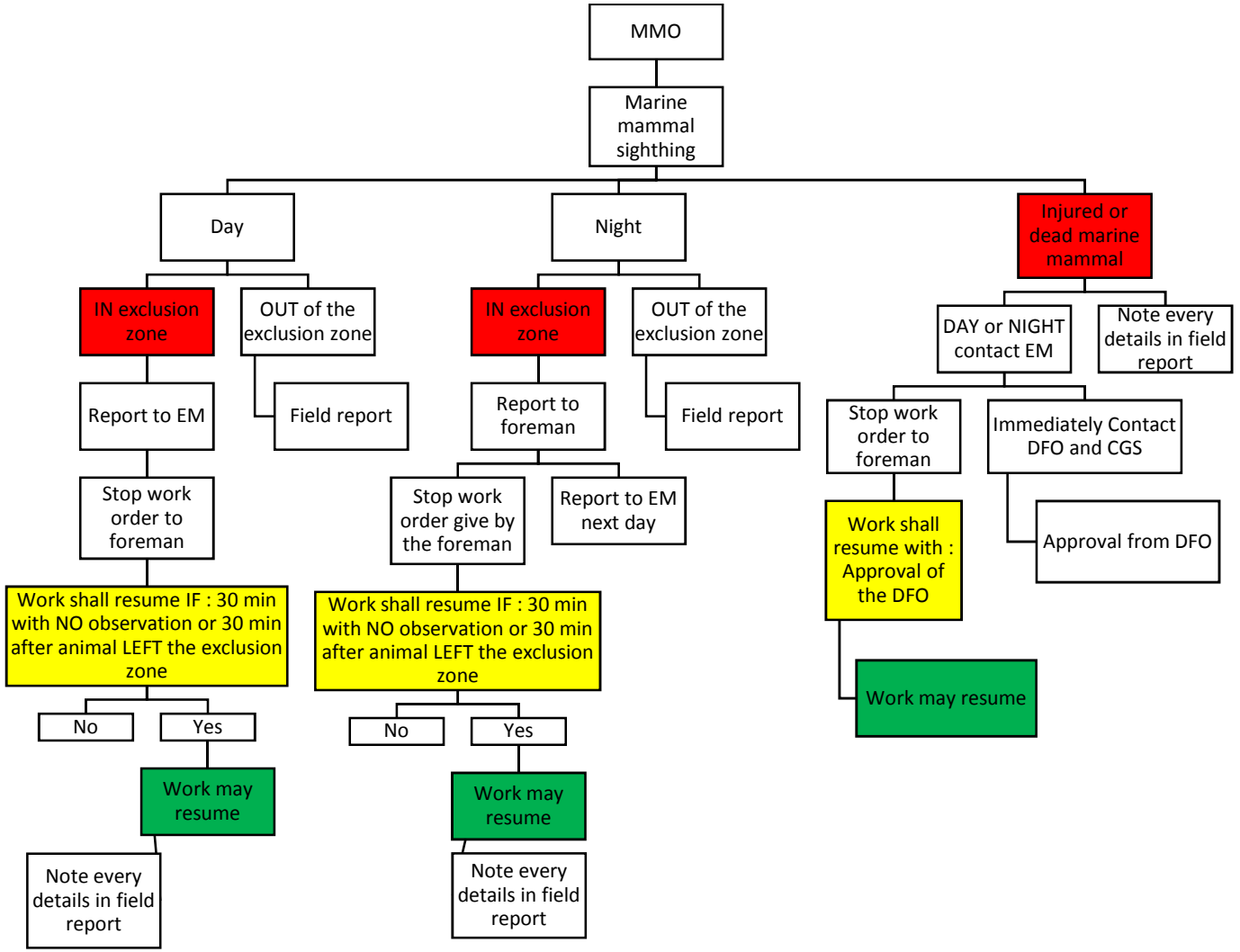


Table 6-1 : Contact informations

	Cellphone number	**Radio frequency**
Environnemental Monitor		
Day shift Superintendent		Simplex 1
Night shift Foremen		Simplex 1

In the case of abuse, harassment or poaching, contact the following toll-free numbers as soon as you can:

- Crime Stoppers: 1-800-222-TIPS (8477)
- Canadian Coast Guard: 1-800-565-1633

General DFO Fisheries Act Violations – FisheriesProtection@dfo-mpo.gc.ca or 1-855-852-8320
DFO Nunavut Fisheries Act Violations – 1-867-777-7500
DFO Project Contact (Steve Cho) – Steve.Cho@dfo-mpo.gc.ca

7. MMO report

- If you catch sight of marine mammal, please be prepared to give every detail you can:
  - Species
  - Number of specimens
  - Observation duration
  - Time of observation
  - Behavior (please use the behaviors lists provided in section 4 about normal behaviors and stress related behaviors)

- The complete report forms to be filed by the MMO are provided in the next 2 pages.

MMO REPORT

DATE : _____ MMO NAME : _____ Shift : Day / Night

_____

Construction Activity	Fill placement below the high water level (HWL)	Dredging	Pile Driving
Construction Activity Duration (Hour)			
Wheather condition			
Visibility			
Sea condition and Beaufort			
Presence Duration (Hour)			

Comments :

TOWER ARCTIC LTD

Project : _____

Date (day/month/year) : _____

Marine mammals observer (name) : _____

Environmental monitor on duty (name) : _____

Foreman on duty (name) : _____

Activity and location that is observed : _____

Exclusion zone (metres) : _____

Time of observation (xx:xx pm/am)	Duration of the observation (minutes)	Observed species	Distance from the work area (m)	Number of specimens observed	Comment on animal(s) behaviour	Stop work (yes/no)	Stop work = yes Person contacted

Signature of the observer: _____

page ____ of _____

MMO DAILY TRACKING SHEET

DATE : _____ EM NAME : _____

Day Shift			
Construction Activity	Fill placement below the high water level (HWL)	Dredging	Pile Driving
Construction Activity Duration (Hour)			
Wheather condition			
MMO Name			
MMO Location			
Observation Duration (Hour)			

Comments :

MMO DAILY TRACKING SHEET

DATE : _____ EM NAME : _____

Night Shift			
Construction Activity	Fill placement below the high water level (HWL)	Dredging	Pile Driving
Construction Activity Duration (Hour)			
Wheather condition			
MMO Name			
MMO Location			
Observation Duration (Hour)			

Comments :

Appendix 3: Underwater Acoustic Measurement

UNDERWATER ACOUSTIC MEASUREMENT

Environmental monitor's name	Date (yyyy-mm-dd)	Period

Description of work	Description of mitigation measures

Results

Underwater noise

Duration (minutes)	Initial position		Final position		SPL_{RMS} (dB re 1µPa)
	X	Y	X	Y	

Include a plan of the recording location and the construction activity.

Notes

Include length of time required to install a pile relative to the length of time the underwater acoustic data were collected.

Details on how the collection of ambient sound versus construction activity sound were determined.

Any other relevant details for the underwater acoustics (i.e. a vessel passed by, or there was other activity in the region that may contribute to the sounds, narwhal was present etc.).

Include noise exceedance (SPLrms over 160 dB re 1µPa)

Marine conditions		Weather conditions	
Tide	Water depth (m)	Temperature (T°C)	Wind condition

Instrumentation

Hydrophone:		Depth:	

Completed by : _____ **Date :** _____

Appendix 4: Wildlife survey methodology

METHODOLOGY TO CONDUCT THE PRE-CONSTRUCTION WILDLIFE SURVEY

Personal Protection Equipment (PPE):

- Hard hat
- Protective gloves
- Safety boots
- Safety glass
- Safety vest
- Bear spray

Equipment list:

- GPS
- Field notebook and pencil
- Binoculars
- Flagging tape
- Map of the project footprint
- Camera

Code of conduct:

- Inventory in a non-intrusive way
- Respect the presence of birds and nests
- Be alert to potential predators
- Minimize inventory time
- Observe from a distance first
- Do not take nests or eggs
- Monitor safely

Methodology:

- Survey conditions as follows must be noted in the field form:
    - Wildlife observer name
    - Date and time
    - Surveyed feature
    - Weather conditions
    - Any comments related to the survey

- To conduct the survey, the wildlife observer walks quietly in and around the footprint of the project features (Small Craft Harbour, Haul Road and Quarry) to cover 100% of the project footprint plus the buffer areas provided in **Table 8-2** of the Monitoring Plan. The observer must move while respecting the variations of the ground since it is very steep.

