



Design Requirements Document

Boat Harbour Remediation Planning and Design

Nova Scotia Lands Inc.

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1. Introduction

1.1 Purpose

The purpose of this Design Requirements (DR) document is to define the functional, performance, non-functional, and operational requirements forming the basis for the conceptual design for the remediation of Boat Harbour in Pictou Landing, Nova Scotia. The Boat Harbour Remediation Design (BHRD) includes: decommissioning of the Boat Harbour Treatment Facility (BHTF); remediation of impacted soil, sediment, surface water, and groundwater; and returning Boat Harbour (A'se'k) to tidal conditions. A Site Plan showing the boundaries of the Boat Harbour Remediation Project is shown on Figure 1.

This DR document outlines the conceptual design requirements and aspects of the physical works of the remediation of Boat Harbour. This DR document sets forth the parameters that are required to prepare the design and assist in the subsequent identification of remedial options. Factors such as functionality, performance, safety (i.e., worker, public, and environment), applicable codes and standards, environmental and geotechnical/hydrogeological conditions, reliability and maintenance, decommissioning, end use, regulatory compliance, and cost effectiveness have all been taken into account in the preparation of this document.

The DR presented herein incorporates results of both an internal DR review (brainstorming) process and a collaborative Design Requirements Workshop with NS Lands and selected stakeholders, which were conducted to identify DR and gain consensus on the criteria to be used. Factors such as functionality, performance, safety, codes and standards, regulatory compliance, environmental and (geotechnical/hydrogeological conditions), reliability and maintenance, (decontamination and decommissioning), historical Site use, and cost effectiveness have all been taken into consideration in the development of the DR for the conceptual design of the BHRD.

The overall goal of the BHRD is to remove the contaminants contained primarily in the sediment, and return Boat Harbour to tidal influence. (RFP No. WS41760868, NS Lands, 2016). Through implementation of Boat Harbour Remediation project, GHD understands that it is PLFN's hope that A'se'k be restored to allow the Band to reestablish its relationship with the water and land of A'se'k.

The ultimate goal of the DR process is to facilitate determination of the best proven remedial option by ensuring consensus/agreement among stakeholders with respect to the requirements of the remedial design.

GHD will utilize experienced remediation design personnel to develop the conceptual requirements founded on the DR, and will collaborate with NS Lands and the Boat Harbour Environmental Advisory Committee (BHEAC) to expand, review, discuss, and finalize the preferred approach for the project.



2. Background

2.1 Site Overview

Boat Harbour, formerly known as A'se'k in Mi'kmaq, was originally a tidal estuary connected to Pictou Harbour and the Northumberland Strait. The Boat Harbour lagoon covers 142 hectares (350 acres), has a narrow entrance to the Northumberland Strait just east of the PLFN community, and has some small, seasonal fresh water streams flowing into it. Historically, A'se'k was a gathering place where food, knowledge and skills were exchanged between generations and amongst family groups. The land was traditionally used by the Mi'kmaq for recreation, fishing, hunting and gathering, as well as for physical, mental, spiritual, and emotional purposes.

The Boat Harbour Treatment Facility (BHTF) was built in 1965 to treat effluent from the pulp and paper mill located at Abercrombie Point on the shore of Pictou Harbour. The effluent travels from the mill through a pipeline over 3 km in length. In order to help control the water flow from Boat Harbour into the Northumberland Strait, a series of structures were built by the Nova Scotia government in the late 1960s. These structures caused the water level within Boat Harbour to rise by approximately one metre above the original water level, which flooded some of the shoreline. Northern Pulp and Paper is currently responsible for operating the facility (under a lease arrangement with the Province). In accordance with the Boat Harbour Act (*Boat Harbour Act, 2015, c. 4, s. 1.*), the Province has committed to closing the facility by January 31, 2020 with the subsequent remediation of Boat Harbour, including returning it to a tidal estuary.

The hills that surround Boat Harbour dominate the topography of the watershed and range up to an elevation of 60 m above mean sea level. Surface water and shallow groundwater flow downhill and provide base flow to Boat Harbour. Shallow groundwater occurs in the silty glacial till that overlies the bedrock or where the till is thin or absent in the shallow bedrock. The bedrock consists of sandstone and shale and groundwater flow is mainly via fractures in the rock. Fracturing generally decreases with depth. Drilled wells in the area provide drinking water for both the PLFN and the residences within the watershed. The quality and quantity of groundwater available are generally good. There are several springs in the area that are probably sourced by bedrock fractures that occur near the ground surface.

The land in and around the project area is used for community living, water supply, sustainable forestry, and recreational activities. The Pictou Landing First Nation (PLFN) community is located on a peninsula with the south and southeast boundaries bordering Boat Harbour. The majority of community development is on IR24. Within this area, there are numerous residential and community facilities, including a health centre, a school, playground, church, gas station, Band Office, and a cemetery. The community also has a secondary wastewater treatment plant with an outfall that extends approximately 286 m into Pictou Harbour (Northumberland Strait). One of the land parcels owned by PLFN to the east of Boat Harbour has been designated as a water supply area.

Some of the reserve land south of Boat Harbour (IR37) is used for sustainable forestry activities with only periodic harvesting. The forest is part of the maritime lowland eco-region and has red spruce, hemlock, and pine. Current growth types include red and white pine; red, white, and black



spruce; balsam fir; tamarack; and yellow, white, and grey birch. The land around Boat Harbour is used for activities including hiking and walking, and off-road vehicle use. The woodland designated under the sustainable forestry activities is considered an important social resource given the historical and cultural importance of woodlands to the community.

Mature hardwood forest surrounds Boat Harbour, and there are four basic plant communities present at the shoreline area, including freshwater marsh, brackish marsh, tall shrub dominated swamp, and shoreline. Freshwater marsh is the most abundant and widespread plant community on Boat Harbour. The area of brackish marsh in Nova Scotia has decreased substantially because of the dyking of salt marshes to produce agricultural land. Brackish marshes are typically found at the landward edges of salt marshes.

According to the Atlantic Canada Conservation Data Centre, no provincially (Nova Scotia Endangered Species Act) or federally (Species at Risk Act) listed species of flora, or flora listed under the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), have been observed within 5 km of the project area. Seven species of fauna that have been observed within 5 km of the project area are listed provincially, federally, and/or under COSEWIC, including piping plover, common nighthawk, olive-sided flycatcher, barn swallow, Canada warbler, bobolink, and eastern wood-pewee.

2.2 Boat Harbour Treatment Facility

The Boat Harbour Treatment Facility was constructed to treat the effluent discharged from the pulp and paper mill because of concerns raised regarding its environmental impact. The effluent flows to two settling basins that allow for sedimentation and heavy particles to fall to the bottom, which are ultimately excavated and relocated to the containment cell located on the Northern Pulp and Paper property. The effluent then flows into an aeration-stabilizing basin where oxygen is added to help remove some of the harmful contaminants in the effluent. The effluent reportedly meets the Pulp and Paper Effluent Discharge Criteria where it enters Boat Harbour (Point C). Finally, the effluent flows into the stabilization lagoon where it remains for approximately 20-30 days, allowing suspended solids to settle to the bottom, after which the remaining water flows into estuary to the Northumberland Strait.

2.3 Potential Contaminants of Concern at Boat Harbour

As a result of the pulp and paper mill effluent flowing into Boat Harbour, every aspect of Boat Harbour (e.g., sediments, surface water) is impacted. One of the main sources for contaminants in Boat Harbour is the layers of unconsolidated and consolidated sludge overlying the native marine sediment. The sludge layer is generally 10-20 cm thick (with some areas in excess of 1 m thick) and is impacted with metals, polycyclic aromatic hydrocarbons, and dioxins/furans. In addition, other potential contaminants of concern, including volatile organic compounds, petroleum hydrocarbons, and chlorophenols, are expected to be present.

