



**DREDGING AND DISPOSAL AT SEA
ENVIRONMENTAL MANAGEMENT PLAN (EMP)
PANGNIRTUNG SMALL CRAFT HARBOUR
DEVELOPMENT, NUNAVUT**

Submitted to:

Public Works and Government Services Canada
167 Lombard Avenue, Suite 100
Winnipeg, Manitoba
R3C 2Z1

Submitted by:

**AMEC Earth & Environmental,
A Division of AMEC Americas Limited**
1868 Boulevard des Sources, Suite 400
Pointe-Claire (Montréal), Québec
H9R 5R2

01 March, 2011

TV01050

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1.0 INTRODUCTION

This Environmental Management Plan (EMP) provides environmental mitigation measures that would be implemented during the proposed disposal at sea of dredged material from the development of the Fisheries and Oceans Canada (DFO) – Small Craft Harbour (SCH) in Pangnirtung, Nunavut. This document is presented as an addendum to the Construction EMP (CEMP) developed by WorsleyParsons dated May 11, 2010.

The CEMP provided environmental protection and mitigation measures for construction activities related to the dredging of both inner and outer harbour basins and the entrance channel, installation of new fixed and floating wharf structures, and construction of a new marshalling area, breakwater, and sea-lift ramp. This addendum document is intended to supplement the CEMP and provides environmental protection and mitigation measures related to the disposal at sea of the sediments dredged from the entrance channel and outer harbour basin of Pangnirtung Harbour. Mitigation measures as identified in the Disposal at Sea Application and associated Screening-level Environmental Assessment document prepared by AMEC Earth & Environmental, a division of AMEC Americas Limited (AMEC) in December 2010 are presented in this EMP document.

It is important to note that review of the Disposal at Sea Application and Screening-level Environmental Assessment document is currently underway. Therefore measures identified in this EMP may be amended or augmented subsequent to receipt of comments and/or approvals at a later date.

1.1 Project Location and Activities

The Pangnirtung Harbour is located in the Hamlet of Pangnirtung, Nunavut on the eastern shore of Baffin Island off Cumberland Sound and inland along Pangnirtung Fjord. Dredging is required in the access channel and outer harbour of the Pangnirtung DFO-SCH to remove material deposited by siltation and create a new wider and deeper channel. The removal and subsequent disposal of this material will provide better and more continuous access to an expanded inner harbour basin. The anticipated volume of material to be removed and ocean disposed is estimated in the range of 120,000 cubic metres (m³) (place-measure).

Marine sediment to be dredged from the outer harbour and entrance channel areas is intended to be disposed of within the Pangnirtung Fjord, at latitude 66.170100°N and longitude 65.698900°W (NAD83, or 378,35m E, 7,341,488m N UTM, Zone 20), located approximately 2 kilometres (km) northeast of the dredge site. The disposal site encompasses an approximate total area of 200,000 square metres (m²) and the approximate water depth of the area ranges from 140 to 150 m with an estimated tidal range of 7 m. Please refer to Appendix A of this document for figures and drawings depicting the Project area and activities.

2.0 REGULATORY FRAMEWORK

All works associated with the SCH development must comply with Federal legislative requirements of the *Fisheries Act*, *Canadian Environmental Protection Act* (CEPA), *Navigable Waters Protection Act* (NWPA), *Migratory Birds Convention Act* (MBCA), and *Species at Risk Act* (SARA) as well as other relevant Territorial legislation such as the requirements of the *Nunavut Land Claims Agreement* (NLCA) and *Nunavut Environmental Protection Act* and associated Regulations (i.e., Spill Planning and Reporting Regulations).