- At different observation points where the wildlife observer can have a good point of view on the facilities footprints and the buffer, the observer scan and listen to the environment for around 15 or more minutes with and without the use of binoculars to observe potential wildlife species or evidences of the presence of species.

- If birds are observed, the wildlife observer must note its behaviour to determine if there is a potential nestling area. The kind of behaviour can be warning shouts, the regular comings and goings, transport food to the nestlings, etc. The characteristics of the observed bird should be noted. Based on the signs of the presence or absence of a nest, the wildlife observer could approach quietly to confirm the presence of a nest without disturbing the nestling. If a nest is present, a flag tape will be placed not near but at the limit of the setback distance of the nesting site without disturbing the nestling to allow a buffer around the nest.

- If marine or terrestrial wildlife is observed, the wildlife observer shall note the characteristics and the number of animal(s). If possible, a picture will be taken. If a large wildlife congregation or a sensitive species is monitored, the information must be noted.

- For each wildlife observation, the observer shall note in the field form the information as follows:

    - Date and time of the observation
    - Point of observation name (GPS waypoint name)
    - Project feature
    - Species observed
    - Number of specimens observed
    - Species distance from the feature
    - Species behaviour
    - Nest observation
    - Any comments related to the observation.

Appendix 5: Stability Condition Monitoring Form

STABILITY CONDITION MONITORING FORM

DATE : _____ OBSERVER NAME : _____ WEATHER : _____

Inspection Item:	CS-01	CS-02	CS-03	CS-04	CS-05	CS-06	CS-07
Picture name							
Erosion							
Slope Collapse							
Runoff Discharge in Watercourse							
Stability Improvement Measures							
Date Communicated							
Date Implemented							
Date follow up inspection							

Comments :

Appendix 6: RUNOFF DISCHARGE MONITORING FORM

RUNOFF DISCHARGE MONITORING FORM

MONITORING PERIOD : MELTING SUMMER

DATE : _____ OBSERVER NAME : _____ WEATHER : _____

Inspection Item:	CS-01	CS-02	CS-03	CS-04	CS-05	CS-06	CS-07
Runoff Discharge in Watercourse	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
Discharge Duration							
Discharge Origin							
Turbidity (NTU)							
Mean of Backgound Sample							
Mean of Compliance Sample							
Turbidity Increase (Compliance - Background = Increase)							
NTU converted to TSS							
pH							
Picture Name							
Runoff Control Measures							
Date communicated to EM							
Date communicated to Superintendant							

Date implemented							

Comments :

Appendix 7: Detailed checklist based on commitment register

Name:							
Inspection period:							
Location:							
Nature of work:							
Element to verify		**Respect of requirement**					**Comment**
		Compliant	**Non-Compliant**	**On-going**	**Opportunity for Improvment**	**NA**	
Administrative							
CIRNAC 35, 36, 37	Maintain a copy of the permit and its application on site and provided to federal or provincial officials. The permit must be kept on hand at all times. Work crews should be familiar with and adhere to the conditions: - Display a copy of CIRNAC permit in a conspicuous plan in each campsite established for this land use operation. - Display the permit number on all vehicles and equipment.						
NIRB Hamlet PI Quarry 50	Maintain a copy of the Project Terms and Conditions and permits on site at all times. Obtain a permit NRCan Explosive transport, storage and use. Obtain a Nunavut Water Board Liscence (water crossings).						
CIRNAC 1	The Permittee shall not conduct this land use operation on any land(s) not designated in the accepted application, unless otherwise authorized in writing by the Engineer.						
CIRNAC 4	Field Supervisor shall contact or meet with a Land Use Inspector at the Department of Crown-Indigenous Relations and Northern Affairs Canada, phone number (867) 975-4289, at least 48 hours prior to the commencement of this land use operation.						
CIRNAC 5	Field Supervisor shall provide notification of commencement of the land use operation within 10 days, to the Engineer at the Iqaluit office of the Department of Crown-Indigenous Relations and Northern Affairs Canada, either by emailing aadcc.landsmining.aandc@Canada.ca or by telephone at phone number (867) 975-4283.						
CIRNAC 6	Provide locations of the following activities, if applicable, related to the project within 10 days of establishment (campsite, fuel caches, airstrip, drill laydown area and quarry locations) to the Land Use Inspector and Engineer.						
CIRNAC 7	Provide in writing to the Engineer, at least forty-eight (48) hours prior to commencement of this land use operation, the following information: a) person(s) in charge of the field operation to whom notices, orders and reports may be served; b) alternates; c) indirect methods of contacting above person(s)						
CIRNAC 8	Notify a Land Use Inspector at least 10 days prior to the completion of the land use operation of: a) a plan for removal or storage of equipment and materials; b) when final clean-up and restoration of the lands used will be completed.						
CIRNAC 9	Submit an annual report by March 30th of each year of permitted activities including a technical summary of activities undertaken for the year, a table and maps showing camp locations, air strip and landing locations, drilling locations, fuel caches, locations of activities conducted, backfilled sumps, work plan for the following year, progressive reclamation undertaken.						
CIRNAC 10	Submit to the Engineer and the Land Use Inspector a Spill Contingency Plan for use during the construction and operation of the winter road, 10 days prior to the commencement of activity.						
CIRNAC 34	It is required to immediately notify the Engineer of the transfer/sale of property/assets authorized under this permit upon completion of transaction.						
CIRNAC 38	Abide by and comply with all applicable lawful rules, acts, regulations, and by-laws of Canada, Nunavut, and any Municipal or regulatory body or authority having jurisdiction, the Nunavut Land Claim Agreement, and all other agreements, permits, licenses, and other instruments whatsoever related to the project.						
	Transmit CEMP and Spill contingency anf Emergency Management Plans to NIRB.						
NWB B4	The Licensee shall, within ninety (90) days of completion of construction activities, submit to the Board for review a Construction Summary Report that includes stamped as-built plans and drawings, explanation for any deviation from construction drawings, and consideration of construction and field decisions and their effects on the performance of engineered facilities.						
NWB B3	The Licensee shall submit to the Board for review and acceptance, for-construction drawings stamped and signed by an Engineer, at least thirty (30) days prior to the construction of any dams, dykes or structures intended to contain, withhold, divert or retain Water or Wastes.						
NIRB MO-3	Submit a comprehensive report to NIRB at the completion of construction activities and prior to operations (activties, caracterization of dredged material and mitigation as required, reasons for installation of silt fences if requied, wildlife log with notes on species and behavior, mitigation activities and stop work events and outcome, discussion with regulators about wildlife and updated procedures, spills and responses, how compliance with conditions).						
DFO 3.1	Provide an annual report to DFO, by January 31, 2019, 2020, and 2021, and summarizing whether the measures and standards to avoid and mitigate serious harm to fish were conducted according to the conditions of this authorization.						
DFO 3.1.1 DFO 3.1.2	Demonstration of effective implementation and functioning: Providing dated photographs and monitoring reports to demonstrate effective implementation and functioning of mitigation measures and standards to limit the serious harm to fish to what is covered by this authorization. Provide details of any contingency measures that were followed, to prevent impacts greater than those covered by this authorization in the event that mitigation measures did not function as described.						

