

**CANADA-NEWFOUNDLAND and LABRADOR OFFSHORE
PETROLEUM BOARD
CEA ACT SCREENING REPORT**

PART A: GENERAL INFORMATION

Screening Date	June 10, 2011
EA Title	Environmental Assessment of Chevron's North Grand Banks Regional Seismic Program, 2011-2017
Proponent	Chevron Canada Limited (CCL) 500 – 5th Avenue SW Calgary, AB T2P 0L7
Contact	Ms. Jennifer Wyatt Environmental and Regulatory Specialist
C-NLOPB File No.	26006-020-002
CEAR No.	11-01-59815
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CEAA Law List Triggers	Paragraph 138(1) (b) <i>Canada-Newfoundland Atlantic Accord Implementation Act</i> (Accord Act)

Part B: PROJECT INFORMATION

On January 7, 2011, Chevron Canada Limited (Chevron) submitted a project description *North Grand Banks Regional Seismic Program, 2011-2017 Project Description* (LGL 2010) to the Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB), describing its plans to conduct 2D and/or 3D seismic surveys and geohazard programs offshore Newfoundland in the region between the northern Grand Banks and the Orphan Knoll. Chevron may conduct 2D or 3D seismic surveys and geohazard surveys in one or more years within the 2011-2017 timeframe. Chevron submitted the *Environmental Assessment of Chevron's North Grand Banks Regional Seismic Program, 2011-2017* (LGL 2011a) on March 14, 2011. On May 11, 2011, the C-NLOPB requested additional information from Chevron to respond to review comments on the March 14 submission. On May 18, 2011, Chevron responded to the review comments, via the *Addendum to the Environmental Assessment of Chevron's North Grand Banks Regional Seismic Program, 2011-2017* (LGL 2011b).

The remainder of Part B summarizes the proposed project, the related environmental setting and existing human use of the area, based on the abovementioned information.

1 Description of Project

The North Grand Banks Regional Seismic Program, 2011-2017, as proposed by Chevron, is a series of 2D and/or 3D and geohazard survey programs in the Newfoundland and Labrador offshore area over a seven year (2011 to 2017) period. The proposed Project is a ship-based seismic program which is designed to acquire 2D and/or 3D data approximately 340 km to 620 km northeast of St. John's, NL. The geographic coordinates (latitude, longitude; datum NAD83) of the approximate "corners" of the Project Area, starting in the northwest and moving clockwise are as follows: NW = 49°51'28"N, 46°7'18"W; NE = 49°25'6"N, 44°47'57"W; SE = 47°13'0"N, 46°50'5"W; SW = 47°41'4"N, 48°10'50"W; W = 49°10'18"N, 47°31'57"W. The Project Area encompasses a 37,050 km² area including a 10 km buffer area for vessel turning. The Study Area encompasses a 62,960 km² area and includes the Project Area plus a 20 km buffer area around the Project Area. In 2011, Chevron is proposing to conduct a 2D and/or 3D seismic survey in an area extending from the northern Grand Banks to Orphan Knoll. Additional seismic surveys may be conducted within the Project Area in 2012 to 2017. Geohazard surveys may be conducted over potential drilling targets within the Project Area in 2012 to 2017. The geohazard surveys will be conducted using a smaller vessel and a combination of smaller scale seismic equipment, sonars, and a boomer. There may be additional 2D and/or 3D seismic surveys and two geohazard surveys in any one year from 2012 to 2017. The 2D and/or 3D surveys, in any given year from 2011 to 2017, will occur between 1 May and 30 November. Geohazard surveys may be conducted at any time of the year. In 2011, the duration of the proposed 2D and/or 3D seismic survey is estimated at 30 to 90 days. In 2012 to 2017, it is estimated that seismic surveys may occur from 30 to 120 days. Data for geohazard surveys may be collected during a two-week period.

In 2011, Chevron is proposing to acquire approximately 6400 linear km of multi-streamer seismic survey data within the Project Area and considering the acquisition of about 1500 km² of 3D seismic. The seismic survey ship will tow a sound source (airgun array) and streamer(s) composed of receiving hydrophones. No geohazard surveys are planned for 2011.

2 Description of Environment

The following sections provide a summary of the environmental factors described in the EA Report. A complete description of the biological and physical environment can be found in that report.

2.1 Physical Environment

The survey will be conducted in water depths ranging from < 200 m to > 3500 m. The sea surface temperature is warmest in August with a mean temperature of 12.3°C and coldest in February and March with a mean temperature of 1.6°C. The mean sea surface temperature is colder than the mean air temperature from May to August, with the greatest difference occurring in the month of July.

The atmosphere is coldest in February with a mean temperature of 0.1°C, and warmest in August with a mean temperature of 12.6°C. Winter has the highest frequency of precipitation with 33.6 % of the observations reporting precipitation. Snow accounts for the majority of precipitation during the winter months, accounting for 55.4% of the occurrences of winter precipitation. Summer has the lowest frequency of precipitation with a total frequency of occurrence of 13.5%.