This Project is subject to review and authorization by the following groups:

- Environment Canada: under their mandated responsibilities arising from Section 127 of the CEPA and associated Disposal at Sea Regulations as well as MBCA (and associated Migratory Birds Regulations) and SARA.
- DFO: under the habitat protection provisions of Section 35(1) which prohibits the harmful alteration, disruption or destruction (HADD) of fish habitat and Section 36(3) which prohibits the discharge of deleterious substances to waters frequented by fish either directly or indirectly;
- Transport Canada (Navigable Waters Protection Program (NWPP)): under their mandated responsibilities arising from Sections 5, 6(4), 16, and 20 of the NWPA; and
- Nunavut Impact Review Board: under their mandated responsibilities arising from Section 12.4.1 of the NLCA.

DFO has concluded that the proposed disposal of marine sediments at the identified disposal site in Pangnirtung Fjord are not likely to result in impacts to fish and fish habitat, provided that plans are implemented as described in the document prepared by AMEC Earth & Environmental, a division of AMEC Americas Limited (AMEC) entitled *Disposal at Sea Permit Application, Dredged Marine Sediments, Pangnirtung Fjord, Nunavut* dated December 2010.

Transport Canada has also indicated that no authorization under the NWPA is required for the movement of the barge to and from the disposal site or for the process of dumping the spoil, due to the depth of the fjord at that location (S. Vollema, pers. comm, 2011).

Comments and/or approvals for the disposal at sea Project is currently under review by EC and the NIRB. Mitigation measures presented in this document may be amended and/or augmented once comments are received from these groups.

3.0 ENVIRONMENTAL PROTECTION AND MITIGATIVE MEASURES

This EMP is designed to minimize the impacts of the disposal at sea of marine sediment activities to the environment. The proposed activities have the potential to degrade water quality through the release of harmful substances, interfere with local faunal species migrations, cause disturbances from excessive noise, and disrupt local vessel and fishery traffic through the operation of dredge and disposal vessels to/from the disposal site.

3.1 Air Quality

The equipment involved in the disposal of marine sediments at sea produces emissions typical of large gas or diesel-fueled vehicles and equipment. Generally, emissions in the form of noise as well as carbon monoxide (CO), carbon dioxide (CO₂), and unburned hydrocarbons from the combustion of fuels, gas, or diesel may cause occasional nuisance problems during transportation and disposal activities.

Noise from disposal activities will be limited to the operation of the disposal vessels. Additional noise will be emitted by dredging activities and excessive noise from the loading and transporting of dredge materials may disrupt local homes, businesses, and recreational facilities.

While a certain level of gaseous emissions (CO, CO₂, and unburned hydrocarbons) and noise from machinery, equipment, and vessels will be unavoidable during Project activities, certain operational practices will be employed to reduce or mitigate emissions to acceptable levels. These include:

- Vessels and equipment are to be kept in good repair.
- Vessels and equipment are to be fitted with standard and well-maintained noise suppression devices.
- Disposal activities are to be efficiently scheduled to minimize back-tracking.
- Care is to be taken to avoid equipment and vessel idling.

3.2 Marine Water and Sediment Quality

The disposal of sand/silty-sand with occasional deposits of silty-clay from the outer basin of the Pangnirtung Harbour will result in a localized area being affected by diminished water quality relative to suspended solids. It is anticipated that the suspended solids will settle or disperse within a period of several hours following each dump event.

Potential contamination of the seabed can occur as a result of contaminant mobilization from dredging activities. Where the Disposal at Sea Permitting process, however, allows for only acceptable (i.e., "non-contaminated") dredging materials to be ocean disposed, contaminant mobilization is not an issue for this Project.