Hamlet PI Quarry 4, 48	Contact or meet with the authorized Departmental representative at least 48h prior to the commencement of quarry operation and provide the authorized Departmental representative with the following information: persons in charge of field operation, alternates and their contact information.									
Hamlet PI Quarry 5	Advise the authorized Departmental representative at least 10 days prior to the completion of the quarry operation regarding: his plans for removal or storage of equipment and materials and when final clean-up and restoration of the lands used will be completed.									
Hamlet PI Quarry 49	Provide authorized Departmental representative 14 days prior to completion of land use, a statement indicating when reclamation measures commenced or will commence and when completion of clean-up and restroration is expected. Within 14 days following completion of the land use, a brief report on the final clean-up and restoration of the lands for review and approval.									
DFO 1 Hamlet PI Quarry	All permits are valid for the duration of the associated work (DFO December 1, 2020, Hamlet PI Quarry June 28, 2019)									
NWB 2	The Licensee shall notify the NWB of any changes in operating plans or conditions associated with this project at least thirty (30) days prior to any such change.									
NWB E2	The Licensee shall notify the Board and the Inspector at least ten (10) days prior to the construction or installation of any of the Water crossings associated with the Project.									
NWB Part H	Under Part H of the Nunavut Water Board permit, concerning the water crossings for the haul road, some conditions are present in case of any facilities need to be reclaimed. These conditions dictate that an eventual reclamation would be done in an appropriate manner. No facilities is yet to be reclaimed.									
Hazardous Materials Measures										
HM01.	Ensure staff are trained and qualified to safely handle the hazardous waste and materials.									
HM02. NIRB 8	Hazardous waste, fuel and materials shall be stored a minimum 31 m distance from high water mark of any waterbody or identified sensitive environmental area (as identified through permitting, during pre-construction surveys [if required] or by the EI or EM).									
HM03.	A suitable container, based on the properties of the waste or materials to be stored, shall be selected:hazardous materials shall be stored in their original containers, where possible, or in containers specially manufactured for the purpose of storing a specific hazardous waste or materials.									
HM04.	Containers used for hazardous waste and materials shall not be used for non-hazardous waste types.									
HM05. NIRB 10	All hazardous waste and materials shall be stored on a firm working surface that is impervious to leaks.									
HM06. NIRB 7. CIRNAC 27, 33	All hazardous waste and materials shall be stored within a container which has at least 10% more capacity than the total volume of substances to be stored, and is inaccessible to wildlife.									
HM07. NIRB 10.	Drainage into and from the storage area shall be controlled, and/or suitable secondary containment implemented, to prevent spills or leaks from leaving the site and to prevent run-off from entering the site.									
HM08.	Containers shall be sound, sealable and not damaged or leaking.									
HM09. Hamlet PI Quarry 33	Containers shall be closed and sealed at all times, except while materials are being added or removed.									
HM10.	All hazardous waste and materials shall be classified and labelled – containers must be clearly labelled to identify their contents according to requirements of the WHMIS and the relevant Transport Authority.									
HM11.	All hazardous waste and materials containers shall be accompanied by the Material Safety Data Sheet (MSDS) or have the MSDS on file available.									
HM12.	Incompatible waste and materials shall be stored in a manner that contact, in the event of a spill or accidental release, is not possible (i.e. corrosive materials must be kept away from flammable materials).									
HM13.	Containers shall be placed so that each can readily and easily be inspected for signs of leakage, corrosion or deterioration. Leaking, corroded or deteriorated containers shall immediately be removed and their contents transferred to a sound container.									
HM14.	Inspections of the hazardous waste and materials management shall be performed and recorded at least weekly.									
HM15. NIRB 52	A registered hazardous waste carrier shall be used to transport the waste to a registered receiver or hazardous waste management facility if disposal is required.									
HM16. NIRB 10	Shipping of all dangerous goods shall be registered with Government of Nunavut as detailed in Table 4-1 and appropriate shipping documents shall accompany all movements of dangerous goods.									
HM17. NIRB 10	Records are to be maintained indicating the type and quantity of waste being stored along with the date, type and quantity of hazardous waste or material brought into or removed from the facility.									
HM18.	Any open source of ignition, open flame, hot works and smoking is prohibited in the hazardous waste and materials storage area. All designated smoking areas shall have appropriate fire proof containers for waste.									
HM19.	Engines will be shut off and smoking shall be prohibited during fueling.									
HM20. NIRB 9 Hamlet PI Quarry 26	During transfer of petroleum products, a trained person must be in attendance for the entire duration of the operation. Refueling of all equipment must occur a minimum of 31 m away from the high water mark of any water body, unless otherwise authorized by the Nunavut Water Board. Reasonable precautions shall be taken to avoid the discharge of petroleum products onto land or into water (i.e. Fuel transfers must be stopped prior to overflowing to leave room for expansion, refuelling system inspection).									
HM21. NWB G7 CIRNAC 32	Hydrocarbon contaminated soils shall be removed and treated on site or transported to an approved disposal site for treatment.									
HM22. NIRB 29	The Contractor shall not deposit, nor permit the deposit of any fuel, chemicals, or wastes (including waste water) into any marine waters or within 31 meters of the HWL.									

WW01.	Staff shall be trained on sorting and storage requirements of specific wastes or materials that will be reused; or are prohibited from disposal in the non-hazardous waste system.								
CIRNAC 28, 31	Permittee shall not allow petroleum products or chemicals to spread to surrounding lands or into water bodies.								
Hamlet PI Quarry 34	The Permittee shall mark all fuel containers with the Permittee's name.								
NIRB 22.	ensure that appropriate spill response equipment and clean-up materials (e.g., shovels, pumps, barrels, drip pans, and absorbents) are readily available during any transfer of fuel or hazardous substances, at all fuel storage sites, and at all refuelling stations at vehicle maintenance areas and at drill sites								
Hamlet PI Quarry 32	The Permittee shall report in writing to the authorized Departmental representative the location and quantity of all petroleum fuel cache within ten (10) days after the establishment of any such caches.								
Spill Prevention and Response Measures									
SP04. Hamlet PI Quarry 25, 26, 30 NWB C8	Hydraulic, fuel, and lubrication systems of equipment near watercourses and sensitive habitats shall be inspected periodically to ensure that the systems are in good condition and free of leaks.								
SP02. NWB G6	Spill kits shall be readily available, and will be appropriate to the type and amount of hazardous and waste materials anticipated for the Project. Standard spill kits typically contain absorbent booms, socks, pads, waste bags and ties, and personal protective equipment (PPE) such as gloves and goggles. Further details on the contents of the spill kits will be provided in the SPRP by the successful Contractor.								
SP06.	Routine inspections of equipment for leaks, cracked hoses and other conditions that may result in spills shall be undertaken. The Contractors shall ensure external equipment surfaces are free of oil, diesel and other potential contaminants prior to use.								
SP01. Hamlet PI Quarry 29	All workers shall be trained in the spill prevention, response and about the spill response plan requirements during site induction and subsequent toolbox talk sessions.								
Hamlet PI Quarry 31 NWB G4, G5 Cirnac 26	Spills shall be reported according to the Spill Contingency Planning and Reporting Regulations (R-068-93) and magnitudes of the events. (24-Hour Spill Report Line by calling 1-867-920-8130). Report all spills in accordance with instructions contained in the NT-NU spill report.								
Non-Hazardous Waste and Wastewater Measures									
WW01.	Staff shall be trained on sorting and storage requirements of specific wastes or materials that are to be reused; or are prohibited from disposal in the non-hazardous waste system.								
WW02.	Where possible, materials shall be re-used, reduced and/or recycled to minimize waste generated.								
WW03.	Install barriers to prevent vehicle interaction at waste storage areas.								
WW04. Hamlet PI Quarry 27	Waste shall be segregated in clearly marked waste containers applicable to the end use (e.g. landfill waste categories used by the Hamlet; i.e. wood waste).								
WW05. NIRB 06.	Domestic waste containers shall be kept closed (e.g. equipped with lids, covers / tarps over skips) at all times except when bins are being emptied or filled, to prevent scavenging by wildlife and domestic animals, as well as to control odour.								
NIRB 06.c Hamlet PI Quarry 8	keep all garbage and debris in bags placed in a covered metal container or equivalent until disposed of at an approved facility. All such wastes shall be kept inaccessible to wildlife at all times.								
WW06.	Containers and tanks are to be in good condition (no rusting or apparent structural defects).								
WW07.	Tanks or vessels must be able to withstand the pressure expected by the stored waste, taking into account factors such as temperature fluctuations.								
WW08.	All waste shall be stored in plastic bags while conducting marine work to prevent waste being released into the water.								
WW09.	Waste shall not be deposited in, or placed on land or ice, under any conditions where the waste may enter Arctic waters.								
WW010. Hamlet PI Quarry 12	Daily site cleaning (housekeeping practices) and routine inspections shall be completed to ensure materials are correctly sorted and placed in the proper bins and that the area is kept clean and tidy at all times.								
WW011.	Vehicle washing areas for haul trucks, if required, shall be contained separately and shall be provided with an oil water separator sized to expected flows and conditions.								
WW012. Hamlet PI Quarry 3, 44, 45 NIRB 34	All garbage, scrap metal, fuel, machinery parts, barrels and kegs, building material and equipment shall be removed upon abandonment and completion of the construction activities.								
WW013. NIRB 35 NWB H2	All clean-up and restoration of the lands used shall be completed prior to the end of each field season and/or completion of site construction/expiry of the permit.								
Hamlet PI Quarry 13	A layer of coarse gravel on top of will be placed on top of the reclaimed quarry site to prevent wind from moving dust and fines to other locations.								
Hamlet PI Quarry 6 Hamlet PI Quarry 7 Hamlet PI Quarry 46	Clean-up and restoration of lands affected by Quarry operation will be completed prior to permit expiry date (June 28th 2019), including stabilizing and re-vegetating all distrubed areas to pre-disturbed state. The obligation with respect to clean up and restoration only ceases upon possession of a letter of clearance from the Director, Community & Government Division.								
WL07.	Food, food waste, and other attractants shall be handled, stored and disposed of safely to avoid attracting and habituating animals.								