Wind speed and direction data were chosen from grid point 13428 located at 48.0°N 46.3°W and grid point 14697 located at 48.8°N 46.3°W to represent conditions within the Project Area. Wind speeds during the fall (October – December) and the winter (January – March) exceed 9 m/s with an upper limit of 12.1 m/s in January. Wind speeds decline in the spring (April – June) and summer (June – August) with a range of 6.2 m/s to 9.0 m/s. There are no wind speeds reported during the summer greater than 25 m/s.

The presence of advection fog increases from April through July. The month of July has the highest percentage of obscuration to visibility, most of which is in the form of advection fog, although frontal fog can also contribute to the reduction in visibility.

The two major current systems in the area are the Labrador Current and the North Atlantic Current. The Labrador Current consists of two major branches. The inshore branch of the Labrador Current is approximately 100 km wide and is steered by the local underwater topography through the Avalon Channel. The stronger offshore branch flows along the shelf break over the upper portion of the Continental Slope. This branch of the Labrador Current divides east of 48°W, resulting in part of the branch flowing to the east around Flemish Cap and the other flowing south around the eastern edge of the Grand Banks and through Flemish Pass.

This flow transports cold, relatively low salinity Labrador Slope water into the region. To the southeast of the Flemish Cap the North Atlantic Current transports warmer, high salinity water to the northeast along the southeast slope of Grand Bank and the Flemish Cap. The additional freshwater in spring and summer is largely confined to the waters over the shelf.

Wave climate in the study area was assessed by using the MSC50 data for Grid Points 13428 and 14697. The majority of wave energy comes from the southwest, and accounts for 33.9% of the wave energy at grid point 13428. At Grid Point 14697 the majority of wave energy is from the southwest, accounting for 32.9% of the wave energy. The dominant wave height is between 1.0 and 3.0 metres at both grid points. There is a gradual decrease in frequency of wave heights above 3.0 m and only a small percentage of the wave heights exceeding 8.0 m can be found.

The maximum extent of pack ice in the Study Area is in February. The Canadian Ice Service's 30-Year Frequency of Presence of Sea Ice in the area shows that the area is affected by sea ice beginning the week of January 15 and lasting until the week beginning May 7. Analysis shows that icebergs have been spotted within the region from December to August however they are most prominent during the month of June. With respect to size, the most prominent icebergs are medium sized, accounting for 26.3% of observed icebergs within the region. Large icebergs occur 8.2% of the time.

2.2 Biological Environment

2.2.1 Species at Risk

There are a number of Species at Risk, as defined under Schedule 1 of the *Species at Risk Act* (SARA) that are likely to be within the Study Area. The following table identifies species likely to be present and their SARA listing and the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) status. A brief description of species listed as endangered or threatened on Schedule 1 is included below.

SPECIES	SARA Status	COSEWIC Status
Blue Whale (<i>Balenoptera musculus</i>)	Schedule 1 – Endangered (May 2002)	Endangered (May 2002)
North Atlantic Right Whale (<i>Eubalaena glacialis</i>)	Schedule 1 – Endangered (2003)	Endangered (May 2003)
Fin Whale (<i>Balaenoptera physalus</i>)	Schedule 1 – Special Concern (May 2005)	Special Concern (May 2005)
Leatherback Turtle (<i>Dermochelys coriacea</i>)	Schedule 1 – Endangered (May 2001)	Endangered (May 2001)
Ivory Gull (<i>Pagophilia eburnea</i>)	Schedule 1 – Endangered (April 2006)	Endangered (April 2006)

