



UPDATE REPORT

**ENVIRONMENTAL ASSESSMENT FOR MARINE 2-D SEISMIC
2012-2017 REFLECTION SURVEY
NORTHEAST NEWFOUNDLAND SLOPE**

MULTI KLIENT INVEST AS

**Prepared for:
Canada-Newfoundland and Labrador Offshore Petroleum Board**

**Prepared by:
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On behalf of
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1.0 INTRODUCTION

Multi Klient Invest AS (MKI), a wholly owned subsidiary of Petroleum Geo-Services ASA (PGS) and TGS-NOPEC Geophysical Company ASA (TGS), has entered into a cooperation agreement to conduct a regional marine two-dimensional (2-D) seismic reflection survey. The surveys involve an offshore region that encompasses portions of the Labrador Shelf Orphan Basin (east and west), Flemish Pass Basin and Jeanne d'Arc Basin of the northeast Newfoundland Slope in the Atlantic Ocean (Figure 1). The multi-year survey commenced in September 2012 for a six-year seismic program (2012-2017) between May until November 30th each year on a seasonal basis. MKI is "The Operator". The Project received approval through the Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB).

This document provides an update of the environmental assessment report (YOLO Environmental 2012) prepared on behalf of MKI for the 2-D seismic reflection survey. The C-NLOPB requested a validation of the EA predictions relative to the 2013 program. MKI acknowledged in the EA report that the scope of the Project being assessed extends over several years, during which time the regulatory, biophysical, and socio-economic environment may change from that assessed in this report. MKI will periodically review the EA report, as directed by the C-NLOPB, for current applicability and will work with regulatory authorities to ensure that the EA remains fit for purpose. At the time of application for subsequent program authorizations in the Project Area, MKI will be required to provide information to the C-NLOPB regarding these activities.

1.1 Proponent Information

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1.2 Regulatory Context

There are no regulatory changes that have occurred since the approval of this Project that affect the planned 2014 operations.

2.0 Project Overview

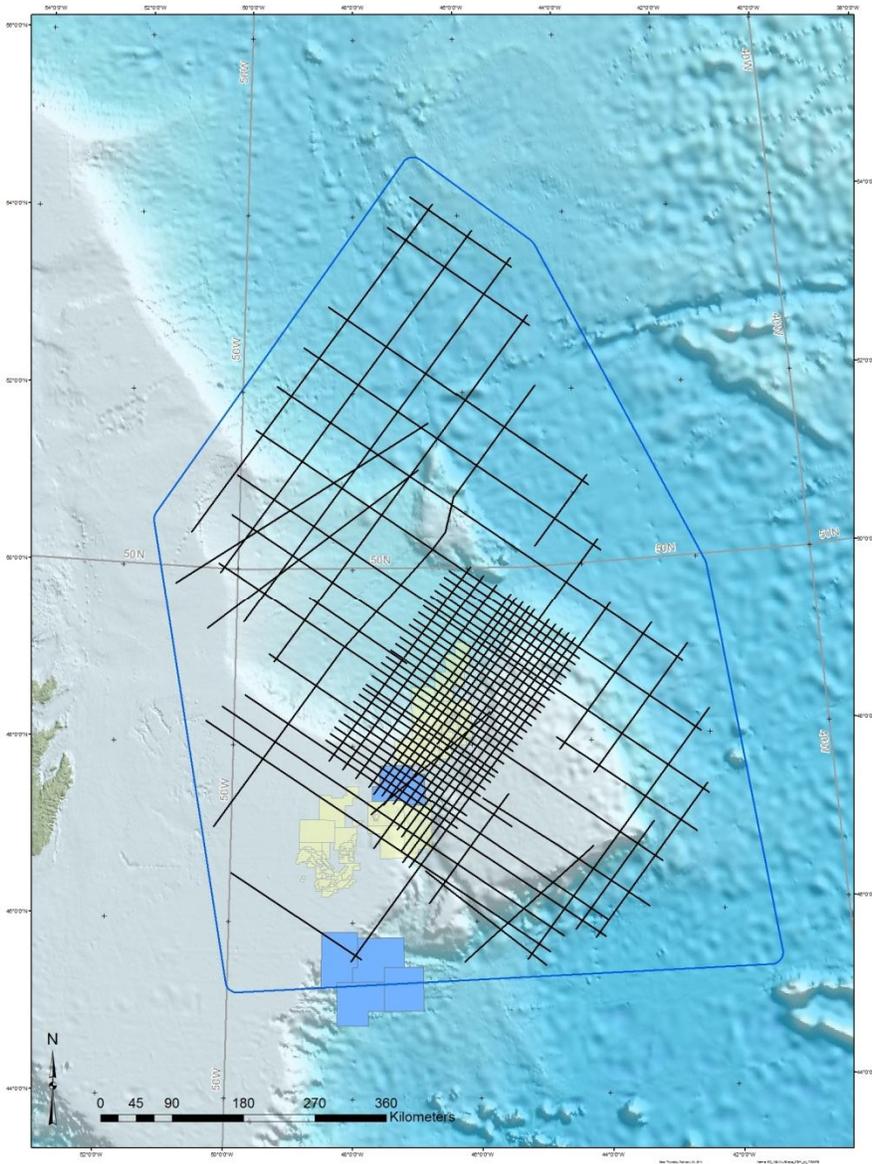
The proposed survey season is June until November for 2014. The exact dates will depend on the location, weather conditions, and vessel availability, although the program is expected to commence on June 1, 2014. Based on previous work on the Newfoundland Slope, weather usually allows productive recording until approximately early November. The vessel will be at sea and operate continuously (i.e., 24-hour operations) during survey operations.

Seismic vessels typically operate on a 5/6 week crew change schedule, which will be maintained for this project. Crew changes will be made via port call.

All seismic equipment being used for the 2014 program will be the same as the 2012 and 2013 programs (Sercel - G Gun 2, 4808 Cubic Inch Array, PGS GeoStreamer®). The vessel will collect gravity data as was the case in 2012 and 2013 and the same equipment will be onboard (a CHEKAN AM GraviMeter).

All mitigations listed in the EA will continue to be adhered to as demonstrated in the 2012 and 2013 programs. There will be two Marine Mammal Observers, two Inuit Observers, and a Fisheries Liaison Officer onboard for the duration of the program, for each rotation. There have been no incidents with fishing vessels during the 2012 or 2013 surveys.

Figure 1 represents the survey area and lines collected in 2012 and 2013. The main priority for the 2014 program is going to focus on the Sector which will be subject of the 2015 Call for Bids which is due to be announced by the C-NLOPB in mid-April. Our current belief is that this Sector will be overlapping and adjacent to the northern area of the 10x10km seismic grid that was acquired as part of this survey in 2012 and 2013. In addition a North West extension to the 10x10 km grid is planned. Detailed maps will be submitted as soon as the announcement of the Sector is made by the C-NLOPB. The Geophysical data to be collected will be within the previously assessed "Project Area".



Date: 2/20/2014

Figure 1. Northeast NF Slope Survey Lines collected 2012 and 2013

2.1 Seismic Vessel

The program will use the same vessel as in the 2012 and 2013 survey programs, the dedicated seismic research vessel, the *M/V Sanco Spirit* (Photo 1).



Photo 1. Survey Vessel M/V Sanco Spirit

The vessel will have equipment, systems, and protocols in place for prevention of pollution by oil, sewage, and garbage in accordance with international standards and certification authorities.

The survey vessel will comply with all applicable regulations concerning management of waste and discharges of materials into the marine environment. The vessel has a ballast water management plan. The International Maritime Organization (IMO; <http://www.imo.org/>) is the United Nations specialized agency with responsibility for the safety of shipping and the prevention of marine pollution by ships. Canada became a member of the IMO in 1948.

2.2 2-D Seismic Survey Towed Array

The seismic air guns for the 2014 program are the same as last two years: Sercel – G Gun 2. The guns have a working pressure of 2000 psi and the typical array is a single source array made up of 4 sub-arrays. The source was towed approximately 127 m astern of the research vessel at a depth of 9m ± 1m. In addition, a single 2D PGS Geo-Streamer® of 8100 m active length was towed. The survey parameters for the program are shown below in (Table 1).

Table 1. Seismic Source Array Specification

Specification	Value
Number of Airgun Arrays	1
Number of Airgun Subarrays	4
Number of Airguns operating at Full Power	40
Maximum Operating Volume	4808 in ³
Operating Pressure	2000 psi
Shotpoint Interval	25 m
Maximum Source Output (zero to peak)	86.25 μbar
Maximum Source Output (peak to peak)	179,1 μbar
Peak Frequency	206 Hz

2.3 Streamer

The vessel will use the same streamer as in 2012 and 2013 - the PGS GeoStreamer® which is a solid streamer. Solid streamers are less sensitive to weather-related noise than liquid streamers and eliminate the potential environmental impact of fluid loss from breaks or tears in conventional fluid-filled streamers. Technical specification of the streamer system is provided in (Table 2).

Table 2. Solid Streamer Specification PGS GeoStreamer®

Skin material	Polyurethane
Outside diameter	62mm
Length of each group	12.5mm
Streamer set-up	8,000m to 10,000m
Manufacture and type of hydrophones	Hydrophones: Teledyne T-2BX or equivalent, Velocity Sensors: PGS confidential (Mark III)
Type of array (e.g., linear, binomial)	Linear
Number of hydrophones per group/distance apart	Hydrophones: 12 per 12.5 m, Velocity Sensors: PGS confidential
Coupling between phones and pre-amp	Capacitive
Sensitivity of near and far group at 1/P to recorder	20V/Bar
Bandwidth over which above sensitivities apply	Specified at 100Hz
Availability of shore-side spares if required	Pool system
Manufacturer and type of depth controller and compass	ION DigiCourse 5011

About 30 minutes prior to arriving at the start of a line, the source array is slowly brought up to a specified power; a ramp-up procedure referred to as a “soft start”. This procedure is an environmental protection measure to permit marine animals the opportunity to temporarily vacate that area if the sound levels are perceived as a disturbance. The source array will be shut down or reduced to a smaller source while the vessel is turning and between survey lines.

This approach is discussed in greater detail below. Vessels towing streamers have reduced manoeuvrability when the equipment is deployed. MKI will include a 10 km vessel turn-around perimeter around the survey area; this activity is within the EA Project Area.

2.4 Marine Mammal Safety Zone and Ramp-up Procedure

MKI will implement a 500 m safety zone monitoring program for marine mammals and sea turtles during survey data acquisition. The air source array(s) will be shut down immediately if a marine mammal or sea turtle listed as endangered or threatened on Schedule 1 of the Species at Risk Act is observed as per the Geophysical, Geological, Environmental and Geotechnical Program Guidelines (C-NLOPB 2012).

An environmental observer, trained for marine mammal observations, will watch for marine mammals and sea turtles from the bridge of the seismic vessel throughout the survey. In addition there will also be an Inuit environmental observer on board the seismic vessel to assist with the marine mammal observations and a further Inuit observer on the support vessel. Safety

zones for marine mammals are commonly defined by the areas within which specific sound level thresholds are exceeded. These have been quantified by the US National Marine Fisheries Service (NMFS) (NMFS 2000) and adopted by DFO in the Statement of Canadian Practice with Respect to Mitigation of Seismic Sound in the Marine Environment (2008). NMFS policy regarding exposure of marine mammals to high-level sounds is that whales should not be exposed to impulse sounds exceeding 180 dB re 1µPa (rms).

