



Aivek Stantec Limited Partnership
607 Torbay Road
St. John's, NL A1A 4Y6
Tel: (709) 576-1458
Fax: (709) 576-2126

Geochemical Data Acquisition and Seabed Sampling for Basin Modelling in Labrador Offshore (2013 to 2018)

Prepared on behalf of:



Project Description

File No. 121511190.200

Date: August 9, 2013



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GLOSSARY

C-NLOPB	Canada-Newfoundland and Labrador Offshore Petroleum Board
COSEWIC	Committee on the Status of the Endangered Wildlife in Canada
CTD	conductivity, temperature and depth
SARA	<i>Species at Risk Act</i>



1.0 INTRODUCTION

1.1 Background

Nalcor Energy – Oil and Gas Inc. (Nalcor O&G) holds and manages both onshore and offshore oil and gas interests in Newfoundland and Labrador. Nalcor O&G has an active exploration strategy designed to enhance knowledge and accelerate exploration activity in the province's numerous onshore and offshore petroleum basins. The onshore and offshore basins of Newfoundland and Labrador are vast and largely underexplored, and the modern technologies now available in onshore and offshore research could help identify potential new oil fields.

Nalcor O&G is proposing to conduct exploration activities in the Newfoundland and Labrador offshore area from the tip of Labrador to the Orphan basin to identify those areas that have the potential to contain oil-bearing structures/basins. The proposed Project is a multi-year program (2013 to 2018) to be conducted within the Study / Project Area illustrated in Figure 1.1 (coordinates are provided in Table 1-1) and includes the following non-invasive research activities: sampling of natural seabed seeps, conducting seabed heat flow measurements, collection of shallow seabed cores and collection of metocean data (specifically, basic conductivity, temperature and depth (CTD) data). As only specific sampling points have been identified for the 2013 program, the Project Area is synonymous with the Study / Project Area for activities in 2014 to 2018. Given the restricted nature of the proposed Project (casting and retrieving fishing lines, lowering and raising a core sampler and lowering and raising a CTD meter), interactions with the environment and commercial fisheries will be limited.

1.2 Regulatory Framework

The activities proposed for this Project can be summarized as sampling of potential natural seabed seeps, collecting shallow seabed cores, conducting seabed heat flow measurements and collection of metocean data. According to the *Geophysical, Geological, Environmental and Geotechnical Program Guidelines* (Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB 2012)), an environmental assessment must be conducted on any proposed technical programs in the Newfoundland and Labrador Offshore Area. The limited nature of the proposed activities would suggest the requirement for a C-NLOPB review under the Accord legislation only, at a level comparable to a geotechnical program. That is, based on the activities as described, an environmental assessment pursuant to the *Canadian Environmental Assessment Act 2012* is not required.