Northern Wolffish (<i>Anarhichas denticulatis</i>)	Schedule 1 – Threatened (May 2001)	Threatened (May 2001)
Spotted Wolffish (<i>Anarhichas minor</i>)	Schedule 1 – Threatened (May 2001)	Threatened (May 2001)
Atlantic Wolffish (<i>Anarhichas lupus</i>)	Schedule 1 – Special Concern (2000)	Special Concern (November 2000)
Atlantic cod (<i>Gadus morhua</i>)	Schedule 3 – Special Concern (May 2003)	
Atlantic cod (<i>Gadus morhua</i>) NL population		Endangered (April 2010)
Porbeagle shark (<i>Lamna nasus</i>)		Endangered (May 2004)
White shark (<i>Carcharodon carcharias</i>)		Endangered (April 2006)
Cusk (<i>Brosme brosme</i>)		Threatened (May 2003)
Shortfin mako shark (<i>Isurus oxyrinchus</i>)		Threatened (April 2006)
Blue shark (<i>Prionace glauca</i>)		Special Concern (April 2006)
American plaice (<i>Hippoglossoides platessoides</i>)		Threatened (April 2009)
Basking shark (<i>Cetorhinus maximus</i>)		Special Concern (November 2009)
Roughead grenadier (<i>Macrourus berglax</i>)		Special Concern (April 2007)
Roundnose grenadier (<i>Coryphaenoides rupestris</i>)		Endangered (November 2008)
Atlantic salmon (<i>Salmo salar</i>) various		Endangered, Threatened, Special Concern (November 2010)
Acadian redfish (<i>Sebastes fasciatus</i>) Atlantic population		Threatened (April 2010)
Deepwater redfish (<i>Sebastes mentella</i>)		Threatened (April 2010)
Spiny dogfish (<i>Pagophila ebumea</i>)		Special Concern (April 2010)
Sowerby's beaked whale (<i>Mesoplodon bidens</i>)	Schedule 3 – Special Concern (November 2006)	Special Concern (November 2006)
Harbour porpoise (<i>Phocoena phocoena</i>)	Schedule 2 – Threatened (April 2006)	Special Concern (April 2006)
Killer whale (<i>Orcinus orca</i>) NW Atlantic/E Arctic populations		Special Concern (November 2008)
Loggerhead sea turtle (<i>Caretta caretta</i>)		Endangered (April 2010)

Blue whales are in the low hundreds in the NW Atlantic and have been sighted only sporadically off the NE coast of Newfoundland. There were no sightings of blue whales in the Study Area in the DFO cetacean sightings database. During a Controlled Source Electromagnetic monitoring program in 2007, there were two sightings of blues whales in the Study Area, both of which occurred in August and in water depths of 2366 m and 2551 m (Abgrall et al. 2008). Blue whales are considered rare in the Study Area. A recently proposed Recovery Strategy (DFO 2009) for blue whales is available with a long-term recovery goal to reach a total of 1000 mature individuals through the achievement of three 5-year objectives. A recovery action plan will be developed by 2014.

The total population of North Atlantic Right Whale currently numbers about 325 individuals and is considered extremely rare in the Study area. The Recovery Strategy (Brown *et al.* 2009) noted a goal “to achieve an increasing trend in population abundance over three generations” via seven recovery objectives. Critical habitat has been identified in the Grand Manan Basin (Bay of Fundy) and Roseway Basin (Scotian Shelf). There have been some relatively recent sightings of small numbers of right whales off Iceland and Norway, and recorded once in the Study Area; on 27 June 2003 during a PAL reconnaissance survey.

The current estimate for the western North Atlantic stock of the fin whale is 3,985 individuals. Fin whales continue to regularly occur in Newfoundland and Labrador waters, particularly during summer months. Based on the Department of Fisheries and Oceans (DFO) cetacean sightings database, fin whales have been sighted throughout the Study Area from May to September. Fin whales were commonly observed in the Orphan Basin during the 2004 and 2005 seismic monitoring programs. It is likely that fin whales commonly occur in the Study Area at least during late spring to fall.

The Leatherback sea turtle is the largest and most widely ranging of sea turtles. There are an estimated 26,000 to 43,000 individuals globally. Adult leatherbacks are considered regular summer visitors to eastern Newfoundland, with the northernmost records occurring off Labrador at nearly 54°N; observations around Newfoundland and Labrador occur from June to November, but are most common in August and September. DFO Newfoundland Region has maintained a database of leatherback turtle sightings and entanglements in Newfoundland and Labrador. However, no leatherback turtle observations were made in the Study Area. In the Recovery Strategy (ALTRT 2006) for the leatherback sea turtle in the Canadian Atlantic Ocean, the recovery goal is to “achieve the long-term viability of the leatherback turtle populations frequenting Atlantic Canadian waters” via six supporting objectives. No critical habitat has been designated.

The Ivory Gull is a rare gull species that is associated with pack ice at all time of the year. Ivory Gulls occur among the pack ice of the Davis Strait, the Labrador Sea, Strait of Belle Isle, and northern Gulf of St. Lawrence. Currently, the Canadian breeding population is estimated at 500 to 600 individuals. Surveys conducted during 2002 to 2005 indicate a total decline of 80% and an annual decline of 8.4% over the last 18 years. During heavy ice winters, the Ivory Gull may occasionally reach the southern Orphan Basin and northern Grand Banks in the Study Area. The thirty-year median of ice concentration shows ice extending into the northern edge of the Grand Banks east to 48°W during late February to late March. This species is expected to be very rare in most winters in the Study Area and absent during the summer.

