APPENDIX G
Construction Environmental Protection Plan

Anuriqjuak Nukkiksautiit Project
Construction
Environmental Protection Plan

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Acronyms & Abbreviations

BESS	Battery Energy Storage System
CCME	Canadian Council of Ministers of the Environment
CIRNAC	Crown-Indigenous Relations and Northern Affairs Canada
CNSC	Canadian Nuclear Safety Commission
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
dB	decibels
DFO	Fisheries and Oceans Canada
ECCC	Environment and Climate Change Canada
ECCC-CWS	Environment and Climate Change Canada – Canadian Wildlife Service
EPP	Environmental Protection Plan
FEED	Front End Engineering and Design
GN	Government of Nunavut
GN CGS	Government of Nunavut Community and Government Services
GN DCH	Government of Nunavut Department of Culture and Heritage
GN EPD	Government of Nunavut Department of Environment - Environmental Protection Division
GN WMD	Government of Nunavut Department of Environment - Wildlife Management Division
h	hour
km	kilometer
m	meter

Acronyms & Abbreviations (cont'd)

MW	megawatt
NIRB	Nunavut Impact Review Board
NNC	Nunavut Nukkiksautiit Corporation
NPC	Nunavut Planning Commission
NT	Northwest Territories
NTU	Nephelometric Turbidity Units
NU	Nunavut
NWA	Nunavut Wildlife Act
NWB	Nunavut Water Board
PEMR	Project Environmental Management Report
QEC	Qulliq Energy Corporation
RCMP	Royal Canadian Mounted Police
RCAF	Royal Canadian Air Force
SAR	Species at Risk
SARA	Species at Risk Act
SDS	Safety Data Sheets
SPRP	Spill Prevention and Response Plan
TC	Transport Canada
TSS	total suspended solids
WHMIS	Workplace Hazardous Materials Information System
WMMP	Wildlife Mitigation and Monitoring Plan
WMP	Waste Management Plan
WTG	Wind Turbine Generator

1.0 Introduction

Nunavut Nukkiksautiit Corporation (NNC) is committed to the mitigation of the environmental impacts of construction activities for the Anuriqjuak Nukkiksautiit Project (the Project). The Project is a renewable energy development in Sanikiluaq, NU, that incorporates wind turbine generation with a Battery Energy Storage System (BESS) into the existing diesel generation plant. This Environmental Protection Plan (EPP) has been developed for the Project to document practices and procedures that will serve to minimize or eliminate potential environmental impacts resulting from construction. This EPP has been written to satisfy conditions of approvals and authorizations that have been, or are anticipated to be, issued by the Government of Nunavut (GN), the Nunavut Impact Review Board (NIRB), the Nunavut Water Board (NWB), Fisheries and Oceans Canada (DFO), and Environment and Climate Change Canada (ECCC), among others.

1.1 Purpose

Environmental protection is a key consideration throughout the lifetime of the Project. The EPP demonstrates a practical understanding of environmental regulations as well as practices and procedures required to minimize or eliminate potential environmental impacts of the project. This plan was developed to serve as a reference document; to be used as a tool to achieve environmental management objectives and ensure environmental regulatory compliance during project construction. The EPP also describes practical procedures required of all personnel (i.e., proponents, contractors, suppliers), as well as instructions for addressing unplanned activities/events associated with the Project. As such, the EPP will be made available to all personnel to ensure that each is aware of their responsibilities and of the procedures to be used in the management of this work.

1.2 Objectives of the EPP

The EPP was developed to support the execution of Project construction activities in an environmentally responsible manner. As such, the EPP aims to:

- Manage and reduce risks and averse environmental effects from construction activities;
- Identify avoidance and mitigation measures to mitigate or reduce adverse construction-related effects;
- Identify and document potential environmental concerns and associated protection measures;

- Provide a reference document for Project personnel to guide planning and/or conduct specific construction activities;
- Provide guidance in the event of accidental events or malfunctions;
- Communicate changes in the program through the revision process;
- Provide a reference to applicable laws, regulations, guidelines, and other requirements, including potential permitting;
- Provide measures against which to verify that environmental commitments are being met throughout Project construction; and
- Include a quick reference for NNC and applicable regulators to monitor compliance and recommend improvements.

Deviation from procedures and commitments outlined in the EPP must be discussed with, and approved by, NNC.

1.3 Organization of the EPP

The EPP guides the implementation of environmental protection procedures for both routine activities and unplanned events associated with the Project. The style and format of the EPP is intended to facilitate use by field personnel, as well as those wishing to revise or expand the document. This EPP contains the following sections:

Section 1.0 is an introduction to the EPP, including the purpose, objectives, organization, and outline of roles and responsibilities.

Section 2.0 provides a description of planned Project activities.

Section 3.0 lists the permits, approvals and authorizations that may be required for the Project and provides an overview of compliance monitoring.

Section 4.0 provides descriptions of environmental concerns associated with project activities, as well as environmental protection procedures designed to address these concerns and mitigate potential impacts.

Section 5.0 provides a description of potential environmental concerns applicable to the Project for resources of concern, including historic resources, avifauna, wildlife, and fish and fish habitat.

Section 6.0 outlines contingency and monitoring plans for accidental or unplanned events that could occur during Project construction.

Section 7.0 provides guidelines for document revisions and updates.

Section 8.0 lists key Project personnel and regulatory contacts.

Section 9.0 presents a list of references consulted in the creation of the EPP.

Section 10.0 is a signature page for employee and contractor signoff.

Supporting information and documents are appended to the EPP.

1.4 Corporate Environmental Policy

NNC is committed to sustainable development while protecting environmental and human health. Key concepts of NNC's environmental, health and safety policy include:

- Protection of employees, the public and the environment;
- Compliance with all applicable authorizations, legislation, and regulations;
- Anticipation of future environmental protection requirements and implementation of associated provisions;
- Proactive collaboration with federal, territorial, and Hamlet governments, Inuit Organizations, other relevant organizations, and the general public, on all aspects of environmental protection; and
- Inform Project personnel, inspectors, management boards, appropriate governments (federal, territorial, Hamlet), Inuit Organizations, and the public of any changes at the site or with Project activities.

This EPP operationalizes environmental management commitments made by NNC, providing a set of standards to guide Project construction in an environmentally and socially responsible manner.

1.5 Roles and Responsibilities

NNC

NNC is responsible for overall project governance, and will:

- Develop an approved EPP and keep it current through subsequent revisions to those specified in the EPP Distribution List (Appendix A);
- Monitor and inspect work to ensure compliance;
- Liaise with Rightsholders, stakeholders and relevant government agencies, as required.
- Oversee all aspects pertaining to compliance with respect to community affairs and social responsibility; and
- Coordinate with the Project Manager, Construction Manager, and Environmental Manager to ensure that objectives are met.

Project Manager (Growler Energy)

Growler Energy (Growler) is responsible for overall project management; taking responsibility for consulting engineering and contracting services relating to the development of the Project and ensuring the resources and support required are in place for successful implementation and maintenance of the environment and regulatory compliance program. Growler will report to NNC and will coordinate and collaborate with the Environmental Manager and Construction Project Manager to ensure objectives are met.

Environmental Manager (Sikumiut Environmental Management Limited)

Sikumiut Environmental Management Limited (SEM) is responsible for overall management of Project environmental programs and permits, overseeing all aspects pertaining to compliance with respect to environmental issues. SEM will:

- Manage the development and submission of environmental regulatory permitting applications, with follow-up through to approval, and associated reporting requirements;
- Monitor and report on regulatory compliance, including conditions of authorizations and permits;
- Liaise with regulatory agencies on conditions of authorizations/permits, reporting requirements and environmental incidents;
- Support the periodic review and update of the EPP; and
- Develop training materials for environmental orientation.

SEM will report to Growler and collaborate with the Construction Project Manager to ensure objectives are met.

Construction Project Manager (Canadian Projects Limited)

Canadian Projects Limited (CPL) is responsible for engineering and construction oversight and will support the implementation and maintenance of environmental procedures and contingency plans outlined in the EPP that could require manual labor and/or heavy equipment. CPL will report to Growler and collaborate with the Environmental Manager to ensure objectives are met.

Construction Site Manager (Canadian Projects Limited)

CPL's Construction Site Manager is responsible for the overall management of Project construction activities, including oversight of on-site environmental monitoring and compliance related to construction activities, and ensuring that all personnel have received

environmental orientation and training. The Construction Site Manager will report to CPL's Construction Project Manager.

Environmental/Wildlife Monitor

The Environmental/Wildlife Monitor is responsible for on-site environmental protection, and will:

- Conduct environmental inspections and wildlife surveys, and report any environmental concerns or cases of non-conformities to the Construction Site Manager;
- Protect Project personnel, wildlife and habitat, recording instances of wildlife activity; and
- Assist with the implementation of Environmental Management Plans, including the EPP.

The Environmental/Wildlife Monitor will report to the Construction Site Manager and will collaborate with the Environmental Manager and Project Manager, as required.

Polar Bear Monitor

The Polar Bear Monitor is responsible for monitoring for polar bear activity and protecting Project personnel from potential polar bear interactions, which may include the use of a firearm. The Polar Bear Monitor will report to the Construction Site Manager.

All NNC Personnel, Contractors, Subcontractors and Visitors

All NNC personnel, contractors, subcontractors and visitors will:

- Review and become familiar with procedures contained in the EPP, including any revisions;
- Adhere to and implement commitments noted in the EPP, including conditions outlined in approvals, authorizations and permits;
- Demonstrate capacity to perform in a manner consistent with NNC's commitments, policies and procedures;
- Immediately report concerns to the Environmental/Wildlife Monitor (or Construction Site Manager) of any spills or other accidental events or malfunctions that could adversely affect the environment;
- Perform clean-up activities as directed by the Construction Site Manager, Environmental Manager or regulatory agencies; and
- Provide feedback to the Environmental/Wildlife Monitor regarding any changes or comments they believe would improve the EPP.

The general reporting structure for project Construction is illustrated in Figure 1.1.

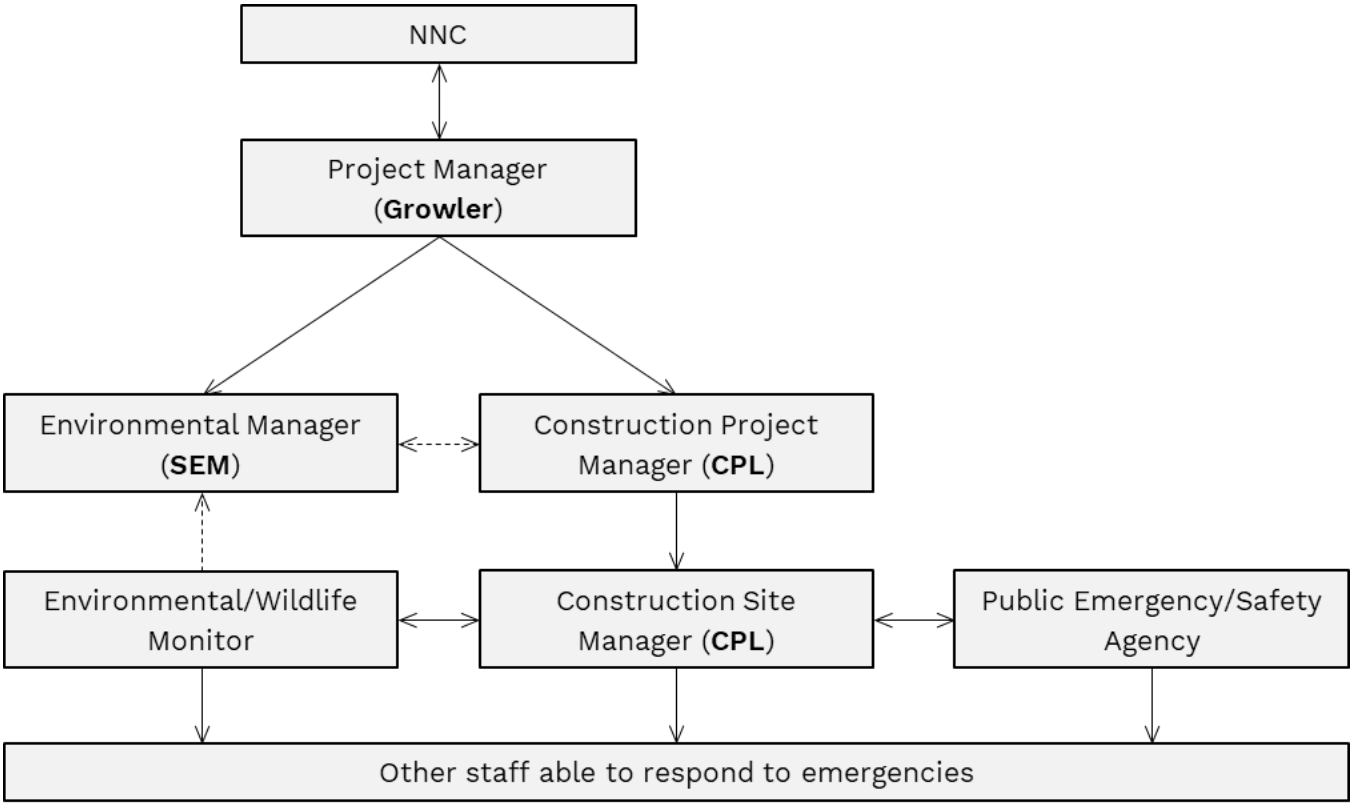

Figure 1.1 EPP Organization Chart.

1.6 Environmental Orientation and Training

Through ongoing environmental orientation and awareness training, NNC will confirm that all Project personnel understand their roles and responsibilities and potential environmental effects of the Project, particularly those related to their specific work activities.

Environmental orientation will include a presentation on environmental protection procedures to be applied to all work, and will be provided to:

- All new personnel arriving on site during construction activities; and
- All workers prior to the start of any new activity and thereafter on an as-needed basis.

All Project personnel will also receive training for spill response measures, active nest disturbance and associated avian response behaviour, historic resources awareness and response procedures, and potentially invasive plant species identification, eradication, and control methods.

2.0 Project Description Overview

The Anuriqjuak Nukkiksautiit Project is a renewable energy development in Sanikiluaq, NU, that incorporates wind turbine generation with a BESS into the existing diesel generation plant. The Project will involve the installation and operation of a single wind turbine generator (WTG) of 1 megawatt (MW) capacity located approximately 4.5 kilometers (km) south of the Sanikiluaq Airport. An existing community trail will be upgraded to a road and extended to facilitate access to the construction site. An above-ground transmission line corridor will be constructed in close alignment with the access road, where possible. The BESS and microgrid controller system will be constructed near the Qulliq Energy Corporation (QEC) power plant. Once operational, the Project is expected to generate about 50 percent of the community's electricity demand. Wind energy will be sold to the QEC for integration into the local electrical grid. An overview of the Project layout is provided in Figure 2.1. Project construction is anticipated to begin by mid 2023, pending issuance of regulatory permits and authorizations. The Project construction process entails:

- **Site Preparation:** removing vegetation and other organic materials (i.e., grubbing) in areas to be developed into an access road and laydown areas and preparing laydown area(s).
- **Infrastructure Construction:** constructing an access road, WTG laydown area, and WTG foundation.
- **Equipment Installation:** placing WTG steel foundation, tower sections and top (top tower, nacelle and blades).
- **Utilities Installation:** placing a transmission line between the WTG and existing substation, installing a substation and BESS, and utility interconnection.
- **Commissioning & Testing** of the turbine and electrical infrastructure.