The potential release of hazardous materials to the marine environment from accidents or malfunctions during Project activities (i.e., petroleum products from equipment) can have an adverse effect on marine water and sediment quality. All associated personnel must be familiar with accidental spill responses for materials associated with the Project pertaining to their area of involvement. Spills must be reported and immediately cleaned up to required standards. Specific mitigation includes:

- The Contractor will provide and implement a comprehensive Spill Contingency Plan in accordance with the Nunavut Department of Environment Spill Contingency Planning and Reporting Regulations. This document must include (but will not be limited to) specific measures to keep wildlife out of a contaminated area, equipment available to do this, measures to be taken if animals do come in contact with the spill, and when such procedures should be used. Copies of this plan must be readily available on site, and all Project personnel must be made familiar with the appropriate response procedures in the event of a spill.
- All fuel and hazardous materials are to be located a minimum of 30 m away from the high water mark of any water body and in such a manner as to prevent their release into the environment.
- Any vessel working on the water is to be free of loose petroleum fluids and lubricants.
- Hoses and tanks are to be inspected regularly by the Contractor to prevent fractures and breaks over water.
- Petroleum products are to be secured, and kept in a contaminant holding area on the vessel.
- All fuels and chemicals shall be stored in such a manner that they are inaccessible to wildlife.
- Secondary containment of a surface liner (drip pans, fold-a-tanks, etc.) shall be used at all fuel transfer and refueling stations.
- An adequate supply of spill kits, shovels, barrels, sorbents, and pumps shall be maintained on site at all times.
- All site personnel are to be properly trained in fuel and hazardous waste handling and spill response procedures. All spills of fuels or other deleterious materials of any amount must be immediately reported to the Northwest Territories - Nunavut Spill Report Line at (867) 920-8130.

3.3 Resident and/or Migratory Species

There is not expected to be any interaction with marine flora as they are virtually absent from the proposed ocean-based disposal site. The impact to fish and other marine fauna is habitat degradation from increased suspended solids and contaminant introduction, which has been discussed in Section 3.2. The majority of the material to be dredged (approximately 84-85%) is expected to rapidly settle to the bottom. There will be direct mortality of some benthic organisms from the smothering effects of the dumped material, however benthic communities are expected to recolonize on the spoil pile after the disposal program is completed.

The dredging is expected to commence in June 2011, which overlaps with the breeding season window for migratory birds in the area (May to August). Dredging and disposal activities may interfere with migratory birds that nest nearby or use the Fjord for resting/staging areas. The Proponent will ensure that all disposal at sea of dredged material work activities are compliant with applicable legislation, with particular reference to the MBCA and associated Migratory Birds Regulations, such as:

- Except as authorized by the regulations, no person shall, without lawful excuse,
 - (a) be in possession of a migratory bird or nest; or
 - (b) buy, sell, exchange or give a migratory bird or nest or make it the subject of a commercial transaction.
- No person or vessel shall deposit a substance that is harmful to migratory birds, or permit such a substance to be deposited, in waters or an area frequented by migratory birds or in a place from which the substance may enter such waters or such an area; and
- No person or vessel shall deposit a substance or permit a substance to be deposited in any place if the substance, in combination with one or more substances, results in a substance-in waters or an area frequented by migratory birds or in a place from which it may enter such waters or such an area-that is harmful to migratory birds.

In addition, as several species have been identified as potentially occurring within the vicinity of the Project site or using habitat found in the area (primarily the narwhal and beluga whales), the following mitigation measures will be implemented:

- Only designated navigational channels are to be used.
- All equipment and vessel mufflers must operate efficiently during Project activities. Other sounds such as whistle blasts and horns must be limited or replaced with radio communication, to the extent permitted for safe navigation.
- Wildlife shall not be harassed. This includes persistently worrying or chasing animals, or disturbing large groups of animals.
- Concentrations of seabirds, waterfowl, or shorebirds will not be approached. The Contractor will be made aware of the possible presence of migratory birds such as eiders and gulls occurring at the Project site and will ensure that work crews and equipment do not approach these species.
- No fishing or hunting activities shall take place by Contractors during disposal activities.
- A local observer ("spotter") must be employed by the Contractor to monitor the movement of marine mammals in the Study Area during Project activities. The transport of sediment and disposal activities must be halted if the presence of one or more migrating whales such as belugas or narwhals is noted within a distance of 3 km of the disposal site.
- Equipment is to be kept clean and clear of any food/debris. All garbage and debris will be properly contained and inaccessible to wildlife until disposed of. All wastes must be disposed of in an approved waste management facility.