In 2005, NMFS specified that Level A Harassment for pulsed sources occurs when an animal is exposed to sound pressure levels of 180 dB re 1 µPa rms (for *cetaceans*) or 190 dB re 1 µPa rms (for *pinnipeds*). The criterion of 160 dB re 1 µPa rms SPL is considered as Level B Harassment for both mammal groups for pulsed sources. In order to address the shortcomings of the 180 to 160 dB rms SPL criteria, the Noise Criteria Group was established, which was sponsored by NMFS. The Noise Criteria Group considers the differential frequency responsiveness of various marine mammal groups and use what are known as M-weighted curves (Southall et al. 2007). The observations were made for the occurrence of permanent threshold shift (PTS) or temporary threshold shift (TTS) in animals' hearing. As a result, the criteria for injury were suggested. In terms of behavioral impacts, Southall et al. (2007) did not propose criteria for sources other than a single impulse (e.g., explosion) for the reasons of context-dependence and other complexities in the nature of behavioral responses and available literature. This is important when considering airgun sounds: the energy in airgun sounds is predominantly at low frequencies (below 500 hertz [Hz]), with diminishing amounts of energy at progressively higher frequencies (Greene and Richardson 1988; Goold and Fish 1998). Baleen whales (*mysticetes*) are most sensitive to low-frequency sounds, and not very sensitive to high-frequency sounds. On the other hand, *odontocetes* or toothed whales (including dolphins and porpoises) are quite insensitive to low frequencies, but very sensitive to mid and high frequencies (Richardson et al. 1995).

NOAA (NMFS and National Ocean Services) released the Draft Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammals (Dec 2013) that produced updated acoustic threshold levels for the onset of TTS and PTS based on further science advances on the topic. The scientific community is moving away from arbitrarily chosen threshold criteria, in particular the 180 dB_{rms} criteria. Based on the NOAA proposed TTS and PTS onset acoustic threshold levels the Level A injury and Level B harassment and behavior sound effects are shown in (Table 3).

Table 3. Injury, Harassment and Behaviour Exposure Criteria for Cetaceans (M-weighted)

Hearing Group	PTS Onset Level A (Injury)	TTS Onset Level B (Harassment)	Level B (Behavior)
Low Frequency <i>Cetaceans</i>	230 dB _{peak} 187 dB SEL _{cum}	224 dB _{peak} 172 dB SEL _{cum}	160 dB _{rms}
Mid Frequency <i>Cetaceans</i>	230 dB _{peak} 187 SEL _{cum}	224 dB _{peak} 172 dB SEL _{cum}	160 dB _{rms}
High Frequency <i>Cetaceans</i>	201dB _{peak} 161 dB SEL _{cum}	195 dB _{peak} 146 dB SEL _{cum}	160 dB _{rms}

Sources: NOAA 2013

The guidance document is under review and has not been adopted by the NMFS nor DFO.

The Statement of Canadian Practice with respect to Mitigation of Seismic Sound in the Marine Environment (DFO 2007) provides guidance to the seismic program, as stipulated in the scoping document. This DFO document aims to formalize and standardize the mitigation measures used in Canada with respect to the conduct of seismic surveys in the marine environment. It is based on a DFO-sponsored peer review by Canadian and international experts.

In May 2008 the C-NLOPB adopted the Statement of Canadian Practice with Respect to the Mitigation of Seismic Sound in the Marine Environment, which, in its entirety, is contained in Appendix 2 of the Geophysical, Geological, Environmental and Geotechnical Program Guidelines (C-NLOPB 2012). MKI will implement the mitigations listed in the statement when planning and undertaking marine seismic surveys, in addition to any other project-specific measures that may be identified during the environmental assessment process. Appendix 2 also describes recommended practices for interaction with other ocean users, particularly fisheries interests, and recommended reporting formats for marine mammal and seabird observations that will be adhered to.

In late March 2014, DFO is holding a national-level Canadian Science Advisory Secretariat (CSAS) process meeting to develop science advice for measures to monitor and mitigate the impacts of seismic survey activities on *cetaceans* and species at risk.

MKI will adhere to the mitigation measures outlined in the Statement of Canadian Practice with Respect to Mitigation of Seismic Sound in the Marine Environment.

2.5 Logistical Support

Details of logistical operations to support the subject geophysical program will largely depend on seismic acquisition company, season, and weather.

2.6 Shore Base

MKI will continue to use the shore facilities in St. John's, Newfoundland.

2.7 Support Vessels

The primary function of the support vessel is to assist in the event of an emergency situations scouting ahead for other ocean users and obstructions. MKI is the operator of the dedicated seismic research vessel, M/V Sanco Spirit. There will be a dedicated support vessel for the duration of the 2014 project as in the past.

2.8 Emissions and Waste Discharges

The vessels and towed array will generate underwater noise. The vessels also generate atmospheric, light, liquid, and solid emissions. Discharges and emissions from this program will be similar to those of any standard marine vessel. These emissions and discharges are described below.

2.8.1 Atmospheric Emissions

Atmospheric emissions will result from vessel and equipment exhaust. These emissions are minor and will be reduced through best management practices and preventative maintenance procedures. These include properly maintaining and routinely inspecting ship equipment, controlling vapor loss from fuel tanks, and avoiding engine idling when not in use. Emissions from ship engines and onboard equipment will comply with the Air Pollution Control Regulations

(Newfoundland and Labrador Environmental Protection Act) and the Ambient Air Quality Objectives *(Canadian Environmental Protection Act)*.

2.8.2 Liquid Emissions

Ballast water is stored in dedicated ballast tanks to improve vessel stability. No oil will be present in these tanks or in any discharged ballast/preload water. If oil is detected to be in the water, it will be tested and, if necessary, treated to ensure that oil concentrations in the discharge do not exceed 15 mg/L as required by the MARPOL 73/78 (International Convention for the Prevention of Pollution from Ships, 1973, and the Protocol of 1978 related thereto), IMO and the Offshore Waste Treatment Guidelines (OWTG) (NEB et al. 2010).

The OWTG were developed specifically for the treatment and control of waste generated by petroleum operations related to exploration and production on Canada's offshore areas. Before discharge, bilge water is treated in accordance with MARPOL 73/78, IMO and OWTG, using an oil/water separator. The extracted water is tested to ensure that the discharges contain no more than 15 mg/L of oil. The vessel has a Ballast Water Management Plan.

2.8.3 Solid Waste

All solid waste will be transferred to shore and disposed of at an approved facility. Any hazardous materials (e.g., oily rags) will be handled separately in hazardous materials containers. Sanitary and food wastes will be macerated to a particle size of 6 mm or less and then discharged as per the OWTG.

2.8.4 Light Emissions

The survey vessel will carry operational, navigation, and warning lights. PGS's vessel *Sanco Spirit* operates under strict "Dark Ship" at night whenever operations allow. This is to enable the lookouts to retain night vision and locate obstructions and the navigation lights of other vessels. Working areas will be illuminated with floodlights as required for compliance with occupational health and safety standards and will be fully equipped with emergency lighting. All deck working lights are shielded and only operate while personnel are present to prevent light pollution that may affect the lookouts. A byproduct of this mode of operation is that it is optimal for the safety of migrating birds.

The *Sanco Spirit* is equipped with a Helideck, it will be floodlit and have omni-directional guidance lights with an average illumination intensity of between 20 and 25 candelas. Hazards in the vicinity of the helideck will also have omni-directional hazard lighting. Lighting will comply with relevant offshore standards/regulations, including Transport Canada's Guidelines Respecting Helicopter Facilities on Ships.

The vessel does use flashing 'safety lantern' lighting on its towed equipment. The *Sanco Spirit* only uses Canadian, Carmanah programmable lanterns. These flash the letter U in Morse code as required by maritime authorities. They are low intensity (intensity is governed by latitude and day length) and close down completely between flashes.

The Leach's Storm Petrel Mitigation Program, (The Leach's Storm-Petrel: General Information and Handling Instruction, Williams and Chardine (1999)), was provided in its entirety in Appendix B of the Environmental Assessment Northeast Newfoundland Slope 2D Seismic Survey Program 2012-2017 by Multi Klient Invest AS (MKI) (YOLO Environmental Inc. for RPS Energy Canada Ltd. April 2012). MKI will adhere to the Leach's Storm Petrel Program.

2.8.5 Potential Malfunctions and Accidental Events

There are unplanned situations that may be encountered during seismic operations. Potential hazards are addressed during site-specific planning as part of emergency response planning. Procedures are developed by MKI to ensure that such events are managed in a safe and environmentally sound manner. MKI has policies, plans, and procedures in place to prevent or mitigate effects of malfunctions and accidents. These policies, plans, and procedures will be located on the seismic vessel, and in MKI's St. John's shore office. During seismic surveys, there will be limited amounts of marine fuel and lube oil onboard that could potentially be spilled to the ocean. All of the vessels involved in the survey will use diesel fuel. MKI understands that it is required to report all safety and unauthorized discharges or spills in a manner consistent with the Incident Reporting and Investigation Guidelines (2012).

The contracted vessel is equipped with solid-streamer technology, as this type of streamer is not reliant on flotation fluid to achieve a neutral ballast state, thus eliminating the risk of an accidental spill from a damaged streamer.

Other accidental events could include damage or loss of seismic equipment, entanglement of seismic equipment with fishing gear, and vessel collisions. Best management practices and communications will be used on the survey vessel to avoid equipment loss or damage. Gear will be retrieved from the water if wave heights reach or exceed unacceptable limits. The unacceptable limits are generally prescribed by the Geophysical Contractor in agreement with the Contractor's and Client's HSE policies, and are based on consideration of multiple factors, including but not limited to the geophysical equipment deployed, the weather conditions at the time, and the short and long-term weather forecasts during survey operations. Generally though, unacceptable limits may occur when wave heights reach or exceed 3 to 4 metres height, though unacceptable limits may occur at shorter wave heights depending upon the above-noted considerations. In case of severe weather, the vessel may return to shore until conditions improve.

3.0 CONSULTATIONS

MKI is conducting ongoing consultations with fishing representatives and organizations, representatives from users of alternative resource sectors within the Study Area, and relevant communities with an interest in the Project.

On February 25th, 2014, a meeting was held separately with the Fish Food and Allied Workers Union (FFAW) and Association of Seafood Producers.

One Ocean was unable to attend the scheduled meeting with FFAW. Two meetings were scheduled with Ocean Choice International, but both were cancelled by OCI. A key Newfoundland Fisheries representative was out of the country and unable to meet. A brief review of last year's activities and information on this year's activities in the form of a PowerPoint presentation was sent to OCI, Newfoundland Fisheries and One Ocean for their review and comments.

DFO was contacted for a consultation meeting and declined on the basis that DFO will be participating in the EA review lead by the C-NLOPB and will offer comments on the project through that process.

Minutes of the meetings relative to this EA update report are provided in Appendix A.

4.0 ENVIRONMENTAL SETTINGS

4.1 Physical Setting

There have been no significant changes in meteorology, climate, physical oceanography, or ice condition in the Study Area from that reported in the 2012 EA report.

Comments on water temperature shifts from fishing organizations indicate significant warming of bottom waters in 2013 that was attributed to affecting location of abundant shrimp catches.

4.2 Biological Environment

There are no changes in populations of plankton, marine birds, marine mammals or sea turtles since submission of the June 2012 EA report.

The FFAW and ASP comments included shrimp catches improving northward of traditional fishing areas. Atlantic halibut population appears to be abundant in 2013 as the Greenland halibut quotas were not reached because the Atlantic halibut by-catch was filled early in the season.

4.2.1 Species at Risk

Since the update in 2013, no new species were listed on Schedule 1 of SARA under the category of special concern (Table 4) lists the Schedule 1 species identified and updated in 2014.