Project construction is anticipated to take place over a 13-month period between September 2023 and September 2024, as outlined in Table 2.1. The schedule is subject to change/revision as the Project advances.

Table 2.1 Anticipated Project Construction Schedule.

Project Activity	Anticipated Schedule
Site Preparation	60-day period anticipated to commence September 2023 and June-July 2024
Infrastructure Construction	
Equipment Installation	40-day period commencing July 2024
Utilities Installation	40-day period commencing July 2024
Commissioning & Testing	10-day period commencing September 2024

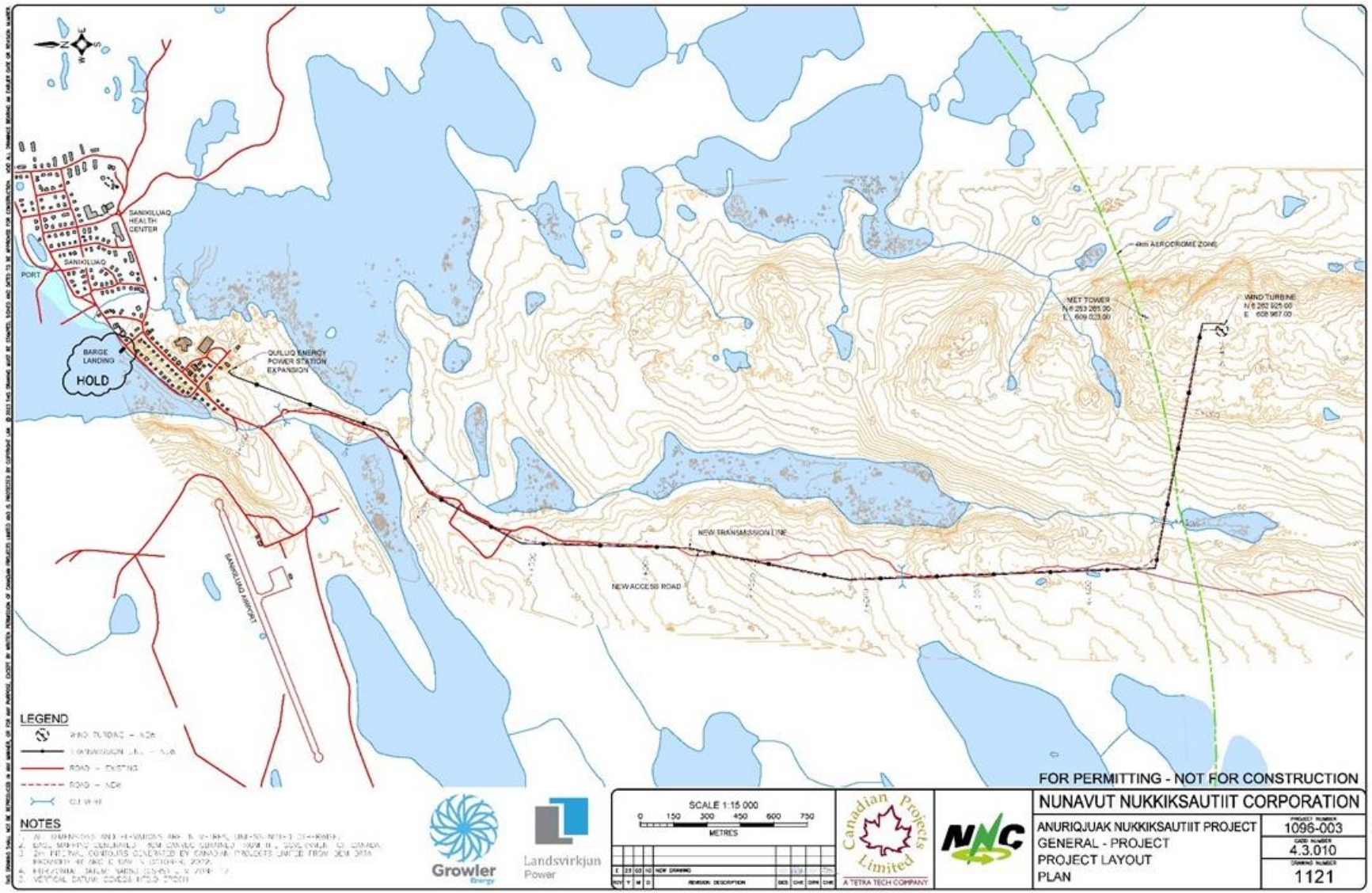

Figure 2.1 Project Layout.

3.0 Regulatory Requirements

3.1 Potential Approvals, Authorizations and Permits

Regulatory approvals, authorizations and permits are required for Project construction. Prior to initiating any new work/activity, Project personnel should engage NNC to confirm that applicable permits are in place, and to understand environmental and regulatory requirements and conditions of authorization.

Conditions and expiry/renewal dates should be considered elements of this EPP, and all personnel should familiarize themselves and adhere to all relevant permits and approvals. A list of approvals, authorizations and permits that may be required for Project construction is outlined in Table 3.1. Additional approvals, authorizations and permits may be required prior to the operations phase of the Project. A comprehensive Permitting Registry has been developed for the Project under a separate cover. The Permitting Registry includes details regarding approval(s) status, copies of approvals as received, and conditions of approvals.

Table 3.1 Environmental Approvals, Authorizations and Permits for Construction.

Issuing/Approval Agency	Environmental Approval, Authorization or Permit
Municipal	
Hamlet of Sanikiluaq	Development Permit
	Land Use Permit
Territorial	
Government of Nunavut Community and Government Services (GN CGS)	Emergency Response Plan approval
	Waste Management Plan approval
Government of Nunavut Department of Culture and Heritage (GN DCH)	Historic Resources Management Plan approval
Government of Nunavut Department of Environment - Environmental Protection Division (GN EPD)	Spill Prevention and Response Plan approval
	Environmental Protection Plan approval
	Waste Management Plan approval
Government of Nunavut Department of Environment - Wildlife Management Division (GN WMD)	Wildlife Mitigation and Monitoring Plan approval
Nunavut Impact Review Board (NIRB)	Annual Project Environmental Management Report (PEMR)
	Screening Decision Terms and Conditions
Nunavut Planning Commission (NPC)	Conformity Determination

Table 3.1 Environmental Approvals, Authorizations and Permits for Construction (cont'd).

Issuing/Approval Agency	**Environmental Approval, Authorization or Permit**
Nunavut Water Board (NWB)	Water Licence
	Spill Prevention and Response Plan approval
Federal	
Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC)	Annual PEMR
Environment and Climate Change Canada (ECCC)	Environmental Protection Plan approval
	Winter Bird Surveys Study Design approval
	Wildlife Management & Monitoring Plan approval
Fisheries and Oceans Canada (DFO)	Letter of Recommendations

3.2 Environmental Monitoring

3.2.1 Site Inspections

Site inspections will be conducted by the Environmental/Wildlife Monitor before, during, and after any site disturbances related to construction activities occur at the site. Prior to construction activity, site inspections will record site details such as vegetation, general terrain/topography, and drainage patterns. Photographs will be collected to accompany site inspection records. The required frequency of site inspections during construction activities will be determined by NNC or designate and will depend on the duration and type of activity. The site inspections will be recorded in the Environmental Site Inspection Checklist (Appendix B).

3.2.2 Compliance Monitoring

Compliance monitoring is required to ensure that applicable regulatory requirements and conditions of permits/authorizations are met, and to verify the accuracy of environmental effects predictions. Additionally, compliance monitoring can be used to assess effectiveness of mitigation and management measures, and to identify Project effects that may require further mitigation. The following monitoring activities will be executed to satisfy compliance requirements:

- Water quality monitoring;
- Wildlife (including avifauna) monitoring;
- Waste and raw materials monitoring (including fuel and chemical); and
- Incidents and complaints monitoring.

Effectiveness of compliance monitoring activities will be captured throughout the lifetime of the Project via regular environmental site inspections conducted by the Environmental/Wildlife Monitor, the Environmental Site Inspection Checklist (Appendix B), and the NT-NU Spill Report Form & Spill Quantities (Appendix C), the Wildlife Sightings Log (Appendix D), and the Wildlife Incident Form (Appendix E).

4.0 General Environmental Protection Procedures

4.1 Sensitive Timing Windows

Environmentally sensitive timing windows include:

- Avifauna (Breeding Migratory Birds) between May 1 and August 15 (Environment and Climate Change Canada, 2018); and
- Fish and Fish Habitat (Zone 2; Fall Spawning Fish): August 15 to June 30 (Fisheries and Oceans Canada, 2013). Fall spawning fish include arctic char, lake trout and whitefish (includes broad, lake and round whitefish).

Potential Environmental Concerns

Construction activities may exacerbate adverse effects on avifauna and fish and fish habitat during sensitive timing windows and are to be avoided where practicable.

Environmental Protection Procedures

Sensitive time periods will be considered during Project planning, where practicable. When construction activities are to be carried out during the sensitive timing window(s), the following additional mitigations shall be implemented, where applicable:

1. Prior to the commencement of construction activities, a complete schedule of activities will be developed to include restrictions that account for sensitive timing windows;
2. Construction activities will be planned, where possible, to avoid locations associated with avifauna use during the sensitive timing window;
3. Where/if vegetation clearing is required during breeding bird season, the area will be inspected by experienced personnel (i.e., biologist, scientist, Environmental/Wildlife Monitor) and a member of the HTA to assess occupancy prior to clearing vegetation;
4. Activities will be conducted such that the amount of time spent working in or around a stream of waterbody is reduced; and
5. Efforts will be made to avoid instream works between August 15 and June 30. Consultation and approval will be required from DFO prior to executing work between August 15 and June 30. If instream works occur during the sensitive timing window, efforts will be made to reduce the instream footprint and duration of instream work.

Refer to Section 5.1, Avifauna Management Plan, and Section 5.2, Fish and Fish Habitat, for additional details and mitigation measures that may apply.

4.2 Buffer Zones

Potential Environmental Concerns

Buffer zones are boundaries of undisturbed areas or natural vegetation maintained along waterbodies and environmentally sensitive and/or rare receptors (e.g., nesting sites, historic resources). Without adequate buffer zone allowances, waterbodies and environmentally sensitive and/or rare receptors could be adversely affected by construction activities. Additionally, waterbodies can become laden with silt from run-off without adequate buffer zone vegetation. Buffer zone vegetation also provides cover for fish, where present, in various aquatic environments. Additionally, buffer zones help reduce sensitive disturbance to wildlife and may also provide wildlife habitat and/or travel corridors near work areas.

Environmental Protection Procedures

Sensitive areas (e.g., wetlands, roosts, etc.) will be identified before construction begins and appropriate buffers will be flagged and maintained around these areas, where feasible. The intended buffer zones (provided in meters (m)) for various activities and receptors are outlined in Table 4.1.

Table 4.1 Recommended Minimum Buffer Zones for Construction Activities.

Activity	Environmental Receptor	Recommended Buffer Width	Reference
Hazardous Materials Storage	Wetland, Watercourse	31 m	Indian and Northern Affairs Canada. (2007). Northern Land Use Guidelines Vol. 6: Camp and Support Facilities. NWB License 8BW-ANU2333.
Fuel Storage	Wetland, Watercourse, Drainage Ditch	100 m (on level terrain)	Indian and Northern Affairs Canada. (2007). Northern Land Use Guidelines Vol. 6: Camp and Support Facilities. NWB License 8BW-ANU2333.
Equipment Fueling	Wetland, Waterbody	50 m	Site-specific recommendation – Wood. (2022). Biophysical Impact Assessment High Displacement Renewable Energy Project.
Equipment Servicing	Wetland, Watercourse, Drainage Ditch	100 m	
Transmission Line Placement – Treated Wood Poles	Watercourse	15 m	

Table 4.1 Recommended Minimum Buffer Zones for Construction Activities (cont'd).

Activity	Environmental Receptor	Recommended Buffer Width	Reference
Access Road Construction (except for culvert placement)	Watercourse	31 m	Indian and Northern Affairs Canada. (2010). Northern Land Use Guidelines Vol. 5: Access: Roads and Trails. NWB License 8BW-ANU2333.
Any land disturbance or site access activities (including but not limited to excavation, equipment operations / traffic, movement of field personnel)	Archaeological site	50 m	Nunavut Archaeology Permit 2023-63A Class 1 Survey Summary Report

Recommended minimum buffer zones for migratory birds are activity and species dependent. Any occupied nest found during Project construction should be protected with a buffer zone until the young avifauna species have permanently left the vicinity of the nest. As such, a qualified biologist (or alternate, such as Environmental/Wildlife Monitor) will develop buffer zones, which are determined by setback distances that vary on a case-by-case basis as recommended by ECCC's Guidelines to avoid harm to migratory birds. Key considerations when establishing buffer zones/setback distances include:

1. Degree of tolerance of the species;
2. Previous exposure of birds to disturbance;
3. Level of disturbance:
    i. Adjustments to setback distances for activities causing greater amounts of disturbance, such as clearing and grubbing, routine approach by humans and vehicles, noise exceeding 10 decibels (dB) above ambient noise levels in the natural environment, and noise greater than approximately 50 dB.
4. Landscape context; and
5. Distance at which nesting birds react to human disturbance.

It is recommended that flagging tape or similar material not be used to mark nests to mitigate the risk of predators finding the nest. Boundaries of the buffer zone can be marked with flagging tape, if necessary.

4.3 Laydown and Storage Areas

Potential Environmental Concerns

Areas will be needed to temporarily store and maintain equipment and supplies during construction. Potential environmental concerns for laydown and storage areas include erosion and run-off of sediment and other hazardous substances into nearby waterbodies or wetlands.

Environmental Protection Procedures

The following procedures shall be implemented with respect to laydown and storage areas:

1. The number of new laydown and storage areas will be kept to a minimum;
2. Procedures for clearing and grubbing (Section 4.4) and erosion prevention (Section 4.5) should be followed when establishing a new laydown or storage area;
3. External storage areas will be sited on level terrain and kept free of ponding and run-off;
4. Drainage from areas of exposed soil will be controlled by grade or ditching and directing run-off away from waterbodies;
5. Laydown and storage areas no longer required for construction activities will be rehabilitated; and
6. Fuel and other hazardous materials will be stored, handled, and transported according to Section 4.9 (Storage and Management of Fuel and Other Hazardous Materials).