The contaminants present in Boat Harbour and the surrounding area are a concern from both a human health and ecological viewpoint.



2.4 Remediating Boat Harbour

After almost 50 years of effluent flowing through the Boat Harbour Treatment Facility, the Boat Harbour Act was put in place in 2015 mandating the cessation of effluent entering Boat Harbour by January 31, 2020. After the flow of effluent ceases, the objective is to remediate Boat Harbour and restore it back to its natural tidal state. The remedial solutions will likely require significant dewatering and sludge removal and treatment along with closure works associated with the treatment facility (e.g., dam removal and construction of new bridge). Furthermore, groundwater and surface water may have been significantly impacted by the effluent and will need to be taken into consideration during the remediation of the site.

Through implementation of Boat Harbour Remediation project, GHD understands that it is PLFN's hope that A'se'k be restored to allow the Band to reestablish its relationship with the water and land of A'se'k. With this in mind, the GHD project team recognizes the relationship of PLFN to their traditionally occupied lands and waters, and the importance of continued engagement with PLFN in the planning and design phases of the proposed project to restore the A'se'k.

3. Design Requirement Overview

3.1 Definitions

Functional Requirements | state what the system is required to do what legislation must be met, if any. Functional requirements may be technical details or other specific functionality that define *what* a system is supposed to accomplish - functional requirements specify particular results of a system.

Non-Function Requirements | state what the system shall *be*; that is, an overall property of the system as a whole. Non-Functional requirements may identify a required physical characteristic of the system or component (i.e., mass, dimension, volume).

Performance Requirements | state how well the system does what it is required to do; that is, performance is an attribute of the system's function. Performance requirements are a type (or sub-set) of non-functional requirements which impose constraints on the design or implementation.

Safety Requirements | state the means to protect the health and safety of workers and general public.

Operational Requirements | state the requirements of the system during implementation and the post remediation operation and maintenance phase, and the applicable permit requirements.

3.2 Boat Harbour Design Components

This DR document covers the conceptual design requirements for the following main components or features of the BHRD:

1. Return to Tidal Conditions
2. Bridge at Highway 348
3. End Use



4. Waste Management
5. Wetland Restoration
6. Infrastructure Decommissioning
 - Dam
 - Treatment Support Building
 - Support Facilities
 - Silo, ditch structures, head channels, maintenance building/garage
 - Settling Basins
 - Pipeline and effluent ditches
7. Remediation Methodology and Approach
8. Provision of Benefits
 - Educational Benefit
 - Financial/Employment Benefit

4. Design Requirements

4.1 Return to Tidal Conditions

Boat Harbour was originally a tidal estuary connected to Pictou Harbour and the Northumberland Strait. In 1967, the Province of Nova Scotia constructed the Boat Harbour Effluent Treatment Facility (BHTEF) to treat effluent from the bleached kraft pulp mill at Abercrombie Point. The construction included disconnection of Boat Harbour from Pictou Harbour and removal of tidal influence (Aecom, April 2016).

According to an earlier study, reinstatement of tidal influence was predicted to have positive effects on marine water quality, marine sediment quality and benthic community, marine fish, avian fauna, vegetation, Aboriginal resources and land use, and commercial fisheries (JWEL, October 2004). More importantly, restoration of Boat Harbour to tidal conditions will allow the PLFN to reestablish its relationship with the water and land of A'se'k.

Following remediation, Boat Harbour will be returned to tidal conditions through removal and/or decommissioning of existing infrastructure, including weir structure, tide gates, and box culverts at the current outlet structure/effluent discharge point, Point D.

4.1.1 Functional Requirements

- **Minimum Channel Depth** | Under high tide conditions, the required minimum channel depth shall be 4.0 m; under low tide conditions, the required minimum channel depth shall be 1.5 m. Minimum channel depth under high/low tidal conditions shall comply with the Navigation Protection Act (R.S.C., 1985, c. N-22) and Navigable Waters Works Regulations (C.R.C., c. 1232), as applicable.



4.1.2 Performance Requirements

- **Wet Area** | Total wet area to be maintained under high/low tidal conditions has not been defined, and is a function of the water level within Boat Harbour. Current topographic elevation of Boat Harbour is (approximately) -0.7 m above mean sea level (AMSL), i.e., 0.7 m below mean sea level. No additional sub-grading will be implemented to meet specific wet area requirements.

4.1.3 Safety Requirements

- **Velocity at Inlet/Outlet** | In accordance with bridge (or other open-bottom structure) design requirements identified in Nova Scotia Watercourse Alterations Standard (NSE 2015b), the hydraulic capacity must be sufficient to ensure the maximum velocity (does not exceed/of) 1.8 m/s during a 1:100 year return period storm event once Boat Harbour is returned to tidal conditions.
- **Temporary Discharge** | Works related to outfalls within navigable waters may be subject to additional safety requirements in accordance with Navigation Protection Act (resulting from the 2012 amendments to the Navigable Waters Protection Act).

4.1.4 Non-Functional Requirements

- **Wetland Compensation** | Discussed in greater detail in Section 4.5 – Wetland Restoration.

4.1.5 Operational Requirements

- Additional permits and approvals may be required, including Watercourse Alteration Permit from Nova Scotia Environment (NSE), and approval from the Minister of Fisheries and Oceans as part of Fisheries Protection and Pollution Prevention under the Fisheries Act (R.S.C., 1985, c. F 14).

4.2 Bridge at Highway 348

A causeway crosses the lower end of the Stabilization Lagoon and carries Highway 348. Prior to the conversion of the stabilization lagoon, a bridge with a span of approximately 25 m existed. The bridge was eventually removed and replaced with a causeway complete with three 1500 mm diameter concrete culverts (CBCL, April 2003).

The stabilization Lagoon was formed when a dam was constructed adjacent to the Highway 348 Causeway that consisted of an earthen berm and an outlet structure with a diffuser pipe (Point D) (CBCL, April 2003).

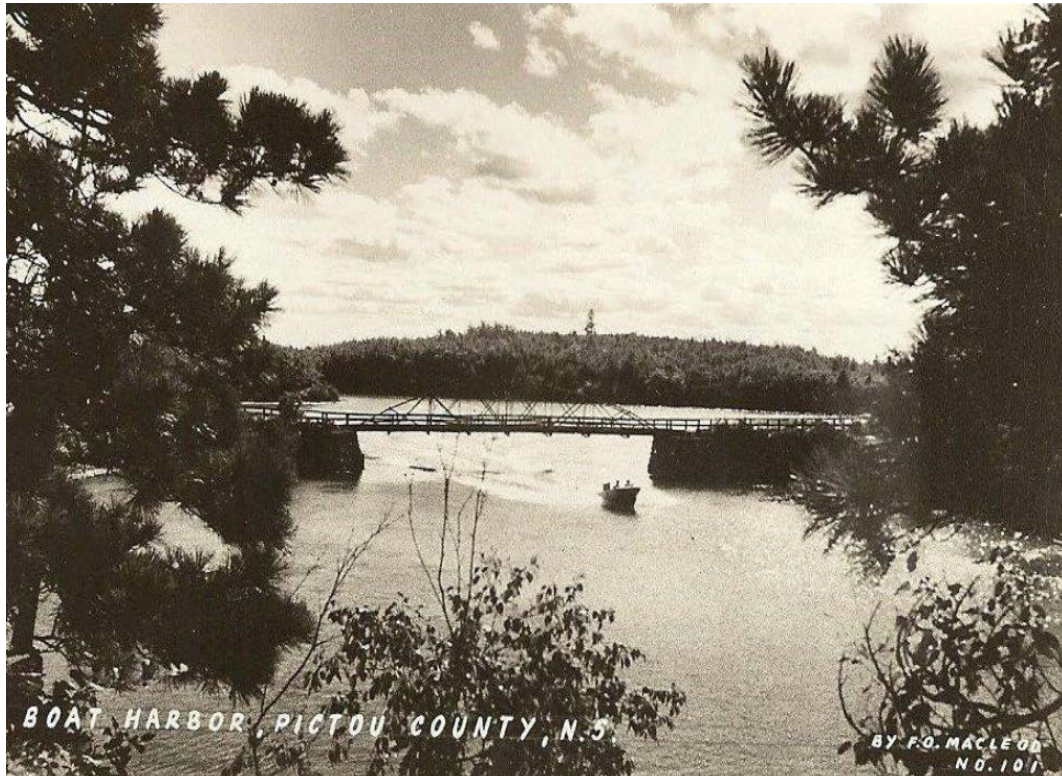


Figure 4.1 Former bridge spanning Boat Harbour

Source: "General Consulting Services, Boat Harbour Remediation Planning and Design, Mandatory Proponent Briefing" Presentation, RFP WS41760868 Addendum#02, NS Lands, December 15, 2016.