The northern and spotted wolffish have a very similar life history, except that the northern wolffish inhabits slightly deeper water. Atlantic wolffish is primarily demersal and inhabits shallower areas than northern and spotted wolffishes. During 1980-1984, most wolffish were concentrated on the northeast Newfoundland and Labrador shelf and banks, the southwest and southeast slopes of the Grand Banks, along the Laurentian Channel, and in the Gulf of St. Lawrence. Between 1995 and 2003, the area occupied and density within the area was considerably reduced. The species is still relatively widespread, and therefore exists in considerable numbers. A Recovery Strategy for the northern wolffish and spotted wolffish, and a Management Plan for Atlantic wolffish in Canada was published in 2008 (Kulka *et. al.*, 2008).

2.2.2 Fish and Fish Habitat

A detailed description of the plankton and benthos communities can be found in the EA Report (LGL 2011a) and EA Addendum (LGL 2011b). There are three main types of marine fish present in the Study Area: pelagic fish, those that live and feed close to the surface; demersal or groundfish, those that live and

feed close to the bottom; and shellfish, which include crustaceans and bivalves. A list of the macroinvertebrates and fishes caught during DFO RV surveys within the Study Area in 2008 and 2009 is presented in the EA Report. The three species that have typically made up more than 99% of the Study Area harvest in recent years are described below. Other species that have been harvested as incidental by-catch within the Study Area during recent years are described in the EA Report.

The Northern shrimp (*Pandalus borealis*) is distributed from Davis Strait to the Gulf of Maine. It usually occupies soft muddy substrates up to depths of 600 m in temperatures of 1°C to 6°C. Larger individuals generally occur in deeper waters. Based on DFO RV survey data collected in the Study Area in 2008 and 2009, most of the northern shrimp were caught at mean water depths ranging between 140 and 340 m.

The snow crab, (*Chionoecetes opilio*), occurs over a broad depth range in the NW Atlantic from Greenland south to the Gulf of Maine. Snow crab distribution is widespread and continuous in waters off Newfoundland and southern Labrador. Large males are most common on mud or mud/sand, while smaller crabs are common on harder substrates. Based on DFO RV survey data collected in the Study Area in 2008 and 2009, most of the snow crab was caught at mean water depths ranging between 75 to 225 m.

The Greenland halibut (*Reinhardtius hippoglossoides*) is distributed throughout cold, deep waters of the Labrador-eastern Newfoundland area, inhabiting the continental shelf and slope at depths of 200 to 600 m or more. Based on DFO RV survey data collected in the Study Area in 2008 and 2009, most of the Greenland halibut were caught at mean water depths ranging from <200 to 700 m, and as deep as 1385 m. The majority of the adult population is distributed in the deep and warm N Atlantic waters (e.g., Davis Strait, between Greenland and Baffin Island) where spawning occurs in winter or early spring.

Other species that have been harvested as incidental by-catch within the Study Area during recent years include redfish (*Sebastes* spp.), capelin (*Mallotus villosus*), American plaice (*Hippoglossoides platessoides*), Atlantic cod (*Gadus morhua*), roundnose grenadier (*Coryphaenoides rupestris*), roughhead grenadier (*Macrourus berglax*), and wolffishes (*Anarhichas* spp.).

2.2.3 Commercial Fisheries

The Study Area supports a variety of commercial fisheries based on latest available DFO catch landings data. Some of the most important fisheries in and adjacent to the Study Area include those for northern shrimp, snow crab, and Greenland halibut. All major fish groups, including groundfish, pelagic and shellfish fished in the Study Area occur in NAFO subdivisions 3Le, 3Li and 3Ma. Two macroinvertebrate species, northern shrimp and snow crab, and one fish species, Greenland halibut, were targeted commercial fisheries prosecuted within the Study Area during the 2003-2009 period. The domestic harvest within the Study Area is very largely northern shrimp, with much lesser quantities of snow crab and Greenland halibut / turbot. Together, these three species have typically made up more than 99% of the Study Area harvest in recent years. June, July and August were the most productive months for harvesting, accounting for more than 50% of the annual catch. Snow crab is fished using fixed gear (crab pots), Northern shrimp by mobile gear (trawling), and Greenland halibut by fixed gear gillnets.

2.2.4 Marine Mammals and Sea Turtles

A total of 20 marine mammals, including 17 cetacean and three seal species are known or expected to occur in the Study Area. Most marine mammals use the Study Area seasonally, and the region likely represents important foraging areas for many. Sea turtles regularly occur on the Grand Banks and adjacent waters with three species potentially occurring within the Study Area. The EA Report provides a summary of the marine mammals and sea turtles known or expected to occur in the northern Grand Banks Study Area. It also provides a summary of sightings from data sources including commercial whaling, fisheries observers, Marine Mammal Observers (MMOs) on board seismic vessels, and the general public. Within the Study Area, sighting dates ranged from 1961 to 2009.