Due to the possible presence of the Harlequin Duck (pictured below) within Pangnirtung Fjord, Project-related activities will be avoided in areas where a nest or a hen with ducklings is encountered until nesting is complete and the brood has moved beyond the range of disturbance.



Source: Environment Canada. 2010. Species at Risk Registry. Harlequin Duck Eastern Population.
Accessible at: http://www.sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=22

All observations of Harlequin Ducks must be reported to the Canadian Wildlife Service of Environment Canada through the NWT/NU Bird Checklist Program:

NWT/NU Bird Checklist Survey
Canadian Wildlife Service, Environment Canada
5019 – 52 Street, 4th Floor
P.O. Box 2310
Yellowknife NT, X1A 2P7
Phone: 867.669.4773
Email: NWTChecklist@ec.gc.ca

During Project activities, there is potential for accidental fuel leaks and spills into Pangnirtung Fjord. Refer to Section 3.2 for mitigation recommended in order to minimize the likelihood of oil spills, wastes, or contaminants entering the aquatic environment and adversely effecting species and their habitats.

3.4 Fishers and Commercial Traffic

The effects of disposal at sea operations on commercial and food fisheries relate to potential interference between vessels and the equipment undertaking the disposal activities. Sealift and fuel deliveries will account for approximately five visits to Pangnirtung Harbour between June and October. Cruise ship traffic is variable and may add between one and ten visits during the summer season. The effects of ocean disposal on commercial traffic can be limited to potential

interference between vessels and the equipment undertaking the disposal activities in Pangnirtung Fjord.

To mitigate potential adverse effects on fishery resources and navigation/commercial traffic, the following mitigative measures will be implemented:

- Dredging vessels navigating from the loading site to the disposal site must be equipped with a tracking device.
- Dredging vessels navigating from the loading site to the disposal site are to be restricted to a defined zone of passage.
- Normal notices to mariners, as controlled by the Hamlet Office, must be in place.
- Alterations to approved routes, disposal methods, or due to emergency conditions, must be reported to Environment Canada and the appropriate parties of concern.
- Open communication will be maintained between the proponent and local fishers regarding fishing activities.
- Coordination of Project activities with commercial traffic (fuel delivery, sealift, cruise ships) must be undertaken, as required.
- The DFO area office is to be advised as per the above conditions.

3.5 Weather-Related General Practice

Pangnirtung Fjord exhibits tides in excess of 7 m and can experience high winds. Project vessels can become stranded on mud flats if attention is not paid to the tidal regime. Project vessels could experience damage or loss of equipment during high wind events. Weather conditions should be assessed on at least a daily basis and more frequently, as required by prevailing conditions, to determine the potential risk of climate on components of the Project.

The disposal season is delineated by the absence of sea ice from the fjord. The open water season (generally June to October) has been considered in Project planning.

4.0 COMPLIANCE

4.1 Environmental Monitoring and Auditing

A suitably qualified and experienced Environmental Monitor (EM) will be employed from the local community (if possible) to ensure all activities are conducted in compliance with the applicable legislation as outlined in Section 2.0. It is anticipated that the EM employed for the harbour development/construction operations will also be responsible for monitoring disposal at sea activities. As such, it is anticipated that the EM will undertake an audit every three to four weeks during the construction season, primarily during Project start-up, when significant issues have been identified with the disposal activities, or if otherwise requested by DFO-SCH or Public Works and Government Services Canada (on DFO-SCH's behalf). This may be subject to change as the actual level of effort will be dependent upon the Contractor's schedule and their environmental performance.

