WorleyParsons

resources & energy

FISHERIES AND OCEANS CANADA - SMALL CRAFT HARBOURS BRANCH

Construction Environmental Management Plan

Pangnirtung Small Craft Harbour Development

09182

11 May 2010

Infrastructure & Environment
8658 Commerce Court
Burnaby, BC V5A 4N6 CANADA
Phone: +1 604 298 1616
Facsimile: +1 604 298 1625
www.worleyparsons.com

PROJECT 09182 – CONSTRUCTION CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

FILE LOC.: BURNABY

REV	DESCRIPTION	ORIG	REVIEW	WORLEY-PARSONS APPROVAL	DATE	CLIENT APPROVAL	DATE
E	Issued for review	A.Gilbride	M.Jarvis	O.Robinson	28-Mar-10		
F	Issued as Final	B. Lynch		J. Clarke	06-May-10		

CONTENTS

Figures

1. INTRODUCTION

The Small Craft Harbours Branch (SCHB) of Fisheries & Oceans Canada (DFO) has been mandated to develop a small craft harbour facility in Pangnirtung, Nunavut (Figure 1).The existing harbour is located in an area of tidal flats, and includes a partially excavated entrance channel and basin, a 365 m long rubble mound ("east") breakwater, a vertical wharf structure and a marshalling area. The existing facilities were constructed between 1993 and 1996.

In order to provide the community of Pangnirtung further economic opportunities, the proposed small craft harbour development will include the following improvements (Figure 2):

- Deeper vessel mooring basins and entrance channel;
- A new marshalling area in front of the fuel farm
- New fixed and floating wharf structures attached to the inside of the east breakwater;
- A new breakwater located on the west side of the harbour; and
- A new sea-lift ramp

It is anticipated that the construction works will be carried out in two or more phases, spanning the summers of 2010, 2011 and 2012.

The Construction Environmental Management Plan (CEMP) enclosed herein provides environmental protection and mitigation measures for construction activities related to the above-noted improvements. The CEMP may require subsequent updates and/or revisions to accommodate design revisions and/or alternate construction techniques.

2. CONSTRUCTION ACTIVITIES

Upgrading of the harbour at Pangnirtung will involve the following construction activities which will require environmental management planning:

1. Access road upgrading and temporary river crossing of the Duval River,
2. Dredging;
3. Foreshore fill placement for west breakwater and marshalling area;
4. Sea-lift ramp construction;
5. Fish habitat compensation construction.
6. Fixed wharf construction (future phase); and
7. Ocean disposal of dredgate, as required (future phase).

Due to seasonal and timing constraints, construction will be staged over two or more years. The 2010 construction schedule will likely only include dredging of the small vessel basin, construction of a marshalling area, construction of the west breakwater, and construction of fish habitat compensation measures. The remaining work will be completed in subsequent years.

2.1 Access Road Upgrade and Temporary River Crossing of the Duval River

Upgrading existing roadways and the possible construction of temporary access roads will be required to accommodate truck passage between the harbour and the local rock quarry. A temporary river crossing across the Duval River will also be required to accommodate large truck passage. Key concerns from road upgrading include dust and traffic control. Key concerns from temporary river crossing include sediment erosion and sediment release impacting water quality, physical disturbance of habitat and restoration to pre-disturbance conditions following removal of the temporary river crossing.

2.2 Dredging

Dredging of the basins and the approach channel will increase the water depth for larger vessels. The dredging may be completed with a combination of land-based and water-based equipment. Examples of land-based equipment include excavators and dump-trucks, while water based equipment includes barge mounted cranes, excavators and suction dredges. Key concerns from dredging include impact to water quality, the release of sediment laden waters into fish habitat, and physical disturbance of habitat.

2.3 Foreshore Fill Placement

Fill will be placed in the foreshore to construct the marshalling area and the breakwater. Construction techniques may include end-dumping, grading/covering appropriately, and armour rock placement. Key

concerns from foreshore filling include impact to water quality, the release of sediment laden waters into fish habitat, and physical disturbance of habitat.

2.4 Sea-lift Ramp

A sea-lift ramp will provide facilities for loading/off-loading cargo and fish products. Key concerns during the construction of this facility include impacts to water quality, construction waste management, and potentially, the use of concrete.