Six species of baleen whales occur in the Study Area. Blue whales (*Balaenoptera musculus*) are considered rare and North Atlantic right whales (*Eubalaena glacialis*) are considered extremely rare in the Study Area. The four more common baleen whales are the Fin Whale (*Balaenoptera physaalus*), Sei whale (*B. borealis*), Humpback whale (*Megaptera novaeangliae*) and Minke whale (*B. acutorostrata*). Although some individual baleen whales may be present in offshore waters of Newfoundland and Labrador year-round, most baleen whale species presumably migrate to lower latitudes during winter months. Based on the DFO cetacean sightings database, fin whales have been sighted throughout the Study Area from May to September. Based on the DFO cetacean sightings database, seven sei whale sightings have been reported in the Study Area. Humpbacks are the most commonly recorded mysticete in the Study Area, with sightings occurring year-round, but predominantly during summer. Within the Study Area, minke whales were the fourth most commonly recorded mysticete in the DFO sightings database, with sightings predominantly recorded during summer months.

Eleven species of toothed whales, Odontocetes are known or expected to occur in the Study Area. Many of these species seem to be present in the Study Area only seasonally, but there is generally little information on the distribution and abundance of these species. The eleven species include the: Sperm Whale (*Physeter macrocephalus*), Northern bottlenose whale (*Hyperoodon ampullatus*), Sowerby's beaked whale (*Mesoplodon bidens*); Killer whale (*Orcinus orca*); Long-finned pilot whale (*Globicephala melas*), Atlantic white-sided dolphin (*Lagenorhynchus acutus*), Short-beaked common dolphin (*Delphinus delphis*), White-beaked dolphin (*L. albirostris*), Common bottlenose dolphin (*Tursiops truncatus*); Striped dolphin (*Stenella coeruleoalba*), and Harbour porpoise (*Phocoena phocoena*). Sperm whales were regularly sighted in the deep waters of Orphan Basin during the summers of 2004-2007 but were not observed in the shallower waters of Jeanne d'Arc Basin in 2005-2007. There are 87 sightings of sperm whales reported in the DFO cetacean sightings database that occurred in the Study Area. Northern bottlenose whales may occur at low densities, but year-round, throughout the deep, offshore waters of the Orphan Basin. Based on the DFO cetacean sightings database, there have been five sightings of northern bottlenose whales in the deeper waters of the Study Area from May to September. Long-finned pilot whales were the most commonly recorded toothed whale in the DFO cetacean database, occurring most months of the year and primarily in waters >500 m deep in the Study Area. Atlantic white-sided dolphins occur regularly from spring to fall in offshore areas of Newfoundland. Sightings in the North Atlantic seem to coincide with the 100 m depth contour and areas of high relief; there were 17 sightings in the DFO cetacean sightings database, all in water >500 m deep. There were eight sightings of Short-beaked common dolphin recorded in the Study Area in the DFO database; with the exception of one sighting on the shelf, all other sightings were in waters >500 m deep. White-beaked dolphins are thought to remain at high latitudes year-round and are generally observed in continental shelf and slope areas. Offshore waters of Newfoundland are thought to be at the northern limit of the Striped dolphin's range. There were only two sightings of this species recorded in the Study Area based on the DFO cetacean database; both occurred in August. There were eleven harbour porpoise sightings in the Study Area in the DFO cetacean sightings database.

Two species of seals including harp (*Pagophilus groenlandicus*) and hooded (*Cystophora cristata*) occur in the Study Area. Harp seals are common during spring off northeast Newfoundland and southern Labrador where they congregate to breed and pup on the pack ice; the majority of the NW Atlantic population uses this region while the small remainder uses the Gulf of St. Lawrence. Hooded seal whelp and breed in the pack ice off northeast Newfoundland/southern Labrador in late winter-early spring.

Three species of sea turtles regularly occur on the Grand Banks and adjacent waters and could potentially occur in the Study Area. They are: leatherback, loggerhead (*Caretta caretta*), and Kemp's Ridley (*Lepidochelys kempii*). The leatherback sea turtle is listed as endangered under SARA and discussed above. Loggerheads have not been reported in the Study Area. Most records offshore Newfoundland

have occurred in deeper waters south of the Grand Banks and sightings have extended as far east as the Flemish Cap. There are no known reports of Kemp's Ridley sea turtle in the Study Area.

2.2.5 Marine Birds

The Grand Banks area supports large numbers of seabirds during all seasons. There are approximately 27 seabird species that occur in the Study Area that are described in the EA Report. Results of seabird surveys, including the more recent Canadian Wildlife Service (CWS) and monitoring programs for geophysical surveys are also included in the EA Report. In summary, the Sackville Spur, Orphan Basin and Flemish Pass all emerged as important to one or more species/groups in one or more seasons. The Orphan Knoll held high numbers of Black-legged Kittiwake during summer. Northern Fulmar and gulls were found in the highest concentrations in the Newfoundland and Labrador Shelves region on the Sackville Spur during spring. Substantial numbers of these birds were also present in winter. Northern Fulmars, Leach's Storm-Petrels and shearwaters were found in summer along the southern edge of the Orphan Basin. In particular, The Eastern Canadian Seabirds at Sea (ECSAS) surveys initiated by the CWS and conducted in the Flemish Pass and Flemish Cap showed local hotspots during winter and spring for Northern Fulmar, Black-legged Kittiwake, Dovekie, Gulls (spring only) and murre. Shearwaters were in high densities in summer.