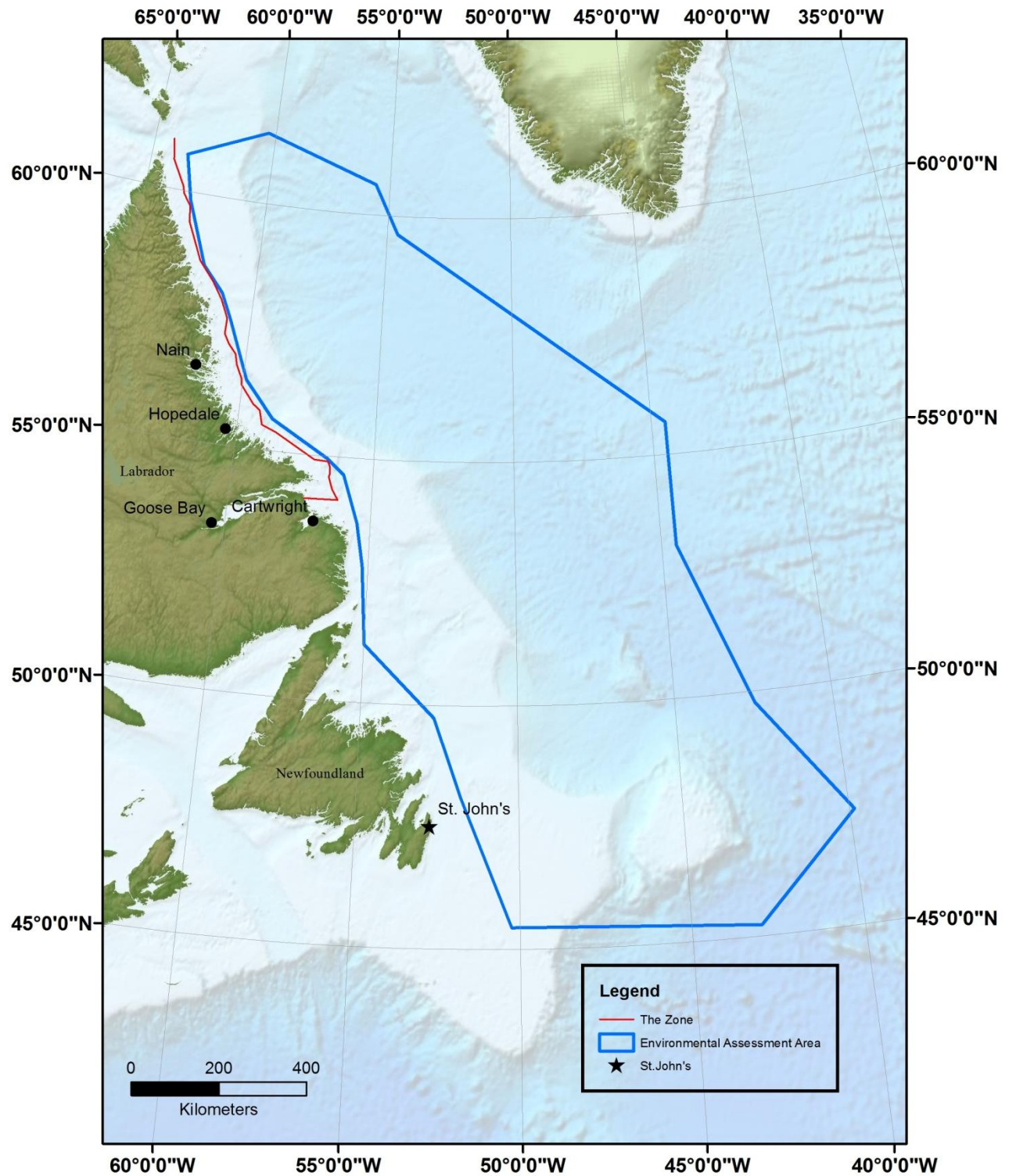


Figure 1.1 Multi-year Study / Project Area



Table 1.1 Multi-year Study / Project Area Coordinates (NAD 83, zone 22)

x (meters)	y (meters)
-180842.928	6798936.072
3669.673	6845685.895
249354.917	6728313.998
298094.094	6614423.47
908328.494	6187706.995
934190.099	5905716.038
1112734.638	5547632.282
1339521.016	5306423.086
1130638.826	5039352.285
557704.817	5033384.223
442322.274	5327311.305
380652.294	5511326.568
221006.619	5678432.321
216033.234	5860458.23
203599.77	5956941.908
173262.119	6067848.405
137453.743	6103159.442
11129.752	6194172.396
-47556.197	6284190.673
-84856.588	6422948.129
-102263.438	6483126.093
-142547.86	6455796.073
-174874.866	6694494.976

2.0 THE PROPOSED PROJECT

The proposed Project is comprised of the following components: sampling for natural oil seeps; shallow seabed coring; heat flow measurements of the seabed using a thermal probe; and, collection of basic CTD data. Not all datasets will be acquired every year. Nalcor is proposing to collect the following data in 2013 in the areas shown in Figure 2.1:

- sampling of potential natural seabed seeps (by collecting water samples) ;
- collection of shallow seabed cores using a gravity core method at 20 locations;
- conducting seabed heat flow measurements using a thermal probe for the same 20 locations; and,
- sub-bottom profiler at the shallow core locations only.

No metocean data will be collected in the first year (2013).

2.1 Detection of Natural Seabed Seeps

Natural seeps accounted for 160,000 tonnes of the 260,000 tonnes of petroleum released into the marine environment in North America from 1990 to 1999 (National Academy of Sciences 2002). Nalcor is proposing to conduct a sampling program to identify areas of potential natural seabed seeps.