4.4 Clearing and Grubbing

Potential Environmental Concerns

Vegetation clearing and grubbing will be required prior to infrastructure construction and installation activities. Potential concerns associated with vegetation clearing include loss of habitat (particularly for avifauna), stockpiling vegetation in or near watercourses, loss of permafrost protection (i.e., shade provided by vegetation may prevent ground thaw) and wildlife disturbance. The principal concern associated with grubbing and disposal of related debris is the potential for erosion and its associated effects on water quality of nearby watercourses. The potential for disturbing habitat and historical resources is also an environmental concern related to grubbing.

Environmental Protection Procedures

The following procedures shall be implemented with respect to clearing and grubbing:

1. Clearing and grubbing activities will comply with requirements of all applicable permits. To limit erosion, grubbing of the organic vegetation mat and/or surface organic layer shall be minimized, particularly on steep slopes and along the access road;
2. The boundaries of areas to be cleared and/or grubbed will be clearly marked prior to the start of activities:
    i. Clearing for road construction will be limited to the width required for road embankment, as well as drainage and safe line of sight requirements.
3. Clearing and grubbing activities will be scheduled to avoid sensitive timing windows as outlined in Section 4.1:
    i. Refer to Section 5.1, Avifauna Management Plan and Section 5.2, Fish and Fish Habitat for avoidance and mitigation measures.
4. Buffers of undisturbed natural vegetation will be maintained beside waterbodies to prevent erosion and sediment deposition, as well as sensitive areas (e.g., wetlands);
5. Grubbing will be minimized in areas of fine-grained soils or wet areas, where feasible. If required in areas of fine-grained soils, grubbing should be conducted during dry weather;
6. When working in or near wetlands, ground level cutting, mowing, and/or mulching of wetland will be conducted instead of grubbing, where practicable;
7. The period of time that inactive grubbed areas will be exposed to natural elements will be minimized to prevent unnecessary erosion. Mitigation measures are outlined in Section 4.5, Erosion Control and Sediment Prevention Plan;

8. Clearing and grubbing materials, except for organic topsoil, will not be disposed of in or near waterbodies, nor in otherwise unaffected land;
9. Organic topsoil will be stockpiled separately from other materials for future reclamation use:
    i. Stockpiles will be situated in a location that will not interfere with operations, will allow for meltwater drainage, and will not be eroded by surface runoff; and
    ii. The location of stockpiles shall be in clearly designated, pre-defined areas.
10. Discovery of historic resources will be managed according to procedures outlined in Sections 5.3 and 6.6 Historic Resources.

4.5 Erosion Control and Sediment Prevention Plan

Potential Environmental Concerns

Eroded material could potentially cause siltation in water bodies and, subsequently, adversely affecting suitable habitat for aquatic and terrestrial animals.

Environmental Protection Procedures

This section outlines general measures to be implemented with respect to erosion control and sediment prevention during Project construction.

Erosion Control

The primary mechanism for erosion control is the avoidance of activities that may contribute to erosion. The following erosion control measures will be implemented during construction:

1. The disturbance of new areas will be limited to the minimum required;
2. Installation or implementation of erosion prevention and drainage control measures will be conducted prior to land disturbance;
3. Routine monitoring will be conducted during construction to identify areas of potential erosion and to implement appropriate mitigation measures. Progressive erosion and sediment control measures will be implemented as required;
4. Erosion control options will be considered as appropriate to enhance soil stability and reduce surface water runoff. Such options may include:
    i. **Slope treatments**, achieved by roughening slopes (e.g., step-grading, grooving, tracking) to improve stability and increase seeding success and vegetation growth. Such treatments reduce runoff velocity and increase soil-water infiltration;
    ii. **Erosion control structures** (e.g., mats, nets, fibrous rolls) deployed on short, steep slopes where there is high erosion potential and slow vegetation establishment. Such structures are used to slow runoff and reduce erosion where there is flowing water;
    iii. **Rip-rap** is an erosion-resistant ground cover created by placement of rocks. It is typically used on riverbanks and/or bottoms, roadside ditches and tops of slopes; and
    iv. **Check dams and dikes** are temporary barriers constructed of rocks, gravel bags, sandbags or fibre rolls. Such structures are installed across a constructed swale or drainage ditch to reduce water velocity.

5. If required, drainage ditches will be stabilized to reduce soil erosion. Stabilization methods may include lining with vegetation or rock, terracing, interceptor swales, or installation of rock check dams. Measures to reduce soil erosion will be properly inspected and maintained following installation;
6. All work and laydown and storage areas will be monitored for erosion and appropriate remediation action taken as necessary;
7. Erosion control measures will be inspected on a regular basis by a designated on-site Environmental/Wildlife Monitor, and after a significant storm; and
8. Erosion control measures will be kept in good working order. If a repair is necessary, it will be initiated within 24 hours.

Sediment Prevention

Sediment barriers are temporary sediment control devices, used to protect water quality of receiving environments (i.e., down gradient rivers, streams and other water bodies) from sediment in water runoff. The most common sediment barriers are silt fences, which are often used in combination with other water control measures such as sediment traps and basins. Other sediment barrier options include straw bales and berms of erosion control mix. Engineering requirements may vary depending on the locations of sediment barriers. Factors including drainage/surface area of exposed soils and time of year will be considered when placing sediment barriers.

The following sediment prevention measures will be implemented during construction:

1. If an inspection reveals that silt is entering any waterbody, further mitigative measures will be implemented, such as temporary drainage ditches, ditch blocks/check dams, siltation control (silt fencing/silt curtain/geotextile/spring berms) or sediment dam traps, to intercept run-off. The necessary or appropriate measures will be determined in the field;
2. Existing or new siltation control structures used during construction will be monitored for excessive accumulation of sediment. Accumulated sediment will be removed from control structures to maintain effectiveness. In particular:
    i. Accumulated sediment will be removed when it reaches 60% of the height/depth of the siltation control structure, or no less than once per month during active accumulation;
    ii. Effluent from control structures will be released to flow overland for appropriate filtration prior to entering waterbodies; and
    iii. Excess water will be removed from siltation control structures prior to excavation of sediment.

4.6 Stream Crossings

Potential Environmental Concerns

Potential environmental concerns associated with stream crossings and culvert installations include impacts to fish such as direct mortality, disturbances, and loss of fish habitat. There is also potential for erosion, which may impact water quality of nearby watercourses as well as fish and wildlife habitat.

Environmental Protection Procedures

No work will be conducted below the high-water mark of any surface water feature without prior notification and assessment by the Construction Site Manager, as provincial, federal and regulatory approvals may be required. Stream crossings will be constructed in compliance with guidelines from DFO, and any approvals required from GN, NWB and NIRB.

An assessment of soil erosion potential will be conducted at each of the stream crossing locations, which will bolster the development of specific erosion stabilization methods and effective sedimentation control practices on a site-specific basis as per the above Section 4.5 Erosion Control and Sediment Prevention Plan.

The following procedures shall be implemented with respect to stream crossings:

1. The entry of deleterious substances such as sediment and fuel to watercourses and waterbodies should be avoided during stream crossing work. In particular:
   i. Cutting stream banks should be avoided to reduce the amount of sediment entering the watercourse; and
   ii. In-stream activities will be minimized (i.e., limited to either no-flow or low-flow water periods) to reduce sediment mobilization and watercourse flow restriction and diversion.
2. A minimum buffer of undisturbed natural vegetation must be maintained between the access road and the bank of any watercourse that it parallels. The buffer width will be at least 31 m wide (Indian and Northern Affairs Canada, 2010, Water License 8BW-ANU2333);
3. Culverts will be constructed according to permit specifications and in accordance with DFO Standards and Best Practices for Instream Works – Culverts (Appendix H);

4. For culverts required in locations with fish habitat, recommendations received from the DFO Request for Review (23-HCAA-00697) will be adhered to where possible. These include:
    i. Monitor for fish trapped within isolated, enclosed, or dewatered areas. Dewater gradually to reduce the potential for stranding fish;
    ii. Screen intake pipes to prevent entrainment or impingement of fish using the code of practice for water intake screens (Fisheries and Oceans Canada, 2020);
    iii. Limit impacts on riparian vegetation to those approved for the work, undertaking or activity;
    iv. Limit access to banks or areas adjacent to waterbodies;
    v. Construct access points and approaches perpendicular to the watercourse or waterbody;
    vi. Re-vegetate the disturbed area with native species suitable for the site;
    vii. Restore stream geomorphology (i.e., restore the bed and banks, gradient and contour of the waterbody) to its initial state;
    viii. Conduct all instream works, undertakings or activities in isolation of open or flowing water to reduce the introduction of sediment into the watercourse;
    ix. Use the code of practice for temporary cofferdams and diversion channels (Fisheries and Oceans Canada, 2020);
    x. Schedule work to avoid wet, windy and rainy periods (and heed weather advisories) that may result in high flow volumes and/or increase erosion and sedimentation; and
    xi. Monitor the watercourse to observe signs of sedimentation during all phases of the work, undertaking or activity and take corrective action.
5. Culvert locations will be marked, using a stake or post, to ensure they are visible during snow removal operations. The marker can also help locate the culverts in the event that they become covered in debris;
6. Culvert installation activities will be monitored on a daily basis in accordance with Section 6.3 Surface Water Quality Monitoring. Culverts will be inspected annually during operations, and repaired/debris removed as necessary to maintain culvert function;
7. Should additional permanent stream crossings (i.e., in addition to those included in Figure 2.1) be required they are subject to prior approval by DFO and NWB;
8. Fording involves a vehicle travelling through a stream bed. While fording will be avoided as much as possible, the following procedures should be implemented when fording any watercourse:

i. Locations should be selected to mitigate disruption of land, vegetation, and physical features of the channel as much as possible. Fording may be acceptable under the following conditions (Indian and Northern Affairs Canada, 2010):
    - The stream bed is composed of non-erodible, coarse-grained material;
    - Riparian vegetation disturbance is minimized;
    - The crossing will not result in erosion and sedimentation into the watercourse or alteration (e.g., rutting or compaction) of the channel bed or banks; and
    - Avoidance of fish-bearing streams, or spawning and migration periods, at minimum.

ii. All vehicles will be kept mechanically sound, where possible, to avoid leaks (e.g., oil, gasoline, hydraulic fluids);

iii. Fording sites will be used as infrequently as possible;

iv. Fording activities will be conducted in low flow conditions and halted during high flow periods to mitigate unnecessary channel disturbance or siltation; and

v. No servicing or washing of mobile equipment will occur adjacent to watercourses; servicing will not be allowed within 100 m of a watercourse.

4.7 Working in or near Wetlands

Potential Environmental Concerns

Wetlands, generally characterized by hydrophytic vegetation, can vary from a closed peat bog to an open water body dominated by submerged vegetation. Wetlands serve a variety of important ecological functions, including provision of wildlife habitat, and maintenance of surface and groundwater resources and quality. The Project will occur in the Sub-Arctic region, which is highly influenced by permafrost – the active layer of soil that thaws above the permafrost is very shallow. During the summer months, wetlands appear all over the landscape and are predominantly fens and bogs.

Project construction will result in alteration and/or loss of wetland habitat through direct disturbance, as well and changes in hydrology and vegetation (clearing, potential introduction of invasive/non-native species).

Environmental Protection Procedures

The following procedures shall be implemented with respect to working in or near wetlands:

1. Where wetland crossing beyond the area to be cleared cannot be avoided, protective layers such as matting, biodegradable geotextile and clay ramps or other approved materials will be used between wetland root/seed bed and construction equipment if encountered ground conditions are susceptible to rutting, admixing and compaction;
2. Grading will be directed away from wetlands, where possible, and will be reduced within wetland boundaries unless required for construction;
3. Rather than grubbing, ground level cutting, mowing, and/or mulching of wetland vegetation will be conducted where practicable; and
4. The access road will be constructed of quarried, crushed material to mitigate the risk of introducing or spreading non-native and/or invasive species.

4.8 Vehicle Traffic and Site Access

Potential Environmental Concerns

Potential environmental concerns associated with vehicular traffic relate to fugitive dust, emissions and noise that can impact other land users, wildlife, and wildlife habitat. Vehicular traffic can bring risk of wildlife injury and mortality through wildlife collisions. Proper drainage on and around the access road is required to ensure sediment and run-off is not introduced to nearby watercourses.

Environmental Protection Procedures

The procedures outlined below shall be implemented with respect to traffic along the access road and turn around. In addition to the mitigation of potential environmental concerns, environmental protection procedures will also enhance public, employee, and contractor safety.

1. Signage will be installed around the project area to alert the public and land users;
2. All site vehicles and equipment will be properly maintained to meet emission standards. Vehicles and equipment will be equipped with Tier 3 and 4 engines, where locally available;
3. All vehicle and equipment use, including heavy equipment (e.g., loader, dozer) and side by side ATV, is restricted to designated work areas and the access road, unless refuelling or maintenance is required;
4. Maintenance and refuelling of vehicles and equipment will be conducted in Sanikiluaq (i.e., outside of the project area);
5. The access road will be maintained in good condition and monitored for proper drainage and signs of erosion. Appropriate action (e.g., ditching, grading, managing vegetation growth) will be taken to repair roads, when necessary;
6. Dust control mechanisms may be required on the access road. If required, water will be used as a dust suppressant. Water for dust suppression purposes will be supplied by the Hamlet of Sanikiluaq water truck;
7. All vehicles and equipment shall comply with posted speed limits on the access road (30 kilometers per hour (km/h)), main roads (50 km/h) and turn around (10 km/h);
8. All vehicles and equipment will yield to wildlife (see procedures in Section 6.4, Wildlife Encounters) and people, where present, and speed will be reduced accordingly. Chasing and/or harassing wildlife with vehicles and equipment will not be permitted;

4.9 Storage and Management of Fuel and Other Hazardous Materials

Potential Environmental Concerns

Hazardous substances used during Project construction include, but may not be limited to petroleum, oil and lubricants, hydraulic fluid, and glycol (e.g., antifreeze). The primary concern associated with hazardous substance use is the potential for uncontrolled release to the environment as a result of spillage. Uncontrolled releases of hazardous substances may adversely affect terrestrial and aquatic habitat and species, as well as soil, groundwater quality, and human health and safety.