2.2.6 Sensitive and Special Areas

Potential sensitive areas include: important bird areas (IBA); Ecologically and Biologically Significant Areas (EBSAs), Marine Protected Areas (MPAs) and MPA Areas of Interest (AOI) identified pursuant to the *Oceans Act*; and important coral areas.

There are nine significant seabird nesting sites, or Important Bird Areas (IBAs), on the southeast coast of Newfoundland from Cape Freels to the Burin Peninsula. The closest IBA is approximately 350 km from the Study Area.

The Study Area includes a portion of the Placentia Bay Grand Banks (PBGB) Large Ocean Management Area (LOMA), one of the marine regions established to form the planning basis for implementation of integrated-management plans by DFO. The Ecologically and Biologically Significant Area in the Study Area (i.e., the Northeast Shelf and Slope) is a potential AOI for a MPA. The Northeast Shelf and Slope EBSA has an overall 'low priority' rating relative to other EBSAs within the PBGB LOMA. Aspects of this EBSA are described in the EA Report. As well, the *Oceans Act* provides the Minister of DFO with a leadership role for coordinating the development and implementation of a federal network of MPAs, which can include areas within and outside of the Integrated Management (IM) area that have yet to be developed within the Region. Therefore, there remains potential for further identification of EBSAs, AOI, MPAs and other sensitive areas within the Study Area.

In 2003, as protection for the Northern cod, the Fisheries Resource Conservation Council (FRCC) recommended the establishment of an experimental 'cod box' in the Bonavista Corridor. The Corridor has been identified as an area important for cod spawning and juvenile cod. The FRCC recommended that this area be protected from all forms of commercial fishery (excluding snow crab trapping) and other invasive activity such as seismic exploration. In April 2003, DFO announced that special conservation measures were required for the Bonavista Corridor, including the Bonavista Cod Box, located about 135 km west of the Study Area.

In 2008 and 2009, the NAFO Scientific Council identified areas of significant coral and sponge concentrations within the NAFO Regulatory Area. Based on these identification, areas for closure to fishing with bottom contact gear were delineated. A figure is provided in the EA Addendum showing the

locations of 11 of these areas that occur either within or close to the Study Area. Implementation date of the closures started on 1 January 2010.

A search of the Department of National Defence (DND) records was conducted to determine the possible presence of unexploded ordnates (UXO) within the Study Area. The submarine wreck U-658 (Long - 46.53333, Lat 50.00889, depth >2000 meters) is situated in close proximity to the survey area. The position of this submarine wreck was provided by the aircraft which sank the submarine, circa 1942, and its accuracy has not been confirmed. Consequently, it is advisable to assume that the U-658 may potentially be within the survey area. The U-658 was a German VIIC Class submarine which typically carried torpedoes and ammunition for deck guns. Consequently, it is possible that munitions may still be aboard. Given the submarine wreck's recorded location, and understanding of the seismic and geohazard survey activities to be conducted, the associated UXO risk is assessed as low. Nonetheless, due to the inherent dangers associated with UXO and the fact that the Atlantic Ocean was exposed to many naval engagements during WWII, should suspected UXO be encountered during the program, Chevron should not disturb/manipulate it, mark the location, and immediately inform the Coast Guard.

2.2.7 Research Surveys and Vessel Traffic

DFO conducts a spring survey in sections of 3LNOPs (April-July), and a fall survey of 2HJ3KLMNO (September / October to December). The fall survey may employ two vessels. The deeper waters of 3L (slope areas) are typically surveyed in October, and the shallower areas in November or December. The DFO Science Advisory Schedule can be accessed on-line to view activities scheduled in Canada <http://www.isdm-gdsi.gc.ca/csas-sccs/applications/events-evenements/index-eng.asp> . Since the timing of DFO scientific surveys will vary from year to year, Chevron will contact relevant DFO managers at the start of each program year to ensure that there are no timing conflicts.

Members of the Fish, Food and Allied Workers (FFAW) have been involved in an industry survey for crab in various offshore harvesting locations over the past few years, such as the snow crab Industry-DFO collaborative post-season trap survey (CPS). This survey is conducted every year and starts on September 1 and may continue until November before it is completed. The set locations are determined by DFO and do not change from year to year. These stations do not appear to be within CCL's Project Area, and all are within the 200 mile limit. Actual latitude and longitude locations of the stations will be obtained from DFO before the survey.