As noted in Section 1, specific construction methods will require confirmation from the Contractor and revisions to the CEMP may be necessary, where applicable.

2.5 Fish Habitat Compensation

Fish habitat compensation measures are necessary for this project that will likely include construction of tidepools and boulder areas to increase habitat complexity. Key concerns during the construction of fish habitat include impacts to water quality, construction waste management, the release of sediment laden waters into fish habitat, and physical disturbance of habitat.

2.6 Wharf Construction

New fixed and floating wharves will be installed to provide vessel moorage. Fixed wharves are typically constructed using a sheet pile bulkhead or concrete caisson structure. Floating wharves may be anchored by block and chain (ie concrete blocks with chains to the floats) to the seabed. Environmental concerns will depend on the final design of the structures and construction techniques employed. Key concerns may include underwater noise from pile driving, construction waste management, and chemical preservatives such as wood preservatives.

2.7 Ocean disposal of dredgate

If this activity is required in the future, a dredging plan will be prepared as an addendum to the CEMP and submitted to Environment Canada in accordance with the *Canadian Environmental Protection Act, 1999* (CEPA) and the associated *Disposal at Sea Regulations, 2001.*

3. REGULATORY FRAMEWORK

All works associated with this Project shall comply with Federal legislative requirements of the *Fisheries Act*, the *Canadian Environmental Protection Act* and the *Navigable Waters Protection Act* and other relevant Territorial legislation, such as the requirements of Nunavut Impact Review Board Part 4 Screening, *Nunavut Environmental Protection Act* and associated Regulations (ie *Spill Planning and Reporting Regulations*).

Under the habitat protection provisions of the *Fisheries Act*, Section 35(1) prohibits the harmful alteration, disruption or destruction (HADD) of fish habitat while Section 36(3) prohibits the discharge of deleterious substances to waters frequented by fish either directly or indirectly. The proposed harbour improvements at Pangnirtung are subject to DFO review and authorization under Section 35(2) permitting the construction to proceed under conditions outlined and authorized by DFO-Eastern Arctic Area (EAA). In consultation with DFO-EAA, it is anticipated that relevant DFO operational statements such as *Nunavut In-Water Construction Timing Windows for the Protection of Fish and Fish Habitat, DFO/2007-1329* and federal water quality guidelines such as CCME, 2007 will be referred to in establishing threshold values for relevant parameters such as turbidity (nephelometric turbidity units = NTUs), Total Suspended Solids (TSS, mg/L) and pH for this project.

This project is also subject to review and authorizations by Environment Canada under their mandated responsibilities arising from Section 36(3) of the *Fisheries Act* and the *Canadian Environmental Protection Act* (CEPA), as described previously in Section 2 of this report.

4. ENVIRONMENTAL PROTECTION & MITIGATIVE MEASURES

The CEMP is designed to minimize the impacts to the environment during construction such as water quality, underwater noise, waste disposal, and inadvertent spills of harmful substances. The proposed construction activities have the potential to disturb fish and benthic habitat and sediments. The release of sediments into the water column can degrade the water quality to the extent of being harmful to fish. Various studies have been undertaken to assess the potential impacts. A near shore fish and fish habitat assessment was conducted during the summer of 2007 by Nunami Jacques Whitford Ltd. (Nunami 2008). It was concluded that there would be a net loss of intertidal and subtidal habitat and associated productive capacity.

In March 2009, a sediment sampling program was undertaken to meet the minimum sampling requirements of the Environment Canada (EC) Disposal at Sea Guidelines (Knight Piesold 2009). Samples were taken within the proposed excavation area on the edge of the tidal flats at the entrance to the proposed channel and within and just outside the east breakwater. The following analysis was conducted: Metals, Polycyclic Aromatic Hydrocarbons (PAHs), Polychlorinated Biphenyls (PCBs) and Total Organic Carbon (TOC). All measured parameters were found below method detection limits and/or below the lower limits of the applicable regulations, therefore no specific measures are deemed necessary to mitigate potential contaminated sediment impacts during construction.