NWB D2	The Licensee shall locate areas designated for temporary Waste disposal at a minimum distance of thirty-one (31) metres from the ordinary High Water Mark of any water body such that the quality, quantity or flow of water is not impaired									
NWB D4	The Licensee shall backhaul and all Waste generated through the course of the operation to a licensed Waste disposal site in the Municipality of Pond Inlet.									
NWB D5	The Licensee shall provide to the Board, documented authorization from all communities in Nunavut receiving Waste from the Coral Harbour Airport Community Road Washout Rehabilitation Project prior to the backhauling any Waste.									
NWB D6	The Licensee shall maintain records of all Waste backhauled and records of confirmation of proper disposal of backhauled Waste. These records shall be made available to an Inspector upon request.									
CIRNAC 3, 23	Remove from Territorial lands all garbarge, debris, scrap metal, discarded machinery and parts, barrels and kegs, buildings and building materials, to an approved landfill or disposal facility (approved by a Land Use Inspector).									
Traffic Measures										
TF01.	Consult and coordinate with existing road service providers in the Hamlet. Road use shall not disrupt the delivery of community services and will be done in consultation with the Hamlet administration.									
TF02.	A traffic awareness campaign concerning road safety, particularly for children and teens shall be implemented in the community.									
TF03.	Project specific speed limits shall be set for the haul route, not greater than limits specified by the Hamlet (to be agreed). Speed limits will be set such that community safety is maintained and for the control of dust mobilization.									
TF04.	Road use timing restrictions shall be adhered to (to be agreed with Hamlet administration).									
TF05.	Traffic control measures shall be implemented at intersections along the haul road route, as required. This may include the use of a traffic monitor.									
TF06.	Appropriate roadway construction materials, which will not require significant dust management efforts during use, shall be selected.									
TF07.	Suitable dust suppressants (non-toxic and biodegradable) to reduce dust generation to acceptable levels shall be used. Dust suppressants will be in accordance with the Government of Nunavut, Department of Sustainable Development, Environmental Protection Service, and Environmental Guideline for Dust Suppression.									
TF08.	Proactive maintenance shall be undertaken to address problem areas of the road which may produce significant dust.									
TF09.	Haul road shall be maintained and repaired immediately if damaged. Undertaking regular grading and compacting to remove potholes.									
TF11.	Consultation with the sealift companies and Hamlet administration shall be undertaken to minimize obstructing access to the existing sealift during SCH construction.									
WL09.	Escape routes for wildlife on access roads shall be provided (where possible), particularly during winter (i.e. avoid creating continuous berms of snow adjacent to roads that restrict wildlife).									
WL10.	Appropriate mitigation measures will be implemented in the event large congregations of wildlife and birds occur in the Project Area.									
SE05. NIWB 57	Road surfaces shall be stabilized and controlled runoff channels created where required.									
Vehicle and Equipment Use Measures										
VE01.	Drivers will be properly trained and licensed. Personnel shall be encouraged to drive defensively and courteously.									
VE02.	All vehicles shall have adequate lighting so they can be easily seen.									
VE03.	Combustion emissions sources (machinery) and staging areas for vehicles and heavy duty machinery shall be located away from sensitive receptors.									
VE04.	Construction equipment shall be sized correctly for the task and in compliance with any Hamlet road restrictions.									
VE05.	A regular maintenance program for Project vehicles and equipment shall be implemented to ensure construction equipment is in good working order.									
VE06.	When existing local facilities are not available for refuelling, onshore equipment and vehicles must be serviced and refuelled at least 15 m away from sensitive habitats unless secondary containment is used; preferably over an impermeable surface (e.g. drip trays). Drip pans and / or other protective devices shall also be used to prevent spills of petroleum products and other potentially hazardous liquids (e.g. antifreeze) during servicing.									
VE07. NIRB 21	Revving of engines on mobile or stationary machines shall be limited and equipment not in use shall be shut down (restrict idling).									
VE08. NIRB 21	Gas or diesel engine exhausts shall be fitted with noise mufflers, where available.									
VE09.	The use of horns, bells, hooters, or other audible signals on mobile equipment shall be limited, while maintaining safe operation.									
VE10.	Ongoing visual assessments of the potential for dust generation and combustion emissions shall be conducted (during work and/or when machinery is operating) to determine requirement for the implementation of dust suppression measures.									
VE11.	Equipment (including material stockpiles and vehicle parking areas) shall be located as far as practical from residences or sensitive wildlife features (or habitats). If the noise source is directional, equipment will be orientated to minimize propagation in critical directions.									
VE12.	When offshore equipment and marine vessels are refueled through a floating hose, Contractor will ensure that all hoses and equipment are in good working order, appropriate spill containment and clean-up equipment is available, and personnel are trained in refueling and spill response procedures.									
VE13. NIRB 19. Hamet PI Quarry 22 NWB C12	Equipment or vehicles shall not be moved unless the ground surface is in a state capable of fully supporting the equipment or vehicles without rutting or gouging. Overland travel of equipment or vehicles must be suspended if rutting occurs.									
HM19.	Engines shall be shut off and smoking shall be prohibited during fueling.									

NWB C7	Machinery is not permitted to travel up the stream bed and fording of any Water body is to be kept to a minimum and limited to one area and a one-time event. Equipment used should be well cleaned and free of oil and grease and maintained free of fluid leaks.								
CIRNAC 2	a) The permittee shall offset vehicle travel in areas without snow covered surface. b) The permittee shall confine the line to a maximum of 10 m unless otherwise authorized in writing by the land use inspector.								
CIRNAC 13	Only the type, size and number of equipment that is listed in the accepted application may be used, unless otherwise authorized in writing by the Land Use Inspector.								
Marine Traffic Control Measures									
MT01.	Construction vessels will keep to pre-defined work areas and routes that will not interfere with sealift deliveries and to minimize the impact on existing traffic and navigation.								
MT02.	Clear communication protocols or procedures for vessels working in the area will be established.								
MT03.	Communication protocols will be established to notify the community of marine activities, including ongoing consultation with the community and HTO and Notice to Shipping.								
MT04.	All delivery of construction equipment will occur through existing sealift shipments.								
MT05.	A permit or approval will be issued by Transport Canada under the Navigation Protection Act, which will include notification and communication protocols for marine users to be aware of potential navigation interferences.								
MT06.	Construction vessels will be appropriately marked in accordance with regulations administered by Transport Canada.								
MC13.	Project-related vessels shall maintain vigilance for marine mammals, document sightings, and employ minimum distances and best practices if within 100 m of any marine mammals. Collisions or any injured or distressed marine mammal must be reported immediately to the CA/EI and DFO.								
MC14.	Rapid acceleration of vessels shall be avoided.								
MC15.	Vessels must follow the guidance for marine mammals and protected areas as outlined in the most recent Notice to Mariners published by the Canadian Coast Guard.								
TC 1 TC 2 TC 3 TC 4	Signs stating Construction Ahead must be legible from a mnimum distance of 100 m, be marked with retro-reflective material, be visible from all points of marine approach and display black ettering on a yellow or orange background.								
TC 6 TC 7 TC 8	Cautionary buoy (yellow) must be lit with a yellow flashing light from dusk to dawn during periods of restricted visibility, must be marked with retro reflective material, must be placed at each end of the work and at the end of the works that is farthest from the nearest bank or shore.								
TC 10	All dredged maerial must be deposited above the high water mark								
TC 11	Navigational aids and markings must be maintained in accordance with the attached Site Drawing 307071-01148-01-MA-DGA-4001. (General arrangement)								
Blasting Measures									
NIRB 23	Quarry/pit facilities will be located so as to avoid all recreational sites and public use areas, and to protect unique geographical features and natural aesthetics								
BL01.	Construction should be initiated prior to the arrival of migratory birds (breeding season mid-May to mid-August) such that the quarry and surrounding area becomes unattractive for nesting. A pre- construction survey shall be conducted by the EM to identify all sensitive wildlife features, e.g. active bird nests, wildlife dens and wildlife foraging or traveling nests, if blasting commences within this window.								
BL02.	Blasting shall be restricted to hours as agreed with the Hamlet.								
BL03.	A notification protocol with input from the local community and other stakeholders for advance notification of planned substantial noise-causing activities shall be implemented.								
BL04.	Buffers or exclusion zones shall be implemented, in the event a sensitive species or feature (e.g. nest) is identified, to ensure wildlife are not disturbed.								
BL05.	Prior to blasting occurring, warning must be issued in affected area using loud signaling devices.								
BL06.	Blast mats shall be used as needed to prevent physical damage from fly rock and supress dust.								
BL07.	Dust suppressants and/or watering shall be used to reduce dust generation from blasting to acceptable levels.								
NIRB 28	use water or other non-toxic and biodegradable additives for dust suppression as necessary to maintain ambient air quality without causing water to pool or runoff								
BL08. Hamlet PI quarry 38	No blasting shall occur in water or within 15 meters of any water body of water that is not completely frozen to the bottom.								
Hamlet PI quarry 1 Hamlet PI quarry 11	Quarry operation is carried out only on lands designated in the accepted application, unless otherwise approved in writing by an authorized Departmental representative. The NIRB will be notified of any changes.								
BL09.	Quarry and pit boundaries shall be clearly staked and flagged so they remain visible to other land users.								
BL10. Hamlet PI Quarry 15 NWB C5	Natural drainage, flooding or channel diversion shall not be obstructed or affected by quarry/pit access, stockpiles, or other structures or facilities. Correctives measures to mitigate impacts will be implemented.								
BL11. Hamlet PI Quarry 14	An undisturbed 31 m buffer zone shall be maintained between the periphery of quarry sites and the high water mark of any water body that is of an adequate distance to ensure erosion control.								
BL12.	Screening and crushing equipment shall be located on stable ground, at a location with ready access to stockpiles.								
WL11.	A pre-construction wildlife sweep will be conducted by the EM to identify all sensitive wildlife features, e.g. active bird nests, wildlife dens and wildlife foraging or traveling.								