The DND is likely to be transiting and conducting navy exercises within the Study Area during the May to November 2011 to 2017 timeframe. It will be necessary to maintain contact with DND throughout each work season.

In the summer, the main North Atlantic shipping lanes between Europe and North America lie to the north of the Grand Banks into the Strait of Belle Isle. In the winter, that traffic shifts to the main shipping lanes along the southern Grand Banks into the Gulf of St. Lawrence.

There are three existing offshore production developments (Hibernia, Terra Nova, and White Rose) on the northeastern part of the Grand Banks which fall outside of the boundaries of the Study Area. Statoil is proposing to conduct seismic programs between 2011 and 2019 in the Jeanne d'Arc Basin and Central Ridge/Flemish Pass Basin. Seismic vessels will remain at least 40 km apart during surveying.

Part C: ENVIRONMENTAL ASSESSMENT PROCESS

3. Review Process

On January 7, 2011, Chevron submitted a project description *North Grand Banks Regional Seismic Program, 2011-2017 Project Description* (LGL 2010). The Project requires an authorization pursuant to Section 138(1) (b) of the *Canada-Newfoundland Atlantic Accord Implementation Act* and Section 134(1) (a) of the *Canada-Newfoundland and Labrador Atlantic Accord Implementation Newfoundland and Labrador Act*. The C-NLOPB, as Responsible Authority (RA), forwarded the *CEAA Federal Coordination Regulations* (FCR) Section 5 Notification on January 10, 2011 to: Fisheries and Oceans Canada (DFO); Environment Canada (EC); Department of National Defence (DND); Transport Canada (TC); Natural Resources Canada (NRCan); Health Canada; and the Newfoundland and Labrador Departments of Environment and Conservation, Fisheries and Aquaculture, and Natural Resources.

On February 14, 2011, the C-NLOPB notified Chevron that a screening level of assessment was required and the proponent was provided with a Scoping Document.

Pursuant to paragraph 12.4(2) of the *Canadian Environmental Assessment Act* (CEA Act), and the *Regulations Respecting the Coordination by Federal Authorities of Environmental Assessment Procedures and Requirements*, the C-NLOPB assumed the role of the Federal Environmental Assessment Coordinator (FEAC) for the screening and in this role was responsible for coordinating the review activities by the expert government departments and agencies that participated in the review.

On March 14, 2011, Chevron submitted the “*Environmental Assessment of Chevron’s North Grand Banks Regional Seismic Program, 2011-2017*” (LGL 2011a). The C-NLOPB forwarded the EA Report on March 15, 2011 to DFO, EC, Department of National Defence (DND), and the provincial Departments of Environment and Conservation, Fisheries and Aquaculture, and Natural Resources (DNR). The Fish, Food, and Allied Workers Union (FFAW) and One Ocean were also provided a copy of the EA Report for review.

Comments on the EA Report were received from DFO, EC, DND and the FFAW. In order to address deficiencies in the EA Report, Chevron was required to provide a response to the EA Report comments. Chevron responded on May 18, 2011 and the C-NLOPB forwarded the responses to DFO, EC, DND and the FFAW.

It is the obligation of the RAs to consider which physical works and undertakings, in relation to the proposed Project, fall within the scope of the Project. First, there are no associated physical works that should be included in the scope of the Project. Second, if the proposed Project were to proceed, as set out in the application, it would constitute a single Project for the purposes of subsection 15(2) of *CEAA*. For the purposes of subsection 15(3) of *CEAA*, the scoping exercise is complete because an assessment was conducted in respect of every construction, operation, modification, decommissioning, abandonment, or other undertaking proposed by Chevron that is likely to be carried out in relation to their proposed Project.

3.1 Scope of Project

The survey in 2011 is located 340 km to 620 km northeast of St. John’s, NL. The geographic extent of project activities includes the Exploration Area and an additional 10 km buffer around this area for vessel turns. The proposed Project is a ship-based seismic program commencing with a 30 to 90 day 2D and/or 3D survey in 2011. In 2011, Chevron is proposing to acquire approximately 6400 linear km of multi-streamer seismic survey data within the Project Area. In addition, the acquisition of about 1500 km² of 3D seismic is under consideration for 2011.