Table 4. SARA Schedule 1-listed COSEWIC-assessed Species Expected to Occur in Study Area

Common Name	Scientific Name	SARA Risk Category	COSEWIC Status
Marine Mammals			
Blue Whale	<i>Balaenoptera musculus</i>	Endangered	Endangered
Fin Whale	<i>Balaenoptera physalus</i>	Special Concern	Special Concern
North Atlantic Right Whale	<i>Eubalaena glacialis</i>	Endangered	Endangered
Sowerby's Beaked Whale	<i>Mesoploden bidens</i>	Special Concern	Special Concern
Marine Reptiles			
Leatherback Sea Turtle	<i>Dermochelys coriacea</i>	Endangered	Endangered
Marine Fish			
Atlantic Wolffish	<i>Anarhichas lupus</i>	Special Concern	Special Concern
Northern Wolffish	<i>Anarhichas denticulatus</i>	Threatened	Threatened
Spotted Wolffish	<i>Anarhichas minor</i>	Threatened	Threatened
White Shark	<i>Carcharodon carcharias</i>	Endangered	Endangered
Sea and Migratory Birds			
Ivory Gull	<i>Pagophila eburnea</i>	Endangered	Endangered
Red Knot <i>rufa</i>	<i>Calidris canutus rufa</i>	Endangered	Endangered

Sources: Species at Risk website

Under Section 32 of the SARA, killing, capturing, and destruction of critical habitat of extirpated, endangered, and threatened species listed under Schedule 1, is prohibited. These prohibitions do not apply to those listed as special concern. Recovery strategies are required for endangered, threatened, and extirpated species and management plans are required for special concern species. SARA is administered by Environment Canada, Parks Canada, and DFO.

MKI submitted the Marine Mammal, Sea Turtle and Seabird Monitoring of MKI's Seismic Program on the Northeast Newfoundland Slope, June-November 2013 report to the C-NLOPB in January 2014 which describes the outcome of the monitoring (Environmental Observations). No significant adverse effects on those species were evident. This monitoring will continue in 2014.

Ecologically and Biologically Significant Areas (EBSAs) have already been identified in each of DFO's five Large Ocean Management Areas (LOMAs), including the Placentia Bay Grand Banks LOMA (PBGB LOMA) as described in Section 5.4.8.1 of the environmental assessment report (YOLO Environmental Inc. 2012). DFO identified additional EBSAs - the study area for which these EBSAs are currently being identified is the Newfoundland and Labrador Shelves Bioregion that is north of the PBGB LOMA (DFO 2013). Off the northeastern coast of Newfoundland and the coast of Labrador, the study area extends eastward from the shoreline to Canada's Exclusive Economic Zone (EEZ) between 49.8°N and 61.1°N and is inclusive of the Northwest Atlantic Fisheries Organization (NAFO) divisions of 2GHJ3K.

The Orphan Spur is the only additional identified EBSA in the Project Area (Figure 2). The following text is directly from the DFO 2013 CSAS report. The Orphan Spur EBSA encompasses a large area that extends along the Labrador Slope and Outer Shelf in NAFO Division 3K, and includes the Orphan Spur and part of the Trinity Trough Mouth Fan. The northern portion of the EBSA extends from 400 m to 2000 m depth, although south of the Orphan Spur the maximum depth is approximately 1000 m. Similar to the Labrador Slope EBSA, this area is high in diversity as a number of species are found here in high concentrations. The dominant data layers identifying this EBSA were those for corals, fish, marine mammals and seabirds, including rare or endangered species. During the Campelen period, high densities of witch flounder, American plaice, Atlantic cod and redfish were distributed throughout the EBSA. Several rare or endangered fish species (spotted, northern and Atlantic wolffish, skates and roundnose Grenadier) were found throughout this EBSA in large concentrations during the Campelen period, with the wolffish species heavily influencing the demarcation of the southwestern boundary. With the exception of planktivores and planktivores, many of the fish functional groups were abundant throughout this EBSA during both Campelen and Engel periods. Several marine mammal and seabird species (e.g., Thick-billed Murre, storm petrels, Black-legged Kittiwake, skuas and jaegers, Northern Fulmar, Greater Shearwater, Dovekie) also frequent this area. Bycatch data have shown that this area seems to be important to several species of sharks. Peer review participants identified that coral bycatch has been recorded to 1300 m depth, and the Orphan Basin area to the east of this EBSA is known to be important for a diverse array of marine birds and other taxa. Although similar habitat types would be expected in the Orphan Basin based on the geomorphology of the area, data are generally limited beyond 1000 m. Therefore further exploration into the ecological significance of this area is highly recommended if management action is contemplated.

DFO considers the seasonal pack ice a unique feature of the entire bioregion (DFO 2013) and the information below is direct from the CSAS report. Although ice provides an important

habitat for a number of species throughout the Newfoundland Shelf, the southern portion of the pack ice is particularly significant.

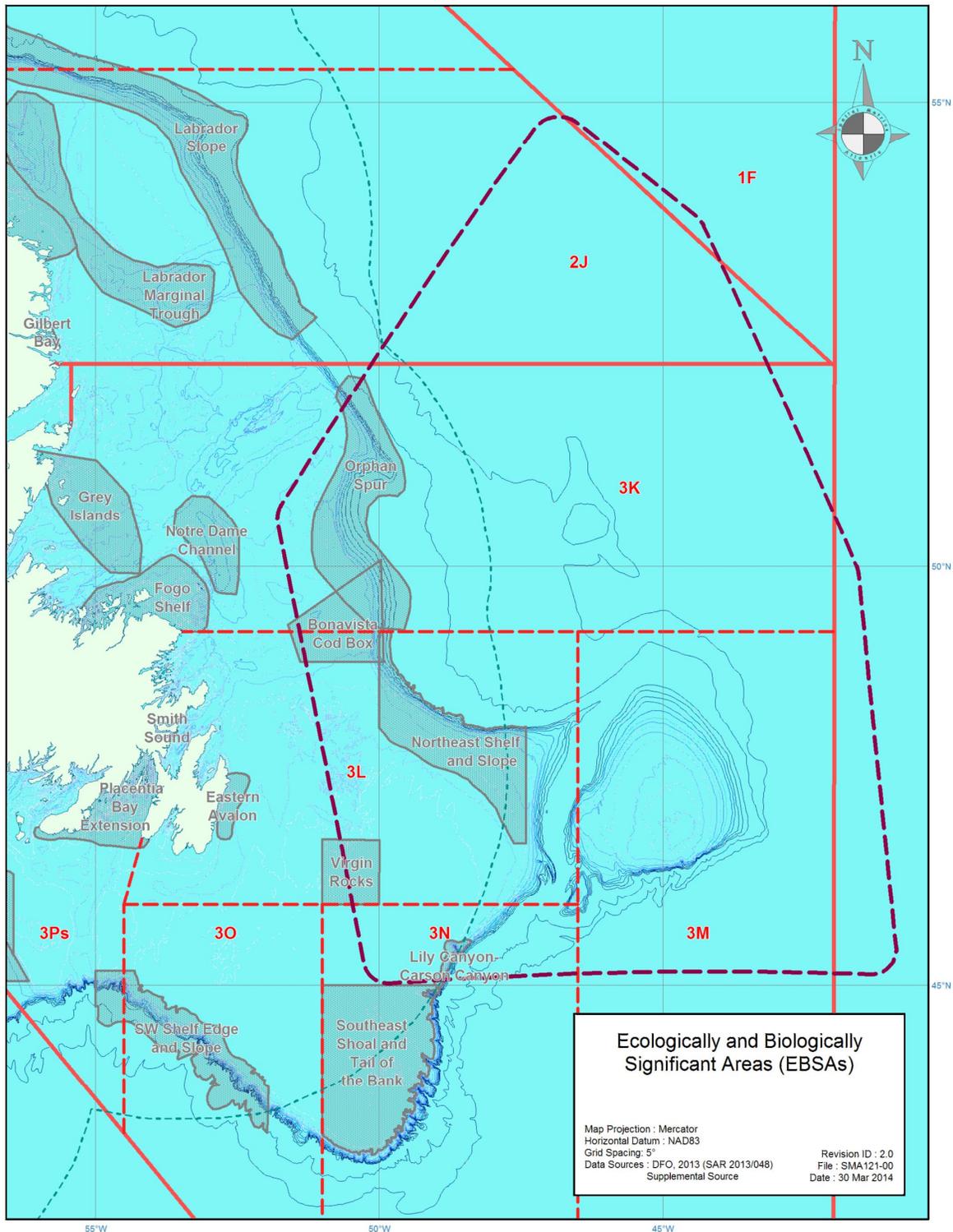


Figure 2. Ecologically and Biologically Significant Areas (EBSAs)

The development and recession of the ice in this region influences a variety of important environmental and biological processes including changes in light penetration, wind driven mixing, salinity, and the timing and extent of the spring phytoplankton bloom. The extent of ice and time of retreat has also been shown to influence the population dynamics of capelin. The southern part of the pack ice is the location of the main pupping concentrations of both harp and hooded seals. Both species rely upon suitable ice extent and thickness to give birth and nurse their pups. Currently, ~70% of all harp seals and >90% of hooded seals give birth in the area although the proportions will likely increase if ice conditions in the Gulf of St. Lawrence continue to deteriorate.

The large concentration of seals using this area provides the basis for a complex ecosystem that includes a variety of marine scavengers, seabirds, including the Ivory Gull, and polar bears.

The bears travel to the area from northern Labrador and Baffin Island to feed intensively during March. The energy gained off southern Labrador maintains them for much of the year. Unlike other EBSAs, the location of the southern pack ice is transitory and varies both within and among years, as it is influenced by winds and currents. However, it is usually located south of Hamilton Inlet, as far south as Notre Dame Bay. Although it cannot be defined by rigid boundaries, the southern pack ice is an area that is highly productive and ecologically important within the Newfoundland shelf ecosystem and the North Atlantic

4.3 Ocean Resources Users

4.3.1 Commercial Fisheries

The commercial fisheries analysis is typically based on data derived from a DFO multi - region and multi - year catch and effort dataset (ZIFF data). The ZIFF datasets are no longer publicly available and the only data source is from NAFO. The NAFO data includes both domestic and foreign catch data and is not geo-referenced to allow for data selection by area for analysis (i.e. relative the EA Study Area) or designated fishing regions such as Shrimp Fishing Areas.

The change in the commercial fisheries in 2010, 2011 and 2012 compared to the 2005 to 2010 dataset is unknown due to the lack of high precision data formally available through DFO-Ottawa. This lack of data comparison is evident in (Figure 2-Figure 4) Discussions with the harvester companies and unions indicate that the harvest time and locations relative to the MKI 2014 survey will be similar as depicted in the EA and previous update reports (Figure 5). Landings on shrimp, snow crab and turbot in the project area in 2012 has not decreased significantly from the pre- MKI surveys in 2010 and 2011 shown in (Figure 6-Figure 8).

Using NAFO data, (Table 5) and (Table 6) show changes in total domestic and foreign landings of the dominant fisheries per the unit areas that the Study Area falls within for 2010 and 2011. Note, that these values are not spatially geo-referenced relative to the Study Area; therefore, no further analysis can be performed spatially or temporally. There is also no means to differentiating catches in shrimp fishing areas from catches in the NAFO areas.

MKI submitted the 2013 Environmental Observation Report which included an FLO summary and weekly FLO reporting to the C-NLOPB which described all encounters with vessels. On three occasions over the course of the survey, the Sanco Spirit encountered 11 fishing vessels, and one survey vessel. There was no interruption in any vessel operations.