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

- Ensuring the Contractor and workers are trained on the methods to prevent spills and how to respond in the event of a spill, and that appropriate spill kits and absorbents are on-site and readily accessible.
- Attending daily tailgate meetings to provide support and information to the Contractor regarding ongoing environmental issues and ensuring compliance is occurring.
- Halting disposal activities that are resulting in adverse environmental impacts (i.e., disturbance of species at risk; visual evidence of impact due to mitigation failure, spills, etc.). The EM will work with the Contractor to rectify the issue and ensure further mitigation measures are implemented, as appropriate, and will advise the Contractor when activities may be permitted to re-start.
- Ensuring any hazardous materials used, stored, and disposed of are in accordance with the information contained in their Material Safety Data Sheets (MSDS).
- Ensuring the Contractor replaces used spill abatement and clean-up materials and maintenance of the inventory throughout the duration of operations.
- Completing environmental reporting duties as outlined in the CEMP as well as in Section 4.2 of this EMP.

4.2 Environmental Reporting

The EM will complete and maintain monitoring and auditing documentation for Public Works and Government Services Canada (PWGSC)'s records, on behalf of DFO-SCH. The EM will complete daily reports during each audit which will be summarized with weekly reports and provided at PWGSC'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 disposal activities and the work-site from an environmental perspective (i.e., integrity of mitigation measures, turbidity of water, presence of species, 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 reports, upon completion of the Project, the EM will provide PWGSC with a final post-construction report. This final report shall contain the following information:

- A summary of disposal at sea activities;
- Comments on the disposal at sea activities 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.

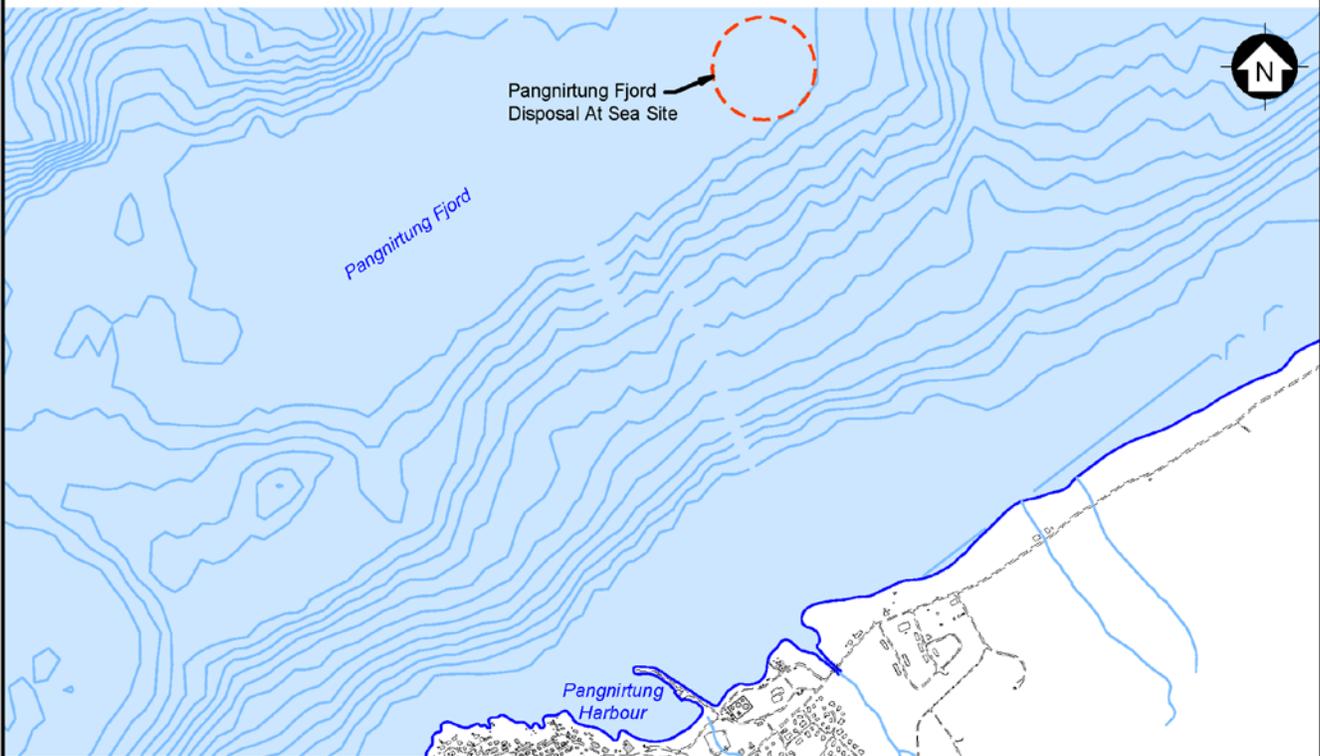
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- AMEC Earth & Environmental, a division of AMEC Americas Limited (AMEC). 2010. Nunavut Impact Review Board Screening-level Environmental Assessment for the Disposal at Sea of Dredged Marine Sediments, Pangnirtung Fjord, Pangnirtung, Nunavut
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- Nunavut Impact Review Board (NIRB). 2009. Screening Decision Report for Fisheries and Oceans Canada's "Pangnirtung Small Craft Harbour Development" project proposal. NIRB File No. 09UN052. Letter dated 24 July 2009.
- WorleyParsons. 2010. Construction Environmental Management Plan – Pangnirtung Small Craft Harbour Development. Report prepared for Fisheries and Oceans Canada-Small Craft Harbour Branch, dated 11 May, 2010.