Environmental Protection Procedures

NNC has developed a comprehensive Spill Prevention and Response Plan (SPRP) under a separate cover. The SPRP provides an inventory of the amounts and types of hazardous materials on-site and outlines detailed steps for environmental protection and emergency spill response. The procedures outlined below will be followed to prevent and mitigate environmental incidents, and shall be implemented with respect to the storage, handling and transfer of fuel and other hazardous materials:

1. The *Workplace Hazardous Materials Information System* (WHMIS) *Regulations* under the federal *Occupational Health and Safety Act* will apply to all handling and storage of hazardous materials. All relevant, up-to-date Safety Data Sheets (SDS) will be readily available for the site;
2. All necessary precautions will be taken to prevent and reduce spillage, misplacement or loss of fuels and other hazardous materials. In the event of a reportable spill on-land, or a spill, regardless of size, to a waterbody, the **Northwest Territories-Nunavut (NT-NU) 24-Hour Spill Report Line (1-867-920-8130) and the Inspector On-Call at (867) 975-4284** will be contacted as noted in the contact list in Section 8.0. A spill is defined as reportable depending on class and quantity of the spilled material. The spill report form and immediately reportable quantities are provided in Appendix C;
3. Fuelling will be done at least 50 m from a wetland or waterbody;
4. Servicing of mobile equipment should not occur within 100 m of a wetland, watercourse, or drainage ditch;
5. A copy of the SPRP (summarized in Section 6.1, Fuels and Hazardous Materials Spills) for fuel and hazardous materials spills will be readily available;
6. Only personnel who are qualified and properly trained in handling fuel and hazardous materials will do so; and

7. Mobile equipment will be equipped with fire and spill response materials, ensuring that there are always adequate supplies on site.

4.10 Equipment Use and Maintenance

Potential Environmental Concerns

A variety of vehicles and equipment, including loaders, dozers, cranes, and generators, will be employed during Project construction. Potential environmental concerns associated with the operation and use of such equipment include air emissions, accidental spills and fuel leaks that could contaminate on-site waterbodies. Wetlands and plant communities may also be adversely affected by the introduction of non-native and/or invasive plant species via soil and vegetative debris on equipment brought to site.

Environmental Protection Procedures

The following procedures shall be implemented with respect to equipment use and maintenance:

1. Equipment brought to site should be clean and free of soil and vegetative debris to reduce the risk of introducing or spreading non-native and/or invasive species. Equipment inspections will be conducted by the on-site Environmental/Wildlife Monitor or appropriate designate and, if deemed to be in appropriate condition, will be approved for use. If it is determined that equipment is not in appropriate condition, it will not be allowed on site until it has been cleaned and deemed suitable for use following reinspection;
2. Equipment maintenance and fuelling activities will be conducted at a location outside of the project area, where possible;
3. Drip pans will be placed under generators and other equipment that could leak or spill fuel or other hazardous materials;
4. Hoses and connection on equipment will be inspected routinely for leaks and drips;
5. All leaks will be repaired and reported immediately to Construction Site Manager, who will relay details to the Construction Project Manager and the Environmental Manager, as required;
6. All fuel and other hazardous materials will be handled according to procedures outlined in Section 4.9, Storage and Management of Fuel and Other Hazardous Materials;
7. Equipment will be supplied with spill kits, and personnel who handle fuel-containing equipment will be trained in the use of spill kits and spill response procedures;
8. Engines and exhaust system of mobile equipment will be subject to a preventative maintenance program to maintain fuel efficiency and performance;

9. Equipment and vehicle idling times will be minimized, where practicable, to reduce emissions;
10. Mobile equipment will be maintained in good working order and equipped with appropriate noise-reducing mufflers; and
11. Operation of equipment during earthworks will be conducted in a manner such that fugitive dust emissions are reduced. Measures to reduce fugitive dust emissions may include using tarps to cover truck beds and temporary stockpiles of road materials.

4.11 Concrete/Grout Handling and Placement

Potential Environmental Concerns

Concrete will be required for Project construction, particularly during the infrastructure phase. Cement, concrete additives, agents and aggregates will be used in the production of concrete.

The primary potential environmental concern associated with concrete production activities is the effect of wash water released to the environment. While cured concrete has little effect on water quality, fresh concrete and concrete products may raise the pH in receiving waters to potentially toxic levels (i.e., pH level exceeding 9). Since cement is alkaline, wash water from spoiled concrete or from cleaning of concrete equipment is expected to have a very high pH that may exceed applicable regulatory guidelines, even after dilution. Aquatic species may also be impacted by releases of spoiled concrete or wash water as some concrete additives and agents are toxic to aquatic species. Additionally, aggregates, particularly finer sand fractions, can be expected to be washed from spoiled concrete or in wash water discharges. Aquatic life and habitat can be adversely impacted by uncontrolled releases of wash water, chemicals, and sediments.

Environmental Protection Procedures

The following procedures shall be implemented to minimize the potential impacts from concrete production or placement:

1. Strict adherence to procedures outlined in Section 4.9, Storage and Management of Fuel and Other Hazardous Materials, is required for all chemical additives, agents and other potential hazardous materials associated with concrete handling and placement;
2. Dust control measures will be adhered to with respect to stockpiling and storage of aggregates (i.e. covered such as with a tarp), as well as the handling of cement;
3. All equipment will be outfitted with required dust and emission control filters, as outlined in Section 4.10, Equipment Use and Maintenance;
4. Cement or fresh concrete shall not enter any watercourse or water body;
5. Dumping of concrete or washing of tools and equipment in any body of water is strictly prohibited;
6. No chemicals will be used in the washing of concrete equipment or tools on-site;

7. Water to be used for concrete/grout mixing shall be sourced from the Hamlet of Sanikiluaq water truck exclusively. The volume of water used, and extent of washing of concrete tools and equipment will be kept to a minimum;
8. Washing of concrete tools and equipment will be conducted at a designated location. Wash water from cleaning of tools and equipment will be directed into a secure, designated location approved by NNC. The wash water will be managed, treated, or recycled for future use; and
9. Ensure no seepage or spillage of concrete or concrete residues occurs outside of the work site.

4.12 Waste Management

Potential Environmental Concerns

If not properly disposed or controlled, waste (i.e., domestic and industrial) could potentially cause human safety and health concerns and adverse environmental effects. Improperly controlled or disposed waste could also attract wildlife, leading to the potential for human-wildlife conflicts.

Environmental Protection Procedures

A comprehensive Waste Management Plan (WMP) has been developed by NNC under a separate cover. The WMP outlines specific details regarding waste management during Project construction. The following general procedures shall be followed to properly manage solid waste:

1. All waste streams (i.e., hazardous and non-hazardous) will be handled according to the WMP and governing regulations and guidelines;
2. Prior to disposal, solid waste materials such as wood, and metal shall be considered for reuse, resale or recycling;
3. Wastes generated at the project site will be collected, segregated, labeled, and temporarily stored until transported for reuse, recycling or disposal so that it does not pose an environmental or health hazard;
4. Collected wastes will be transported to an approved waste disposal facility; and
5. Burning of waste is not permitted without appropriate permits.

4.13 Noise Control

Potential Environmental Concerns

Construction activities will generate a variety of noises, which can cause adverse effects on wildlife distribution and abundance. Noises associated with heavy equipment use are temporary in nature.

Environmental Protection Procedures

The following procedures shall be implemented with respect to noise control:

1. Adherence to all permits, approvals and/or authorizations;
2. Exhaust systems of all vehicles (including heavy equipment) and generators will be inspected regularly, and mufflers will be operating properly; and
3. Equipment use will be limited to daylight hours, where possible, to minimize nighttime disturbance.

4.14 Lighting

Potential Environmental Concerns

Artificial lighting can result in light trespass and glare, affecting visual aesthetics of the area and creating a nuisance for nearby land uses. It may also cause sensory disturbance to wildlife, particularly avifauna. Mobile artificial lighting may be required during construction to provide a secure and safe work environment for all personnel. Fixed lighting will be required on the wind turbine for aviation safety purposes. Lighting associated with construction activities is temporary in nature while wind turbine lighting is considered long term but localized.

Environmental Protection Procedures

The following procedures shall be implemented with respect to Project-related lighting:

1. Project lighting will be limited to what is necessary for safe and efficient construction activities;
2. The minimum allowable amount of lighting (e.g., minimum intensity and number of flashes per minute) will be used;
3. Strong exterior lights (e.g., sodium vapour lights) will be avoided or shielded;
4. Lighting will be located such that unavoidable light spill off the working area is not directed toward receptors outside of the Project area, where practicable; and
5. To the extent feasible without affecting safe construction activities, lighting will be reduced and/or have limited time of operations during sensitive wildlife periods (e.g., migration).

4.15 Progressive Rehabilitation

Potential Environmental Concerns

Rehabilitation involves the implementation of measures to restore the Project area as close to its former condition or use as practicable, or to an alternate use or condition as deemed appropriate and acceptable by applicable regulatory agencies. Progressive rehabilitation, whereby measures are implemented throughout the lifetime of the Project, ensures that rehabilitation is completed in advance of closure, where practicable.

During Project construction, progressive rehabilitation measures may include the removal and rehabilitation of temporary works, including stream crossings, laydown areas and construction-related infrastructure.

Environmental Protection Procedures

Progressive rehabilitation measures will be considered throughout the construction period, rather than waiting for the end of construction to implement rehabilitation measures. The following procedures shall be implemented with respect to progressive rehabilitation:

1. Any solid wastes (hazardous and non-hazardous) will be removed from the site and disposed of according to Section 4.12, Waste Management.
2. Project components will be progressively rehabilitated (including revegetation, where practicable) to reduce dust emissions.
3. Disturbed areas will be graded and/or scarified and covered with overburden and organic materials, where practicable.
4. Vegetation or other cover materials may be established on slopes to control erosion and dust, as site conditions dictate.
5. Native plant (including seed mix) and soil material will be used for rehabilitation and re-vegetation.
    i. If local plants are not available or do not meet rehabilitation objectives, only non-aggressive and non-persistent species will be used.
    ii. If a native seed mix is not commercially available, an appropriate seed mix will be selected based on an evaluation of included species and will ensure that invasive or non-native species not already widely established in the region are not included.

5.0 Resource-Specific Protection Procedures

5.1 Avifauna Management Plan

Potential Environmental Issues

Project construction activities can negatively impact avifauna by alteration, degradation or loss of habitat and sensory disturbances, as well as injuries and mortality from collisions with project equipment and infrastructure. Impacts on avifauna species are outlined in the Wildlife Mitigation and Monitoring Plan (WMMP), developed by NNC under a separate cover.

Avifauna species at risk (SAR) may be particularly vulnerable to potential adverse effects. Avifauna SAR include those listed under Schedule 1 of the federal *Species at Risk Act* (SARA). SAR are also assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). A list of avifauna SAR that may occur in the project area and could be affected by Project construction is provided in Table 5.1. Birds of prey (i.e., hawks, owls, eagles, falcons, harriers and ospreys), their nests and eggs are protected under the Nunavut *Wildlife Act* (NWA). There is some potential for birds of prey within the project area, as evidenced by an owl pellet observed during field studies in 2022.

Table 5.1 Avifauna Species at Risk and Birds of Prey.

Species	COSEWIC Status	SARA Status (Schedule 1)	NWA
Barn Swallow (*Hirundo Rustica*)	Special Concern	Threatened	No
Buff-breasted Sandpiper (*Tryngites subruficollis*)	Special Concern	Special Concern	No
Common Nighthawk (*Chordeiles minor*)	Special Concern	Threatened	No
Eskimo Curlew (*Numenius borealis*)	Endangered	Endangered	No
Harlequin Duck (*Histrionicus histrionicus*)	Special Concern	Special Concern	No
Horned Grebe (Western Pop.) (*Podiceps auratus*)	Special Concern	Special Concern	No
Ivory Gull (*Tringa flavipes*)	Endangered	Endangered	No
Olive-sided Flycatcher (*Contopus cooperi*)	Special Concern	Threatened	No
Peregrine Falcon (*Falco peregrinus anatum/ tundrius*)	Not at Risk	Not at Risk	Yes
Red Knot (*Calidris canutus Islandica*)	Not at Risk	Special Concern	No
Red Knot (*Calidris canutus rufa*)	Endangered	Endangered	No
Red-Necked Phalarope (*Phalaropus lobatus*)	Special Concern	Special Concern	No

Table 5.1 Avifauna Species at Risk and Birds of Prey (cont'd).

Species	COSEWIC Status	SARA Status (Schedule 1)	NWA
Ross's Gull (*Rhodostethia rosea*)	Endangered	Threatened	No
Rusty Black Bird (*Euphagus carolinus*)	Special Concern	Special Concern	No
Short-Eared Owl (*Asio flammeus*)	Threatened	Special Concern	Yes
Snowy Owl (*Bubo scandiacus*)	Not at Risk	Not listed	Yes
COSEWIC – Committee on the Status of Endangered Wildlife in Canada SARA – *Species at Risk Act* NWA – Nunavut *Wildlife Act*			

Environmental Protection Procedures

This Avifauna Management Plan outlines measures to reduce potential impacts to birds, including scheduling activities that could cause potential harm, implementing mitigation measures if activities are required during breeding bird season, and applying appropriate buffer/set-back distances from active nesting areas.

The following procedures shall be implemented to protect avifauna during Project construction:

1. Where practicable, clearing and grubbing will be avoided during the breeding season between May 1 and August 15 (Environment and Climate Change Canada, 2018).
2. If clearing and grubbing activities are required during breeding bird season, the following measures will be implemented:
    i. The area will be inspected by experienced personnel (i.e., qualified biologist or scientist, Environmental/Wildlife Monitor, local hunter) to assess the presence of migratory and resident bird nests, as well as birds displaying nesting behaviours. The survey shall be conducted no more than five days before the commencement of clearing and grubbing during nesting season.
    ii. Survey the area for sensitive habitat that typically supports nests.
    iii. An appropriate buffer zone will be established around identified active nests or areas of active nesting behaviours until fledging has occurred. Buffer zone/setback distances will be developed on a case-by-case basis by qualified personnel (e.g., biologist). Specific considerations are detailed in Section 4.2, Buffer Zones.
3. Work in the area of a migratory bird nest discovery will be ceased immediately. The Environmental/Wildlife Monitor will assess the nest and contact the Construction Site Manager and/or the Environmental Manager for further guidance, if necessary. A buffer

of appropriate size may be required if the nest contains a live bird or viable egg (with some exceptions depending on the species of bird, as per the federal Migratory Bird Regulations 2022 and the Nunavut Wildlife Act 2003). Should a buffer be required, it must be maintained until fledging occurs. Further guidance on establishing appropriate buffers or procedures for removing an inactive nest are provided under a separate cover in the WMMP.