Samples to detect the presence of oil from natural seabed seeps will be collected with an AGI (GORE) sampling kit. The sampler is hydrophobic (i.e., repels water) and can collect hydrocarbons from very thin oil layers in the water. The deployment/retrieval mechanism is basically fishing line (folding casting device, weighted bobbers and fishing line and hardware); the sampling containers are deployed by casting them out from the vessel. Laboratory analysis (by thermal desorption/gas chromatography/mass spectrometry) can detect approximately 100 compounds from C₆ to C₃₅, including key biomarkers (AGI 2013).

As Nalcor O&G is proposing to collect samples along a pre-identified sampling design, rather than from a known oil seep, it is proposed that the sampler will be cast from the bow of the vessel, allowing the sampler to ride the bow wave of the vessel for five minutes as the vessel maintains a speed of 3.7 to 5.6 km/h (2 to 3 knots).

The samples will be collected every 15 km along the seven transects indicated in Figure 2.1. The little circles are core / thermal measurement locations and yellow circles within the 2013 Study / Project Area indicate where Nalcor O&G will be taking more dense sampling at four different locations that Nalcor has identified as a potential seep / basin area. The coordinates for the 2013 Study / Project Area are provided in Table 2.1.

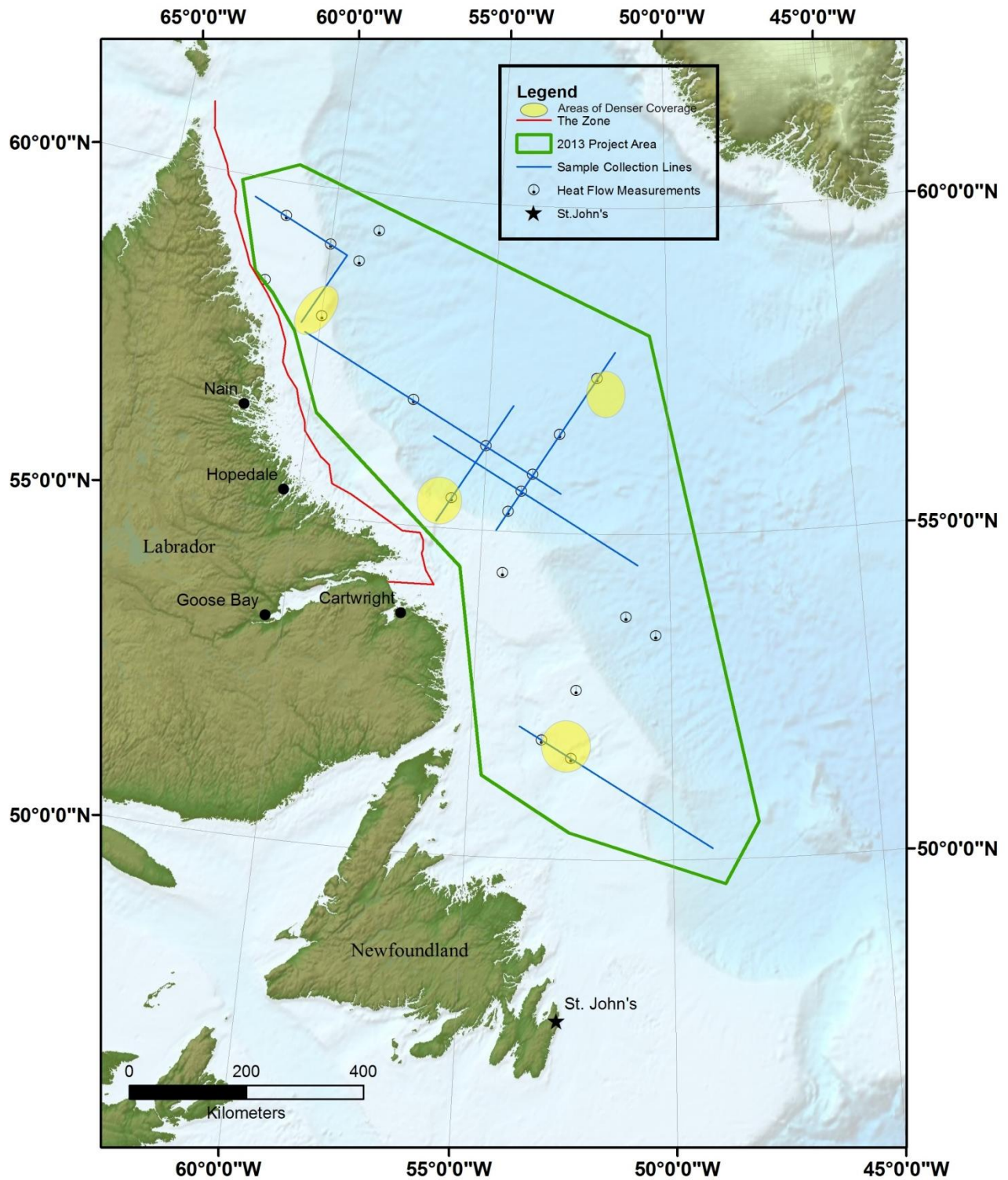


Figure 2.1 Proposed 2013 Program Study / Project Area



Table 2.1 Proposed 2013 Program Study / Project Area Coordinates (NAD 83, zone 22)

x (meters)	y (meters)
-67187.699	6726207.301
528501.841	6433782.386
716780.03	5604814.881
660023.842	5498808.969
392354.338	55885407.93
242560.518	5683921.279
205608.171	6040372.851
-39725.027	6303648.329
-76374.538	6442110.154
-113034.412	6507897.05
-143533.926	6546052.176
-165320.978	6701124.728

2.2 Heat Flow Measurements

The temperature of the substrate can give an indication of the potential for hydrocarbons beneath the surface. Heat flow measurements will be taken using a thermal probe (Antares thermistors) mounted to the exterior of a gravity core barrel (Figure 2.2). The thermistors are placed along the length of the core barrel on an outrigger made of stainless steel double bands, approximately 50 cm apart. This arrangement can indicate through temperature measurements whether a thermal gradient occurs within the substrate. Heat flow measurements will be collected at 20 locations in 2013 with potential for additional sampling in subsequent years (see Figure 2.1).

Fine, soft sediments (e.g., clays and silts) are required to achieve good penetration by the heat-flow probes. Prior to releasing the gravity corer to sample the substrate, a sub-bottom profiler will be used to determine if any subsurface hazards are present in the sampling area.