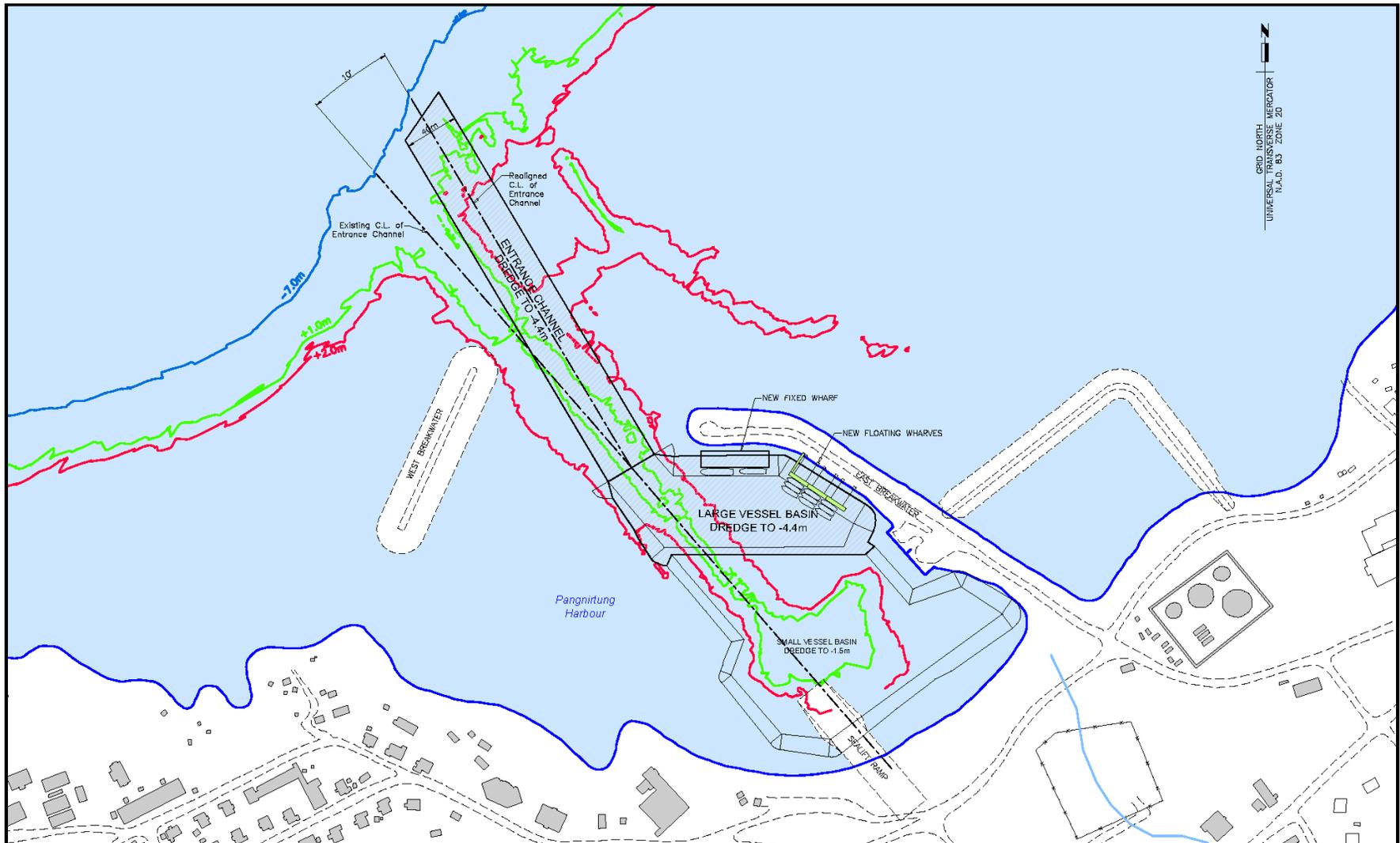
Personal Communications

- Vollema, Shannon. Navigable Waters Protection Program of Transport Canada. Contacted: 7 February, 2011.