Sediment and Erosion Control Measures									
Hamlet PI Quarry 21	Adopt measures as required to conrol erosion by surface disturbance.								
Hamlet PI Quarry 18	Excavation and stockpiling are only carried out in in designated areas.								
NIRB 20 Hamlet PI Quarry 17 NWB I9	implement suitable erosion and sediment suppression measures on all areas before, during and after conducting activities in order to prevent sediment from entering any waterbody								
DFO 2.1.1	Rock or fill materials used for in-wafer construction shall be free of fines								
SE01. NWB C1	Perimeter controls shall be applied to act as a barrier, preventing sediment from reaching surrounding water courses (i.e. sediment/silt fence).								
SE02.	Temporary sediment control measures shall be applied at the base of soil stockpiles.								
SE03.	Soil stockpile storage areas to shall be constructed to prevent sediment from entering waterways (i.e. contour soil stockpiles and bulk material stockpiles to reduce erosion potential).								
SE04.	Sediment control measures shall be applied at the base of exposed slopes (i.e. silt fence) to minimize conveyance of sediment to a waterbody.								
Hamlet PI quarry 9	Slope the sides of excavations and embankments except in solid roche to 2:1 unless approved in writing by a land use inspector.								
SE05.	Road surfaces shall be stabilized and controlled runoff channels created.								
SE06.	Water quality in potentially impacted water bodies shall be monitored for sediment run-off. If visual monitoring identifies sediment run-off, turbidity will be measured and compared to the Canadian Council of Ministers of the Environment (CCME) guidelines for the protection of aquatic life (the water quality guidelines).								
SE07. NWB C11, E9	Material shall be stockpiled in such a way that debris/sediments will not enter the marine environment and 31 metres above the ordinary High Water Mark of any Water body(road). Material will not be stockpiled on the ice.								
SE08.	Haul road embankments shall be constructed to a suitable thickness (1 to 1.5 m) before a surface course is applied in order to limit disturbance to thermal regime.								
SE09.	The Contractor shall consider haul road design alternatives that allow for a reduction in grade, and minimizes watercourse crossings and disturbance to riparian areas.								
SE11. CIRNAC 18	Sediment and erosion control measures shall be implemented as soon as possible after vegetation removal in riparian areas.								
BL11	An undisturbed buffer zone shall be maintained between the periphery of quarry sites and the high water mark of any water body that is of an adequate distance to ensure erosion control.								
Hamlet PI Quarry 20	Ensure that a minimum undisturbed buffer zone of at least 100 m between the proposed quarry operation and any public road or navigable waterways, unless otherwise approved in writing.								
Hamlet PI Quarry 22	The Permittee shall establish vegetation on all areas stripped of vegetation during this quarry operation unless otherwise approved in writing by the authorized Departmental representative.								
NWB C2, E8	No removal of any material from below the ordinary High Water Mark of any Water body unless authorized.								
NWB C9 CIRNAC 20	To minimize impacts on surface drainage, the Licensee shall prepare all sites in such a manner as to prevent rutting of the ground surface.								
NWB E5	The Licensee shall ensure that all fill material used for the project is from an approved source, shall be free of all contaminants, and shall be characterized and confirmed to not possess acid generating potential or metal leaching properties prior to its use, with results and assessment to be submitted within the annual reporting requirements of Part B, Item 1.								
CIRNAC 19	Insulate the ground surface beneath all structures and facilities associated with this land use operation to: a) prevent the ground from settling and/or eroding; b) prevent the melting of permafrost								
Marine Construction Management Measures									
MC01.	The Contractor will prepare a Monitoring Plan for the Project shall be developed that includes requirements during dredging and placement of quarry material. This will include allowable levels of Turbidity/Total Suspended Solids (TSS) and marine mammal monitoring requirements.								
MC02.	Measures to reduce sediment mobilization during in-water activities shall be used by the Contractor when TSS/turbidity exceeds Canadian Council of Ministers of the Environment (CCME) water quality guidelines for protection of aquatic life (the water quality guidelines).								
NIRB 32	implement suitable erosion and sediment suppression measures on all areas before, during and after conducting activities in order to minimize turbidity plumes from the work site into the waterbody including the installation of silt screens.								
NIRB 33	construction shall be carried out during periods when wind, wave and tidal conditions minimize the dispersion of silt and sediment from the work site								
MC03.	Prior to construction, contractor will communicate with HTO to obtain information relevant to the current marine mammal sightings before the onset of construction practices that could result in disturbance or injury.								
MC04.	Soft-start procedure shall be implemented for pile-driving that could generate underwater noise above auditory thresholds for marine mammals.								
MC05. DFO2.2.1.2	Vibratory piling equipment shall be used to reduce noise effects to community and marine fauna, where possible. A monitoring program shall be developed to verify that underwater noise levels are less than 30 kPa @ 10 m from the piling activity for the protection of fish.								
MC06. DFO 2.3.3	Additional mitigation measures, e.g. bubble curtains or exclusion zone expansion, shall be required for pile driving if the underwater noise auditory thresholds are exceeded, DFO shall be notified if such measures are implemented.								
MC07.	Pile driving shall be conducted within hours as agreed with the Hamlet.								
MC08.	Mechanical dredging methods shall be used, which result in lower levels of underwater noise compared to hydraulic methods.								