The sub-bottom profiler is mounted on the hull of the vessel and consists of an array of transducers driven by a Knudsen CHIRP 3260 top end system with up to 10kW combined on all channels. This sub-bottom profiler has a frequency bandwidth of 2 to 16 kHz; this is within the threshold (less than 228.8 dB measured 1 m from the energy source) stated in the *Geophysical, Geological, Environmental and Geotechnical Program Guidelines* (C-NLOPB 2012).



Source: Seaforth 2013

Figure 2.2 Antares Thermistors (heat-flow probes) Outriggers on Gravity Coring System

2.3 Shallow Core Collection

Substrate cores will be collected to a depth of 3 m using a gravity corer (refer to Figure 2.2 for a picture of the proposed gravity coring system). The gravity corer will be lowered to within 50 m of the substrate. Once positioned (and thermal probe acclimation is completed), the corer will be triggered to release and penetrate into the substrate. Once the core is retrieved, temperature will be recorded at set depths within the core. These temperature measurement supplement the data obtained from the Antares thermistors. Gravity core samples will be collected at 20 locations (see Figure 2.1).

2.4 Study / Project Area

The Study / Project Area for the multi-year geotechnical data acquisition program is illustrated in Figure 1.1. The 2013 survey area is illustrated in Figure 2.1. The 2013 program focuses on the Labrador offshore area, specifically the Hopedale Basin, Saglek Basin, St. Anthony Basin and deepwater area of the Labrador Sea.



2.5 Vessel

As the geochemical data acquisition program is designed to collect information to be used in a basin model, accurate positioning data are key. The data will be collected using a vessel with dynamic positioning capabilities. The vessel will also be required to be able to deploy and retrieve the various sampling equipment proposed as part of the geochemical data acquisition program. And given the Study / Project Area (Figures 1.1 and 2.1), the vessel will also be required to work in the harsh conditions of the Labrador offshore area and the northern Grand Banks/ Orphan Basin/Flemish Pass/Cap areas.

Nalcor O&G will ensure that a certified vessel will be used that is capable of working in Labrador Sea conditions. Nalcor O&G will ensure the selected vessel will have equipment and protocols and procedures in place for prevention of pollution by oil, sewage and garbage in accordance with the *Canadian Shipping Act* and international standards and certification authorities. At no time will a survey vessel enter or attempt to conduct any survey work in restricted or protected areas.