Figure 3. Shrimp Fishing Effort, 2010-2012

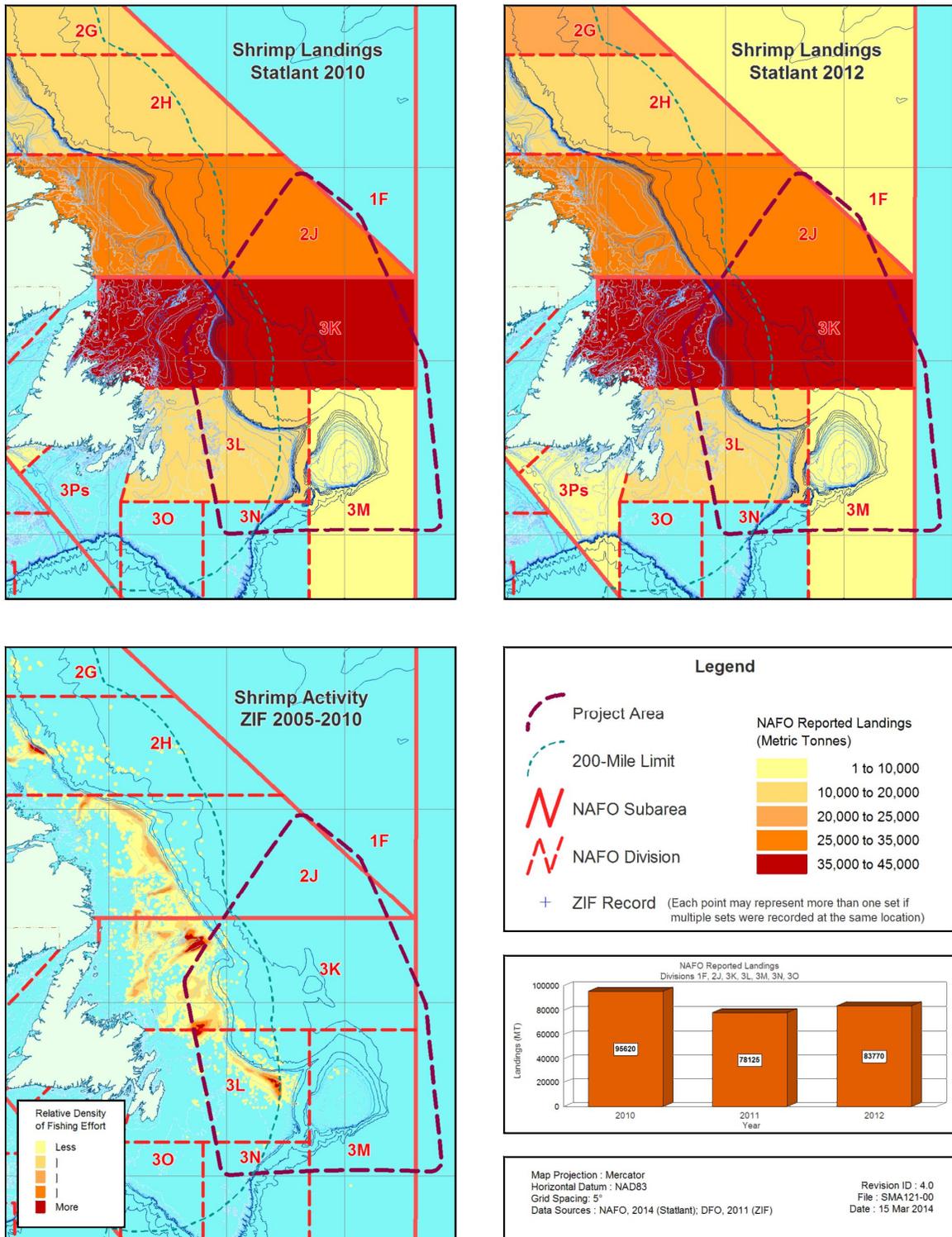


Figure 4. Snow Crab Fishing Effort, 2010-2012

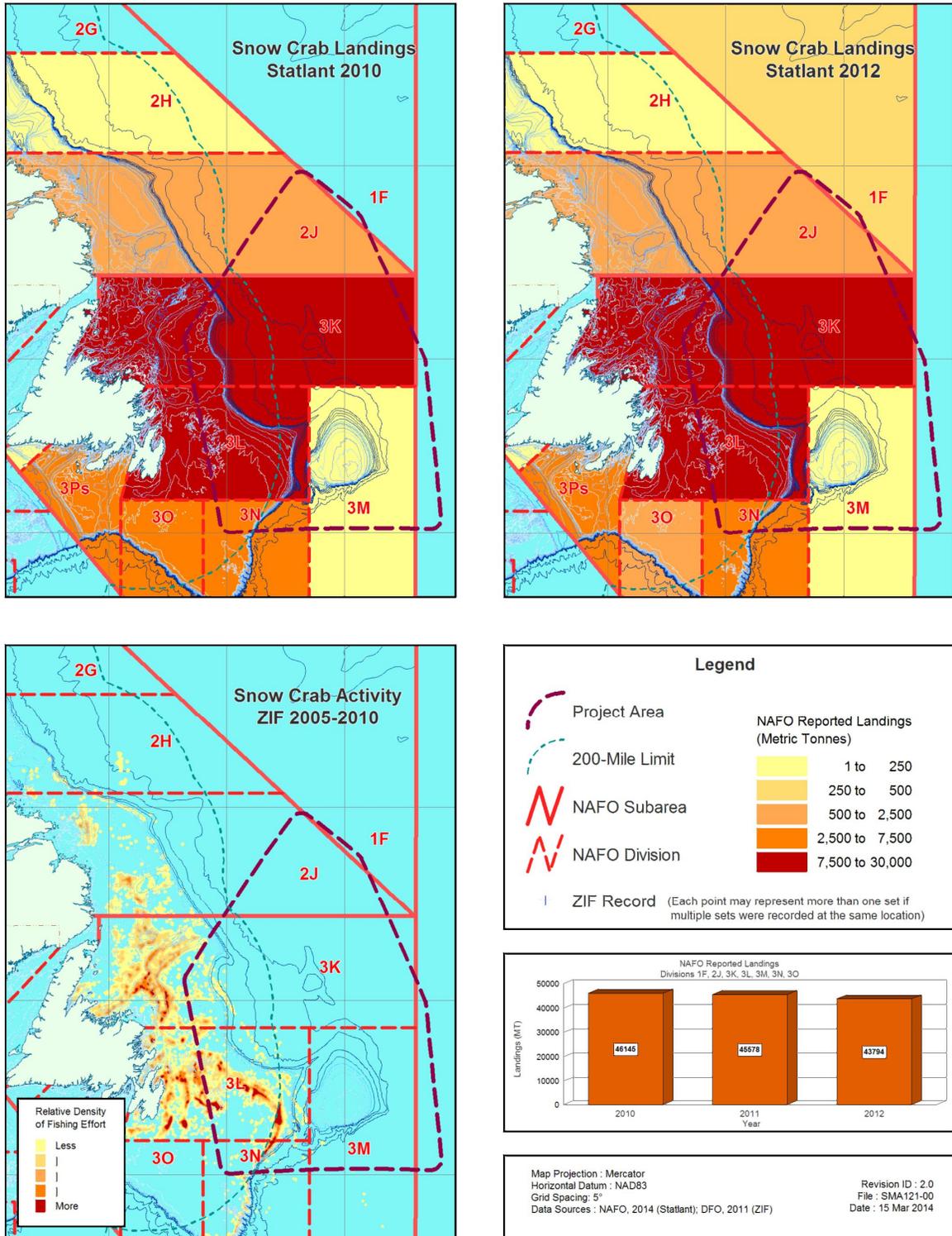


Figure 5. Turbot Fishing Effort, 2010-2012

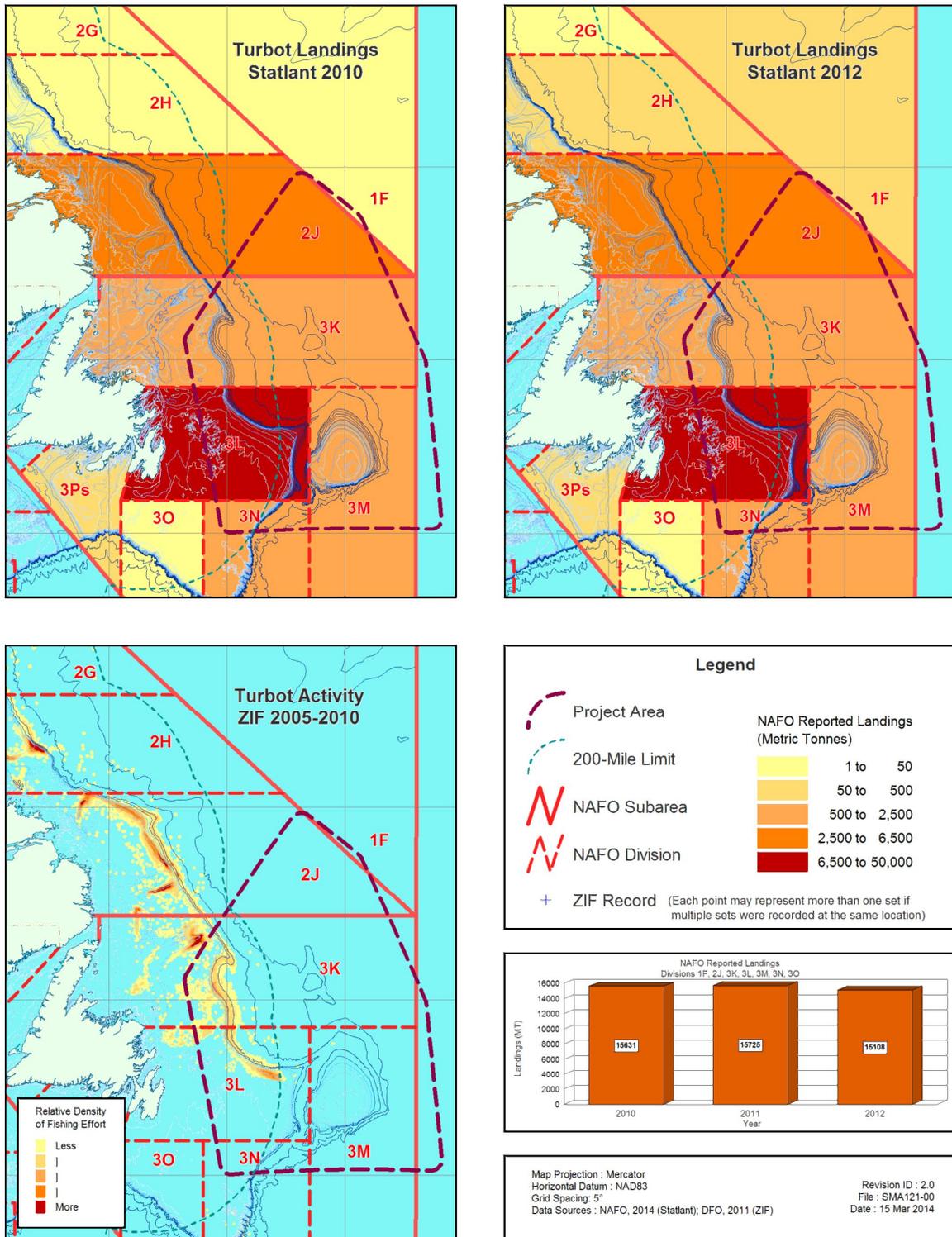
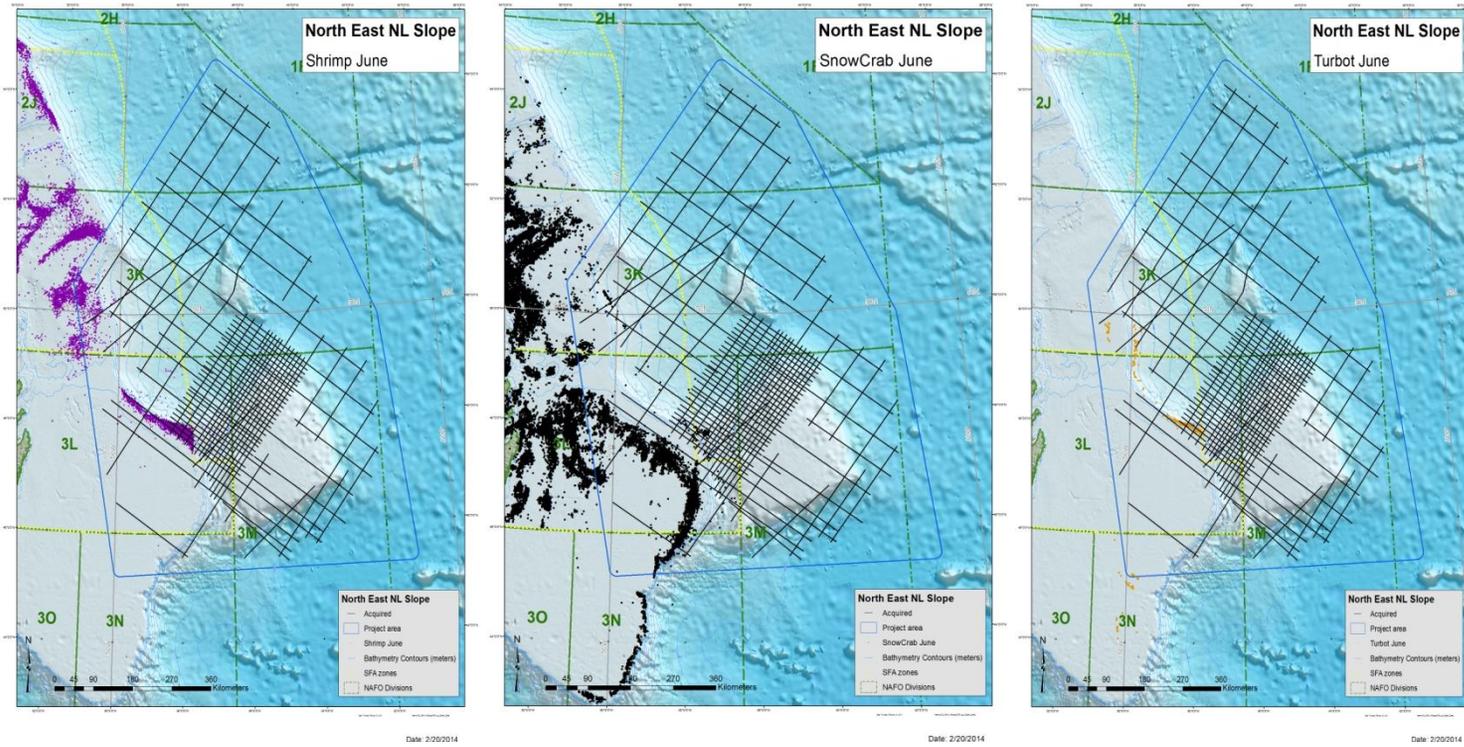