MC09. DFO2.2.1.1 DFO2.2.1.2	MMOs will be employed to monitor for the presence of marine mammals in a defined marine mammal exclusion zone. During the open-water season, the exclusion zone will be initially set at 500 m, with in-situ underwater noise monitoring to be conducted at the onset of in-water works to verify the exclusion zone based on the underwater sound auditory threshold of 160 dB re 1µPa. Communication with construction teams and reporting of data will be included.								
MC10.	An MMO will be present during dredging, dredge disposal and in-water placement of fill material to monitor for presence of marine mammals. The MMO will monitor for stress related behaviours to marine mammals. If observed, adaptive management will be implemented or, if necessary, stop work will be implemented until effective mitigation measures are in place.								
MC11. DFO 2.3.1 DFO 2.3.2	Prior to construction, stop-work conditions shall be specified. Such conditions will include exceedance of underwater noise thresholds for the protection of fish, or sighting of a marine mammal within the exclusion zone by the MMO. Work must not re-start until conditions are met : 30 minutes after the marine mammal was last observed, 30 minutes after it is seen leaving the exclusion or with DFO approval in case a dead fish or marine mammal are observed (DFO shall be notified within 48 hours).								
MC12. DFO2.3.4 DFO2.2.1.3	If construction is to occur during the iced-season, the in-air sound levels will be measured and pinnipeds monitored on the ice. In the absence of Canadian guidelines, the United States in-air acoustic threshold for non-harbour seal pinnipeds of 100 dB re20µPa rms will be adopted. The construction activity will be suspended if the seals are exposed to noise levels above the threshold.								
MC13. DFO 2.2.2	Project-related vessels shall maintain vigilance for marine mammals, document sightings, and employ minimum distances and best practices if within 100 m of any marine mammals. Collisions or any injured or distressed marine mammal must be reported immediately to the CA/EI and DFO.								
MC14. DFO 2.2.2	Rapid acceleration of vessels shall be avoided.								
MC15. DFO 2.2.2	Vessels must follow the guidance for marine mammals and protected areas as outlined in the most recent Notice to Mariners published by the Canadian Coast Guard.								
MC16.	The area of sea that is artificially illuminated shall be minimized.								
MC17.	Water-based equipment or machinery shall be located and secured in such a way as to prevent grounding in identified sensitive habitats.								
NIRB 31	implement measures designed to minimize disturbance to seabed sediments and benthic communities and marine wildlife when carrying out project activities within the marine environment.								
MC18.	Rock material used for in-water construction, will be free of material that would result in exceedances of the water quality guidelines outside the work area.								
MC19. NIRB 30.	An EM will be present during all in-water construction activities to monitor for stress related behaviours or for fish kills. If observed, adaptive management will be implemented or, if necessary, stop-work will be implemented until effective mitigation measures are in place.								
MC20.	All lubricants and hydraulic fluids used on equipment that will be working below the high water level will be biodegradable and non-toxic.								
MC21.	All Project marine construction vessels and equipment shall be clean and free of marine fouling to avoid the introduction of invasive species.								
WW08. NIRB 29	All waste shall be stored in plastic bags while conducting marine work to prevent waste being released into the water.								
Stream									
NWB I1, I2, I6, I9 SE10. TF10.	The Licensee shall monitor all activities/haul road/water crossings for signs of erosion and shall implement and maintain sediment and erosion control measures prior to the undertaking to prevent entry of sediment into any Water body and to ensure watercourse crossings structural integrity and hydraulic function. Including a digital photographic record of the water crossing before, during, and after the completion of construction activities.								
NWB I3	The Licensee shall determine the GPS co-ordinates (in degrees, minutes and seconds of latitude and longitude) of the location where the watercourse crossing (culverts) are located.								
NWB I4, E6, E12, I7, I8, I12	The Licensee shall, during periods of flow, conduct water quality testing immediately upstream and downstream of the water crossings, any significant water seeps in contact with the road and any significant seeps originating from borrow pits or rock quarries prior to construction, weekly during the construction and monthly upon completion. All surface runoff or discharges impacted by construction activities associated with the Project, where flow may directly or indirectly enter Water, shall not exceed value presented in the permit for TSS, Oil and grease and pH. All samples preservation and handling shall be conducted according to Standard Methods for the Examination of Water and Wastewater and analyze in a laboratory accredited according to ISO/IEC Standard 17025								
NWB I5	The Licensee shall monitor water quality runoff and/or discharge from the borrow pits and quarry sites, during blasting activities, during periods of flow and following significant precipitation events, on a monthly basis, for the parameters mention in the permit								
NWB E11	The Licensee shall not excavate and/or remove material from the quarry/borrow area beyond a depth of one (1) metre above the ordinary High Water Mark or above the groundwater table, to prevent contamination of groundwater.								
Wildlife Measures									
NIRB 46 NIRB 47	The Proponent should review the Government of Nunavut's booklet on Bear Safety, which can be downloaded from this link: http://gov.nu.ca/sites/default/files/bear_safety__reducing_bear-people_conflicts_in_nunavut.pdf.								
WL01. NIRB 15	A zero-tolerance policy regarding the harassment, disturbance and feeding of wildlife, whilst working on the Project, is implemented and communicated through the induction process.								
WL02.	The EM shall be on site as required to assess the presence of wildlife (including Species at Risk) and determine potential impacts to construction activities.								
WL03. NIRB 16 NIRB 49	All workers shall be trained in relation to the wildlife (particularly species at risk) expected to occur in the area, including traditional knowledge, as well as on measure to protect wildlife, through site induction and tool box sessions. http://www.sararegistry.gc.ca/virtual_sara/files/policies/EA%20Best%20Practices%202004.p								

WL04. NIRB 48	Polar bear sightings shall be reported immediately to the EM and CA/EI so that appropriate actions are taken. (report to Conservation officer of Iqualuit 867-924-6235)http://www.bearsmart.com/play/safety-in-polar-bear-country/ (…)								
WL05.	Sightings of wildlife species, with particular attention to species at risk, shall be recorded on a wildlife sighting form (including recording the time, date, location, activity, and proximity to workers).								
WL06.	Wildlife sightings shall be tracked in order to respond appropriately to emerging trends.								
WL07.	Food, food waste, and other attractants shall be handled, stored and disposed of safely to avoid attracting and habituating animals.								
WL08.	Speed limits will be implemented and enforced on all roadways and wildlife will be given the right-of-way so as not to chase, weary, harass or injure animals on the road.								
WL10.	Appropriate mitigation measures will be implemented in the event large congregations of wildlife and birds occur in the Project Area.								
WL11.	A pre-construction wildlife sweep shall be conducted to identify all sensitive wildlife features, e.g. active bird nests, wildlife dens and wildlife foraging or traveling.								
WL12.	Work site boundaries shall be flagged to prevent inadvertent loss or alteration of habitat outside of the designated Project footprint.								
WL13.	Lighting shall be limited to the extent required to provide a safe work site and shielded and directed to reduce diffusion outside of the work area.								
WL14.	In the event caribou are sighted, protection measures implemented will follow those outlined in Appendix I of the North Baffin Regional Land Use Plan.								
NIRB 18	minimize activities during periods when birds are particularly sensitive to disturbance such as migration, nesting and moulting								
WL15. DFO 2.2.5	If fish are encountered in creeks during haul road construction, they will be salvaged from the area and returned downstream. Adaptive management measures will be implemented for any further construction in or about that creek.								
WL16. NIRB 5 Hamlet PI Quarry 16, 19	The Contractor shall not construct within, abstract water from or disturb any stream, lakebed or the banks of any definable water course unless written permission is given by GN and an authorization is obtained from the Nunavut Water Board and the DFO								
BL04. NIRB 17	Buffers or exclusion zones shall be implemented, in the event a sensitive species or feature (e.g. nest) is identified, to ensure wildlife are not disturbed. Buffer of 250 metres without sensitive areas for quarry site								
SE12 DFO 2.2.3 DFO 2.2.4 Hamlet PI Quarry 41	Culverts and /or other drainage features (sized appropriately) shall be installed at water crossings and in lowland areas to avoid ponding and to maintain flow and fish passage.								
NIRB 14. Hamlet PI Quarry 37	Ensure that there is no damage to wildlife habitat in conducting this operation								
NWB C6, E13	In-stream activity will be limited to either no-flow or low-flow Water periods. In stream activity is prohibited during fish migration.								
Hamlet PI Quarry 39, 40	The Permittee shall ensure compliance with the Fisheries Act								
Bird Measures									
BR01.	Activities and infrastructure will be sited away from nests and roosts that will be protected by prohibited entry buffers based upon government or biologist recommended setback distances. Any nest that is disturbed will result in immediate notification to ECCC and the Government of Nunavut.								
BR02.	Construction activities will not begin until the area has been surveyed for migratory birds and nests (in a non-intrusive manner).								
BR03.	Nest monitoring may be periodically required to determine efficacy of setbacks and buffers.								
BL01.	Construction should be initiated prior to the arrival of migratory birds (breeding season mid-May to mid-August) such that the quarry and surrounding area becomes unattractive for nesting. A pre- construction survey shall be conducted by the EM to identify all sensitive wildlife features, e.g. active bird nests, wildlife dens and wildlife foraging or traveling nests, if blasting commences within this window.								
BL04.	Buffers or exclusion zones shall be implemented, in the event a sensitive species or feature (e.g. nest) is identified, to ensure wildlife are not disturbed.								
WL01. CIRNAC 30	A zero-tolerance policy regarding the harassment, disturbance and feeding of wildlife shall be implemented.								
WL10.	Appropriate mitigation measures will be implemented in the event large congregations of wildlife and birds occur in the Project Area.								
WL11.	A pre-construction wildlife sweep shall be conducted to identify all sensitive wildlife features, e.g. active bird nests, wildlife dens and wildlife foraging or traveling.								
WL13.	Lighting shall be limited to the extent required to provide a safe work site and shielded and directed to reduce diffusion outside of the work area.								
Vegetation Measures									
VG01.	Working areas shall be inspected prior to clearing to confirm the absence of rare plants by the environmental monitor.								
VG02.	Vehicle and equipment mobilized to site shall be inspected to ensure they are clean and free of soil, invasive plants and/or their seeds.								
VG03.	All personnel shall be trained through the induction and subsequent toolbox talk session on the risk of damaging or disturbing vegetation and sensitive communities.								
VG04.	Monitoring of disturbed areas for potential weed infestations shall occur on a regular basis by the environmental monitor.								
Cultural, Heritage and Archaeological Measures									