The outlet structure and diffuser pipe (Point D) were replaced in 1996 by a Weir structure complete with tide gates. The weir structure was constructed to allow the levels in the lagoon to be controlled, while blocking the tidal inflow (with three 1800 x 3600 mm tide gates. The three existing 1500 mm diameter culverts were at an elevation that would not allow the expected flows to pass beneath the causeway when the level in the stabilization lagoon was lowered). The culverts were supplemented with the construction of twin 3600 x 3000 mm box culverts with a lower invert elevation (CBCL, April 2003).

Though much of this infrastructure will be removed during the remediation of Boat Harbour, the bridge span will be reinstated.

4.2.1 Functional Requirements

- **Navigable Channel Size** | The navigable channel shall be sized to accommodate one vessel at a time under high/low tidal conditions, and be approximately 25 m in wide and 4 m¹ in height to reinstate to original opening size. In accordance with Navigation Protection Act (R.S.C., 1985, c. N-22), all navigable channels shall be a minimum of 8 m wide by 1.25 m high. The depth of the water column will be established based on remedial solution and predicted through

¹ NS Lands to make a final determination on the design requirements for Opening Size following September 5, 2016 meeting with selected stakeholders.



hydrodynamic modelling. No subsurface grading is required to create a minimum depth of water under low or high tide

- **Design Capacity** | The multi-use bridge shall be designed to accommodate two vehicle lanes (3.3 m width) with shoulders/bike lanes (1.5 m width), and a pedestrian walkway (1.5 m width), for a total width of approximately 11.1 m. The overall width may need to be reduced to suit existing conditions. The anticipated span of the bridge is 25 m (to match existing causeway and historical bridge span), constructed at a height of approximately 4 m above the water during high tidal conditions. The bridge shall be designed in accordance with the requirements specified in CSA S6-14 - Canadian Highway Bridge Design Code, and applicable Navigable Waters Bridges Regulations (C.R.C., c. 1231). Additional construction details (i.e., footings, abutments, arches) may be dictated by the Nova Scotia Watercourse Alterations Standard (NSE 2015b).
- **Design Load** | The bridge shall be designed to accommodate design vehicle configuration CL-625, applying a gross vehicle weight of 625 kilonewtons (kN) or 64 tonnes, in accordance with requirements specified in CSA S6-14 - Canadian Highway Bridge Design Code.
- **Hydraulic Capacity** | In accordance with the requirements of the CSA S6-14 - Canadian Highway Bridge Design Code, the bridge shall be designed such that the minimum soffit elevation is either the water elevation of a 1:50 year return storm event plus 1.0 m, or the water elevation of a 1:100 year return storm event, whichever is greater. To allow for an additional factor of safety, it is recommended that NS Lands or Nova Scotia Transportation and Infrastructure Renewal (NSTIR) consider an additional increase to the minimum soffit elevation to accommodate for increased variability due to climate change.

4.2.2 Performance Requirements

- **Viewing Platform** | Subject to further consideration by NS Lands, the feasibility of incorporating a viewing platform into the bridge design may be required. If approved, NS Lands to provide further direction on the requirements for the viewing platform.
- **Lighting** | Currently no requirements. At a minimum, it is anticipated that lighting on the bridge will meet the requirements specified in Navigable Waters Bridges Regulations (C.R.C., c. 1231). During conceptual lighting and bridge design, consideration will be given to migratory birds and possible effects from lighting.

4.2.3 Safety Requirements

- **Velocity Under Bridge** | In accordance with bridge (or other open-bottom structure) design requirements identified in Nova Scotia Watercourse Alterations Standard (NSE 2015b), the hydraulic capacity must be sufficient to ensure the maximum velocity (does not exceed/of) 1.8 m/s during a 1:100 year return period storm event once Boat Harbour is returned to tidal conditions.
- **Railing** | The bridge safety railing design height and configuration shall be dictated by the proposed use(s) for the bridge, including pedestrian/bike/cars, and shall be designed in accordance with the requirements of the CSA S6-14 - Canadian Highway Bridge Design Code.



NS Lands has indicated that a steel bridge rail would be preferable to a concrete barrier, as it would allow for better viewing of the harbour off the bridge.

4.2.4 Non-Functional Requirements

- **Materials** | The construction materials shall be selected based on the type of bridge (i.e., single or multi-span, static or moving span, etc.), suitability, and aesthetic considerations. In accordance with Navigable Waters Bridges Regulations (C.R.C., c. 1231), certain construction details may be subject to Ministry approval in the event that a plan and description of the bridge is required under the *Navigable Waters Protection Act*. If applicable, use of corrugated steel sheet or structural plate arches must meet the requirements of CSA G401-14 Corrugated Steel Pipe Products, in accordance with Nova Scotia Watercourse Alterations Standard (NSE 2015b).
- **Temporary Facilities and Controls** | During the remedial options assessment stage, the need for temporary bypass (i.e., use of dam as potential pedestrian bypass) or road closure with detour (i.e., detour route for automobile and/or pedestrian traffic) will be determined by NS Lands (Note: a traffic study may be needed to make this determination). Depending on identified pedestrian requirements during construction/remediation, a temporary pedestrian bridge may be required. Alternatively, use of the dam as a detour bridge, or twinning the bridge during construction will be considered. If selected, the temporary bypass design shall be in accordance with Nova Scotia Department of Transportation and Public Works Standard Specifications for Highway Construction and Maintenance, and functional requirements identified in NSTIR Standard Highway Drawings. In the event that existing causeway is removed, approval from Nova Scotia Department of Natural Resources (DNR) will be required for relocation of power lines.

4.2.5 Operational Requirements

- **Potable Water Supply** | The bridge shall be designed to accommodate provision of potable water supply to PLFN, in accordance with potable water guidelines (Atlantic Canada Guidelines for Drinking Water Supply Systems). Temporary water supply service will be required during causeway removal and bridge construction activities. Upon completion of bridge construction, permanent water supply services will be reinstated. Permanent water supply services will be conveyed suspended from the bridge, and will require continual electric power source/supply for heat tracing. At a minimum, the potable water supply will require approval from NSE, and potentially Health Canada (due to federal water supply provisions). In the event that power lines over the waterway have to be relocated, approval from Nova Scotia Department of Natural Resources (DNR) will be required.
- **Lighting** | Power supply for lighting is available from overhead service.

4.3 End Use

GHD understands that it is PLFN's hope that A'se'k be restored to allow the Band to reestablish its relationship with the water and land of A'se'k. Historically, A'se'k was a gathering place where food, knowledge and skills were exchanged between generations and amongst family groups. The land was traditionally used by the Mi'kmaq for recreation, fishing, hunting and gathering, as well as for physical, mental, spiritual, and emotional purposes.