4.1 Construction Timing and General Practice

In-water activities may have potential direct and indirect impacts on fish and fish habitat. The altering of physical and biological features may impact spawning, rearing, foraging or migratory opportunities for fish. It is recognized that construction will be occurring during summer months when Arctic Char are out-migrating and using marine nearshore areas. Final mitigation measures will be developed in consultation with DFO-EAA and local sources such as hunter and trapper organizations.

The following mitigation measures are recommended to protect fish habitat and water quality:

- In-field monitoring of construction activities and water quality shall be undertaken by an environmental monitor (EM). The EM will have the authority to shut down operations impacting water quality/fish habitat and will make recommendations in the field for minimizing impacts.
- In-water marine construction should be avoided whenever possible, especially during the period considered to be sensitive to Arctic char fish populations in Pangnirtung (Approx. June 1 – August 15; WorleyParsons 2009), unless otherwise authorized by DFO-EAA.
- Any temporary accesses constructed within fish habitat (eg. across the intertidal flat) shall be deactivated and fully restored to a natural state.
- The Environmental Monitor (EM), in consultation with DFO-SCHB and DFO-EAA, shall ensure any additional project-specific mitigation measures specified in the Section 35(2) authorization are adhered to by the Contractor.

- All materials used within the construction areas (eg. rip-rap) shall be clean and free of fines, organic material, contaminants and deleterious substances that may be harmful to fish.
- Any pump intakes associated with the construction, if required, shall be screened and specifications shall be provided to the EM for approval in line with DFO approved marine intake guidelines (Fedorenko, A.Y. 1991).

4.2 Water Quality and Sediment Release

The disturbance of sediments should be minimized, as the release of sediments into the water column may be deleterious to fish and fish habitat. Activities shall be completed in such a way as to minimize release of sediment or mobilization of sediment into the water column. The following mitigation measures shall be employed to contain sediment and prevent it from entering fish habitat:

- Land-based foreshore construction activities should be undertaken during low tides to allow work to be undertaken in “dry” conditions, where practical.
- In-water construction activities with the potential to release sediment will have sediment control measures in place.
- Sediment control measures, such as silt curtains, or other DFO-EAA approved measures, shall surround in-water and foreshore construction areas and extend from water surface to seabed during all tide conditions to effectively isolate and minimize the dispersal of sediments and sediment-laden waters beyond the immediate work area. These measures shall be designed to withstand storm events and rising tides.
- The sediment control measures must be left in place until all disturbed areas have been stabilized, where applicable, and returned to their pre-disturbed state or better.
- Removal of sediment control measures shall only occur after any sediment plume within, has dissipated, as confirmed both visually and by turbidity/TSS monitoring data measured throughout the water column (see Section 5.1).
- Accumulated sediment and excess spoil shall be removed from the isolated area before removing containment structures.
- Regular monitoring, maintenance, and repair of sediment control systems is required to ensure proper functionality and effectiveness. Any holes in sediment control devices, deployment failures or other problems shall be remedied without delay. No further work shall occur until the problem is addressed.
- Barges and other vessels used during construction should avoid grounding on the foreshore or seabed or otherwise disturb the foreshore/seabed (ie disturbance as a result of vessel propeller wash), with the exception that barges may be secured with the use of spuds.
- De-watering measures such as dams made of non-earthen materials (water-inflatable portable dams, pea gravel bags, concrete blocks, clean rock etc) may be used to isolate the dewatered work areas. If granular material is used, use clean appropriately sized material in order to withstand tides.