CH01. Hamlet PI Quarry 2, 35	If historical or palaeontological features (e.g. stone features, stone tools, modified bone, fossils) not previously recorded are identified within the construction footprint during construction, the measures outlined in the Archaeological Resource Discovery Protocol shall be implemented. Quarry operation :follow Discovery Protocol and notify the Heritage Director, Department of Culture, Language, Elders and Youth (CLEY), of the location of the site.								
CH02.	All workers shall be briefed regarding the potential negative effects of construction activities to archaeological and palaeontological resources and shall be familiar with this CEMP, including the Archaeological Resource Discovery Protocol.								
CH03.	If potential human remains are found within the footprint during construction, the measures outlined in the Archaeological Resource Discovery Protocol shall be implemented.								
CH04.	Project personnel shall be prohibited from collecting any archaeological or palaeontological materials.								
Hamlet PI Quarry 36	Follow all terms and conditions for the protection and restoration of archaeological resources as outlined by the Department of Culture, Language, Elders and Youths (CLEY)								
Community issues									
CI01.	A dedicated emergency responder shall be provided for the Project and an emergency medi-vac plan will be in place for the construction workforce.								
CI02.	Contractor employees shall be required to sign a Code of Conduct governing behaviour on the Project and during recreational hours to reduce the likelihood of negative social effects on the community.								
CI03.	Contractor shall implement a cultural awareness program for all staff to promote understanding and respect for local residents.								
CI04.	The Project shall impose a zero tolerance policy for alcohol and illicit drug possession or use.								
CI05.	Contractor shall work with the local hotels and Hamlet to determine available bed space and develop a plan for housing workers, maximize use of hotel space but leaving sufficient reserve for normal community needs.								
CI06.	The Project shall implement an on-site fire response plan to reduce impacts to local fire services. Project staff shall be trained in the use of fire suppression aids.								
CI07.	A dedicated fuel truck shall be used to meet Project fuel requirements, if fuel supplies in the Hamlet are insufficient.								
CI08.	Ongoing communication and consultation, as agreed with the Hamlet administration and the HTO, will inform hunters, fishers, cruise ship operators and outfitters during construction to minimize access restrictions and maintain safety.								
MT03.	Communication protocols will be established to notify the community of marine activities, including ongoing consultation with the community and HTO and Notice to Shipping.								
NIRB 36	Engage with local residents regarding planned activities and should solicit available Inuit Qaujimaningit and information regarding current recreational and traditional use of the project area. Posting of translated notices and direct engagement with groups and individuals prior to undertaking project activities is strongly encouraged.								
NIRB 36	Prepare and submit approach to CGS and dates								
NIRB 37	Ensure that project activities do not interfere with Inuit Wildlife harvesting or traditional land use activities.								
CI09.	Access to the existing boat ramp shall be maintained until the new ramp is constructed to allow continuing access to water.								
NIRB 38	To the extent possible, hire local people and access local services.								
NIRB 39	Ensure that acces to work areas is controlled and restricted to construction personnel (includes posing of signs noting hazards).								
NIRB 40	Discuss potential implications of the project on on-land and marine traffic with Hamlet, applicable territorial and federal government agencies and local facility users before the start of the project.								
BL03.	A notification protocol with input from the local community and other stakeholders for advance notification of planned substantial noise-causing activities shall be implemented.								

Appendix 8: Weekly checklist

WEEKLY ENVIRONMENTAL SURVEILLANCE CHECKLIST

Environmental monitor's name	Name of others present	Inspection period (yyyy-mm-dd) to

Location	Nature of work

ENVIRONMENTAL SURVEILLANCE OF WORKSITE

Element to verify	Respect of				Non compliance and opportunity for improvement	
	C	NC	OI	NA	Description	Reference #
1. Cleanliness						
a) Work site and facilities are clean						
2. Environmental management and follow up						
a) Workers have received induction and MMO's have received specific training						
b) Permits & Authorizations (works, discharges, approved method)						
c) Site rehabilitation (compliant, completed and approved)						
d) Issues raised by stakeholders (community, authorities)						
3. Air quality						
a) Dust (control and mitigation measures)						
4. Acoustics						
a) Works carried out in compliance with noise by-laws						
b) Machinery noise (mufflers)						
c) Underwater sound readings carried out for both piling and vibrating						
d) Overpressure readings for blasting and piling						
5. Water management						
a) Domestic wastewater (toilets, level, transport, elimination)						
b) Surface water (turbidity, monitoring, control measures, discharge, snow, culverts)						
c) Industrial wastewater (concrete washout, cleaning stations, curing water)						
d) Drainage and erosion (stabilization, berms, barriers, curtains, basins, drains)						
6. Waste management						
a) Seperation (wood, cardboard/paper, metal, domestic waste)						
b) Handling and storage (identification, location, container, protection)						
c) Disposal (approved facility)						

WEEKLY ENVIRONMENTAL SURVEILLANCE CHECKLIST

7. Hazardous materials and hazardous waste						
a) Storage (location, protection against weather, identification)						
b) Classification and segregation (flammable, gas, compatibility)						
c) Containment (capacity, basin, double wall, condition, watertight)						
d) Storage conditions (identification, container, grounding, cleanliness)						
e) Disposal (approved facility, proof of disposal)						
8. Vehicles and machinery						
a) Fuelling (method, tank, location, mitigation)						
b) Stationary equipment (secondary containment, general condition, leaks)						
c) Mobile equipment (general condition, maintenance, leaks)						
d) Maintenance (method, approved location, watertight surface)						
e) Cleaning and washing (method, approved location, residual water)						
f) Biodegradable and non toxic hydraulic oil (below HWL)						
g) Circulation of heavy machinery under the HWL only in "dry" conditions						
9. Protection of wildlife						
a) Wildlife protection on land (declaration, respect, buffer zones)						
b) Fish (no dead or injured fish observed during construction)						
c) Marine mammals (presence of trained MMO, presence of visual markers, recordings, stop work, DFO informed if incident)						
10. Excavation and management of contaminated material						
a) Contminated soil/sediment (authorization, testing, storage, elimination)						
b) Clean soils and sediments (disposal as per authorization)						
11. Management of accidental spills						
a) Spill kits (availability, contents, critical sites)						
b) Contamination (declaration, intervention, elimination, prevention)						
c) Emergency Preparedness Plan (emergency numbers, awareness)						
12. Traffic management						
a) Marine signage (buoys, lights, location)						
b) Signage on land (site perimeter, traffic)						
c) Traffic management (communication plan authorized and applied)						

C : Compliant *NC : Non compliant* *OI : Opportunity for improvement* *NA : Not applicable*

WEEKLY ENVIRONMENTAL SURVEILLANCE CHECKLIST

COMMENTS

OBSERVATIONS AND PICTURES	
1.	**2.**

Checklist completed by : _____ **Date :** _____

Appendix 9: Weekly Report Template

Pond Inlet Marine
Infrastructure Project

ENVIRONMENTAL WEEKLY REPORT

Week XX : Month day to Month day, 2019

Tower Arctic LTD.