Restoration of Boat Harbour requires meeting numerous Federal and Provincial guidelines for protection of environmental and human health following remediation, including:

- Federal Contaminated Sites Action Plan (FCSAP) Ecological Risk Assessment Guidance (GoC 2012)
- Guidance Documents – Contaminated sites – Environmental and Workplace Health (GoC 2017)
- CCME Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life (FWAL) (CCME 1999a)
- CCME Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health (CCME 1999b)
- CCME Canadian Sediment Quality Guidelines for the Protection of Aquatic Life (CCME 2001)
- Guide for Reporting to the National Pollutant Release Inventory (NPRI) 2016 and 2017 (ECCC 2016)
- Environmental Quality Standards for Contaminated Sites – Rationale and Guidance Document (NSE 2014)
- Nova Scotia Wetland Conservation Policy (NSE 2011b)
- Water for Life: Nova Scotia's Water Resource Management Strategy (NSE 2010)

While the end use design will support replacement or restoration of habitat features to meet these guidelines using a risk-based approach, long-term ecological (restoration and) maintenance is not part of this scope, and will be addressed separately under other contracts with NS Lands.

4.3.1 Functional Requirements

- **End Use** | Support replacement/restoration of habitat features; does not include restoration and maintenance.
- **Recreational Use** | No requirements. Recreational end use, including the provision of boat ramps, trails, and access roads may drive some design components, provided that the end use is identified in a timely manner. Notwithstanding a end use plan being available, once the recreational end use requirements are assessed and the scope of temporary construction facilities are identified, additional opportunities may be created for permanent facilities, as needed.

4.3.2 Performance Requirements

- **Surface Water Quality** | Remedial option design shall support end use following restoration of Boat Harbour using a risk-based approach to meet applicable Federal and Provincial guidelines for protection of environmental and human health, including:
 - Federal Contaminated Sites Action Plan (FCSAP) Ecological Risk Assessment Guidance (GoC 2012)
 - Guidance Documents – Contaminated sites – Environmental and Workplace Health (GoC 2017)



- CCME Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life (FWAL) (CCME 1999a)
- Nova Scotia Contaminated Sites Regulations, N.S. Reg. 64/2012 (NSE 2013)
- Environmental Quality Standards for Contaminated Sites – Rationale and Guidance Document (NSE 2014)
- Nova Scotia Wetland Conservation Policy (NSE 2011b)
- Water for Life: Nova Scotia's Water Resource Management Strategy (NSE 2010)

In accordance Section 13 of the *Beaches Act*, R.S.N.S. 1989, c. 32, Coastal Permit requirements (which apply between high water and low water marks) may also need to be followed pending receipt of Environmental Assessment results.

- **Sediment Quality** | Remedial option design shall support end use following restoration of Boat Harbour using a risk-based approach to meet additional applicable Federal and Provincial guidelines for protection of environmental and human health, including:
 - CCME Canadian Sediment Quality Guidelines for the Protection of Aquatic Life (CCME 2001)
- **Soil Quality** | Remedial option design shall support end use following restoration of Boat Harbour using a risk-based approach to meet additional applicable Federal and Provincial guidelines for protection of environmental and human health, including:
 - CCME Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health (CCME 1999b)

4.3.3 Safety Requirements

- **Site Control and Security** | To permit all forms of end use, no access controls are to remain in place following completion of construction and remediation activities, unless required for management of engineered controls.

4.3.4 Non-Functional Requirements

- **Habitat Features** | Presence or availability of certain habitat features (i.e., flora, fauna, etc.) may be predicated by the water quality coming out of Pictou Harbor; certain habitat objectives may not be attainable in the post-restoration tidal environment. While augmentation of certain habitat features may be ideal, it is noted that long-term ecological rehabilitation and maintenance is not part of the remedial design, and that further augmentation will be addressed post remediation, if needed.
- **Ownership** | NS Lands to confirm whether Provincially owned properties of Boat Harbour are to be returned to PLFN ownership post-restoration, or be maintained by the Province (with the exception of IR24G, IR24, and IR37), as Federal vs. Provincial ownership may affect cleanup standards and long-term management at the Site. It is noted that even if ownership is transferred to PLFN, the liability associated with the Site will remain with the Province. Clean closure certificates and Environmental Indemnity Notice to be supplied to Owner by the consultant following construction/remediation activities.



- **Access Agreements** | NS Lands to negotiate access agreements for IR24G, IR24, and IR37 and Provincially owned properties for use during investigation and construction phase. Prior notification to be provided when accessing IR24G, IR24, and I37, and escorts may be required to accompany individuals accessing IR lands. Protocol for access within boundaries of the current BHTF has been developed to ensure worker health and safety and not interfere with Northern Pulp operation of the Site. GHD to establish access agreements with private land owners.

4.3.5 Operational Requirements

- **Northern Pulp Facilities** | Use of Northern Pulp infrastructure and facilities will not be considered as part of the remedial solution.
- **Record of Site Condition** | Performance of post-remediation Record of Site Condition and Final closure document to be incorporated into the tender document for construction contractor/consultant. Requirements of the Record of Site Condition dependent upon selected remediation approach.

4.4 Waste Management

As part of the conceptual design of remediation options for the BHRD, management of impacted sediment, water, and soil must be considered. In particular, the final storage method and location of contaminated sediment shall be addressed. Due to the significant volume of material to be managed (estimates of all the sediments to be addressed after dewatering is approximately 230,000 cubic metres, plus an amount for the dredging of the native soil below the contaminated sludge [NSIS, December 2015]), NS Lands has indicated that off-Site transportation to a provincially owned, secure landfill may not be feasible/favourable given the aggressive timeframe and high profile nature of the project.

The management of all streams of waste generated during the remediation of Boat Harbour shall be considered, with particular attention paid to applicable regulatory requirements and approvals, and level of effort associated with the long-term management/storage of waste.

4.4.1 Functional Requirements

- **Containment Location** | Currently no requirements. Both on-Site containment and off-Site disposal shall be considered during conceptual design of remedial options.
- **Containment Cell** | Currently no requirements. Use of the existing containment cell (i.e., sludge disposal cell) and construction of a new (on-Site) containment cell shall both be considered during the conceptual design of remedial options, provided they meet applicable NSE Landfill Guidelines (i.e., Guidelines for Industrial Landfills (NSE 2005) and Municipal Solid Waste Landfill Guidelines (NSE 2004), as applicable). The existing containment cell likely has sufficient capacity for disposal of contaminated sludge/sediment and soil (based on estimated volumes by NS Lands), and can be re-purposed such that existing permits already in-place (i.e., Industrial Approval) can continue to be used or amended. Construction of a new (on-Site) facility would require new landfill approvals from NSE.



- **Leachate Management** | Currently no requirements. Both on-Site and off-Site leachate management system(s) shall be considered during conceptual design of remedial options. NS Lands has indicated that long term on-Site management could potentially provide employment opportunity for local and PLFN communities. Leachate system effluent would be subject to NSE Landfill Guidelines (i.e., Guidelines for Industrial Landfills (NSE 2005) and Municipal Solid Waste Landfill Guidelines (NSE 2004), as applicable) and Environment Canada Effluent Guidelines, Wastewater Systems Effluent Regulations (SOR/2012-139).
- **Landfill Gas Management** | Currently no requirements. Landfill gas (LFG) management is already identified as part of the existing Industrial Approval (IA) for the containment cell. Due to the nature of the anticipated waste, only passive LFG management shall be considered, as there will likely be insufficient volumes of LFG generated to collect/recover for subsequent utilization.