Figure 6. Shrimp, Snow Crab and Turbot Fishing Effort June Relative to the MKI survey Lines



Catch Trends in Project Area

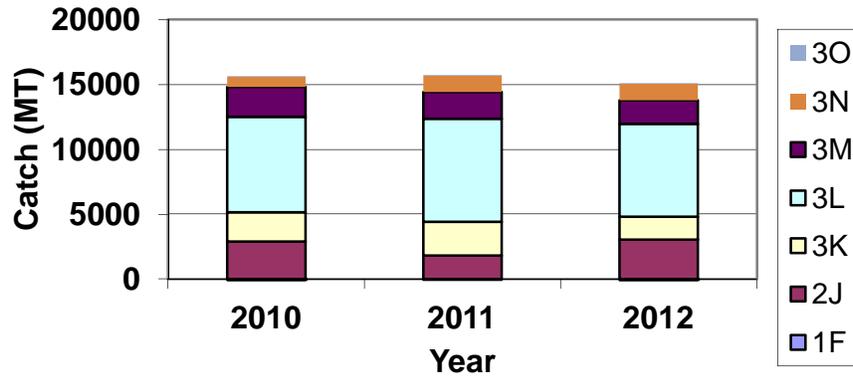


Figure 7. Snow Crab Landing in Project Area, 2010-2012

Catch Trends in Project Area

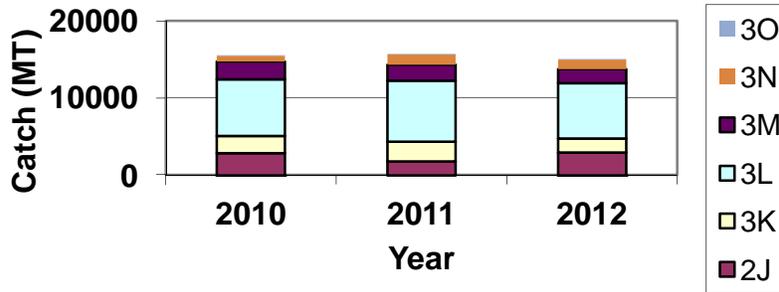


Figure 8. Snow Crab Landings in Project Area, 2010-2012

Catch Trends in Project Area

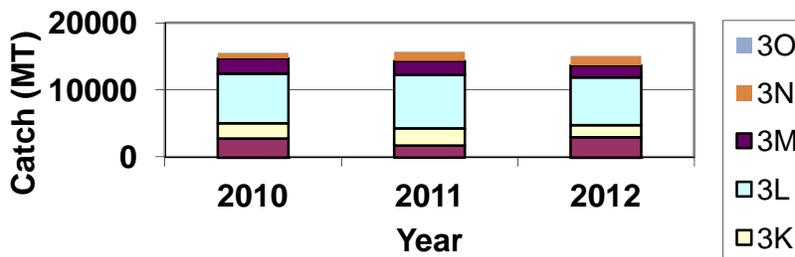


Figure 9. Turbot Landings in Project Area, 2010-2012

Table 5: Change in domestic Landings (MT) for Main Species in Selected NAFO Divisions

Species	Year	2J	3K	3L	3M	3N	Grand Total
Shrimp	2010	30593	43307	13212	0	0	87112
	2011	27644	36257	9276	0	0	73177
	Change	-9.6%	-16.3%	-29.8%	-	-	-16.0%
	2011	27646	36256	9275	0	0	73177
	2012	32654	40641	8075	0	0	81370
	Change	0%	0%	0%			0%
Snow Crab	2010	2031	12427	26308	1	2626	43393
	2011	1896	10771	27266	0	3273	43206
	Change	-6.6%	-13.3%	3.6%	-	24.6%	-0.4%
	2011	1896	10771	27266	0	3273	43206
	2012	1604	8390	28169	0	3474	41637
	Change	-15%	-22%	3%		6%	-4%
Greenland Halibut	2010	2893	2266	1302	0	0	6461
	2011	1835	2579	1664	0	0	6078
	Change	-36.6%	13.8%	27.8%	-	-	-5.9%
	2011	1835	2579	1664	0	0	6078
	2012	2962	1775	1268	0	0	6005
	Change	61%	-31%	-24%	-	-	-1%
Yellowtail Flounder	2010	0	0	115	0	5581	5696
	2011	0	0	167	0	2850	3017
	Change	-	-	45.2%	-	-48.9%	-47.0%
	2011	0	0	167	0	2850	3017
	2012	0	0	199	0	1171	1370
	Change	-	-	19%	-	-59%	-55%
Atlantic Cod	2010	58	1075	1572	4	70	2779
	2011	47	1271	1613	202	34	3167
	Change	-19.0%	18.2%	2.6%	4950.0%	-51.4%	14.0%
	2011	47	1271	1613	202	34	3167
	2012	60	1589	1511	0	11	3171
	Change	28%	25%	-6%	0	-68%	0%
Redfishes	2010	4	57	113	0	2	176
	2011	17	56	1958	2	0	2033
	Change	325.0%	-1.8%	1632.7%	-	-	1055.1%
	2011	17	56	1958	2	0	2033
	2012	39	64	909	0	11	1023
	Change	129%	14%	-54%	-	-	-50%

Table 6. Change in Foreign Landings (MT) for Main Species in Selected NAFO Divisions

Species	Year	2J	3K	3L	3M	3N	Grand Total
Atlantic Cod	2010	0	0	61	5241	542	5844
	2011	0	0	292	9775	546	10613
	Change	-	-	378.7%	86.5%	0.7%	81.6%
	2011	0	0	292	9775	546	10613
	2012	0	0	135	9138	535	9808
Change	-	-	-54%	-7%	-2%	-8%	
Redfishes	2010	0	0	473	8154	2484	11111
	2011	74	0	1590	9670	1819	13153
	Change	-	-	236.2%	18.6%	-26.8%	18.4%
	2011	74	0	1590	9674	1819	13157
	2012	32	0	1881	7708	1524	11145
Change	-57%	-	18%	-20%	-16%	-15%	
Greenland Halibut	2010	0	0	6035	2315	765	9115
	2011	0	0	6296	2022	1314	9632
	Change	-	-	4.3%	-12.7%	71.8%	5.7%
	2011	0	0	6296	2022	1314	9632
	2012	0	0	5890	1815	1293	8998
Change	-	-	-6%	-10%	-2%	-7%	
Shrimp	2010	0	0	6533	1976	0	8509
	2011	1002	208	3738	0	0	4948
	Change	-	-	-42.8%	-	-	-41.8%
	2011	1002	208	3738	0	0	4948
	2012	10	0	2129	0	0	2139
Change	-99%	-100%	-43%	-	-	-57%	
Skates	2010	0	0	146	255	4787	5188
	2011	0	0	95	193	5126	5414
	Change	-	-	-34.9%	-24.3%	7.1%	4.4%
	2011	0	0	95	193	5126	5414
	2012	0	0	132	139	3844	4115
Change	-	-	39%	-28%	-25%	-24%	
Blue Shark	2010	0	0	0	1219	1202	2421
	2011	0	0	0	1753	872	2625
	Change	-	-	-	43.8%	-27.5%	8.4%
	2011	0	0	0	1753	872	2625
	2012	0	0	5	4339	1860	6204
Change	-	-	-	148%	113%	136%	

A qualified Fisheries Liaison Observer (FLO) will be onboard the seismic vessel during the seismic program to liaise with fishers who may have gear deployed in the Project Activity Area, in order to ensure effective and ongoing communication and avoid unnecessary gear conflicts and possible vessel collisions. Entanglement of marine mammals in seismic equipment is not likely since streamers have no tangle gear and marine mammals are expected to avoid the vessel during operations. The trained onboard Marine Mammal Observers (MMO) will keep watch for marine mammals during the survey program.

5.0 CUMULATIVE EFFECTS ASSESSMENT

Individual environmental effects can accumulate and interact to result in cumulative environmental effects. Past and ongoing human activities have affected the region's natural and human environments. The description of the existing environment reflects the effects of these other actions. Past, present and future activities that may impact cumulatively with the Project are outlined in (Table 7).