4. Active work areas will be maintained free of vegetation to limit the attraction of migratory birds.
5. Discoveries of injured or dead birds on site, as well as observations of bird collisions with Project infrastructure or equipment, are to be reported to the Environmental/Wildlife Monitor, who will contact the on-call Wildlife Officer in Sanikiluaq at **(867) 266-8098** and the Environment and Climate Change Canada – Canadian Wildlife Service (ECCC-CWS), as applicable.
    i. Handling of bird carcasses will be conducted by qualified personnel (i.e., Environmental/Wildlife Monitor under the direction of the Wildlife Officer in Sanikiluaq). Precautions will be taken to avoid exposure to potential disease, including wearing gloves or using a doubled plastic bag and avoid contact with blood, body fluids and feces. You should then wash your hands thoroughly with soap and warm water or use hand sanitizer.
    ii. Under the guidance of the Wildlife Officer in Sanikiluaq, bird carcasses will be disposed of or delivered to a lab for analysis as applicable.
    iii. If found, carcasses of SARA-listed species will be sent to the ECCC-CWS office with suitable permitting, as advised by CWS.
6. A Wildlife Sightings Log (Appendix D) should be completed and submitted to NNC immediately following each sighting of avifauna.
7. A Wildlife Incident Form (Appendix E) should be completed and submitted to NNC immediately following each incident with avifauna(e.g., encounters, nuisances, mortalities, injuries, etc.).

5.2 Fish and Fish Habitat

Potential Environmental Issues

Potential environmental issues with Project construction on fish and fish habitat include changes to surface water resources, and vegetation and wetlands. Such changes occur through direct removal of riparian vegetation, alterations to stream flow, introduction of sediment and contaminants. Additionally, direct injury or mortality may also occur from the presence of equipment, culvert installation and water management activities that result in changed in water levels in surrounding waterbodies. Regulators will be immediately informed should unanticipated events that may affect fish and fish habitat arise.

Environmental Protection Procedures

The following procedures shall be implemented to protect fish and fish habitat during Project construction:

1. Before commencing work in or near a watercourse, a survey will be conducted by qualified personnel (e.g., Environmental/Wildlife Monitor) to assess whether fish or fish habitat is present.
2. Buffer zones will be established as per Table 4.1 in Section 4.2, Buffer Zones.
3. Environmental protection procedures presented in the following sections of this EPP shall be implemented to help protect fish and fish habitat:
    i. 4.1, Sensitive Timing Windows
    ii. 4.5, Erosion Control and Sediment Prevention Plan
    iii. 4.6, Stream Crossings
    iv. 4.7, Working in or near Wetlands
    v. 4.9, Storage and Management of Fuel and Other Hazardous Substances

5.3 Historic Resources

Potential Environmental Issues

Nunavut is a territory deep with tradition and history, and with the passing of time, many of these traditions have changed or disappeared (Griebel, 2014). Archaeological resources are finite resources and are of value not only to local communities, but to Nunavummiut and all Canadians. They are important sources of historical knowledge and cultural identity, and must be respected and preserved.

Archaeological sites can be disturbed by any activity that causes ground disturbance and are often not readily identifiable by the untrained eye. Archaeological sites are very common throughout Nunavut, mostly consisting of stone structures that usually represent tent rings and shelters, caches, traps, hunting blinds, cairns, *inukshuks*, and stone tools. Specifically, for the Project, archaeological sites can be directly affected by such activities as geotechnical testing, excavation, road construction work, and general travel or increased presence of people on the land.

An archaeological assessment was undertaken in advance of the construction of the Project. Six archaeological sites were documented during the survey of the access/transmission line path and the wind turbine site. Five of these consist of a single cultural feature, while one site has two features about 10m apart. There is another previously identified archaeological site near the local quarry where the material for the access road construction will be sourced. Direction has been given by the Territorial Archaeologist to avoid all archaeological sites and to install appropriate protection mitigations.

Environmental Protection Procedures

No activities shall be conducted in the vicinity of a 50-metre buffer zone of an archaeological/historical site. The Proponent shall ensure that archaeological and paleontological sites are not purposely or inadvertently disturbed by contractors or staff as a result of project activities. In the event of an accidental discovery, procedures detailed in Section 6.5, Discovery of Historic Resources shall be followed.

The following procedures have been developed in close communication with the office of the Nunavut Territorial Archaeologist, and will be put in place to protect known archaeological sites during Project construction:

1. The Construction Site Manager will mark the 50 m radius protective buffer around each site using stakes, flagging and/or brightly colored rope. All construction personnel will be instructed to avoid the demarcated area. Barriers will remain in place throughout construction.
2. The access/transmission corridor route will be adjusted, where necessary, to avoid all cultural features by at least 50 m.
3. The wind turbine location will be adjusted to avoid all cultural features by at least 50 m.
4. The Construction Site Manager will place visual barriers on the east side of the site near the gravel pit, to prevent those loading the gravel from accidentally impacting the site. This barrier too will be maintained for the duration of the construction.
5. Existing inukshuks shall not be modified or disturbed. New inukshuks or rock piles shall not be constructed since building new rock piles may clutter the archaeological record and/or result in unknowingly using rocks from existing archaeology sites.
6. Archaeological site location coordinates / maps have been held in confidence and will not be shared with anyone — other than those who need it for construction — and will never be put on the Internet. These data will be destroyed upon completion of the transmission line and service road.

5.4 Wildlife Management Plan

Potential Environmental Issues

Potential environmental issues associated with Project construction on wildlife include changes in habitat and mortality risk. Project construction activities are anticipated to result in habitat loss, alteration or destruction, particularly due to vegetation clearing, sensory disturbance, and edge effects. The risk of wildlife mortality may be increased during Project construction due to habitat loss, alteration, or destruction as well as through collisions with Project equipment and increased predation pressures. Impacts on wildlife species are outlined in the WMMP, developed by NNC for the Project under a separate cover.

Environmental Protection Procedures

The following procedures shall be implemented to protect wildlife during Project construction:

1. The Environmental Manager will observe changes to species' status prior to and/or during Project activities and review activities in consideration of applicable species/habitat restrictions and SAR recovery strategies.
2. The on-site Environmental/Wildlife Monitor will be trained to recognize species of conservation concern that may be present in the project area.
3. Project personnel are strictly prohibited to hunt, fish, or harvest wildlife on the Project site during working hours.
4. Pets are prohibited on site.
5. If discovered, the presence of roosts, hibernacula or dens in the project area will be reported to the on-site Environmental/Wildlife Monitor, and appropriate action or follow-up will be conducted in consultation with NNC, a qualified biologist, the on-call Wildlife Officer in Sanikiluaq (**(867) 266-8098**) and/or applicable federal/provincial regulators.
6. Wildlife-vehicle collisions, near misses, or observations of wildlife road mortality on the access road or in the project area, and/or involving Project equipment are to be reported to the Environmental/Wildlife Monitor, who will report to NNC, the on-call Wildlife Officer in Sanikiluaq (**(867) 266-8098**) and/or ECC-CWS, as appropriate. Adaptive management measures will be implemented should locations of high frequency wildlife-vehicle interactions be identified.
7. A Wildlife Sightings Log (Appendix D) should be completed and submitted to NNC immediately following each wildlife sighting.

8. A Wildlife Incident Form (Appendix E) should be completed and submitted to NNC immediately following each wildlife incident (e.g., encounters, nuisances, mortalities, injuries, etc.).

6.0 Contingency and Monitoring Plans

6.1 Fuels and Hazardous Materials Spills

Potential Environmental Concerns

Fuel and hazardous materials can damage or harm vegetation, soil, surface water, groundwater, wildlife, aquatic species and habitat, historic resources, and human health and safety.

Environmental Protection and Response Procedures

NNC has implemented a comprehensive SPRP under a separate cover that outlines the procedures to be followed in the event of a fuel or hazardous materials spill. Spill response procedures are outlined below.

1. The individual who causes or discovers the spill shall stop work immediately, stay clear of the spill, warn others nearby and shut down nearby mobile equipment.
   i. The hazard to persons in the area shall be assessed, and injured or contaminated persons shall be assisted if safe to do so.
2. When the spill is discovered, the individual shall find and identify the spill substance and its source.
3. The individual shall make reasonable attempts to immediately stop the leakage and contain the flow, if safe to do so.
4. Information about the status of the situation should be gathered and reported to the Construction Site Manager so they may take appropriate action.
5. NNC will immediately report a reportable spill on land, or any spill to a waterbody regardless of size, to the **Northwest Territories-Nunavut (NT-NU) 24-Hour Spill Report Line (1-867-920-8130) and to the Inspector On-Call at (867) 975-4284**. Refer to Appendix C for the definition of immediately reportable spills and a copy of the spill reporting form. Required information may include:
   i. Name, employer, location and contact number of reporter
   ii. Location of spill or leak
   iii. Time of spill or leak
   iv. Type of product spilled
   v. Quantity of spilled substance
   vi. Source and cause of spill or leak
   vii. Responsible party and phone number

viii. Hazards to persons, property or environment
ix. Factors affecting spill recovery, and if assistance is required.

6. All personnel working in the Project area will receive on-site training for spill prevention, response, clean up and disposal measures. Spill response measures are to be implemented without undue delay.
7. Coordinating a clean-up and adapting response procedures to changing conditions and circumstances will be the responsibility of the Construction Site Manager in collaboration with the Construction Project Manager and Environmental Manager, as required.
8. The SPRP includes a complete list of spill response equipment and locations of spill kits. The spill response equipment inventory will be reviewed and restocked following spill response efforts.
9. The following criteria will be applied to all spill response scenarios:
   i. Minimize dangers to all persons (including the general public);
   ii. Protect water supplies;
   iii. Minimize pollution of water supplies;
   iv. Minimize area affected by spill; and
   v. Minimize the degree of disturbance to the environment.

6.2 Extreme Weather

Potential Environmental Concerns

Extreme weather events, specifically severe storms, can bring heavy precipitation and strong winds. Severe storms during winter months can bring heavy precipitation in the form of snow, ice and freezing rain, while severe summer storms bring heavy rain. Other forms of severe weather include extreme temperature, thunder, and lightning.

Extreme weather events can create unsafe working conditions, causing delays in construction activity and transport of resources (i.e., materials, supplies and workers), and can also affect the environment. Extreme precipitation, as well as associated surface water runoff from snowmelt, rainfall and freezing rain events, may cause flooding, erosion and road washouts. These events could cause erosion and sedimentation control structures to fail, thereby resulting in the potential release of sediment to surface water bodies (see Section 6.3, Failures of Erosion and Sediment Control Measures). High winds, extreme temperatures and heavy snow and ice have the potential to impact and damage Project infrastructure. Ice accumulation on power lines and associated infrastructure could cause power outages, thereby potentially delaying Project activities. Extreme snow and ice could also increase the risk of vehicle accidents in the Project area and on the access road.

Environmental Protection and Response Procedures

The following procedures shall be implemented to mitigate effects of extreme weather:

1. The Project will be designed and constructed to meet applicable engineering codes, standards and best management practices. The codes and standards account for weather variables, including extreme conditions, that could affect the structural integrity of Project infrastructure. Additionally, designs will consider projected climate change over the life of the Project.
2. Potential effects associated with extreme weather (i.e., storms, precipitation, flooding, drought) will be considered during Project planning, design and construction, including the selection of materials and equipment, and design of components. Infrastructure components specifically designed for deployment in arctic climates will be selected, where practicable. Careful attention will be given to material storage in advance of extreme weather warnings such as extra tie-downs for wind events, and higher elevation for sensitive electrical equipment during flooding events.

3. Project infrastructure and equipment that could be affected by the environment will be regularly inspected and monitored. NNC will take required action to ensure infrastructure and/or equipment is maintained, repaired, and upgraded as needed.
4. Project activities will include allowances and/or procedures for delays due to weather.
5. Weather forecasts will be considered when planning construction activities that could be affected by adverse conditions, such as culvert installation, earthworks, and receipt of materials and supplies. These activities should be scheduled for periods of favourable weather conditions, where practicable.
6. Weather forecasts will be regularly monitored, particularly for extreme weather events, to ensure appropriate preventative measures are implemented. Such measures, implemented to reduce risk of damage to Project infrastructure, will include site inspections to identify and secure loose items, materials and equipment that could be susceptible to wind events, and inspection and maintenance of sediment and erosion control measures prior to and following precipitation events.

6.3 Surface Water Quality Monitoring

Potential Environmental Concerns

Management processes and procedures must be implemented to limit the potential for adverse impacts to receiving waters, aquatic ecosystems, fish, and fish habitat. This section outlines the procedures to mitigate and manage drainage and runoff due to project construction activities, address non-point discharges to surface waters, and assess those discharges in terms of water quality relative to their receiving water systems.

Environmental Monitoring Procedures

Turbidity, total suspended solids (TSS), pH, and visual monitoring will be conducted to monitor water quality before, during, and after instream works. The Contractor will be responsible for water compliance. *In situ* water quality samples will measure Nephelometric Turbidity Units (NTU) to evaluate the impact of instream turbidity levels generated by instream construction. Samples for TSS and pH will be collected and sent to a laboratory accredited according to ISO/IEC Standard 17025. All sampling, sample preservation and analyses will be conducted in accordance with methods prescribed in the current edition of *Standard Methods for the Examination of Water and Wastewater*.

Routine surface water monitoring shall be conducted by the Environmental Monitor on a regular basis during construction activities. Inspection areas shall include upstream and downstream of any waterways which may be affected within the project footprint, in accordance with the Environmental Site Inspection Checklist Section 1.0 (Appendix B). Where required, inspection locations will be modified to reflect current Project infrastructure and activities. All records regarding sampling and water quality monitoring will be kept on file and on-site.

6.3.1 Sampling Frequency

During periods of flow or following a major precipitation event, water quality monitoring must be conducted on a monthly basis at minimum, prior to, during and following construction of water crossings.

Before and After Construction

Prior to the commencement of construction activities, samples will be collected on a monthly basis to establish background levels of turbidity, TSS, and pH. Specifics regarding which parameters to be collected at which locations are explained in Section 6.3.2.

Following completion of construction activities, during periods of flow or following a major precipitation event, water quality monitoring will be conducted on a monthly basis to monitor the effectiveness of as-built erosion and sedimentation control measures. Specifics regarding which parameters to be collected at which locations are explained in Section 6.3.2. Monitoring will continue until expiry or termination of the water licence.

During Construction

During the construction period, monitoring shall occur prior to the start of daily instream works and 30 minutes after active works stop for the day. During active instream works, sampling frequency will occur as follows:

- Instream construction activities:
    - During construction hours, measurement of *in situ* parameters and visual inspection will be conducted at a minimum of once every hour at all compliance transects as described in Section 6.3.2.
    - During construction hours, sampling of TSS and pH for laboratory analysis will be conducted once per month at all compliance transects as described in Section 6.3.2. The selected sampling date will take shipping logistics into consideration so that samples arrive within prescribed holding times.
- Isolated works activities:
    - When the Contractor is working within site isolation, sampling of *in situ* parameters will be conducted at all transects described in Section 6.3.2 at three-hour intervals, during construction hours.
    - During construction hours, sampling of TSS and pH for laboratory analysis will be conducted once per month at all compliance transects as described in Section 6.3.2.

Sampling of surface runoff or discharges impacted by construction activities must be conducted depending on site conditions or activities. *In situ* turbidity monitoring downstream of activities will be conducted hourly until parameters have returned to acceptable background levels for two consecutive sampling events.