4.4.2 Performance Requirements

- **Effluent Criteria** | Leachate treatment system effluent shall be subject to NSE Landfill Guidelines (i.e., Guidelines for Industrial Landfills (NSE 2005) and Municipal Solid Waste Landfill Guidelines (NSE 2004), as applicable) and Environment Canada Effluent Guidelines, Wastewater Systems Effluent Regulations (SOR/2012-139). Depending on the receiving waterbody, the LTS and any other on-Site treatment system effluent shall meet:
 - Federal Contaminated Sites Action Plan (FCSAP) Ecological Risk Assessment Guidance (GoC 2012)
 - Guidance Documents – Contaminated sites – Environmental and Workplace Health (GoC 2017)
 - CCME Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life (FWAL) (CCME 1999a)
 - Nova Scotia Wetland Conservation Policy (NSE 2011b)
 - DFO Fisheries Act (R.S.C., 1985, c. F-14), Fisheries Protection and Pollution Prevention (if applicable)

4.4.3 Safety Requirements

- **Site Security** | Site security and controls, including fencing around the on-Site landfill containment cell, shall meet the requirements specified in NSE Landfill Guidelines (i.e., Guidelines for Industrial Landfills (NSE 2005) and Municipal Solid Waste Landfill Guidelines (NSE 2004), as applicable).

4.4.4 Non-Functional Requirements

- **Landfill Ownership** | Landfill containment cell ownership, approval to operate, and associated long-term liability to remain with the Province. In the event that Ownership of the surrounding property is returned/transferred to PLFN, conceptual design of the landfill containment cell shall identify a potential buffer zone around the landfill containment cell to meet the requirements



specified in NSE Landfill Guidelines (i.e., Guidelines for Industrial Landfills (NSE 2005) and Municipal Solid Waste Landfill Guidelines (NSE 2004), as applicable).

- **Landfill Aesthetics** | Final cover of the landfill containment cell shall be designed to blend in with the surrounding area, with a final slope not to exceed a 3:1 slope.

4.4.5 Operational Requirements

- **Post-Closure Monitoring** | Post-closure monitoring and care criteria for the landfill containment cell facility shall be prescribed the IA and must meet NSE Landfill Guidelines (i.e., Guidelines for Industrial Landfills (NSE 2005) and Municipal Solid Waste Landfill Guidelines (NSE 2004), as applicable).
- **Financial Assurance** | Financial assurance shall be considered in the event that Ownership of the surrounding property is returned/transferred to PLFN, however associated long-term liability to remain with the Province.
- **Approvals** | An amendment to existing IA for the on-Site landfill containment cell may be required to facilitate receipt and handling of stabilized or solidified contaminated waste. All remedial and industrial/operational components requiring approval will be in consolidated into the existing IA.
- **Operations** | Ongoing operation of the landfill containment cell shall not contravene the Environment and Climate Change Canada Migratory Bird Convention Act (MBCA). The MBCA and Migratory Bird Regulations are federal legislative requirements that are binding on members of the public and all levels of government, including federal and provincial governments. The legislation protects certain species, controls the harvest of others, and prohibits commercial sale of all species, and protects the nests, eggs, shelters, or duck boxes of migratory birds.

4.5 Wetland Restoration

Following remediation, Boat Harbour will be returned to tidal conditions through removal and/or decommissioning of existing infrastructure. Reinstatement of tidal influence will have positive effects on marine water quality, vegetation, and benthic community, and will allow/facilitate the restoration and recovery/resurgence of wetlands within Boat Harbour. According to NSE, wetlands can be characterized generally as habitats with water at or near the surface (<2 m deep), little or no current (water flow), plants and animals that thrive in wet conditions, and places with typically rich soils that develop where water saturates or floods the surface at least seasonally. Wetlands perform many important functions and services in our landscapes such as, improving water quality, controlling floods, recharging groundwater, protecting coastal infrastructure and providing critical habitat for rare and endangered species (NSE, March 2014).

While remediation of Boat Harbour will support the replacement or restoration of habitat features and wetlands, long-term ecological (restoration and) maintenance is not part of this scope.

4.5.1 Functional Requirements

- **Compensation Plan** | Remedial option design shall support wetland restoration to yield a minimum Net Positive Environmental Benefit of 2:1 replacement of wetlands influenced by



remediation activities. Preference will be given to restoration/creation of saltwater marshes (i.e., vegetated wetland that is flooded regularly by tidal water, or influenced by salt spray or seepage, such that the water and/or soil is saline or brackish), as these are extremely productive wetlands that provide many critical environmental, societal, and economic functions and services (NSE, March 2014).

- **Wetland Replacement** | If required as part of the Compensation Plan, wetlands established to compensate for disturbance or removal due to remediation activities shall be designed to align with government priorities for wetland restoration, enhancement, or creation, and shall minimally meet the requirements of the following criteria:
 - Federal Policy on Wetland Conservation (ECCC 1991)
 - Nova Scotia Wetland Conservation Policy (NSE 2011b)
 - Nova Scotia Watercourse Alterations Standard (NSE 2015b)
 - DFO, EA, and IA stipulations

4.5.2 Performance Requirements

- **Surface Water Quality** | Remedial option design shall support wetland restoration following remediation of Boat Harbour using a risk-based approach to meet applicable Federal and Provincial guidelines for protection of environmental and human health, including:
 - Federal Contaminated Sites Action Plan (FCSAP) Ecological Risk Assessment Guidance (GoC 2012)
 - Guidance Documents – Contaminated sites – Environmental and Workplace Health (GoC 2017)
 - CCME Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life (FWAL) (CCME 1999a)
 - Nova Scotia Contaminated Sites Regulations, N.S. Reg. 64/2012 (NSE 2013)
 - Environmental Quality Standards for Contaminated Sites – Rationale and Guidance Document (NSE 2014)
 - Nova Scotia Wetland Conservation Policy (NSE 2011b)
 - Water for Life: Nova Scotia's Water Resource Management Strategy (NSE 2010)

In accordance Section 13 of the *Beaches Act*, R.S.N.S. 1989, c. 32, Coastal Permit requirements (which apply between high water and low water marks) may also need to be followed pending receipt of Environmental Assessment results.

NS Lands to communicate with PLFN community about risk-based approach to wetlands on IR37.

- **Sediment Quality** | Remedial option design shall support wetland restoration following remediation of Boat Harbour using a risk-based approach to meet additional applicable Federal and Provincial guidelines for protection of environmental and human health, including:



- CCME Canadian Sediment Quality Guidelines for the Protection of Aquatic Life (CCME 2001)
- **Soil Quality** | Remedial option design shall support wetland restoration following remediation of Boat Harbour using a risk-based approach to meet additional applicable Federal and Provincial guidelines for protection of environmental and human health, including:
 - CCME Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health (CCME 1999b)

4.5.3 Safety Requirements

None.

4.5.4 Non-Functional Requirements

None.

4.5.5 Operational Requirements

- **Habitat Features** | In the event that designed wetlands are used for contaminant treatment, harvesting of specific wetland habitat features may be required. Otherwise, for restored wetlands, it is anticipated that most flora habitat features will be allowed to evolve naturally.

4.6 Infrastructure Decommissioning

Following remediation, Boat Harbour will be returned to tidal conditions through removal and/or decommissioning of existing infrastructure, including removal of the dam, weir structure, tide gates, and box culverts at the current outlet structure/effluent discharge point (Point D), as well as decommissioning of support facilities, settling basins, and associated pipelines.

4.6.1 Dam Decommissioning

Considerations include full or partial removal (i.e., cut off at 1.0 m below final ground surface) and decommissioning of dam structures to facilitate return of Boat Harbour to pre-industrial and tidal conditions.

4.6.1.1 Functional Requirements

- **Full or Partial Removal** | Currently no design requirements. Both full and partial removal of the infrastructure shall be considered during conceptual design of remedial options, provided methodologies meet applicable Canadian Dam Association (CDA) Dam Safety Guidelines, 2013 Edition (2007) for the removal of the existing dam, as well as Nova Scotia Watercourse Alterations Standard (NSE 2015b).
- **Waste Disposal** | Disposal of construction waste material from dam decommissioning activities will be disposed of at a licensed facility (i.e., NSE approved Construction and Demolition [C&D] debris disposal sites in Nova Scotia), or within the landfill containment cell on-Site, in accordance with requirements specified in NSE Landfill Guidelines (i.e., Guidelines for



Industrial Landfills (NSE 2005) and Municipal Solid Waste Landfill Guidelines (NSE 2004), as applicable).