Table 7. Summary of Offshore Activities and Interactions with the Survey Project

Activity	Information	Interaction with Project
Offshore Petroleum Production	Exxon Mobil's HMDC, further production drilling 2012 – 2014. Ongoing production until 2036.	The active production platform located in study area.
Offshore Petroleum Drilling	Exxon Mobil Hebron Project commence offshore 2016-ongoing Exxon Mobil HMDC production drilling 2012-2014 Husky exploration drilling 2008-2017 Suncor exploration drilling 2009-2017 Statoil exploration drilling 2008-2016	Four drilling rigs planned to operate on the Grand Banks presently and in the future. No spatial overlap anticipated due to distance between programs. Temporal overlap.
Seismic Exploration	WesternGeco 2D+3D in 2012-2015 from May to November over 40- >150 days Husky 2D, 3D, 4D + geophysical surveys, in 2013 – 2020, March to November, Statoil 3D, 2D + geophysical surveys in 2011-2019, April to October Chevron 2D, 3D + geophysical in 2012-2017, May to November, 30 to 120 days	Four programs in the same region with high potential for overlap. Overlap between two WesternGeco surveys in 2011. No spatial overlap due to late season arrival into Study Area in 2012. Possible for future temporal and spatial overlaps.
	Surveys under EA review: TGS NOPEC MBE+SBP in 2014-2019 30-45 days over 8 weeks ArKeX gravity survey by air or vessel, April to October between 2014-2018 EMGS CSEM survey in 2014-2018 from April to November over 60-150 days GXT Ion 2D+gravity+magnetic surveys in 2014-2018 May to December MKI 2D+3D in 2014-2018 May to December, 60 to <120 days HMDC 2D+3D+4D in 2013 to life of field May to December Suncor 2D+3D+4D in 2014-2024 in May to December over 30 to 120 days; VSP in 2014-2024 in March to December over 7 to 14 days; geo-	Six potentially additional programs in the same spatial and temporal region with high potential for overlap in 2014 to 2017.

Activity	Information	Interaction with Project
	hazard in 2014-2024 any time over a few days	
Marine Traffic	Heavy domestic and international marine traffic over the Grand Banks. Highly competitive Atlantic	Project not in shipping channels
Commercial Fishing	Fishing effort is diverse and shifting in response to stock locations	Temporal and spatial overlaps will occur.

In addition to consideration of these projects and activities, the cumulative effects assessment also considers past biological and/or anthropogenic pressures that may have contributed to existing conditions within the Project Area (i.e., commercial whaling). Where applicable, these pressures and the resulting effects are reflected in the description of existing conditions.

5.1 Species at Risk

With the possibility of 11 seismic programs occurring over the Grand Banks in the next four years migratory species may be affected as they pass by them. However, it is highly unlikely that all programs will be concurrent as seismic vessels are limited in availability. The actual planning scheduled locations and coordination of the surveys with stakeholders is not provided in the EA documents of each Operator. Species at risk are capable of avoiding an ensonified area to prevent harmful and disruptive effects provided there are alternative productive areas available and animals are not deterred by concurrent seismic programs. Critical habitats have not been identified on the Eastern Newfoundland region, although the EBSAs identify important feeding, aggregation, spawning areas.

In general, the seismic survey vessel activity and noise will constitute a minor percentage contribution to the overall noise generated by other such sources and space-user conflict, and will be of short duration in local areas. Based on current knowledge, and especially with the proposed mitigation procedures in place, the proposed Project is not expected to result in or contribute to any significant cumulative impacts on species at risk.

5.2 Marine Fish

Although non-significant, the residual effects of the Project components on finfish at risk that may be cumulative with the effects of other human activities in the region are expected to be very limited, consisting primarily of short-term avoidance behavior. The predicted cumulative effects of the proposed seismic survey with other seismic projects, drilling programs, noise from vessel traffic, and commercial fishing are likely similar to those discussed in the assessment. Seismic surveys produce repetitive, localized and short-term increases in ambient noise levels, with the period between potential exposures ranging from hours to days. Within the near field of an array, about 30 m, received noise levels may reach or is less than 180 dB re 1 μ Pa at a sound source from the array at water depths over the Study Area. Beyond this distance, sound from a seismic survey is similar to commercial vessels (MMS 2004). Cooperation between operators is key to avoid each other programs. Also there are only a few vessels available to conduct these surveys; therefore, not all 11 programs will be underway at the same time. Given the existing and future seismic survey activity, the incremental sound made by fishing vessels and commercial vessel traffic will not add significantly to existing ambient noise levels in the Study Area. MKI is making a compromise in its program to avoid the EBSAs during fish spawning periods. Therefore, MKI will not cumulatively add to other seismic operations that may operate in those areas in the spring to early summer.

Considering the significance criteria provided for fish and given that impacts from cumulative vessel traffic, individual projects and other activities in the Study and Regional Areas are not likely to contribute to significant adverse effects. The Project components are predicted to have minimal interaction with fish species at risk and are not anticipated to result in significant cumulative adverse effects to marine fish species at risk.

The main cumulative impact on fish population is the fishing activities that potentially occur at the same time as the seismic exploration. Fish and shellfish are subject to mortality (direct and indirect) and population (stock) decreases as a result of harvesting in the order of 100s to 100,000s of tonnes. And in some species, harvesting is conducted at unsustainable levels and on species that are listed as species-at-risk. Research indicates that adverse seismic related effects are largely of a temporary behavioral level effect. Therefore, seismic surveys will not contribute significant adverse cumulative effects to fish and shellfish populations to the removal effects of fishing. In general, the cumulative effect on fish populations is short-term and localized and not significant to the overall well-being of the fish and shellfish invertebrate species. The proposed Project components are not expected to result in or contribute to any significant cumulative impacts on fish species at risk populations.

5.3 Seabirds

Routine discharges from marine vessels containing petroleum hydrocarbons could cumulatively influence avifauna. Survey vessels used for this Project will comply with discharge regulations established by OWTG and thus should not significantly add to short-term or long-term effects of oil spillage on marine avifauna.

Overall, there are no cumulative adverse effects of this seismic exploration Project expected to occur on the distribution, abundance, breeding status and general well-being of marine avifauna inside and outside the Study Area.

5.4 Marine Mammals

In general, because the sounds generated by seismic surveys are transient and do not "accumulate" in the environment, the most likely cumulative effects will be associated with other concurrent activities (e.g., cargo ships, tankers, petroleum drilling and production activities, other seismic surveys and fishing vessels). Studies in the Gulf of Mexico showed that seismic surveys produce a relatively minor contribution to the overall underwater noise environment (MMS 2004). The cumulative effect is short term, intermittent and localized, and therefore, not significant with respect to effects on marine mammal species at risk.

In general, the individual seismic survey vessel activity and noise will constitute a minor percentage contribution to the overall noise generated by other such sources and space-user conflict, and will be of short duration in local areas. Based on current knowledge, and especially with the proposed mitigation procedures in place, the proposed Project is not expected to result in, or contribute to, any significant cumulative impacts on marine mammal species at risk.

5.5 Sea Turtle

DFO reviewed literature on laboratory and field studies of the effects of sound on marine organisms (DFO 2004a). Because sea turtles are visually and acoustically difficult to detect, the mitigation of observing to avoid is considered less effective than for marine mammals. However, the air source array will be shut down if a sea turtle is observed within 500 m of the

seismic vessel (500 m from the vessel is more conservative than 500 m from the arrays, as the vessel is moving forward at approximately 4 to 5 knots). A trained Marine Mammal Observer will keep records of marine turtles within visual range, weather permitting. Given the lack of systematic surveys for marine turtles in the Study Area, this opportunity for observation of marine turtles will add to the understanding of their distribution in the area and may provide additional insight into their behavioral response to seismic activities.

5.6 Sensitive Areas

The EBSAs in and adjacent to the Study Area support habitats for some species at risk as well as species not at risk. The threats identified to these EBSAs are considered to result from overfishing (proven) and a concern for oil spills from offshore oil production facilities (perception). This seismic program is not changing preferred habitats within the EBSAs, nor resulting in mass removal of species, and their offspring/eggs and or larvae. The Project will not change the physical or chemical requirements that dictate bird, fish, sea turtle and marine mammal presence, and their ability to reproduce. Major impact producing factors on marine mammals in the EBSAs under cumulative effects include offshore vessel traffic (i.e., from petroleum exploration production activities, other seismic projects, military activities, commercial shipping traffic, commercial fishing, and commercial fishing traffic) and its associated noise and ship strike potential. Seismic surveys produce repetitive, localized and short term increases in ambient noise levels, with the period between potential exposures ranging from hours to days. Within the near field of an array, about 700 m, received noise levels may reach or exceed 180 dB re 1 μ Pa. Beyond this distance, sound from a seismic survey is similar to commercial vessels (MMS 2004).

Operators will be cooperating on their programs to minimize spatial and temporal interference. MKI has committed to avoiding the EBSAs before end of July, thus the Project activities are not likely to contribute to significant cumulative adverse effects.

5.7 Ocean Resource Users

5.7.1 Marine Traffic

Effects from vessel traffic under the cumulative scenario are potentially adverse but not significant. With respect to vessel activity levels, seismic survey vessel activity represents a small portion of total vessel activity in this region. Commercial fishing, commercial shipping and ocean study activities also contribute to the cumulative vessel activity level further reducing the relative contribution from seismic surveys. Therefore, the cumulative incremental impact attributed to the Project vessel operations is negligible.

5.7.2 Offshore Petroleum Activity

Shown in (Table 7) are four other seismic programs, four exploration drilling programs, and one development drilling program to overlap temporally. There are an additional six seismic related exploration programs that are under review that noted schedules that commence in 2014. Spatial overlap will require close cooperation between operators. Typically seismic vessels maintain a distance of 40 to 50 km apart to avoid gear entanglement and damage as well as to eliminate air gun interference in data acquisition. The Sanco Spirit will not be surveying in the area of the production platforms or during exploration drilling areas while they are underway.

5.7.3 Commercial Fisheries

Cumulative effects on commercial fisheries are related to the space-use conflicts and noise associated with other users of the offshore resources. Seismic vessel activity is a minor component of total marine transportation. Although the additional vessel activity from the survey is negligible compared to the other vessels and cumulative effects on fishing gear are not significant, any such damage resulting from the Project will be fully compensated, and the Project will thus not increase economic risk to fishers.

In general, because the sounds generated by seismic surveys are intermittent and non-stationary, the most likely cumulative effects will be associated with other concurrent activities (e.g., cargo ships, tankers, oil and gas exploration and production activities, other seismic surveys, fishing vessels). Studies in the Gulf of Mexico showed that seismic surveys produce a relatively minor contribution to the overall underwater noise environment (MMS 2004). The cumulative effect is expected to be short term, intermittent and localized, and therefore, not significant to the success of commercial fisheries.

There is considerable effort from stakeholders to discuss temporal and spatial surveys related to their activities to minimize space conflicts and effects to each other's activities. In the event of another seismic survey being conducted in the vicinity within the proposed timeframe, a significant distance between surveys will be necessary to prevent both operational conflict and acoustical interference. This will reduce or eliminate the likelihood that the sound levels from two surveys will be additive in a particular area, and reduce the potential for cumulative effects on fishing activities.

In general, the seismic survey vessel activity and noise will constitute a minor incremental contribution to the overall noise generated by other such sources and space-user conflict, and will be of short duration in local areas. Based on current knowledge, and especially with the proposed mitigation procedures in place, the proposed Project is not expected to result in or contribute to any significant cumulative effects on commercial fisheries.