6.3.2 Sampling Locations and Parameters

Before and After Construction

Prior to the beginning of construction activities and during periods of flow, samples will be collected once a month to establish background levels of turbidity, TSS, and pH. Samples going to the laboratory will be collected within 30 cm of the water surface, regardless of watercourse depth. Care will be taken not to disturb the bottom of the watercourse during sampling. Two samples for laboratory analysis will be collected at each of the planned culvert locations: one immediately upstream and one immediately downstream. *In situ* turbidity measurements will be collected immediately upstream and downstream of each of the planned culvert locations, with some adjustment for the depth and width of the watercourse as follows:

- For watercourses with depths less than 1 m, one *in situ* turbidity measurement will be taken at 50% of water depth; and
- For watercourses with depths greater than 1 m, two *in situ* turbidity measurements will be taken at 20% and 80% of water depth at each transect, and the results will be averaged;
- For watercourses with wetted width 3 m or less, sample at 50% of the wetted width (i.e., halfway across); and
- For watercourses with wetted width between 3 m and 10 m, sample at 33% and 67% of the wetted width (i.e., 1/3rd of the way across and 2/3rd the way across).

Following completion of instream works and construction activities onsite, monthly water quality monitoring will continue as per the above.

During Construction

During the construction period, sampling locations are dependent on the watercourse water depth and wetted width, which are as follows:

- Samples going to the laboratory will be collected within 30 cm of the water surface, regardless of watercourse depth. Care will be taken not to disturb the bottom of the watercourse during sampling;
- For watercourses with depths less than 1 m, one *in situ* turbidity measurement will be taken at 50% of water depth;

- For watercourses with depths greater than 1 m, two *in situ* turbidity measurements will be taken at 20% and 80% of water depth at each transect, and the results will be averaged;
- For watercourses with wetted width 3 m or less, sample at 50% of the wetted width (i.e., halfway across);
- For watercourses with wetted width between 3 m and 10 m, sample at 33% and 67% of the wetted width (i.e., 1/3rd of the way across and 2/3rd the way across).
- Both samples going to the laboratory and *in situ* turbidity measurements will be collected at each of the following transects:
    - Background: upstream of the water crossing/work area
    - Transect 1: 1 stream width from the water crossing/work area
- An additional *in situ* turbidity measurement will be collected at each of the following transects:
    - Transect 2: 2 stream widths from the water crossing/work area
    - Transect 3: 3 stream widths from the water crossing/work area

Sampling of surface runoff or discharges impacted by construction activities must be conducted depending on site conditions or activities. It is recommended that samples are collected from surface runoff/discharge from three locations if possible: one within the runoff/discharge stream immediately before it enters a watercourse, one immediately downstream of the entry point, and one upstream of the entry point as a background. Runoff/discharge will be sampled for laboratory analysis of TSS and pH, and must be visually inspected to detect any visible sheen. In addition to collection of laboratory samples, *in situ* turbidity monitoring will be conducted immediately upstream and downstream of the entry point. Guidance given above pertaining to watercourse depth and wetted width for turbidity measurement will be followed.

6.3.3 Water Quality Compliance Thresholds

Water quality compliance thresholds prescribed by the NWB presented below in Table 6.1 pertain to surface runoff or discharges impacted by construction activities associated with the Project, as well as to upstream and downstream of water crossings. Turbidity compliance thresholds were developed based on Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines for the Protection of Aquatic Life (CCME, 2002) and are based on short-term exposure to turbidity. These turbidity compliance thresholds are reflected in the NWB licence as well.

Table 6.1 Water Quality Compliance Thresholds.

Parameter		Maximum Average Concentration (mg/L)	Maximum Concentration of Any Grab Sample (mg/L)	Maximum Increase
Total Suspended Solids (TSS)		50.0	100	--
Oil and Grease		No Visible Sheen	No Visible Sheen	--
pH		Between 6.0 - 9.5	Between 6.0 - 9.5	--
Turbidity	background <= 80 NTU	--	--	8 NTU
	background > 80 NTU	--	--	10%

6.3.4 Exceedance Protocol

If instream turbidity measurements are above the water quality compliance thresholds given above, instream construction will cease or be modified, and Environmental Protection and Response Procedures will be followed as per Section 6.3.5. The Environmental/Wildlife Monitor shall notify the Construction Site Manager immediately.

In the event of an exceedance, instream work will be paused, and efforts will be made to eliminate the size and dispersal of the plume downstream. Increased monitoring will be conducted as follows:

- *In situ* turbidity monitoring will be conducted at all transects and within the plume at a minimum of once per hour, and continue until turbidity levels have returned to acceptable background levels for two consecutive sampling events;
- Sampling frequency for TSS and pH will be conducted at all transects and within the plume area at a minimum of once per day until *in situ* turbidity improves; and
- If the plume or exceeding turbidity readings extend greater than 100 m downstream, additional sampling locations will be required to delineate the impact of any accidental release.

6.3.5 Environmental Protection and Response Procedures

The following procedures shall be implemented to mitigate effects of impaired surface water quality:

1. If surface water quality monitoring or visual inspections reveal that surface water quality may become, or has become, impaired due to erosion or sedimentation (i.e., water appears turbid, control structures appear laden with silt/sediment, erosion of

streambanks is observed) response procedures outlined in Section 4.5, Erosion Control and Sediment Prevention Plan will be implemented.

2. If surface water quality downstream from erosion and/or sediment control measures appears impaired (i.e., cloudy, murky, muddy) or if the control measures have failed:
   i. Sedimentation fencing and other sedimentation control measures will be deployed, inspected, and maintained, as needed, adjacent to wetlands and slow-moving watercourses; and
   ii. Affected waterbodies will be monitored as in Section 6.3.4, and remedial actions and reporting, if required, will take place in consultation with regulators and other appropriate agencies.
3. If an inspection reveals that surface water quality may become, or has become, impaired due to a spill of fuel or other hazardous material, response procedures outlined in Section 6.1, Fuels and Hazardous Materials Spills, and the Spill Prevention and Response Plan (SPRP, separate cover) will be implemented.
4. If an inspection reveals that surface water quality may become, or has become, impaired due to encroachment of activities within buffer zones as per Section 4.2, Buffer Zones, the Construction Site Manager shall be notified immediately. Activities will be halted and relocated accordingly, and activity-specific response measures will be deployed to minimize effects to the receiving environment.
5. If an inspection reveals that surface water quality may become, or has become, impaired due to in-stream works (i.e., culvert installation or temporary fording), the Construction Site Manager shall be notified immediately. Response procedures outlined in Section 4.6, Stream Crossings will be implemented immediately.

6.3.6 Reporting Requirements

Water quality monitoring data shall be provided to the Environmental Manager on a daily basis. Data shall be provided using a Daily Water Quality Monitoring Log (Appendix C) and/or a *In Situ* Turbidity Measurement Log (Appendix D). The following information should be provided on a daily basis:

- Description of instream works;
- Date and time of each sample;
- Results of each NTU sample;
- Weather conditions;
- Documentation of daily NTU calibration;
- Daily average NTU value of the background location;

- Daily average NTU at each downstream transect;
- Photographs before, during, and after instream works; and
- Documentation of all exceedance events, including the level, duration, mitigation measures taken, and exceedance reporting following the Exceedance Protocol outlined in Section 6.3.4 and the Environmental Protection and Response Procedures outlined in Section 6.3.5.

Chain of custody and shipping waybills for all laboratory samples will be emailed to the Environmental Manager on a daily basis. The distribution list for all laboratory results will include the Environmental/Wildlife Monitor, the Environmental Manager, and representative(s) of NNC, as required.

6.4 Wildlife Encounters

Potential Environmental Concerns

The primary environmental concern associated with wildlife (including avifauna) encounters is the potential risk of stress or injury to both wildlife and site personnel. Control measures and environmental protection procedures have been implemented to mitigate this potential risk to wildlife and humans.

Environmental Protection and Response Procedures

The following procedures shall be implemented with respect to wildlife encounters:

1. The project area will be kept clean of food scraps and garbage.
2. Waste generated at the site will be collected for disposal in appropriate containers and transferred to an approved location on a regular basis.
3. No attempt will be made by any individual at the project area, except for the Polar Bear Monitor, to chase, catch, divert, follow, or otherwise harass wildlife by vehicle or on foot.
4. Equipment and vehicles will yield the right-of-way to wildlife.
5. All personnel will be aware of the potential for encounters with wildlife, such as polar bears, caribou, reindeer and foxes. Wildlife sightings will be reported to Environmental/Wildlife Monitor, who will assess actions for follow-up, if required. A Wildlife Sightings Log (Appendix F) should be completed and submitted to the Environmental Manager immediately following each wildlife sighting.
6. Wildlife-vehicle collisions, near misses, or observations of wildlife mortalities on site roads and/or involving Project vehicles on the access road will be reported to the Construction Site Manager. If wildlife-vehicle interactions frequently occur in a particular location, adaptive management measures will be implemented (e.g., deterrents, fencing, etc.).
7. A Wildlife Incident Form (Appendix G) should be completed and submitted to NNC immediately following each wildlife incident (e.g., encounters, nuisances, mortalities, injuries, etc.).
8. Instances of nuisance wildlife in the project area should be handled on a by-case basis, in consultation with the Construction Site Manager and/or Environmental Manager, the Environmental/Wildlife Monitor, the on-call Wildlife Officer in Sanikiluaq and regulatory agencies, as required.

6.5 Discovery of Historic Resources

Potential Environmental Concerns

Historic resources are defined as, but not limited to, archaeological and historical sites, burial grounds, palaeontological sites, historic buildings, and cairns that may be discovered, disturbed or improperly removed during Project construction. These features represent a valuable cultural resource, and disturbance could result in loss or damage to these resources and the information represented by them.

Environmental Protection and Response Procedures

The following procedures shall be implemented in the event of the discovery of historic resources:

1. All Project personnel will be informed of their responsibility to report any unusual findings, and to leave such findings undisturbed.
2. If the presence of historic resources is known, work boundaries may be moved to ensure resources are protected.
3. If an archeological object or fossil is encountered, all work in the area of the find will be stopped immediately. The archeological object/fossil shall not be touched or removed from the location where it was found.
4. The find should be reported immediately to NNC, who will contact the Territorial Archaeologist, GN Department of Culture and Heritage, at (867) 934-2040 as soon as possible. Reporting information will include:
    i. Name and contact information of the person who made the discovery;
    ii. Date of the discovery;
    iii. Nature of the archeological object or fossil;
    iv. A description of the site and any artifacts/fossils noted;
    v. Photographs of the artifact/fossil and/or site;
    vi. GPS coordinates of the location, if possible; and
    vii. Any other relevant information.
5. The find area will be cordoned off for the duration of the Project or until the find is deemed not significant by the Territorial Archaeologist. Under no circumstances will work be carried out at the location of the find, nor will anyone remove material unless authorized by the Territorial Archaeologist via an Archaeology and Palaeontology permit.

6. In the event of the discovery of suspected human remains or a burial site, the following procedures will apply:
   i. Work in the immediate area will be suspended; Construction Site Manager will be notified immediately.
   ii. If remains are discovered during heavy equipment operations, the equipment will not be moved by the operator as physical evidence may be destroyed.
   iii. The site, including heavy equipment, if necessary, will be secured by the operator with flagging tape or some other appropriate means. The suspected remains will be covered with a tarp.
   iv. NNC will contact the Royal Canadian Mounted Police (RCMP) detachment in Sanikiluaq at **(867) 266-1111**.
   v. If the RCMP determines that the remains are associated with a historical burial, NNC will contact the Territorial Archaeologist to obtain guidance on further actions.

7.0 EPP Control Revisions

This EPP is focused on activities during Project construction. The EPP will be revised as necessary to reflect site-specific environmental protection requirements and allows for updates as work progresses and changes. All EPP holders may initiate revisions by forwarding proposed revisions to the Environmental Manager. The following information will be provided on a Revision Request Form (see Appendix H):

1. Section to be revised;
2. Nature of the revision;
3. Rationale for the revision (i.e., environment/worker safety); and
4. Name of the revision requester.

Revisions to the EPP must be approved by NNC prior to distribution. When a revision request is approved, details of the revision will be distributed to all EPP holders and will be documented in the Revision History Log (Appendix I). Each revision will be accompanied by:

1. Revision instructions;
2. A list of sections being superseded; and
3. An updated Table of Contents indicating the status of each section of the EPP.

When EPP holders receive a revision, they will, in a timely manner:

1. Confirm that all listed pages have been received;
2. Read the text of the revision;
3. Update their copy of the EPP by removing and destroying superseded pages and inserting revised pages;
4. Page check the EPP, using the updated Table of Contents to confirm the EPP is complete and current;
5. Enter the revision number and date entered on the Revision History Log; and
6. Confirm that their personnel are informed of and familiar with the revisions.

At the end of each calendar year, the Environmental Manager will review and complete necessary updates to the EPP. In the event that work activities change, the EPP will be reviewed and updated as necessary by the Environmental Manager.