4.6.1.2 Performance Requirements

None.

4.6.1.3 Safety Requirements

- **Site Security** | Remedial approach shall be developed to ensure work (and public) safety through the use of safety barriers and proper signage on existing (one-way) access trails and roads. As part of Temporary Facilities and Controls established during dam decommissioning activities, all (public) vehicle access to the former dam area will be eliminated.

4.6.1.4 Non-Functional Requirements

None.

4.6.1.5 Operational Requirements

- **Permits and Approvals** | Dam decommissioning activities will require NSE approval for works within a waterway, in accordance with Nova Scotia Watercourse Alterations Standard (NSE 2015b). Decommissioning approvals from NSE may be able to be consolidated into a single permit depending on how the work is sequenced (i.e., dam removal coinciding with bridge replacement). In addition, decommissioning activities will require Transport Canada approval for works within Navigable Waters, in accordance with Navigable Waters Protection Act.

4.6.2 Treatment Support Building Decommissioning

4.6.2.1 Functional Requirements

- **Keep or Decommission** | Currently no design requirements. Both keeping for reuse and decommissioning/removal of the treatment support building shall be considered during conceptual design of remedial options. Decision to keep the existing structure will be dependent upon current integrity of the building and end use.
- **Waste Disposal** | If decommissioned, disposal of construction waste material from treatment support building will be disposed of at a licensed facility (i.e., NSE approved Construction and Demolition (C&D) debris disposal sites in Nova Scotia), or within the landfill containment cell on-Site, in accordance with requirements specified in NSE Landfill Guidelines (i.e., Guidelines for Industrial Landfills (NSE 2005) and Municipal Solid Waste Landfill Guidelines (NSE 2004), as applicable).

4.6.2.2 Performance Requirements

None.



4.6.2.3 Safety Requirements

- **Site Security** | Remedial approach shall be developed to ensure work (and public) safety through the use of safety barriers and proper signage on existing (one-way) access trails and roads. As part of Temporary Facilities and Controls established during treatment support building decommissioning activities, all (public) vehicle access to the area will be eliminated.
- **Designated Substances** | Decommissioning activities and remedial approach shall be developed to ensure work (and public) safety through proper handling and transportation of designated substances, in accordance with Dangerous Goods Management Regulations made under Section 84 of the *Environment Act* (S.N.S. 1994-95, c. 1).

4.6.2.4 Non-Functional Requirements

None.

4.6.2.5 Operational Requirements

- **Permits and Approvals** | If decommissioning of treatment support building is selected, demolition activities will require demolition permit issued by the Municipality; additionally, in the event that waste materials potentially include asbestos, a waste permit issued by the Municipality will also be required. Pending site ownership, additional permits and approvals may be required if treatment support building is kept and the on-Site leachate treatment system is required for ongoing use.

4.6.3 Support Facilities

Support facilities under consideration for re-use or decommissioning include silo, shed, and ditch structures, head channels, and the maintenance building/garage.

4.6.3.1 Functional Requirements

- **Ditch Diversion** | Currently no design requirements. Consideration shall be given to provide surface water flow into wetlands to maintain wetland function where possible.
- **Waste Disposal** | If decommissioned, disposal of construction waste material from treatment support facilities will be disposed of at a licensed facility (i.e., NSE approved Construction and Demolition (C&D) debris disposal sites in Nova Scotia), or within the landfill containment cell on-Site, in accordance with requirements specified in NSE Landfill Guidelines (i.e., Guidelines for Industrial Landfills (NSE 2005) and Municipal Solid Waste Landfill Guidelines (NSE 2004), as applicable).

4.6.3.2 Performance Requirements

None.

4.6.3.3 Safety Requirements

None.



4.6.3.4 Non-Functional Requirements

None.

4.6.3.5 Operational Requirements

- **Permits and Approvals** | If decommissioning of support facilities is selected, demolition activities will require demolition permit issued by the Municipality; additionally, in the event that waste materials potentially include asbestos, a waste permit issued by the Municipality will also be required.

4.6.4 Settling Basins Decommissioning

In the event that the settling basins are not selected to be used as containment cells, they will be decommissioned and re-worked to blend in with the surrounding natural environment.

4.6.4.1 Functional Requirements

- **Full or Partial Removal** | Currently no design requirements. Both full and partial removal of the settling basins shall be considered during conceptual design of remedial options, provided post-removal conditions are able to comply with applicable Federal and Provincial guidelines for soil and sediment quality.
- **Waste Disposal** | Disposal of construction waste material from settling basin decommissioning activities (i.e., piping, concrete, outlet) will be disposed of at a licensed facility (i.e., NSE approved Construction and Demolition (C&D) debris disposal sites in Nova Scotia), or within the landfill containment cell on-Site, in accordance with requirements specified in NSE Landfill Guidelines (i.e., Guidelines for Industrial Landfills (NSE 2005) and Municipal Solid Waste Landfill Guidelines (NSE 2004), as applicable).
- **Groundwater Quality** | Remedial option design shall support decommissioning of settling basins using a risk-based approach to meet applicable Federal and Provincial guidelines for protection of environmental and human health, including:
 - Federal Contaminated Sites Action Plan (FCSAP) Ecological Risk Assessment Guidance (GoC 2012)
 - Guidance Documents – Contaminated sites – Environmental and Workplace Health (GoC 2017)
 - CCME Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life (FWAL) (CCME 1999a)
 - Nova Scotia Contaminated Sites Regulations, N.S. Reg. 64/2012 (NSE 2013)
 - Environmental Quality Standards for Contaminated Sites – Rationale and Guidance Document (NSE 2014)
 - Nova Scotia Wetland Conservation Policy (NSE 2011b)
 - Water for Life: Nova Scotia's Water Resource Management Strategy (NSE 2010)



- **Soil Quality** | Remedial option design shall support decommissioning of settling basins using a risk-based approach to meet applicable Federal and Provincial guidelines for protection of environmental and human health, including:
 - CCME Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health (CCME 1999b)

4.6.4.2 Performance Requirements

None.

4.6.4.3 Safety Requirements

None.

4.6.4.4 Non-Functional Requirements

None.

4.6.4.5 Operational Requirements

- **Permits and Approvals** | If decommissioning of sedimentation basins is selected, demolition activities may require demolition permit issued by the Municipality.

4.6.5 Pipeline Decommissioning

Considerations include full or partial removal (i.e., cut off at surface) of the existing pipeline.

4.6.5.1 Functional Requirements

- **Full or Partial Removal (Land Portion)** | Currently no design requirements. Both full and partial removal of the pipeline shall be considered during conceptual design of remedial options, provided approach meets approval from PLFN community – existing pipeline currently situated adjacent to an old Indian Burial ground (i.e., Indian Crosspoint). NS Lands to initiate discussions with PLFN regarding areas of concern, including areas adjacent to the burial ground.
- **Full or Partial Removal or Puncture (Water Portion)** | Currently no design requirements. Both full and partial removal of the pipeline and puncturing in place shall be considered during conceptual design of remedial options. Pipeline decommissioning shall be conducted in accordance with requirements specified in Nova Scotia Watercourse Alterations Standard (NSE 2015b), and will be subject to conditions identified in Navigable Waters Protection Act.
- **Waste Disposal** | Disposal of construction waste material from pipeline decommissioning activities will be disposed of at a licensed facility (i.e., NSE approved Construction and Demolition [C&D] debris disposal sites in Nova Scotia), or within the landfill containment cell on-Site, in accordance with requirements specified in NSE Landfill Guidelines (i.e., Guidelines for Industrial Landfills (NSE 2005) and Municipal Solid Waste Landfill Guidelines (NSE 2004), as applicable).