- Before dewatering, fish must be salvaged within the isolated area and moved outside of the work area.
- Dredging activities shall be limited as much as possible to taking place only within the proposed dredging footprint areas during construction.
- Dredging shall occur on calm days to minimize the disturbance of sediment and ensure the sediment control measures are not affected by high wave action.
- Appropriate silt containment measures shall be installed to prevent wet dredged materials from leaching sediment-laden water outside of intended fill areas.
- Stockpiling or side casting into adjacent foreshore areas not designated for fill placement shall be avoided during dredging.
- Any stockpiled material shall be stored and stabilized away from water to prevent re-entry into the marine environment.
- All dredged material shall be placed on-site within contained areas, unless otherwise authorized by the EM.
- Where possible, construction and removal of the temporary bridge crossing across the Duval River should occur when the water levels of the river are lowest to maximize river bank stabilization, minimize sediment release and better facilitate in-stream works.
- Any rock or cobbles used to construct the temporary river crossing should be cleaned or washed prior to placement in the river to minimise the introduction of silt or fines to the watercourse.
- If diversion of water is required when constructing or removing the temporary river crossing, an appropriately sized pump (or pumps) should be used to handle the anticipated water flows. A back-up pump of similar size should also be available for use. Depending on water flows it may be necessary to isolate the crossing using isolation plates (or similar) to pool the water for clean water bypass with the pumps.
- During the installation of the temporary river crossing, all efforts will be made to separate natural from imported fill material such that the river and river banks can be recontoured as close as possible to their natural pre-construction condition.
- The engineering design of the high flow berm should act to redirect water to the culverts to minimize scouring of the river banks and possible release of sediment over the life of the temporary crossing.
- Culverts used to carry the flow of water under the temporary river crossing should be sized to accommodate high water flows and safe passage of fish.
- Any in-stream components of the crossing will be removed and the bed of the river returned to as near as possible its original condition. Additional clean, rock or cobbles may be required to cap the bottom of the river that may have been disturbed during construction and subsequent removal of the temporary crossing.

- The approaches to the river bank are mainly composed of sands, silts and gravels associated with the changing delta of the river. The approaches will be returned to similar grades and stabilized as necessary following removal of the temporary structures. Any native vegetation in the area will be allowed to propagate naturally. If seeding is required an approved seed mix will be determined by the EM or designate and applied as necessary.

4.3 Noise Control

Underwater noise in excess of 30 kPa (Vagle, S. 2003) has the potential to harm or kill fish. Excessive noise may also be harmful or disruptive to marine mammals. If the Contractor employs construction techniques with the potential to generate significant underwater noise (eg. pile driving), noise mitigation measures may be required. Based on the information presented by DFO-SCHB to-date, it was assumed explosives will not be utilized during dredging. In consultation with the Contractor, if this changes, additional mitigation may be required and the CEMP may need revision as per DFO Guidelines for the Use of Explosives in or Near Canadian Fishery Waters, 1998.

The mitigation measures for underwater noise are as follows:

- If deemed necessary by the EM, underwater noise shall be monitored by the EM using a hydrophone system capable of detecting noises exceeding 30 kilopascals (kPa).
- In the event that overpressures of 30 kPa or greater are measured (or evidence of adverse effects to fish becomes apparent), the noise generating construction activity shall be immediately halted. Construction shall not resume until appropriate mitigation measures (eg. bubble curtains) are implemented.
- In the event that overpressures remain at 30 kPa or greater after application of the mitigation measures (or adverse effects to fish continue), those mitigation measures shall be modified as required until they are functioning effectively to mitigate the impacts.

4.4 Waste Control

The deposition of construction wastes and further contamination within the construction work areas is prohibited. Mitigating measures for waste control are as follows:

- Debris and waste materials generated during construction shall be collected, contained, transported and disposed of at appropriate off-site locations in accordance with all applicable legislation, guidelines and best management practices.
- Best efforts shall be made to prevent the deposition of debris into the marine environment. Any debris that is deposited, whether floating or sinking, shall be contained within the work area and be recovered as soon as practicable. Submerged debris shall be recovered by a diver or other non-intrusive means. Attempts at recovery using intrusive means, such as a grapple or clamshell, shall require prior authorization by DFO-EAA.

- Dredged materials shall be placed within the marshalling areas during the 2010 construction season. In subsequent years, if the dredged material requires ocean disposal, a permit from Environment Canada will be required, as noted in Section 2, and an addendum to the CEMP will be prepared to provide environmental mitigative measures for these activities.