6.0 EFFECTS ASSESSMENT OF PROJECT ACTIVITIES

The potential effects of the MKI seismic survey was assessed in the EA report, which concluded that the vessel presence, noise emissions, and accidental events associated with the proposed seismic surveys are not predicted to result in significant adverse environmental effects on fish and shellfish, marine and migratory birds, marine mammals, sea turtles, species-at-risk, sensitive areas, or fisheries in the Northeast Newfoundland Slope Study Area following mitigation (Table 8). Ecological processes will not be disturbed outside natural variability, and ecosystem structure and function will not be critically affected. All effects are predicted to be reversible, of limited duration, limited magnitude, and limited geographic extent.

Table 8. VEC - Specific Mitigation Measures and Follow - Up

VEC	Mitigation Measures	Follow-Up
Species at Risk	<p>Marine Mammal Observers will be present throughout the duration of the survey and they will record sightings of marine mammals and sea turtles on a daily basis.</p> <p>Adherence to the Statement of Canadian Practice with Respect to Mitigation of Seismic Sound in the Marine Environment.</p> <p>A 30 minute ramp-up procedure will be undertaken. Ramping up will be delayed if a cetacean, marine mammal listed as endangered or threatened on schedule 1 SARA species at risk act or sea turtle is observed in the 500 m safety zone.</p> <p>Source will be shut down or reduced to a smaller source while the vessel is doing turns between survey lines.</p> <p>The Marine Mammal Observers will ensure the delay or shut down of seismic operations if SARA Schedule 1 listed endangered or threatened whales are present within 500 m.</p> <p>Any re-start of the source array will follow the ramping up procedure.</p> <p>The vessel will maintain a steady course and speed, and use existing travel routes, where possible.</p> <p>Compliance with vessel's Waste Management Plan, <i>Canada Shipping Act</i> and MARPOL for all discharges.</p> <p>Turtle guard attached to tail buoy of streamers</p>	<p>Records of sea turtle sightings will be reported to the Atlantic Leatherback Turtle Working Group.</p> <p>Sightings data for marine mammals, and turtles will be summarized in an Environmental Observations Report which will be provided to C-NLOPB for their distribution to DFO.</p> <p>Report all safety and unauthorized discharges or spills in a manner consistent with the Incident Reporting and Investigation Guidelines (2012).</p>
Sensitive Areas	Operations will not take place within the Southeast Shoal; and Tail EBSA until after July.	

VEC	Mitigation Measures	Follow-Up
Marine Birds	Light direction and level controls Shielded deck lighting Strobes fixed on towed equipment Low intensity lighting Dark Ship operations at night	Marine Mammal Observers will be present throughout the duration of the survey and they will record sightings of seabirds on a daily basis. Stranding information for birds on the vessel will be summarized in an Environmental Observations Report which will be provided to C-NLOPB for their distribution to DFO and CWS. The operator provides a final report to CWS, based on their Bird Handling Permit empowered by the <i>Migratory Birds Convention Act</i> .
Ocean Resource Users	Before start of the operations, a meeting will be held with MKI representatives to review sail lines, scheduling, anticipated fishing vessels and gear types, mitigating measures, expectations of all parties and Emergency Response Plans. The Fisheries Liaison Officer will be onboard the seismic vessel. A Notice to Mariners on the location and scheduling of seismic activities will be issued. Communication mechanisms will be developed with the fishing industry and DFO research surveys. Fisheries observers on the seismic vessel will monitor fishing activity and serve as a liaison between the fishing and seismic vessels. A Notice to Shipping and notification on the CBC Fisheries Broadcast on the location and scheduling of seismic activities will be issued. MKI will comply with C-NLOPB's compensation guidelines.	The FLO report will be document daily vessel activities and fisher interactions and submitted to the C-NLOPB upon completion of the program. Twice daily vessel position and status information sent to stakeholders. Weekly communications meetings held between MKI, FFAW and Ocean Choice to review look ahead acquisition plan. Updates of the operations are submitted to SPOC for the vessel and liaison with the fishing communities.

An environmental report was submitted to the C-NLOPB under separate cover that describes the marine mammal observation, seabird observations, and sea turtle sightings and fisheries liaison officer communications with commercial vessels for the 2014 survey program. Mitigation actions and compliance are described in that report.

Appendix 2 of the *Geophysical, Geological, Environmental and Geotechnical Program Guidelines* (C-NLOPB 2012) contains recommended environmental planning, mitigation and reporting measures for marine seismic surveys in the NL offshore area. Section I contains verbatim the *Statement of Canadian Practice with Respect to the Mitigation of Sound in the Marine Environment* that describes measures for the planning and conduct of marine seismic surveys that are intended to prevent or minimize potential effects upon the natural environment. Section II contains recommended practices for interaction with other ocean users, particularly fisheries interests, during the conduct of surveys. Finally, Section III contains recommended reporting formats for marine mammal and seabird observations during surveys. MKI ensures that mitigation measures identified in (Table 8) are consistent with the Guidelines.

During the 2012 and 2013 programs, weekly meetings were held between MKI and the fishery representatives (FFAW). Additional contacts with local fishers groups were made by the shore-based Vessel Supervisor. Updates of the operations were submitted to Canning and Pitt Ltd who were the Single Point of Contact (SPOC) for the vessel and liaison with the fishing communities. The vessel information was distributed at noon and midnight every day and included: vessel's position, heading, and estimated position at the end of each 12 hour period. The same communication and reporting structure will be in place for the 2014 survey.

Independently to the above communications, daily and weekly reports from the onboard FLO were submitted to MKI and FFAW, and this will also be adhered to during the 2014 program. A total of 17.38 hours of stand-by were attributed to fishing activities as a result of extended line changes to avoid specific areas where the DFO end of season crab survey was being performed.

In summary, there were no observed significant effects imposed on any VECs, no compensation claims made for gear damage or loss, and no spills were reported. The effects assessment remains consistent as predicted in the EA report.

In conclusion, the residual effects summaries of the EA and addendum reports remain valid.

7.0 REFERENCES

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Appendix A Meeting Minutes
MKI Consultations

**Meeting Minutes
MKI Consultations
For the
Northeast Newfoundland Slope Survey Program 2014**

MEETING MINUTES

Fish Food & Allied Workers Union (FFAW)

Date: Feb 25th, 2014
Time: 10:00 a.m. to 11:10 a.m.
Attendance:

Jerry Whitney	MKI Representative / Petroleum Geo-Services (PGS)
Darlene Davis	MKI Representative/ RPS Canada Ltd (RPS) Cdn Lead Consultancy
Sue Belford	YOLO Environmental Limited (Marine Biologist) (cancelled flight absent)
Robynn Saunders	FFAW
Johan Joensen	FFAW (Arbitration Meeting Absent)
Maureen Murphy	One Ocean (Personal Matter Absent)

The meeting opened with brief introductions, and Robynn Saunders with FFAW advised MKI representatives that Johan couldn't make it due to arbitration meetings and Maureen Murphy with One Ocean had a last minute personal issue come up.

MKI representative gave a presentation that outlined the multi year program (EA 2012-2017) a six year program. MKI is the Operator, which is a cooperation agreement with TGS, just a reminder that MKI is a subsidiary of PGS. The program is funded by MKI and TGS. Data licensed to interested companies to make a profit at end of day.

MKI explained that Nalcor has a vested interest in the project as a pre-committing company. Pre-funding allows Nalcor to work with PGS on the design of the lines etc., like any other company that license data.

(MKI) As a condition of the Geophysical Operations Authorization explained how the C-NLOPB gets a copy of the data every year, which eventually enters the public domain.

(MKI) has been active for two seasons, 2012 and 2013 using the vessel Sanco Spirit on the Northeast Newfoundland Slope. It is MKI intention to return this season on June 1st to resume the multi year program with the same vessel Sanco Spirit. The vessel is equipped with the GeoStreamer® which is state of the art technology.

(MKI) showed a map of data acquired in Newfoundland and Labrador since 2011. On the Labrador program a total of 22,387km was acquired and processed in 2011 & 2012. An additional 2,963km deep basin study was acquired in 2013. On the Northeast Newfoundland Slope survey in 2012, 7,952km was acquired. An additional 14,537 km were acquired in 2013.

(MKI) The Sanco Spirit arrived on the Northeast Newfoundland Slope survey on June 12th and seismic operations commenced from June 14th through until September 11th. The vessel recommenced work on this program on October 14th until November 9th, 2013.

- (MKI) Reviewed the reporting structure used in the previous years,
- Twice daily vessel position and status information sent to stakeholders
 - Weekly communications meetings held between MKI, FFAW and Ocean Choice to review look ahead acquisition plan
 - Updates of the operations were submitted to SPOC for the vessel and liaison with the fishing communities

(MKI) had restricted access to certain lines due to the DFO end of season crab survey

(MKI) / (FFAW) both agreed that the reporting structure used in previous years seemed to work well, and is a good source of information from both sides.

(MKI) has a shore manager stationed in St. John's for the duration of the project; he is always available for assistance.

(MKI) Canning & Pitt Ltd. are contracted as a Single Point of Contact (SPOC) if necessary, primary contact Strat Canning.

(FFAW) Comment: In the deep water there is not a lot of activity, thus less concern.

(FFAW) Comment: FFAW will keep MKI up to date so that MKI could avoid the fishing activity.

(MKI) Demonstrated maps of Shrimp, Turbot, Snow Crab to demonstrate that landings of turbot, crab and shrimp have not changed as dramatically as previously discussed in past years. There was discussion that seismic may have played a role in decreased catches shrimp and crab fisheries. The graphs show more effort and landings northward in Labrador. The information is meant for discussion and insight from the fishing community.

(FFAW) Comment: The Shrimp is decreasing in the south. The effort will still be in division 3L, quota likely not to be as large and fishermen will probably complete their quota sooner than last year (2013).

(FFAW) Comment: The Scallop fishermen are finding empty shells without scallops in the Port au Port Bay, Department of Fisheries & Oceans apparently have run tests and the results are in conclusive. Apparently there was a press release and Robyn will forward along to MKI via email.

(FFAW) Comment: Port au Port the Fishery Committee has been saying, "That the empty shells without scallops are a result of Oil and Gas contamination". They have suggested that onshore to offshore drilling on the Port au Port Peninsula is in their believe a factor. The issue was the lobster resource has been of concern with oil and gas exploration, fishermen are concerned about noise of drilling.

(MKI) Question: Has there been an observed water temperature rise?

(FFAW) Response: There was a Ship wreck west of Fogo Island leaking oil, Coast Guard attempted last spring to lower a device called a cofferdam to catch leaking oil. It moved due to water temperatures reported to be 12 degrees and 9 degrees. Water temperatures are changing, things are changing general warming means cod, decline in shrimp already being noticed this will also affect crab. People will hold onto the high value fishery for as long as they can.

(FFAW) Comment: The Fishery opens April 1st, expect to hear very shortly, anticipating shrimp quota to go down.

(FFAW) Comment: There was an increased effort on the turbot fishery in 2010 and fishermen are experiencing a lot of by-catch of halibut as it is so abundant. Due to there being so much Halibut in the water, it is hard to avoid the by-catch and thus fishermen are reaching their turbot

quota faster, [thus, it could be more like they didn't reach their turbot quota because they reach the halibut by-catch limit]

(MKI) Shared and explained the new land tender system announced from C-NLOPB on December 19, 2013, it was explained that based on this MKI will not be sure until the C-NLOPB finished evaluating and announce the segments in April/May 2014 the focus for acquisition in 2014.