Nalcor O&G will consult with the FFAW on the location of their members who fish in the area and contact the local FFAW representative to provide information on the vessel movements during the survey program.

2.6 Schedule

Nalcor O&G are proposing to conduct the natural seabed seep sample collection, heat probe and gravity core sample collection components of the research program in the fall of 2013 in the areas identified in Figure 2.1. The program is anticipated to require 14 days to conduct all sample collection; Nalcor O&G have scheduled a three-week period to conclude the program, allowing for weather delays. Future programs (2014 to 2018) will be conducted during the ice-free season.

3.0 ENVIRONMENTAL SETTING

Given the generally non-intrusive nature of the proposed project (casting natural seabed seep samplers into the ocean surface using fishing line and collecting heat gradients and cores using a gravity corer from a science vessel), Project-environment interactions are anticipated to be few. If Project-environment interactions occur, the components of the environment most likely to be potentially affected by the proposed Project are species at risk, fish habitat (sediment) and commercial fisheries (vessel conflict). As such, the description of the environmental setting is focussed on those components of the environment.

The 2013 survey will be conducted both along the Labrador Shelf and in deeper waters in the Labrador Sea. Sea surface temperatures are warmest in August and coldest in March. Air temperatures are warmest in July-August and coldest in January-February. The average number of foggy days is highest from May to August. Seasonal sea or pack ice can occur from November to July, with the maximum southern extent occurring from February to the middle of March. Icebergs can occur from March to July, especially in the region nearest the Grand Banks (Husky Energy 2010; RPS Energy 2012).

A number of species at risk (as listed under the *Species at Risk Act* (SARA) or assessed as at risk by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC)) have the potential to occur throughout the proposed Study / Project Area (Figure 1.1), either as sporadic visitors or regular inhabitants. These include the following species listed on SARA Schedule 1: blue whale (Endangered); North Atlantic right whale (Endangered); leatherback sea turtle (Endangered); Ivory Gull (Endangered); white shark (Endangered); northern wolffish (Threatened); spotted wolffish (Threatened); Atlantic wolffish (Special Concern); fin whale - Atlantic population (Special Concern); Sowerby's beaked whale (Special Concern) and polar bear (Special Concern). Barrow's Goldeneye (Special Concern) and Harlequin Duck (Special Concern) are two primarily coastal species that could occur in the Study / Project Area. Eskimo Curlew (Endangered) is thought to be extinct.

Species assessed as at risk by COSEWIC (but are not listed on SARA Schedule 1) that could occur in the Study / Project Area include Atlantic cod - Newfoundland and Labrador population (Endangered), porbeagle shark (Endangered), cusk (Threatened), shortfin mako shark (Threatened), blue shark - Atlantic population (Special Concern), basking shark - Atlantic population (Special Concern), American plaice - Newfoundland and Labrador population (Threatened), roughhead grenadier (Special Concern), roundnose grenadier (Endangered), Atlantic salmon (various populations) (Endangered, Threatened, Special Concern), Acadian redfish (Threatened), deepwater redfish (Threatened). Spiny dogfish (Special Concern), harbour porpoise (Special Concern), killer whale (Special Concern), loggerhead sea turtle (Endangered), beluga whale (various populations) (Endangered, Threatened, Special Concern), bowhead whale (Eastern Canada – West Greenland population) (Special Concern), thorny skate (Special Concern), smooth skate - Funk Island population (Endangered) (note Hopedale Channel and Nose of the Grand Banks populations have been assessed by COSEWIC as Data Deficient; there is also a Flemish Cap population that is outside Canadian jurisdiction, but within the multi-



year Study / Project Area), American eel (Endangered), northern bottlenose whale (Davis Strait-Baffin Bay-Labrador Sea population) (Special Concern) and Atlantic bluefin tuna (Grand Banks of Newfoundland only) (Special Concern).

The Labrador Sea / Grand Banks / Orphan Basin / Flemish Cap is a highly productive ecosystem, with a spring phytoplankton bloom that starts in March and peaks in the spring, followed by a zooplankton bloom; there is another phytoplankton bloom that peaks in the fall (C-NLOPB 2010). Corals are found in deeper waters (>200 m). Northern shrimp, snow crab and Greenland halibut are important commercial fish species occurring within the Study / Project Area. Coral aggregations found in the Labrador Sea (location of the 2013 survey) are located between Makkovik Bank and Belle Island Bank, Saglek Bank and Hatton Basin (C-NLOPB 2010) (note that the 2013 program will not be conducted in these areas).