4.5 Spill Control

Care shall be taken to prevent all spills which may be hazardous to the environment. As such, the following measures shall be implemented:

- The Contractor will provide and implement a spill control contingency plan (as a requirement of Environment Canada's project authorization) and in accordance with the *Spill Contingency Planning and Reporting Regulations* for Nunavut (DOE 1998).
- The Contractor will appoint a Spill Coordinator on-site who is knowledgeable about spill mitigation, spill containment and spill notification procedures.
- The Spill Coordinator will be responsible for keeping an up-to-date inventory of all materials on site that could be hazardous to the environment if spilled.
- The Contractor will develop and implement a spill prevention, containment and clean-up contingency plan for hydrocarbon products (eg, fuel, oil, hydraulic fluid, etc.) and other deleterious substances prior to work commencing.
- The Contractor will provide the suitable type and number of spill containment and clean-up supplies (ie storage drums, absorbent pads, devices capable of blocking the flow of spilled materials into fish habitat) prior to work at the site commencing. These spill containment and clean-up supplies shall be kept available on-site whenever construction is underway.
- The Spill Coordinator will be responsible for ensuring all personnel are adequately trained and knowledgeable in the use of hazardous materials and the location of spill kits and containment berms in the work area. Spill kits shall be strategically located and readily available.
- All machinery shall be clean, in good operating condition and free of excess oil and grease.
- Vehicle equipment re-fuelling and maintenance shall occur away from water.
- When vehicles and equipment are not in use, drip trays shall be placed underneath to capture any accidental drips that may occur.

4.6 Concrete Control

All work associated with the Project involving the use of concrete, mortars and other Portland cement or lime-containing construction materials will be conducted so as to ensure that sediments, debris, concrete and concrete fines are not deposited, either directly or indirectly, into the marine environment outside the forms of cast in-place structures.

Following placement of concrete, it shall be covered with an appropriate material (eg plastic sheeting) as required to seal the concrete from the marine environment until the concrete is significantly cured. Any water contacted uncured or partly cured concrete, Portland cement or lime-containing construction materials, such as the water for wash-off wet curing, equipment washing etc. shall be contained and prevented from entering, directly or indirectly, the marine environment unless the water has been tested and found to have pH and turbidity values which meet the threshold values developed in agreement with DFO-EAA (see Section 5.1).

4.7 Traffic and Dust Control and Equipment Operation

The following measures shall be implemented in regards to upgrading existing roadways , construction of temporary access roads and operation of construction equipment:

- The Contractor will be required to develop a specific traffic management plan with the goal to reduce the potential for traffic incidents in and around the local community, where applicable.
- All drivers are to maintain safe speeds on unsealed access roads, limiting dust generation where practicable.
- The EM will conduct visual site inspections for potential dust generation and general air quality concerns at all times while construction works and hauling operations are being undertaken.
- Unsealed sections of the worksite and roads that are subject to accumulations of dust and adverse air quality impacts are to be wetted with a water truck on a regular basis.
- General earthworks activities which generate dust and create adverse air quality impacts shall be minimized and dust control methods will be employed, where required.
- The Contractor should implement an education program to address reducing engine idling, operation of equipment at optimum rated loads and routine equipment maintenance procedures.

5. COMPLIANCE

5.1 Environmental Monitoring & Auditing

A suitably qualified and experienced EM will ensure all activities are conducted in compliance with the *Fisheries Act* and all other applicable legislation as outlined in Section 2. It is anticipated the EM will undertake an audit every three to four weeks during construction season, primarily during construction start-up, at the initiation of new construction techniques, when significant issues have been identified with the construction methodologies or if otherwise requested by DFO-SCHB. This may be subject to change as the actual level of effort will be dependent upon the contractor's construction schedule and their environmental performance.

When the EM is not on-site and construction activities are taking place, the EM in consultation with DFO-SCHB, will appoint a designate monitor (DM) to assist with undertaking some of the EM's duties outlined below. Duties may include, but are not limited to:

- The EM/DM ensuring the Contractor and workers are trained to understand the risks of sediment and other deleterious substances and are familiar with the mitigative measures outlined in the CEMP.
- The EM/DM ensuring the Contractor and workers are trained on the methods to prevent spills, how to respond in the event of a spill and appropriate spill kits and absorbents are on-site and easily accessible.
- The EM/DM attending daily construction tailgate meetings to provide support and information to the Contractor regarding ongoing environmental issues and ensuring compliance is occurring.
- The EM/DM implementing the monitoring plan for construction activities as agreed with DFO-EAA to undertake daily visual checks on the integrity and performance of mitigation measures.
- The EM/DM halting construction activities that are resulting in adverse environmental impacts (ie visual evidence of impact due to mitigation measure failure, spills etc). The EM/DM will work with the Contractor to rectify the issue and ensure further mitigation measures are implemented, as appropriate, and will advise the Contractor when construction may be permitted to re-start.
- The EM/DM ensuring any hazardous materials used, stored and disposed of are in accordance with the information contained in their Material Safety Data Sheets.
- The EM/DM ensuring the Contractor replaces used spill abatement and clean-up materials and maintenance of the inventory throughout the duration of construction operations.
- The EM/DM completing environmental reporting duties as outlined in section 5.2 of this CEMP.

5.2 Environmental Reporting

The EM will complete and maintain monitoring and auditing documentation for DFO-SCHB's records. The EM will complete daily reports during each audit which will be summarized with weekly reports and provided at DFO-SCHB's request. Monitoring data and observations from the DM will be included in the weekly reports during the periods the EM is not on-site. Daily reports will include but not be limited to:

- Commentary on the construction and the work-site from an environmental perspective (ie integrity of mitigation measures, turbidity of water, presence of fish, etc).
- Photo-documentation of activities carried out that day, as appropriate.
- Identification of any environmental issues or impacts that arose or occurred and details of specific mitigation measures put in place to address environmental issues and impacts with notable correspondence and completed action items.

In addition to the daily and weekly reports, upon completion of the Project, the EM will provide DFO-SCHB with a final post-construction report. This final report shall contain the following information:

- A summary of the construction carried out in association with the harbour expansion;
- Comments on the construction from an environmental perspective; and
- Identification of any environmental issues and impacts that arose or occurred and details of specific mitigation measures implemented to address the environmental impacts.

6. CLOSURE

We trust that the CEMP satisfies your current requirements and provides suitable documentation for the upcoming harbour construction at Pangnirtung. If you have any questions or require further details, please contact the Project Manager, Jason Clarke at (250) 384-1499 or the undersigned at any time.

Report Prepared by
WorleyParsons

Bryan Lynch, B.SC., RPBio
Marine Biologist

Senior Review by

Jason Clarke, E.I.T.
Marine Environment Specialist

7. REFERENCES

Canadian Council of Ministries of the Environment (CCME), 2007. Canadian Water Quality Guidelines for the Protection of Aquatic Life. Summary Table. Update 7.1 December 2007.

Department of Environment, Nunavut. 1998. Consolidation of Regulation R-068-93 Spill Contingency and Reporting Regulations (1993).

Environment Canada. 1985. *Fisheries Act*. (1985, R.S., c.F-14, s.1)

Environment Canada. 1999. Canadian Environmental Protection Act (1999, c.33).

Environment Canada. 2001. Disposal at Sea Regulations. (SOR/2001-275)

Fedorenko, A.Y. 1991. Guidelines for minimizing entrainment and impingement of aquatic organisms at marine intakes in British Columbia. Can. Manuscr. Rep. Fish. Aquat. Sci. 2098 E: 86 p.