Contract Number: 15255-00331-07

Project Number: 15255-00331

Tower Arctic Number: 15255-00331-TA-Environmental Report Date

Submitted From: Tower Arctic LTD

Submitted To: Government of Nunavut
Advisian

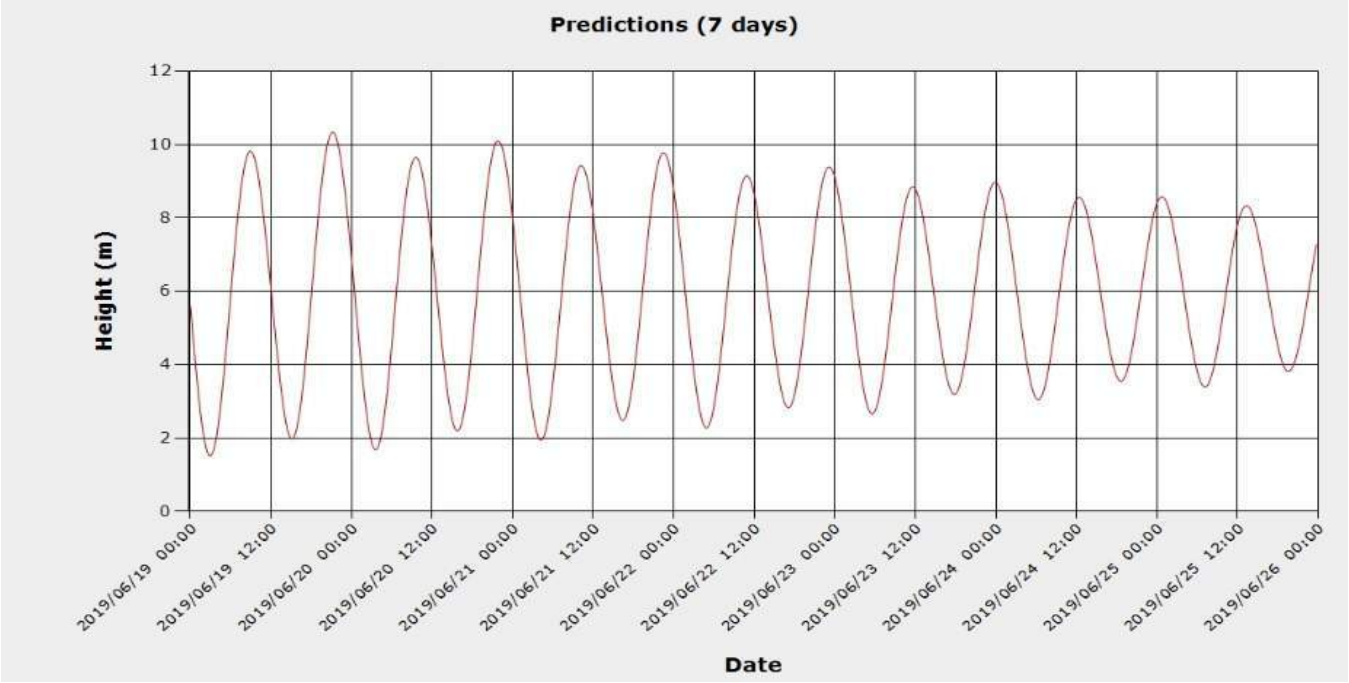
Date Submitted: Month day, 2019

Prepared by : EM on duty in the week

1. Environmental Conditions

1.1 Tides

Tide height at Pond Inlet for week XX ranged from XX m to XX m, with low tides occurring around XX am/pm on MM/DD and XX am/pm on MM/DD.



1.2 Weather

Average temperature ranged from XX°C to XX°C for the week. As for precipitations, XX mm of rain/snow fell on MM/DD. Wind gusts exceeding XX km/h occurred on MM/DD and on MM/DD.

2. Summary of construction activities

Table 2 -1: Summary of construction activities during week XX

Activity	Location	Schedule	Description/ technique	Equipment	Outcome	Photo reference	Comment
Rock drilling							
Rock blasting							
Stockpiling							
Rock crushing							
In water infill							
Out of water infill							
Dredging							
Pile driving							
Other (ex. temp barge)							

3. Environmental Monitoring

3.1 General

- Context
- Main issues or events that do not belong in other sections in point form

3.2 Environmental inspections

- Person responsible for inspections
- Areas inspected with date or frequency during the week
- If specific topics monitored, date and brief description
- Refer to checklist used and join in appendix

3.3 Shipment of dangerous goods

Table 3 -1: Dangerous goods received at site

Item	Quantity

3.4 Equipment

Table 3 -2: List of machinery inspected during week XX (If inspections took place)

Equipment/Vehicule	ID	Inspected by

3.5 Turbidity monitoring

3.5.1 Visual monitoring

Visual turbidity monitoring is being conducted for the following construction activities:

- Dredging
- Infill (in and out of water)

The compliance location for each of these activities is provided in Table 7-1 of the Monitoring Plan.

A record of visual monitoring for week XX is provided in Appendix x .

Table 3 -3: Summary of turbidity observed for each activity

Activity	General observations
Dredging	A summary of whether turbidity was observed for dredging (period, average and max range, average duration)
In-water infill	A summary of whether turbidity was observed for infill. (period, average and max range, average duration)
Out of water infill	A summary of whether turbidity was observed for infill. In this case it would only be a brief statement of whether there is additional turbidity at the tidal exchange

List main observations not associated with activities listed in table 3-3.

3.5.2 Water sampling

Sampling occurred on DD/MM for XX activity associated with XX facility based on visual monitoring. Samples were taken by NAME.

A record of water sampling for week XX is provided in Appendix x.

Additional comments such as bad conditions preventing sampling or other

3.6 Marine Mammal Observer

Marine mammal monitoring is being conducted for the following construction activities:

- Dredging
- Infill (in and out of water)
- Piling

The exclusion zones for each of these activities are provided in Table 7-2 of the Monitoring Plan. General observations are summarized in table 3-5.

Description of:

Incursions in the exclusion zone and interruption of work
Incidents/injuries
Reports to DFO

Table 3 -4: MMOs on-duty for week XX

Dredging	DAS	Infill	Blasting	Pile Driving
Name				

Table 3-5: Summary of tmarine mammals observed for each activity

Activity	General observation	Incidents/Stop work
Dredging	A summary of whether mammals were observed (species, distance, number)	Date, description
DAS		
Infill		
Blasting		
Piling		

Observations were recorded in daily reports and compiled in the associated database. The database is available in appendix XX .

3.7 Acoustic Monitoring

To be adjusted once the relevant MP has been commented and is complete

Should include:

- Monitoring activities carried out (ambient and during piling) with dates
- Main results for SPL_{RMS}
- Set exclusion zone
- Monitoring for overpressure due to piling carried out with dates
- Main results in kPa
- Subsequent weekly verification
- Reference to acoustic monitoring log
- Reference to overpressure log

3.8 Environmental Incidents

No in-water spills reported during week XX. Spills are summarized in table 3-6 below. The product spilled was recovered and XX m^3 of contaminated soils were excavated. Soils and hazardous waste were temporarily stored in closed containers on the laydown area.

Table 3 -6: Incidents during week XX

Date	Location	Quantity/ Product	Environment affected	Incident report

On DD/MM, XX m^3 of contaminated soils and XX m^3 of hazardous waste was disposed of by XX, which specializes in the disposal of hazardous waste. (only when soils and hazardous waste disposed of)

4. Communication

4.1 Training

XX new employees, including XX MMOs, mechanics and operators started working for TA during week XX.

Table 4 -1: Training during week XX

Type of training	Number	Given by

4.2 Internal communication

Brief summary of:

- Kick off meetings (either with GN or internally with subcontractors if carried out)
- Committee meetings (minutes available on request)
- Official meetings with GN
- Meeting with management that needs to be discussed

4.2 Community meeting

- Meetings with the community with date and who presented/rough number of people who participated and representatives from GN or other organizations if information available

- Meetings with the hunting groups with date and who presented/roughly number of people who participated

Minutes of the meeting or a summary of topics discussed and issues raised are presented in appendix XX.

4.3 Advertissements

Blasting	Blasting notices are posted on the Iqaluit Public Services Announcement community Facebook page the day before blasting is scheduled to occur. Notices are also posted in the following locations: •Xx
General construction	General construction signs are posted on the road access to the causeway to continually alert community residents to the ongoing construction occurring for the causeway and DSP.
Marine construction	Only include this when it first occurs or if something changes. Navigational Warnings (NAVWARNs) have been posted since xx, specific for the marine based construction activity (dredging, disposal at sea).
Community access	Summary on whether or not there will be any community access issues for the construction week. If yes, there would also be a note in the Communication section for how this was communicated
Resident feedback and concerns	A few sentences to track issues by residents, should there be a conversation between TA staff and residents that CGS needs to be aware of and may have to handle or deal with, or may affect scope of work.

5. Construction activities for next week

Table 5 -1: Planned construction activities for next week

Activities	Associated monitoring

EM on site for next week : EM name