APPENDIX A
Figures and Drawings

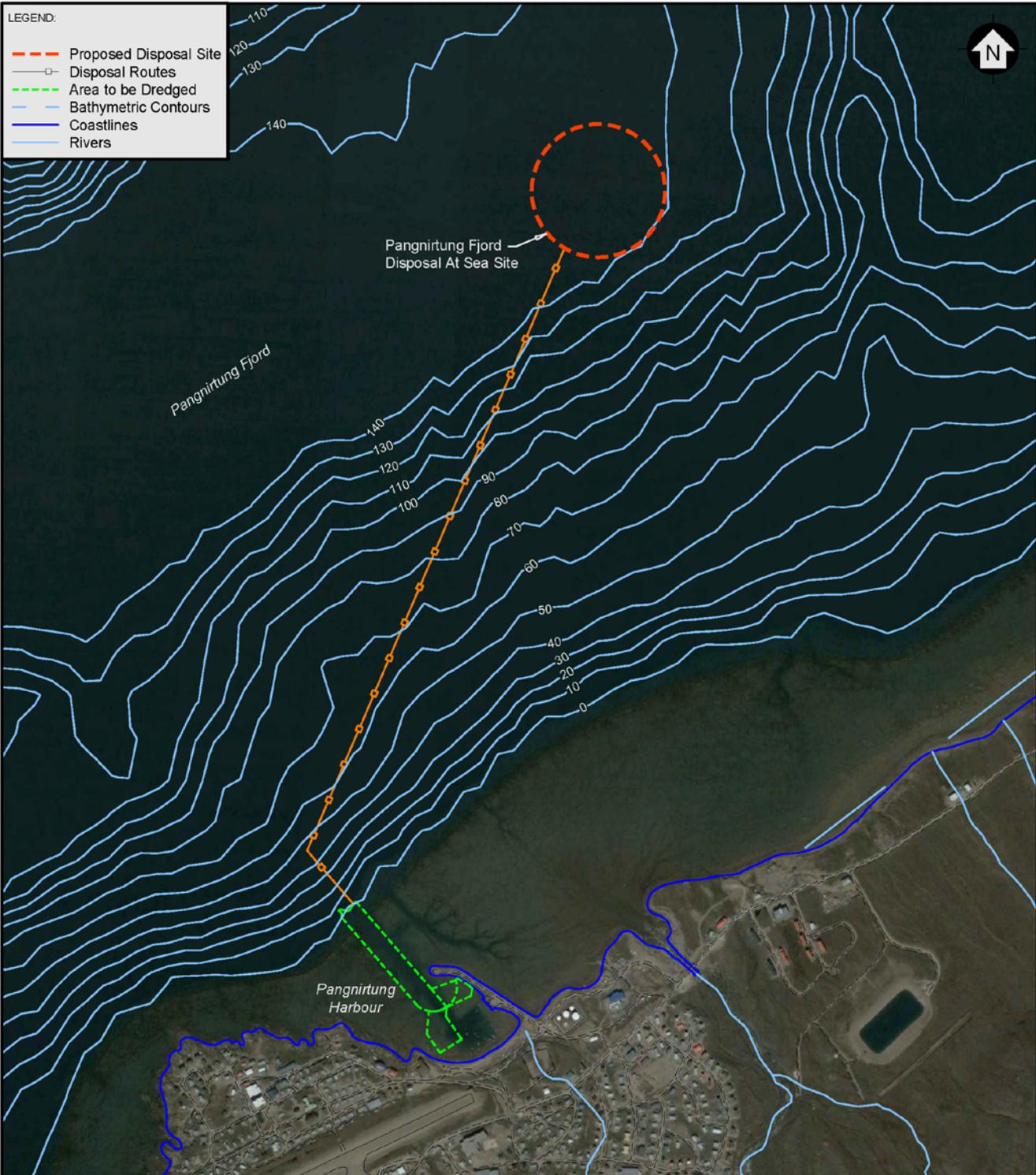


AMEC Earth & Environmental 50 Troop Avenue, Unit 300 Dartmouth, N.S., B3B 1Z1 (P) 902-468-2848 (F) 902-468-1314				CLIENT Public Works And Government Services Canada on behalf of Fisheries and Oceans Canada - Small Craft Harbours	
PROJECT Environmental Management Plan Pangnirtung, NU		DWN BY: DS	PROJECTION: UTM Zone 20	DATE: February 2011	
		CHK'D BY: CK	DATUM: NAD83	PROJECT NO.: TV01050	
TITLE Project Location Plan		REV. NO.: N/A	SCALE: N.T.S.	FIGURE No. 1	



AMEC Earth & Environmental 50 Troop Avenue, Unit 300 Dartmouth, N.S., B3B 1Z1 (P) 902-468-2848 (F) 902-468-1314				CLIENT Public Works And Government Services Canada on behalf of Fisheries and Oceans Canada - Small Craft Harbours	
PROJECT Navigable Waters Application Pangnirtung, NU		DWN BY: DS	PROJECTION: UTM Zone 20	DATE: February 2011	
TITLE Planned Works		CHK'D BY: CK	DATUM: NAD83	PROJECT NO.: TV01050	
		REV. NO.: N/A	SCALE: N.T.S.	FIGURE No.: 3	

- LEGEND:
- - - Proposed Disposal Site
 - Disposal Routes
 - - - Area to be Dredged
 - Bathymetric Contours
 - Coastlines
 - Rivers



AMEC Earth & Environmental 50 Troop Avenue, Unit 300 Dartmouth, N.S., B3B 1Z1 (P) 902-468-2848 (F) 902-468-1314				CLIENT Public Works And Government Services Canada on behalf of Fisheries and Oceans Canada - Small Craft Harbours	
PROJECT Environmental Management Plan Pangnirtung, NU		DWN BY: DS	PROJECTION: UTM Zone 20	DATE: February 2011	
		CHK'D BY: CK	DATUM: NAD83	PROJECT NO.: TV01050	
TITLE Project Location Plan		REV. NO.: N/A	SCALE: N.T.S.	FIGURE No. 4	