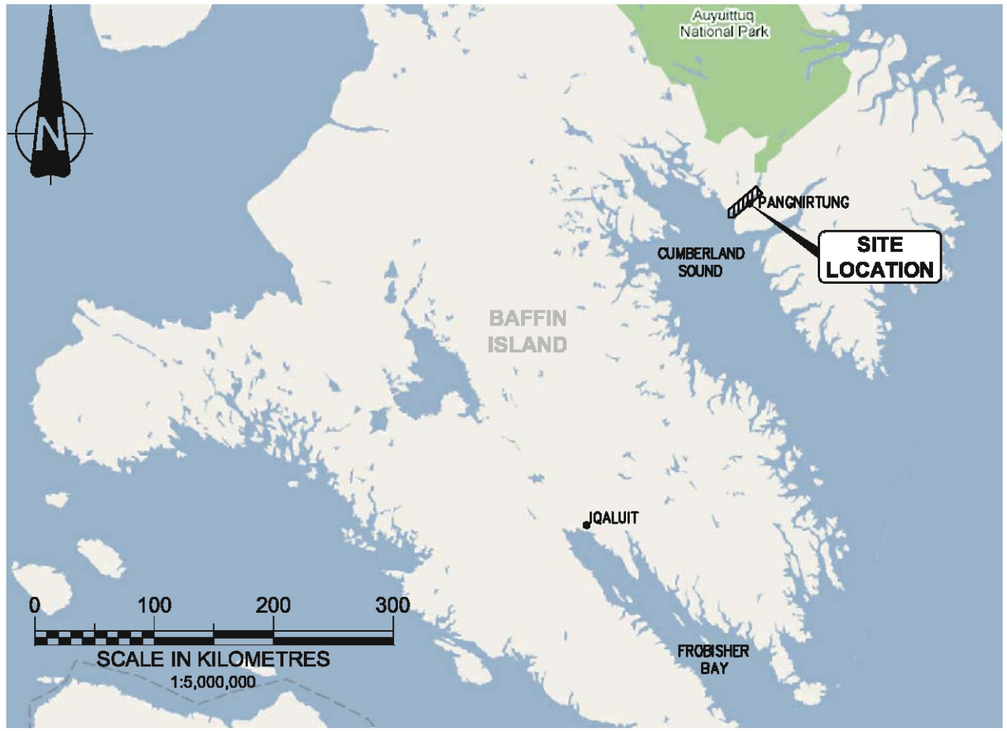
Fisheries and Oceans Canada (DFO). 2007. Nunavut In-Water Construction Timing Windows for the Protection of Fish and Fish Habitat, DFO/2007-1329.

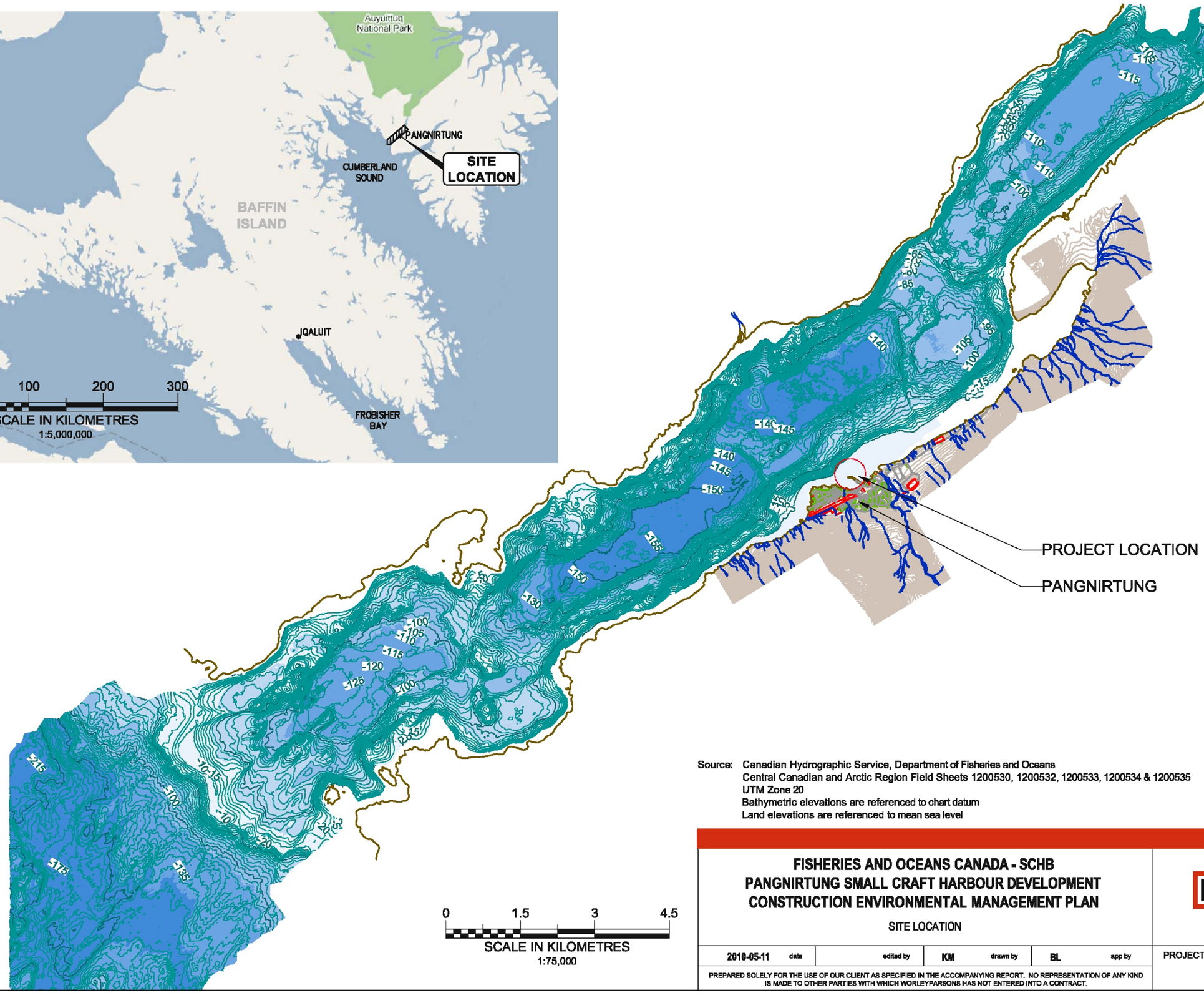
Knight Piesold Consulting. 2009. Final Report, Marine Sediment Sampling Program, Proposed Small Craft Harbour, Pangnirtung, Nunavut.