(MKI) MKI focus will be to acquire some data in Northeast Newfoundland Slope as well as MKI Labrador Sea 2014 program for the next two tender rounds. Northeast Slope will be the MKI priority, starting June 1, 2014.

(MKI) Although we have not generated the acquisition map at this time, it is however anticipated that MKI activity will be in the northern part of the dense 2D grid section of the program and additional infill from the lines collected in 2013. Thus with the shrimp, snow crab and turbot fishery mainly focusing in the south, MKI wouldn't not anticipate any fishery interaction.

(FFAW) Comment: In Agreement that there will not be a lot of activity in this area, so shouldn't have any problems.

(FFAW) Comment: MKI will focus on this area based on the C-NLOPB announcement in April/May?

(MKI) Comment: If MKI gets information to the contrary he will let FFAW know soonest.

(MKI) Comment: This is where MKI stands right now with its acquisition plans for 2014.

(MKI) Comment: Last year (2013) was a good season for MKI, there were no issues with the harvesters, good dialogue with stakeholders, and MKI plan to repeat that procedure this year's program 2014.

(FFAW) Question: Is MKI considering bringing in a second acquisition vessel this year?

(MKI) Response: MKI are considering adding an additional vessel, however, at this time the only vessel known and committed to the projects will be the Sanco Spirit.

(FFAW) Comment: The FFAW feels that the way the C-NLOPB is handling the land tender is good for FFAW planning.

(FFAW) Comment: The fishery area known as 3PS is a very sensitive fishery, but until FFAW knows for sure that MKI may have acquisition lines in this area there is no need to set off an alarm. However, if MKI acquisition includes this fishing zone it will need to be mitigated and further discussions with FFAW will be necessary.

(FFAW) Comment: Fishermen in this area have shown in the past that they are very adamant issues with fishermen in this area believing they catch less of their quota due to seismic in or around the area.

(FFAW) Comment: FFAW put much effort into trying to schedule and track the Post season crab survey; this was done with the intention of getting this completed so that MKI could get into the area.

(FFAW) Comment: The fishermen put much effort into this survey, Fishermen can't start the survey until September 1st, and then there are additional factors such as: They need a sea watch observer, need to complete their quota;

(FFAW) Comment; however they need to catch their quota first. If results don't show much of a stock for next year quota will be cut and they may contribute this to seismic activity.

(FFAW) Comment: Based on how fishermen feel about seismic activity, if MKI were to have their program running right alongside this area it would likely present much concern to fishermen.

(MKI) Comment: It would be nice if this could be better scheduled so that operators could spend some time in the area. If MKI knew when the crab survey was to begin the operator could allow some quiet time of two or three weeks prior to the start of the survey.

(FFAW) Comment: The FFAW believe that avoidance is the best on this issue.

(FFAW) Comment: Based on the potential acquisition plan for MKI 2014 season in Northeast Newfoundland Slope that she did not foresee potential issues with the area potentially planned thus far for 2014.

(FFAW) Comment: The further Oil & Gas Industry stays off the shelf better for us with the fishermen.

(FFAW) Question: When would MKI expect a final acquisition map and final schedule to provide to FFAW?

(MKI) Response: MKI anticipates that this could be early May, possible mid May at the latest that a copy of the final acquisition map for the 2014 season will be provided to FFAW.

(FFAW) Statement: MKI would be more than happy to return to FFAW if necessary and meet again when the final area is mapped, if it continues to makes like easier for everyone or just provide the map and conference call to make sure there are no additional questions;

(FFAW) Comment: In terms of planning, that the opportunity to consult with people is now that as the season begins they are less available obviously.

(MKI) MKI committed to email a copy of the presentation to FFAW to share with Johan and others who were unable to attend the meeting. A copy of this presentation was sent to FFAW on March 3, 2014.

(MKI) In Summary, MKI will return to NE Newfoundland Slope Surveys in June 2014.

- *Further infill seismic will be acquired associated with defined Sector for 2015 Call for Bids;*
- *Acquisition will commence on NE Newfoundland Slope Survey upon vessel arrival ;*

- *Expected acquisition in northern part of project area will avoid heavily fished areas in June;*
- *Will continue weekly communication meetings with FFAW & OCI;*
- *Avoidance of fixed gear and actively heavily fished areas;*
- *Weekly acquisition plan established and circulated;*
- *As in previous seasons;*
- *Support vessel;*
- *FLO present on seismic vessel;*
- *Twice daily broadcast of seismic vessel position and status;*
- *MMO's and Inuit Observer present on seismic vessel;*
- *Inuit observers/FLO on board support vessel;*

Meeting adjourned.

MEETING MINUTES

Association of Seafood Producers

Date: February 25, 2014

Time: 3:30pm-4:30pm

Attendance:

Jerry Whitney	MKI Representative / Petroleum Geo-Services (PGS)
Darlene Davis	MKI Representative/ RPS Canada Ltd (RPS) Cdn Lead Consultancy
Sue Belford	YOLO Environmental Limited (Marine Biologist)
Derek Butler	Association of Seafood Producers

The meeting opened with a brief introduction for those in attendance.

(MKI) explained the relationship between MKI, YOLO Environmental, and RPS Energy and their roles in the MKI Northeast Newfoundland Slope survey.

(MKI) explained the existing Environmental Impact Assessment on file with the C-NLOPB and the purpose of the consultation and intent to finalize and update document on the EA for the C-NLOPB.

(MKI) explained that they visit with a number of stakeholders and that he felt that Seafood Producers should be included in the meetings.

(YOLO) reminded Association of Seafood Producers that she had made contact to meet with them in person and was previously advised that they were happy with email communications on potential projects due to time restraints in the past.

(AOSP) agreed that in the past he was happy with communications via email.

(MKI) gave a brief presentation to explain the multi year program from 2012-2017 Northeast Newfoundland Slope.

(MKI) showed the acquisition to date collected in 2012 & 2013 season and shared their intention to return to the NE NF Slope this 2014 season.

(MKI) showed the history of the Labrador Sea program (2011-2013) and the data collected in this area.

(AOSP) Question: What is the distance shown in the course grid lines of the program?

(MKI) Response: Larger line spread over 100km, explained broad line spacing and MKI intent down the road to infill program.

(MKI) presented a map of data acquired in Newfoundland and Labrador since 2011. On the Labrador program a total of 22,387km was acquired and processed in 2011 & 2012. An additional 2,963km deep basin Study was acquired in 2013. On the Northeast Newfoundland Slope survey in 2012, 7,952km was acquired. An additional 14,537 was acquired in 2013.

(MKI) In 2013, the Sanco Spirit arrived on the Northeast Newfoundland Slope survey on June 12th and seismic operations commenced from June 14th through until September 11th. The vessel departed this survey to collect data on the Labrador Sea survey and the vessel recommenced work back on this program on October 14th until November 9th, 2013.

(MKI) Reviewed the reporting structure used in the previous years,

- Twice daily vessel position and status information sent to stakeholders;*
- Weekly communications meetings held between MKI,FFAW and Ocean Choice to review look ahead acquisition plan;*
- Updates of the operations were submitted to SPOC for the vessel and liaison with the fishing communities;*

(MKI) Comment: MKI offered to send daily position and status to any groups interested in receiving them

(MKI) Comment: MKI had restricted access to certain lines due to the DFO end of season crab survey

(AOSP) Comment: (DFO) End of season survey Trial survey on crab, they have been doing this for many years, this directly impacts quota decisions.

(MKI) Comment: Crab season finishes end of June early July, would be good to get in this area after this if the crab survey doesn't start until at least Sept 1, but MKI cannot get any schedule other than sometime after Sept 1, FFAW and DFO try to keep MKI informed when it has been completed,

(MKI) would like it if there could be a better schedule.

(MKI) Although we have not generated the acquisition map at this time, it is however anticipated that MKI activity will be in the Northern part of the dense 2D grid section of the program and additional infill from the lines collected in 2013. Thus with the shrimp, snow crab and turbot fishery mainly focusing in the south, MKI wouldn't not anticipate any fishery interaction.

(YOLO) Presented maps in the presentation Shrimp, Snow Crab and Turbot fishing effort; Comments:

- You can see an idea of the shrimp concentration based on data provided by DFO. This data are not the traditional ZIFF data which are no longer obtainable, but larger scale Statlant data which is only provided by NAFO divisions and not by shrimp fishing areas.*
- They show from yellow to red in terms of more effort between 2010-2012 (These are shown in the tables of the 2013 EA Update).*
- Comments were a dramatic shrimp decrease in the past years, this shows that shrimp landings are comparable from year to year. More effort is increasing northward.*

(AOSP) Comment: Seafood producers can get spatial distribution data from DFO.

(AOSP) Comment: Shrimp quota decreasing dramatically in the south and increasing in the north. The quota in 3L is expected to decrease as fewer vessels are fishing in that area.

(AOSP) Comment: The harvesters trying to get turbot are having issues 3PS with Halibut by catch, so they are catching too much halibut and not as much turbot because they are reaching their halibut by-catch quota.

(AOSP) Comment: Each boat has a certain amount to catch; the economics are such that fishermen are leaving the fishery. Crab landings in 3L is very strong, likely see a small increase, fishers took 70% of the allowable quota. Crab landings in 3K are decreasing.

(AOSP) Comment: Fishing areas 2J is in trouble as well as fishing area 3K trouble (down 15% likely)

(AOSP) Comment: It is believed that the Shrimp are heading back North. Sea bottom temperatures warming as the Gulf Stream flows under the cold Labrador Current, as the Gulf Stream shifts northward. Seeing colder water in 3Ps from the Labrador current.

(AOSP) Comment: What happens when ground fish come back and shell fish leave, we don't manage fish we manage behavior.

(MKI) Comment: The new Land Tender system was announced by the C- NLOPB on Dec 19/2013.

(MKI) Comment: The system is designed to improve predictability, encourage new entrants, provide a longer timeline to acquire data to support license round.

(MKI) Offshore divided into eight regions, Jerry explained the process.

(MKI) East NF two year cycle makes it priority for MKI.

(MKI) presented catch data for June 2005-2010 to show that in June shrimp activity is down in the south of project area, crab turbot around the shelf edge.

(AOSP) Comment: 3L shrimp fishery is ending earlier and earlier, fewer crab participants to this fishery will take a little longer.

(MKI) Question: If the quota has gone down, then I assume that the amount of effort needs to increase to make the quota?

(AOSP) Question: Do you have the maps for shrimp that goes through until October?

(MKI) Response: We have all the fishing months mapped out.

(AOSP) Comment: There will be a full assessment of shrimp next year and I will share this information with MKI.

(MKI) MKI believe the area that will be defined will be in the northern area, top of small grid area foresee no crab or shrimp interactions in this area.

(MKI) In Summary, MKI will return to NE Newfoundland Slope Surveys in June 2014.

- *Further infill seismic will be acquired associated with defined Sector for 2015 Call for Bids;*

- *Acquisition will commence on NE Newfoundland Slope Survey upon vessel arrival ;*
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- *Twice daily broadcast of seismic vessel position and status;*
- *MMO's and Inuit Observer present on seismic vessel;*
- *Inuit observers/FLO on board support vessel*

(AOSP) Comment: The fisheries are very large in Africa, the Gulf of Mexico has undergone much more seismic activity than Newfoundland, vessel activity and harvesting have been living side by side for the last 30 years

(AOSP) Comment: Lots of room out there to cooperate

(AOSP) Comment: Derek sits on the one ocean board

(MKI) Thank you for taking the time to meet with us today. I will send you a copy of the presentation.

Meeting adjourned