4.6.5.2 Performance Requirements

None.

4.6.5.3 Safety Requirements

None.

4.6.5.4 Non-Functional Requirements

None.

4.6.5.5 Operational Requirements

- **Permits and Approvals** | If decommissioning of pipeline infrastructure is selected, demolition activities will require demolition permit issued by the Municipality; additionally, in the event that waste materials are considered contaminated or hazardous (e.g., pipe may potentially include asbestos), a waste permit issued by the Municipality may also be required.

4.7 Remediation Methodology and Approach

In 2014, the Provincial government made a commitment to remediate Boat Harbour, a process that was considered to take up to 10 years. That commitment was then entrenched into legislation in the spring of 2015. It is anticipated that remediation will likely include activities such as dewatering parts of Boat Harbour in controlled phases to expose the Harbour sediment and through various mechanical techniques remove the contaminated sediments (Amec, March 2017). These activities may create odours and release various airborne contaminants, therefore the remediation must be performed in a safe manner to minimize exposure to humans and the environment.

Remediation of Boat Harbour requires meeting numerous Federal and Provincial guidelines for protection of environmental and human health following remediation, including:

- Federal Contaminated Sites Action Plan (FCSAP) Ecological Risk Assessment Guidance (GoC 2012)
- Guidance Documents – Contaminated sites – Environmental and Workplace Health (GoC 2017)
- CCME Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life (FWAL) (CCME 1999a)
- CCME Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health (CCME 1999b)
- CCME Canadian Sediment Quality Guidelines for the Protection of Aquatic Life (CCME 2001)
- Guide for Reporting to the National Pollutant Release Inventory (NPRI) 2016 and 2017 (ECCC 2016)
- Nova Scotia Contaminated Sites Regulations, N.S. Reg. 64/2012 (NSE 2013)
- Environmental Quality Standards for Contaminated Sites – Rationale and Guidance Document (NSE 2014)



- Nova Scotia Wetland Conservation Policy (NSE 2011b)
- Water for Life: Nova Scotia's Water Resource Management Strategy (NSE 2010)
- Federal Policy on Wetland Conservation (ECCC 1991)

Regardless of the remedial approach selected, the contaminants must be removed and disposed of in a manner that is environmentally acceptable and safe to human health.

4.7.1 Functional Requirements

- **Surface Water Quality** | Remedial option design shall support wetland restoration following remediation of Boat Harbour using a risk-based approach to meet applicable Federal and Provincial guidelines for protection of environmental and human health, including:
 - Federal Contaminated Sites Action Plan (FCSAP) Ecological Risk Assessment Guidance (GoC 2012)
 - Guidance Documents – Contaminated sites – Environmental and Workplace Health (GoC 2017)
 - CCME Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life (FWAL) (CCME 1999a)
 - Nova Scotia Contaminated Sites Regulations, N.S. Reg. 64/2012 (NSE 2013)
 - Environmental Quality Standards for Contaminated Sites – Rationale and Guidance Document (NSE 2014)
 - Nova Scotia Wetland Conservation Policy (NSE 2011b)
 - Water for Life: Nova Scotia's Water Resource Management Strategy (NSE 2010)
 - Federal Policy on Wetland Conservation (ECCC 1991)

In accordance Section 13 of the *Beaches Act*, R.S.N.S. 1989, c. 32, Coastal Permit requirements (which apply between high water and low water marks) may also need to be followed pending receipt of Environmental Assessment results.

- **Sediment Quality** | Remedial option design shall support wetland restoration following remediation of Boat Harbour using a risk-based approach to meet additional applicable Federal and Provincial guidelines for protection of environmental and human health, including:
 - CCME Canadian Sediment Quality Guidelines for the Protection of Aquatic Life (CCME 2001)
- **Soil Quality** | Remedial option design shall support wetland restoration following remediation of Boat Harbour using a risk-based approach to meet additional applicable Federal and Provincial guidelines for protection of environmental and human health, including:
 - CCME Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health (CCME 1999b)



4.7.2 Performance Requirements

- **Implementation Schedule** | Currently no requirements, other than adherence to NS Lands milestone dates. Schedule requirements shall only be prescribed by the amount of time required for implementation of the most cost effective remedial solution. NS Lands has indicated that while a longer implementation schedule could result in greater educational and financial benefit opportunities for the PLFN and local communities, a shorter timeframe will likely be less costly and more value for the NS taxpayer.

4.7.3 Safety Requirements

- **Worker Safety** | Remedial approach shall be developed to ensure work (and public) safety, with a target of zero incidents during construction, remediation, and long-term monitoring phases. Remedial alternatives shall minimize worker direct contact with contaminants, utilizing approaches that will reduce PPE requirements. All work will be implemented in accordance with Nova Scotia's Occupational Health and Safety Act, R.S.O. 1990, c. O.1.

4.7.4 Non-Functional Requirements

- **Proven Technology** | Remedial option design shall only consider application of effective technologies that have been proven on sites of similar size; experimental or burgeoning technologies that have only been applied at a bench scale or pilot scale phases will not merit further consideration. NS Lands has clarified that although incineration was identified as an unacceptable remediation technology in RFP WS41760868, it can be considered as a viable option. NS Lands has indicated that the most effective technologies for sediment treatment/stabilization and water treatment are the most preferable.
- **Cost Effectiveness** | Remedial option design shall be prescribed by the most (effective and most) cost effective solution. NS Lands has emphasized that the remedial approach which provides the best value to the NS Tax Payer shall be considered the most favourable solution.
- **Cost Analysis** | Both remediation costs (i.e., capital or present worth cost) and long-term monitoring costs (i.e., operational costs) shall be taken into consideration when evaluating the cost effectiveness of remedial options.
- **Accessibility** | Remedial approach shall be developed to ensure sufficient access to implement remediation and construction activities. NS Lands has recommended that any privately-owned properties within study boundary be identified to ensure there are no access issues.
- **Access Agreements** | NS Lands to negotiate government and PLFN access agreements for IR24G, IR24, and IR37 for use during investigation and remediation and construction phases. GHD to negotiate access agreements with private land owners for use during investigation and remediation and construction phases. Prior notification to be provided when accessing IR24G, IR24, and IR37, and escorts may be required to accompany individuals accessing IR lands. Protocol for access within boundaries of current BHTF has already been developed to ensure worker health and safety and establish right of way access between the Province, PLFN, and Northern Pulp.



4.7.5 Operational Requirements

- **Maintain Services** | Site services (i.e., electrical/lighting, sanitary) shall be available throughout the duration of the construction, remediation, and long-term monitoring phases, as required. During construction, relocation or partial decommissioning of O/H electrical service (power lines) may be required, subject to approval from Nova Scotia Department of Natural Resources. On-site sanitary/septic systems likely not required for the duration of long-term maintenance. Sanitary systems to be removed once no longer required. Well decommissioning to be completed in accordance Well Decommissioning Regulations – Well Drilling Act.

4.8 Provision of Benefits

The PLFN Engagement Plan (GHD, 2017) strategy was designed to: establish a positive working relationship with PLFN based on mutual trust and respect; increase GHD's understanding of the PLFN members' significant connection to the former tidal lagoon; and identify the importance and potential impacts and benefits resulting from clean-up of the contaminated site. This will be done with direction from provincial guidance documents, including the "A Proponent's Guide to Environmental Assessment", and Proponents Guide: Engagement with Mi'kmaq of Nova Scotia, and in the overall communication plan for the project lead by Communications Nova Scotia.

The PLFN Engagement Plan was revised post-award and is currently under review by NS Lands including the financial aspects. It should be noted that that Sections 4.8.1 and 4.8.2 below may be modified based on NS Lands review of the aforementioned Revised Plan and financial considerations.