8.0 Contact List

Organization	Contact	Location	Telephone
NNC	Heather Shilton, Director	Iqaluit	(867) 979-8400
Growler Energy	Peter Whelan, ANP Project Manager	St. John's, NL	(709) 765-4401
CPL	Greg Sheppard, Construction Project Manager	St. John's, NL	(403) 386-6705
SEM	Brittany Connolly, Environmental Manager	St. John's, NL	(709) 754-0499
NT-NU Spill Centre	24-Hour Spill Report Line	Yellowknife	(867) 920-8130
CIRNAC	Inspector On-Call	Iqaluit	(867) 975-4284
	Joseph Monteith, Water Resource Officer	Iqaluit	(867) 975-1787
Canadian Coast Guard – Arctic Region	Marine Pollution Emergencies Environmental Response Duty Officer	Yellowknife	(867) 979-5269
NWB	Executive Director	Gjoa Haven	(867) 360-6338
GN Department of Environment	Wildlife Officer	Sanikiluaq	(867) 266-8098
GN Department of Environment	Jon Neely, Acting Director Wildlife Operations	Iqaluit	(867) 975-7700
GN Department of Sustainable Development	Environmental Protection Service	Iqaluit	(867) 975-5900
GN Department of Culture and Heritage	Sylvie Leblanc, Territorial Archaeologist	Igloolik	(867) 934-2040
Sanikiluaq Health Centre		Sanikiluaq	(867) 266-8965
Keewanti Air LP	Baffin Region Medevac	Iqaluit/Rankin Inlet/Churchill	(800) 913-4268 (204) 784-6569
RCMP		Sanikiluaq	(867) 266-1111 (Emergencies) (867) 266-0123 (Detachment)
Fire Emergency		Sanikiluaq	(867) 266-8888

9.0 References

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10.0 Signature Page

Nunavut Nukkiksautiit Corporation

The undersigned Certify that, as part of their Environmental Orientation, they have reviewed and understand their roles and responsibilities regarding:

Anuriqjuak Nukkiksautiit Project

Construction
Environmental Protection Plan

_____	_____
Name of Employee (PRINT)	Company
_____	_____
Name of Employee (SIGN)	Date
_____	_____
Name of Manager/Supervisor (PRINT)	Company
_____	_____
Name of Manager/Supervisor (SIGN)	Date

APPENDIX A
EPP DISTRIBUTION LIST

DRAFT - EPP DISTRIBUTION LIST

Organization	Contact	Phone Number	Email
Environment and Climate Change Canada	Senior Environmental Assessment Officer	(587) 401-0553	stephinie.mallon@ec.gc.ca
NPC	Manager Planning and Implementation	(867) 979-3444	gdjalogue@nunavut.ca
NIRB	Manager Impact Assessment	(866) 233-3033	info@nirb.ca / kmorrison@nirb.ca
NWB	Licensing Administrator	(877) 521-3745 / (867) 360-6338	licensing@nwb-oen.ca / robert.hunter@nwb-oen.ca
CIRNAC	Inspector, Water Resource Officer	(867) 975-1787 / (867) 975-4284	Joseph.monteith@rcaanccirnac.gc.ca
GN Department of Environment	Director Wildlife Operations	(877) 212-6438 / (867) 975-6000	jneely@gov.nu.ca
GN Department of Culture and Heritage	Territorial Archaeologist	(867) 934-2040	sleblanc1@gov.nu.ca
Municipality of Sanikiluaq	Senior Administrative Officer	(866)-266-8308	sao@sanikiluaq.ca
NNC	Director	(867)-979-8400	nnc@qcorp.ca
Growler Energy	Director Project Execution	(709) 765-4401	pete.whelan@growlerenergy.com
CPL	Senior Project Manager	(403) 386-6705	gsheppard@canprojects.com
SEM	Environmental Scientist	(709) 754-0499	brittany.connolly@semltd.ca
Construction Contract Company	TBD	TBD	TBD

APPENDIX B
ENVIRONMENTAL SITE INSPECTION CHECKLIST

ENVIRONMENTAL SITE INSPECTION CHECKLIST

Activity:	Inspection Time:
Location:	Inspection Date:
Weather:	
INSPECTOR DETAILS	
Name:	
Company:	
Phone Number:	
INSPECTION DETAILS	

NC	Item	Yes	No*	N/A	Remarks (i.e., location, good practices, problems/issues/risks observed, possible cause(s) and/or proposed corrective actions)
1.0	**Water Management**				
1.1	Is wash water (e.g., from cement/grout preparation or equipment cleaning) contained at least 100 m away from any waterbody?				
1.2	Are culverts free of sediment and debris and working as designed?				
1.3	Are erosion control structures working as intended?				
1.4	Do sediment control structures need maintenance (e.g., has sediment reached 60% of the height/depth of the siltation control structure)?				
1.5	Are undisturbed vegetative buffers being maintained between access road construction and natural waterbodies (except at permitted stream crossings)?				

NC	Item	Yes	No*	N/A	**Remarks** (i.e., location, good practices, problems/issues/risks observed, possible cause(s) and/or proposed corrective actions)
1.6	Do waterbodies adjacent to construction activities appear free from sediment/silt or other visual indicators of contamination?				
1.7	Is temporary crossing of streams (i.e., fording) being kept to a minimum? Are vehicles adequately cleaned and inspected for leaks prior to crossing?				
1.8	Are appropriate buffers being maintained for fueling activities and vehicle maintenance?				
1.9	Has any evidence of a spill been observed in any waterbodies (e.g., oily sheen, notable hydrocarbon odour)?				
1.10	Are appropriate control measures in place during culvert installation? Does downstream water quality appear impaired (i.e., cloudy, murky, muddy) when compared to upstream?				
1.11	Others (please specify)				
2.0	**Air Quality/Dust Management**				
2.1	Is visible dust leaving the project area?				
2.2	Is equipment well maintained (e.g., no black smoke coming from exhaust)?				
2.3	Are temporary stockpiles and truck beds containing materials covered (i.e., by a tarp)?				

NC	Item	Yes	No*	N/A	**Remarks** (i.e., location, good practices, problems/issues/risks observed, possible cause(s) and/or proposed corrective actions)
2.4	Is the construction site access road watered when necessary to minimize dust generation?				
2.5	Are speed control measures in place (e.g., speed limit sign)?				
2.6	Others (please specify)				
3.0	**Waste Management**				
3.1	Is the construction area clean and tidy (i.e., litter free, good housekeeping)?				
3.2	Are separated labelled containers / areas provided for recycling or waste segregation?				
3.3	Are drip trays free of oil and water?				
3.4	Are hazardous wastes (e.g., used oil) being stored properly offsite?				
3.5	Others (please specify)				
4.0	**Noise Control**				
4.1	Is idle equipment turned off or throttled down?				
4.2	Are noisy construction activities carried out during normal working hours?				

NC	Item	Yes	No*	N/A	Remarks (i.e., location, good practices, problems/issues/risks observed, possible cause(s) and/or proposed corrective actions)
4.3	Others (please specify)				
5.0	**Protection of Flora and Fauna**				
5.1	Is the area free of wildlife (or signs of wildlife)?				
5.2	Have any active nests been marked with the appropriate buffer until fledging (i.e., young leave the nest) occurs?				
5.3	Is the area free of invasive plant species?				
5.4	Has the protection of fish and fish habitat been considered prior to instream work?				
5.5	Others (please specify)				
6.0	**Emergency Preparedness and Response**				
6.1	Are all vehicles and equipment equipped with spill kits? Are the spill kits fully stocked?				
6.2	Any evidence of staining or leaks onsite?				
6.3	Others (please specify)				

NC	Item	Yes	No*	N/A	**Remarks** (i.e., location, good practices, problems/issues/risks observed, possible cause(s) and/or proposed corrective actions)
7.0	**Compliance Monitoring**				
7.1	Are conditions of environmental approvals being met?				
7.2	Have all non-conformities from the previous inspection been actioned and resolved?				
7.3	Have any complaints been received from concerned citizens? Have they been addressed?				
7.4	Was there a Turbidity Exceedance Event today?				
7.5	Others (please specify)				

*Any "No" recorded represents potential non-compliance or improvement needed. Details of non-conformity (NC) shall be recorded in the **Remarks** section.

Any non-conformities (NC) shall be reported immediately to the Construction Site Manager and recorded on the following page. Each NC should refer to the checklist as coded. Responsible personnel shall identify the root cause of the NC and adopt appropriate corrective actions (CA) for mitigation within an agreed timeframe. The effectiveness of implemented CA(s) shall be verified by the Environmental/Wildlife Monitor in collaboration with the Construction Site Manager (CSM), Construction Project Manager (CPM) and/or the Environmental Manager.

Site Inspector:_____ Date:_____

CSM/CPM:_____ Date:_____
(CA Implementor)

Environmental Manager:_____ Date:_____

ENVIRONMENTAL NON-CONFORMITY ROOT CAUSE ANALYSIS AND CORRECTIVE ACTIONS

NC Reference (#)	
Description of NC	
Root Cause of NC	
Corrective Actions Recommended	
Target Completion Date	
Persons Contacted (if applicable)	
Follow-Up Actions Recommended	
Closeout Date	
VERIFICATION	
Name:	Date:

APPENDIX C
DAILY WATER QUALITY MONITORING LOG

DAILY WATER QUALITY MONITORING LOG

Date:	Prepared by:
Location:	Weather:
Turbidimeter Calibrated? (Y/N):	Exceedance Event? (Y/N)
Exceedance Event Mitigation Measures Taken:	
Laboratory Sample Collection (pH and TSS)	
Chain of Custody Number:	Waybill Number:
Reason for Sample Collection (pre-/post-construction, during construction, periods of flow, post-major precipitation event)	
Number of Samples Collected:	
1 SAMPLE ID:	
Time:	Colour:
Location/Transect:	
2 SAMPLE ID:	
Time:	Colour:
Location/Transect:	
3 SAMPLE ID:	
Time:	Colour:
Location/Transect:	
4 SAMPLE ID:	
Time:	Colour:
Location/Transect:	
*ATTACH FIELD PHOTOS TO THE FOLLOWING PAGE	

Photo 1.
Photo 2.

APPENDIX D
IN SITU TURBIDITY MEASUREMENT LOG

IN SITU TURBIDITY MEASUREMENT LOG

***In situ* Turbidity Measurements**													
Date:				Prepared by:					Location:				
Measurement		1	2	3	4	5	6	7	8	9	10	11	12
Time													
Background	NTU #1												
	NTU #2												
	Average												
Transect 1	NTU #1												
	NTU #2												
	Average												
Transect 2	NTU #1												
	NTU #2												
	Average												
Transect 3	NTU #1												
	NTU #2												
	Average												
Maximum Average NTU (T1/T2/T3)													
NTU Above Background													

APPENDIX E
NT-NU SPILL REPORT FORM & SPILL QUANTITIES

TDG Class	Substance for NT-NU 24 Hour Spill Line	Immediately Reportable Quantities
1 2.3 2.4 6.2 7 None	Explosives Compressed gas (toxic) Compressed gas (corrosive) Infectious substances Radioactive Unknown substance	Any Amount
2.1 2.2	Compressed gas (flammable) Compressed gas (non-corrosive, non-flammable)	Any amount of gas from containers with a capacity greater than 100 L
3.1/3.2/3.3	Flammable liquids	> 100 L
4.1 4.2 4.3	Flammable solids Spontaneously combustible solids Water reactant	> 25 L
5.1 9.1	Oxidizing substances Miscellaneous products or substances excluding PCB mixtures	> 50 L or 50 kg
5.2 9.2	Organic peroxides Environmentally hazardous	> 1 L or 1 kg
6.1 8 9.3	Poisonous substances Corrosive substances Dangerous wastes	> 5 L or 5 kg
9.1	PCB mixtures of 5 or more parts per million	> 0.5 L or 0.5 kg
None	Other contaminants (e.g., crude oil, drilling fluid, produced water, waste or spent chemicals, used or waste oil, vehicle fluids, wastewater, etc.)	> 100 L or 100 kg
None	Sour natural gas (i.e., contains hydrogen sulfide, H_2S) Sweet natural gas	Uncontrolled release or sustained flow of 10 minutes or more

Additionally, all released harmful substances, regardless of quantity, are to be reported to the NT-NU 24-Hour Spill Line if the release is near or into a waterbody, is near or into a designated sensitive environment or sensitive wildlife habitat, poses imminent threat to human health or safety, poses imminent threat to a listed species at risk or its critical habitat, or is uncontrollable.

APPENDIX F
WILDLIFE SIGHTINGS LOG

WILDLIFE SIGHTINGS LOG

ANIMAL SPECIES:
NUMBER SEEN: (exact or estimated)
LOCATION: (If possible, provide GPS coordinates or mark on map)
DATE AND TIME:
BEHAVIOR WHEN OBSERVED: (e.g., what was it doing when you saw it)
OTHER COMMENTS/INTERESTING MARKINGS: (e.g., anything interesting about the sighting – feeding, signs of injury, etc.)
OBSERVED BY (NAME/COMPANY/PHONE NUMBER):
Please submit sighting log to the Environmental/Wildlife Monitor.

APPENDIX G
WILDLIFE INCIDENT FORM

WILDLIFE INCIDENT FORM

Occurrence Date/Time:	Date Reported:

MAIN CONTACT INFORMATION

Name:

Company:

Phone Number:

INCIDENT DETAILS

Location of incident (provide GPS coordinates or mark on map, if possible)

Type of Incident	Species	Sex
☐ Encounter	☐ Polar Bear	☐ Female
☐ Nuisance	☐ Bird	☐ Male
☐ Wildlife Mortality	☐ Bat	☐ Unknown
☐ Wildlife Injured	☐ Fox	**Age Class**
☐ Defensive	☐ Reindeer	☐ Adult ☐ Juvenile
☐ Other:	☐ Other:	☐ Cub ☐ Unknown

Details of Incident (movement, behaviour, reason for attraction, property damage, etc.)

Details of Action Taken (reporting, deterrence type, disposal, removal of attractant, etc.)

Was the incident resolved?
Has the Wildlife Management Division in Sanikiluaq been contacted? (If yes, include contact name and date/time reported)
Please submit incident form to the Environmental/Wildlife Monitor.

APPENDIX H
REVISION REQUEST FORM

REVISION REQUEST FORM

SECTION TO BE REVISED:	
NATURE OF REVISION	
RATIONALE FOR REVISION: (e.g., environmental/worker safety, etc.)	
SUBMISSION BY (NAME/COMPANY/PHONE NUMBER):	
DATE:	SIGNATURE:
Please submit request to NNC.	

APPENDIX I
REVISION HISTORY LOG

REVISION HISTORY LOG

Revision #	Section(s) Revised	Prepared By	Approved By	Date Issued
0.0	--	B. Connolly	H. Shilton	2023-07-19
1.0	Table 4.1, 5.3, 6.1, 6.3, 6.5, 6.6, 8.0, Appendix, B, C, D	B. Connolly		

IDEX OF MAJOR CHANGES/MODIFICATIONS IN LATEST REVISION

Item #	Description of Change	Relevant Section
1	Moved material from Section 6.5 Turbidity Monitoring Plan into the newly revised Section 6.3 Surface Water Quality Monitoring. Added monitoring & reporting procedures as required by NWB Water License.	6.3, 6.5(removed)
2	Addition of Historic Resources information following archaeological site survey. Re-numbered Section 6.6 as 6.5.	Table 4.1, 5.3, 6.5 (previously 6.6)
3	Change to the anticipated construction start date to September.	Table 2.1
4	Addition of Effluent Quality Limits and monitoring as per NWB Water License. Added a CIRNAC Inspector On-Call contact.	3.2.2, 6.1, 8.0

APPENDIX J
DFO STANDARDS AND BEST PRACTICES FOR INSTREAM WORKS – CULVERT

FACTSHEET

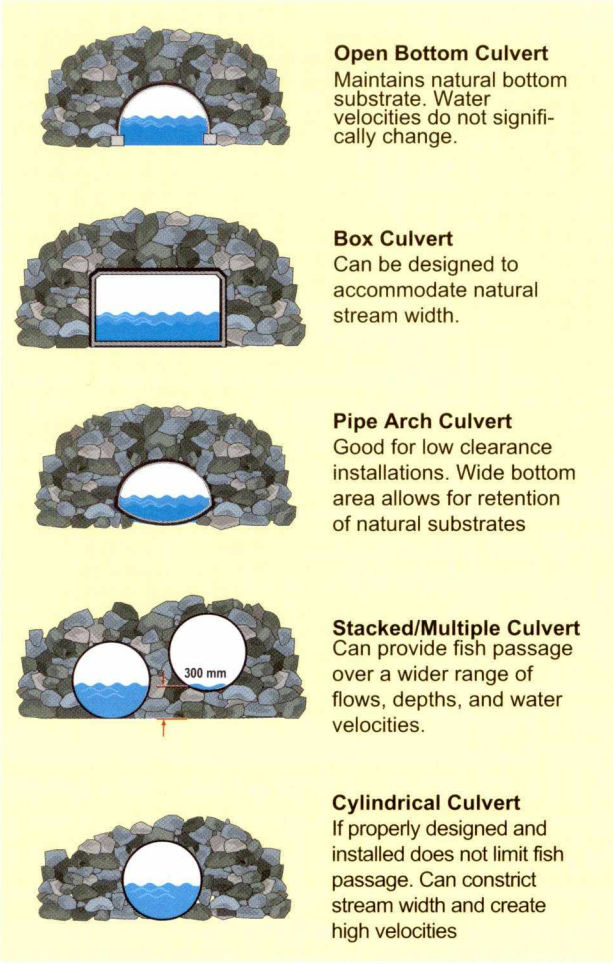
Culvert Installations

Department of Fisheries and Oceans

CONDITIONS WHERE APPLICABLE

Culverts are the most commonly used method for providing access over a watercourse, and particularly for small and medium sized streams. Several types of culverts are used including; open bottom/bottomless arch, pipe arch, box, and circular/cylindrical. Box type culverts are generally made from wood or concrete while other types are made from plastic, concrete or, most commonly, corrugated steel. Figure 1 identifies various culvert shapes.