Commercial fisheries in the Study / Project Area are focused primarily on northern shrimp, which accounts for approximately 85 percent of the harvest in NAFO 2GHJ (Husky Energy 2010), and approximately 60 percent of the harvest in 3KLMN and 2J (RPS Energy 2012). Shrimp spawn in the late summer and fall and are harvested using mobile gear (trawl). Snow crab mate in late winter and spring and are an important component in 3KLMN and 2J; they are harvested using fixed gear (crab pots). Greenland halibut is the other species most often harvested in the Study / Project Area and spawn during December to April; they are harvested using both fixed gear (gillnets and longlines) and mobile gear (otter trawls). These three species account for approximately 95 percent of the harvested fish in the Study / Project Area (C-NLOPB 2010, 2011; Husky Energy 2010).

The southern portion of the Study / Project Area includes the Orphan Basin, Flemish Pass/Cap and the northern Grand Banks. Ongoing oil and gas activities in these areas include exploration drilling, production platforms and seismic surveys.

DFO Research Vessel fall surveys are scheduled for NAFO Areas 2H (first half of October 2013), 2H and 2J (second half of October 2013), 2J + 3K (first two weeks of November 2013), 3K (last two weeks of November 2013) and 3K + 3L Deep (first two weeks of December 2013) (D. Power, pers. comm.). Other potential marine vessels in the Study / Project Area are DND and cruise ships. Nalcor O&G will contact DFO prior to the start of their research program to determine if there are any research vessels in the area. Nalcor O&G will contact DND to determine if there are any naval exercised scheduled during the proposed research program.



4.0 HEALTH, SAFETY AND ENVIRONMENT MANAGEMENT

Nalcor O&G strives for environmental leadership and applies sound environmental management principles focused on prevention of pollution, regulatory compliance and continual improvement to its programs and activities.

Nalcor O&G will ensure the selected vessel will have equipment and protocols and procedures in place for prevention of pollution by oil, sewage and garbage in accordance with the *Canadian Shipping Act* and international standards and certification authorities. Solid wastes, recyclables, hazardous materials and non-biodegradable materials will be stored and returned to shore for proper handling and disposal. At no time will a survey vessel enter or attempt to conduct any survey work in restricted or protected areas.

Transport Canada will conduct a Safety Inspection of the vessel in accordance with requirements of the C-NLOPB. Nalcor O&G will have a representative on board the vessel to accompany Transport Canada during their survey.

Achieving excellence in safety is Nalcor's number one priority and safety is also a shared core value. For Nalcor, safety excellence is more than a way of operating, it is an integral part of the Nalcor identity and our strategy for the future. Nalcor and its subsidiaries are committed to providing a safe and healthy workplace for its employees, contractor personnel, subcontractor personnel, vendors and the general public. The company has established a safety framework that drives our safety initiatives and is built on leadership, procedures and equipment, competence, supportive culture, union management alignment, responsibility and reporting.



5.0 STAKEHOLDER CONSULTATION

Nalcor O&G has initiated contact with the C-NLOPB, providing an overview description of the proposed Project to determine the level of environmental assessment that may be required from the C-NLOPB. Nalcor O&G will continue to consult with the C-NLOPB during the preparation of the environmental assessment to ensure that all potential issues are addressed by the environmental assessment. The official start of the consultation process is initiated with the submission of this Project Description.

Nalcor O&G proposes to meet with the FFAW/One Ocean in St. John's prior to the submission of the environmental assessment to provide details on the proposed Project to the commercial fishing community. Nalcor O&G will also contact via phone or email any local FFAW staff representative as suggested/identified by the FFAW Petroleum Industry liaison. This could include members who are members of the NunatuKavut Community Council (NCC), as the Study / Project Area parallels parts of the Labrador Coast (Cartwright through to the Straits) that NCC members reside/fish.

Nalcor O&G will also meet with the Nunatsiavut Government to provide information on the proposed Project, as the multi-year Study / Project Area parallels the Nunatsiavut Zone (The Zone). The Project will not include any sampling within The Zone.

6.0 REFERENCES

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