4.8.1 Educational Benefit

- **Provision of Educational Benefit** | No minimum requirement for educational benefit to PLFN or local communities; ultimate driver is effective and cost effective clean-up of BH. However, working with NS Lands, PLFN, and the local school system, workshops may be considered to engage and empower youth learn about the history of A'se'k and imagine the long-term potential of the project and what it means for PLFN. (Youth engagement empowers young people to have a voice in the decisions that affect them. It not only informs them about the project, but these initiatives help develop leadership, community organizing and decision making skills and encourage young people to develop their full civic potential.)

4.8.2 Financial/Employment Benefit

- **Provision of Financial Benefit** | No minimum requirement for financial benefit to PLFN or local communities during remediation/construction phase or post-remediation; ultimate driver is effective and cost effective clean-up of BH. However, employment and training opportunities will (likely) become available during remediation/construction phases, as well as during long-term operation and maintenance of treatment systems, wetland restoration and harvesting, etc.



5. Applicable Codes, Standards, and Classifications

5.1 Legislation

General legislation that may be applicable to the Project is outlined below. Key legislation will be determined following completion of the project description.

Federal

1. Canadian Environmental Assessment Act, 2012
2. Fisheries Act
3. Migratory Birds Convention Act – Migratory Birds Regulations
4. Species at Risk Act
5. Navigation Protection Act
6. Navigable Waters Protection Act
7. Navigable Waters Works Regulations
8. *Navigable Waters Bridges Regulations*
9. Canadian Environmental Protection Act
10. Transportation of Dangerous Goods Act
11. *Wastewater Systems Effluent Regulations*

Provincial

1. Environment Act – EA Regulations
2. Environment Act – Contaminated Sites Regulations
3. Environment Act – Activities Designation Regulations
4. Environment Act – Air Quality Regulations
5. Special Places Protection Act and Regulations
6. Wildlife Act
7. Endangered Species Act
8. Crown Lands Act
9. Municipal Government Act
10. Beaches Act
11. Boat Harbour Act



5.2 Guidelines, Policies, Standards

The Project will also be driven by guidelines, policies, and standards that may be applicable during design, construction, operation, and reclamation of the project. Those that may potentially be applicable to the Project are listed below:

Federal

1. CCME Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life (FWAL) (CCME 1999a)
2. CCME Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health (CCME 1999b)
3. CCME Canadian Sediment Quality Guidelines for the Protection of Aquatic Life (CCME 2001)
4. CCME Canada Wide Standards for Particulate Matter (PM) and Ozone (CCME 2010)
5. Guidance Documents – Contaminated sites – Environmental and Workplace Health (Government of Canada, 2017)
6. Guide for Reporting to the National Pollutant Release Inventory (NPRI) 2016 and 2017 (ECCC 2016)
7. Federal Contaminated Sites Action Plan (FCSAP) Ecological Risk Assessment Guidance (Government of Canada 2012)
8. Federal Policy on Wetland Conservation (ECCC 1991)

Provincial

1. Atlantic Canada Guidelines for Drinking Water Supply System (ACWWA 2004)
2. Environmental Quality Standards for Contaminated Sites – Rationale and Guidance Document (NSE 2014)
3. Guidelines for Industrial Landfills (NSE 1991) (2005 edition)
4. Municipal Solid Waste Landfill Guidelines (NSE 2004)
5. Guidelines for Environmental Noise Measurement and Assessment (NSE 1990)
6. Toward a Greener Future: Nova Scotia's Climate Change Action Plan (NSE 2009)
7. Guide to Consider Climate Change in Project Development in Nova Scotia (NSE 2011a)
8. Nova Scotia Wetland Conservation Policy (NSE 2011b)
9. From Strategy to Action, An Action Plan for the Path We Share, A Natural Resource Strategy for Nova Scotia (NSDNR 2011a)
10. The Path We Share: A Natural Resource Strategy for Nova Scotia 2011-2020 (NSDNR 2011b)
11. Water for Life: Nova Scotia's Water Resource Management Strategy (NSE 2010)
12. Nova Scotia Standard Specifications: Highway Construction and Maintenance (NSTIR 1997)



13. Erosion and Sediment Control Handbook for Construction Sites (NSE 1988)
14. Guide to Altering Watercourses (NSE 2015a)
15. Nova Scotia Watercourse Alterations Standard (NSE 2015b)
16. Generic Environmental Protection Plan for Construction of 100 Series Highways (NSTIR 2007)
17. Storm Drainage Works Approval Policy (NSE 2002a)

Municipal

1. Land Use Bylaw
2. Noise Bylaw
3. Municipal Planning Strategy
4. Municipal Government Act

Other

The following applicable Codes and Standards may also be applicable in the conceptual design of Boat Harbour Remediation Design:

1. National Building Code of Canada – Part 3, 2010
2. National Fire Code of Canada, 2010
3. Nova Scotia Electrical Safety Code and Supplements
4. Canada Occupational Health and Safety Act
5. Canada Occupational Health and Safety Regulations, SOR/86-304, October 2014
6. CDA - Dam safety guidelines 2007 (2013 edition)
7. National Plumbing Code of Canada
8. Canada Labour Code
9. Nova Scotia Occupational Health and Safety Act
10. Workplace Hazardous Materials Information System
11. AN/CSA-ISO 9001:08 (ISO 9001:2008) Quality Management Systems or equivalent
12. Canadian Electrical Code CSA C22.1
13. CSA S6-14 - Canadian Highway Bridge Design
14. CSA G401-14 Corrugated Steel Pipe Products
15. CSA Z462 Workplace Electrical Safety

In addition, the Boat Harbour Remediation Design may also consider the applicable codes, standards, classifications, or guidelines from the following organizations not previously identified, on an as-required basis:



1. NSTIR Standard Specifications and Drawings
2. ASTM International (ASTM) standards
3. Canadian General Standards Board (CAN/CGSB)

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All of Which is Respectfully Submitted,
GHD Limited



Eric Farquhar, P.Eng.

A blue ink signature of Eric Farquhar, featuring a stylized 'E' and 'F' with a horizontal line extending to the right.

Andrew Philopoulos, P.Eng.

A blue ink signature of Andrew Philopoulos, written in a cursive style.

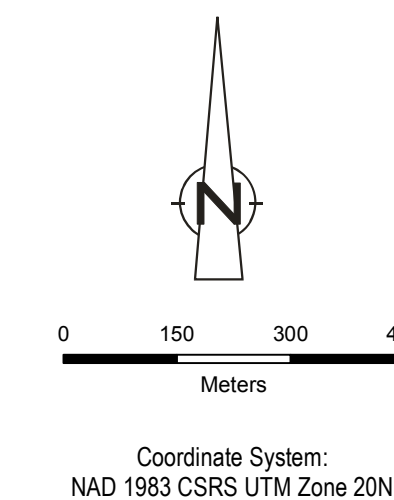
Christine Skirth, C.E.T., PMP

A blue ink signature of Christine Skirth, written in a cursive style.



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Legend

- Sediment Sample Location
- Soil Sample Location
- Sludge Sample Location
- ▲ Seatech Sample Location
- Surface Water Sample Location
- ◆ Monitor Well Location
- Former High Water Mark
- Current High Water Mark
- Indian Reserve No. 24G
- Indian Reserve No. 37
- Study Boundary
- Property
- Pipeline
- Sewage Settling Pond; Tank
- Transmission Line; Substation

Original Size

ANSI D

Bar is one inch on original size drawing
 0 — 1"

Project : 11148275
 Date : Aug 22, 2017

**NOVA SCOTIA LANDS INC
 BOAT HARBOUR, NS
 PHASE I ESA
 SITE LAYOUT AND
 STUDY BOUNDARY**

Figure No.

FIGURE 1



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