Nunami Jacques Whitford Ltd., 2008. Nearshore Fish and Fish Habitat Assessments Related to Marine Structure Developments.

Vagle, S. 2006. On the impacts of pile-driving noise on marine life. Ocean Science and Productivity Division Institute of Ocean Sciences DFO/Pacific.

WorleyParsons Canada Ltd. (WorleyParsons). 2009. Pangnirtung small craft harbour development; Traditional knowledge and local consultation summary – Turbot habitat utilization study (Phase 1). Prepared for Fisheries and Oceans Canada – Small Craft Harbours Branch by WorleyParsons Canada Ltd. Mississauga, ON. 9 p + App.





Source: Canadian Hydrographic Service, Department of Fisheries and Oceans
Central Canadian and Arctic Region Field Sheets 1200530, 1200532, 1200533, 1200534 & 1200535
UTM Zone 20
Bathymetric elevations are referenced to chart datum
Land elevations are referenced to mean sea level

Infrastructure & Environment

FISHERIES AND OCEANS CANADA - SCHB
PANGNIRTUNG SMALL CRAFT HARBOUR DEVELOPMENT
CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

SITE LOCATION

WorleyParsons
resources & energy

2010-05-11	data		edited by	KM	drawn by	BL	app by	PROJECT NUMBER: 09182	FIGURE: 1

FILE: J:\2009 Projects\09182_Fisheries – Phase 2\11.0_Drafting Files\11.4_CAD_Files\CONSTRUCTION ENVIRONMENTAL MGMT PLAN\09182-MA-FIG-0001.dwg Issued By: Victoria CAD

ROCK BERM

11,000 m²

BREAKWATER

340 M

ROCK BERM

1,400 m²
(IF REQUIRED)

30 M

25,000 m²

FIXED

DOCKS

ROCK APRON
AREA = 600 m²

150 M

MARSHALLING AREA

DREDGED BASIN

SEA-LIFT RAMP

N

LEGEND

- ROCK APRON
- TIDE POOL
- RANDOM BOULDER GRID

0 50 100 150
SCALE IN METRES
1:2500

Infrastructure & Environment

FISHERIES AND OCEANS CANADA - SCHB
PANGNIRTUNG SMALL CRAFT HARBOUR DEVELOPMENT
CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

CONSTRUCTION AND DEVELOPMENT PLAN

WorleyParsons
resources & energy

2010-05-11	date	edited by	KM	drawn by	BL	app by

PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.

PROJECT NUMBER: 09182

FIGURE: 2

FILE: J:\2009 Projects\09182_Fisheries – Phase 2\11.0_Drafting Files\11.4_CAD_Files\CONSTRUCTION ENVIRONMENTAL MGMT PLAN\09182-MA-FIG-0002.dwg Issued By: Victoria CAD