Figure 1 Culvert Shapes



Open Bottom Culvert
Maintains natural bottom substrate. Water velocities do not significally change.

Box Culvert
Can be designed to accommodate natural stream width.

Pipe Arch Culvert
Good for low clearance installations. Wide bottom area allows for retention of natural substrates

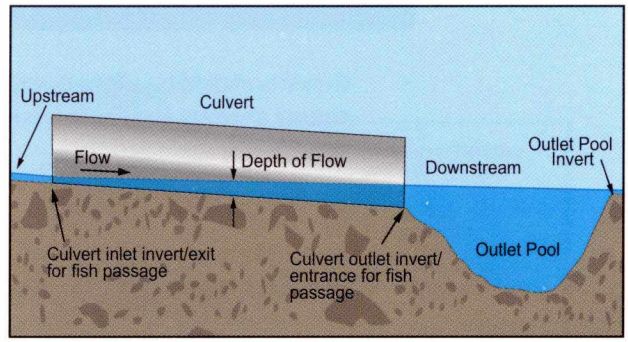
Stacked/Multiple Culvert
Can provide fish passage over a wider range of flows, depths, and water velocities.

Cylindrical Culvert
If properly designed and installed does not limit fish passage. Can constrict stream width and create high velocities

CONSIDERATIONS

- Sufficient depth of flow and appropriate water velocities for fish passage should be provided in culvert installations.
- Culvert size should be based on the capacity to handle peak flows. It may be necessary to have a hydrologic and hydraulic analysis performed in order to determine the correct size of the culvert to be used. The hydrologic analysis is used to determine the peak flow and the hydraulic analysis is used to calculate the capacity of the culvert to adequately pass the peak flows.
- The type of culvert selected and installed should minimize potential impacts on fish habitat, maintain fish passage, and sufficiently accommodate watercourse flows. To the extent possible, natural stream conditions (i.e., widths, habitat, etc.) should be maintained. Figure 2 illustrates some common terms associated with culvert crossings.

Figure 2. General Culvert Terms



- Natural bottom substrate and hydraulic capacity of watercourses are best maintained using open bottom/bottomless arch culverts; these are the preferred type of culvert crossings.

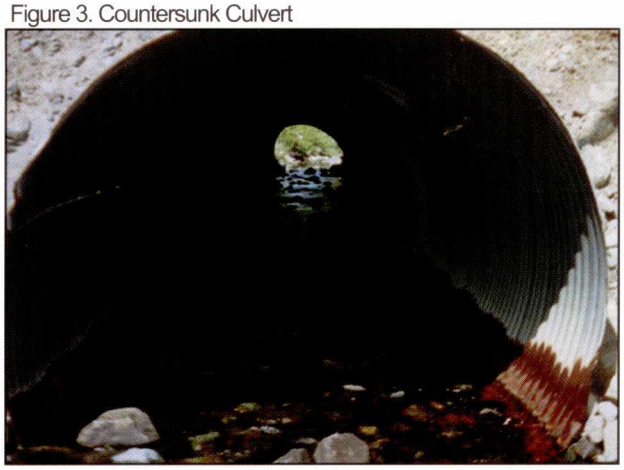
Culvert Installations

- Footings for open bottom culverts should be installed outside the normal wetted perimeter of the watercourse and tied into the bedrock or sufficiently stabilized to prevent erosion around the footing or undermining.

- For installation of cylindrical culverts in fish bearing streams, a minimum culvert diameter of 1000 mm should be provided and designed/sized according to site specific considerations.

- Cylindrical culverts should be installed to simulate open bottom or pipe arch culverts. Culverts up to 2000 mm in diameter should be countersunk a depth of 300 mm below the streambed elevation. Culverts with diameters exceeding 2000 mm should be countersunk a minimum of 15% of the diameter below the streambed elevation. Note: Countersinking reduces the hydraulic capacity of the culvert, therefore the required diameter of the culvert must be adjusted accordingly (Figure 3).

Figure 3. Countersunk Culvert



- Culverts should be aligned parallel to the existing natural channel and located on a straight stream section of uniform gradient.

- The culvert should be placed on firm ground and be countersunk to the appropriate depth. In sites where soft foundations are present the unsuitable material should be removed and replaced by clean granular material to prevent the culvert from sagging. Water movement under or around a culvert installation should be prevented through the use of headwalls, or other means, as necessary.

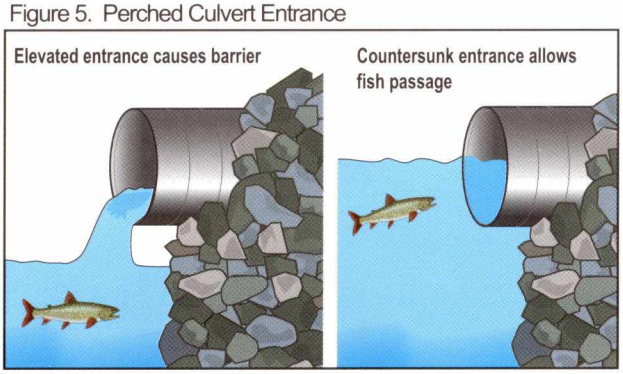
- A culvert should extend beyond the upstream and downstream toe of the fill (eg., a minimum of 300 mm, see Figure 7).

- For multiple culvert installations the culvert intended to provide fish passage should be placed in the deepest part of the channel and be countersunk to the required depth. The remaining culvert(s) should be placed a minimum of 300 mm above the invert of the fish passage culvert. (Figure 4).

Figure 4. Multiple Culvert Installation

- Culverts should be sufficiently sized and installed such that scouring of the outlet streambed does not occur as a result of increased water velocities in the culvert. Elevated culvert entrances can cause scouring which may create an obstruction for migrating fish (Figure 5).

Figure 5. Perched Culvert Entrance



- A minimum water depth of 200 mm should be provided throughout the culvert length. To maintain this water depth at low flow periods an entrance/ downstream pool can be constructed. In some cases, an upstream pool may also be necessary.

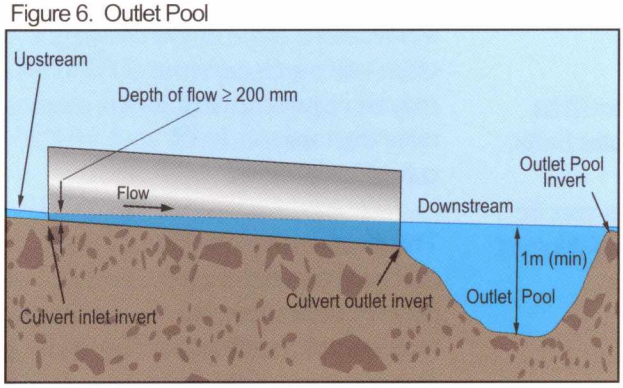
Culvert Installations

- The invert of the pool outlet should be at an elevation that maintains a minimum of 200 mm of water depth up to the inlet or upstream end of the culvert (Figure 6).

- The culvert slope should follow the existing streambed slope where possible. Excessive culvert slope, reduced culvert capacity due to countersinking and maintenance of the 200 mm minimum depth of flow, and back watering due to the creation of an outlet pool should be considered when selecting the required culvert diameter to allow fish passage and pass peak flows.

- Pools should be designed so that there is a smooth transition of flow from the culvert to the natural stream width.

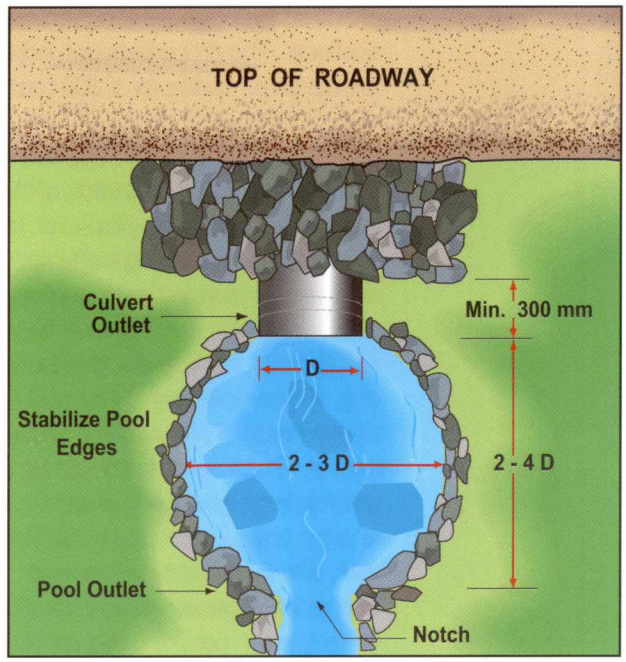
Figure 6. Outlet Pool



- The natural streambed elevation should be used as the pool outlet invert; however, depending on site specific conditions, a pool outlet may need to be constructed. It is essential that the invert elevation of the pool outlet be stable and, if necessary, well maintained to ensure a minimum water level in the culvert. Clean, non-erodible riprap or gabions should be used to stabilize the pool. The pool outlet may need to be v-notched to enable fish passage at low flow periods. More than one pool may be required.

- Pools should be pear shaped and sized such that: pool length = 2 to 4 times culvert diameter; pool width = 2 to 3 times culvert diameter; pool depth = 0.5 times the culvert diameter, 1 metre minimum. (Figure 7). The culvert diameter referred to the above is that of the fish passage culvert.

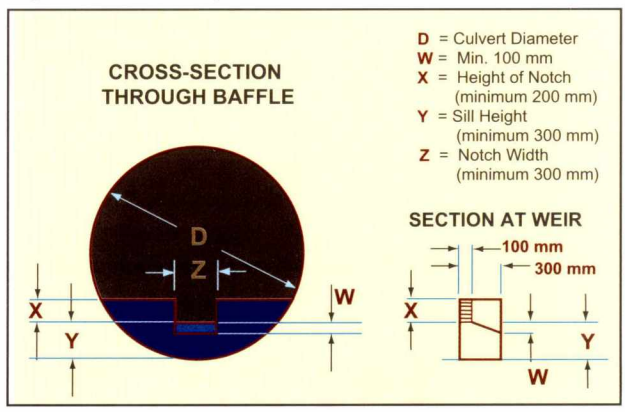
Figure 7. Pool Sizing



- For stacked/multiple culverts, pools should be installed with the fish passage culvert orientated to the centre of the pool to allow for a smooth transition of water from the culvert to the watercourse.

- Depending on site-specific conditions (eg., steep slopes, long crossings, constricted streams resulting in high water velocities, etc.), baffles/weirs may need to be installed in the fish passage culvert. Baffles/weirs can provide an adequate depth of flow and reduce the water velocity in the culvert in order to facilitate fish passage. Baffle dimensions should be provided as per Figure 8.

Figure 8. Baffle Sizing



Culvert Installations

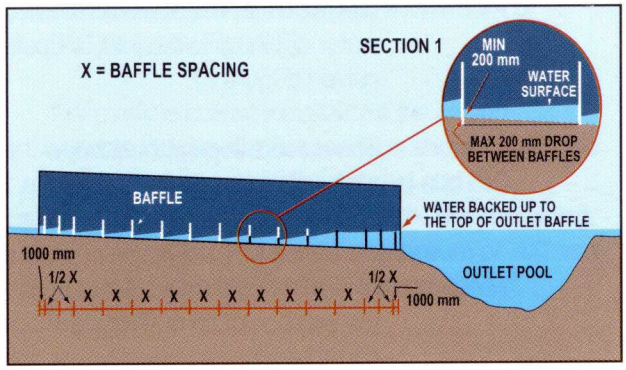
- A minimum depth of flow of 200 mm should be provided throughout the culvert and baffled sections. The drops between adjacent baffles should be a maximum of 200 mm.

- Baffles should be placed approximately 1 metre from the inlet and outlet ends of the culvert, the next baffles should be placed at 1/2 the baffle spacing. The remaining baffle spacing should be determined by using the low flow (flow at the time of fish migration, i.e., lesser of flow at 90% exceedance via flow duration analysis or the 7 day, 10 year low flow) as a basis for meeting the above depth of flow and drop between baffles criteria. Baffle spacing should also provide a pool volume large enough to dissipate the kinetic energy produced by the water falling over the weir; and consider high flows (i.e., 10% exceedence based on flow duration) during the fish migration period. Baffle spacing is illustrated in Figure 9.

- The invert elevation of the outlet pool should be set to back water up to the top of the outlet baffle.

- The upstream culvert invert, in some site specific situations, can be countersunk to facilitate depth of flow provided that the head differential is accounted for.

Figure 9. Culvert Baffle Spacing Requirements



Maintenance

Culvert installations should be suitably stabilized to prevent erosion, seepage, and undermining and maintained in good repair and operating condition.

Special Considerations

Modifications of the above criteria/guidance in consultation with the Department of Fisheries and Oceans may be required to address the passage of fish species other than salmon, brook trout, and brown trout in culvert installations.

This factsheet concerning culvert installations is generic and has been developed to apply to a variety of different circumstances. Some site specific situations may warrant modification of the above guidance, as deemed appropriate and in consultation with the appropriate Area Habitat Biologist. In some site specific situations, a professional engineer and/or biologist should be consulted.

This Fact Sheet does not constitute DFO approval; other mitigative strategies may be required. The proponent is advised to contact all other appropriate regulatory agencies.

For more information contact the nearest
Department of Fisheries and Oceans office