In 2011, seismic data will be acquired along ~70 lines that are primarily oriented southwest/northeast and northwest/southeast. The seismic energy source will be comprised of individual airguns arranged in an array. In 2011, Chevron is proposing to operate airgun arrays, each 5085 in³ in total volume. In subsequent survey years (2012– 2017), Chevron expects to also use two airgun arrays, 3000 in³ to 6000 in³ in total volume. The two airgun arrays will be activated alternately (flip-flop arrangement) along the survey lines, typically every 9 to 12 seconds. Survey speed is around 4.5 knots (8.3 km/h). The arrays will be towed at depths of 6 m to 15 m. Airguns will be operated at 2000 to 2500 psi and the source level (at 1 m) of the array may range from 100 to 150 bar-m (~254 to 257.5 dB re 1 µPa zero to peak). The airguns in the array are strategically arranged to direct most of the energy vertically downward rather than sideways. The proposed 2D and/or 3D seismic survey in 2011 will use a maximum of 10 streamers, each 8000 m long, each separated by 100 m, and deployed at a depth of 12 m. In subsequent survey years (2012– 2017), Chevron expects to use 6 to 12 towed streamers to a maximum of 20 with an approximate length of up to 8000 m and deployed at depths ranging from 5 to 25 m. For 2011, solid streamers will be deployed.

In 2011, the duration of the proposed 2D and/or 3D seismic survey is estimated at 30 to 90 days. In 2012 to 2017, it is estimated that seismic surveys may occur for 30 to 120 days and that geohazard survey data may be collected during a two-week period. Survey activities will occur from May 1 to November 30 in each year from 2011 to 2017.

3.2 Boundaries

The boundaries of the Project are defined in the EA Report as follows and are acceptable to the C-NLOPB.

<i>Boundary</i>	Description
<i>Temporal</i>	Seismic Surveys – From 1 May to 30 November, 2011 to 2017. Geohazard Surveys – Year round, 2012 to 2017.
<i>Project Area</i>	Defined as a 37,050 km ² area including a 10 km buffer area for vessel turning. The geographic coordinates (latitude, longitude; datum NAD83) of the approximate “corners” of the Project Area, starting in the northwest and moving clockwise are: NW = 49°51’28”N, 46°7’18”W; NE = 49°25’6”N, 44°47’57”W; SE = 47°13’0”N, 46°50’5”W; SW = 47°41’4”N, 48°10’50”W; W = 49°10’18”N, 47°31’57”W.
<i>Affected Area</i>	Defined as a 62,960 km ² area including the Project Area plus a 20 km buffer area.
<i>Regional Area</i>	The area extending beyond the “Affected Area” boundary within the Orphan Knoll, Flemish Cap and Flemish Pass.

There may also be an area of influence from the sound array. However, depending on the marine species present, this area of influence will vary in size. Hearing thresholds have been determined for a number of species (seals and odontocetes), but the threshold is not known for others (baleen whales). The sound that is actually received by the marine species depends on the energy released from the source and its

propagation (and loss) through the water column. Therefore, the hearing ability of the species and background noise will affect the amount of noise from an airgun array detected.

3.3 Scope of Assessment

For the purpose of meeting the requirements of the CEAA, the factors that were considered to be within the scope of the environmental assessment are those set out in paragraphs 16(1) (a) through 16(1) (d) of the CEAA, and those listed in the *Chevron Canada Resources North Grand Banks Regional Offshore Seismic Program 2011 – 2017 Scoping Document* (C-NLOPB 2011a).

4. Consultation

4.1 Consultation carried out by Chevron

A summary of organizations and agencies consulted by Chevron is as follows.

DFO did not have any significant concerns regarding the proposed seismic program. Because this is a multi-year assessment, it was suggested that the EA Report should indicate any relevant COSEWIC species since some of these might subsequently be designated as species at risk over the EA time frame (2011-2017).

Chevron met with EC to provide information about the proposed seismic program. No specific concerns or issues with the proposed project were indicated by EC, although it was noted that seabird data should be collected using the EC data protocols to the extent possible. It was recommended that these data should be shared with EC at the end of the seismic program. A report documenting each stranded bird including the date, global position and the general condition of the feathers when found, and if releasable, the condition upon release, will be completed and delivered to the CWS by the end of the calendar year.

The Natural History Society's did not have any significant concerns with the proposed survey, however a number of points were discussed with Chevron including: marine mammal and sea bird observers on board seismic vessels are not entirely "independent"; the possibility for offshore operators to permit such "independent" observers to be part of the regular monitoring process. The Passive Acoustic Monitoring (PAM) system on board the seismic vessel was also discussed. It was suggested that, with respect to minimizing potential negative effects on marine mammals, the most effective mitigative measure would be for seismic vessels to conduct operations during times of the year when the least number of marine mammals are in a survey area

A meeting was held with the FFAW to discuss the potential interactions with the commercial fishery. Fishers had mentioned that they could hear noise from the airgun array during seismic surveys for many miles and questioned the distance the sound of the airgun array can travel across the water. The distance the sound travels and which it can be detected depends on many factors, including the technology one is using to listen to this sound. It was noted that the entire southwest corner of the proposed survey area is a very important and busy fishing ground. The heaviest concentration of harvesting activities occurs during July and mid-August with the overlap between shrimp and crab harvesting operation. There are generally fewer vessels in the southwest corner of the Study Area in September. Chevron will use upfront planning to avoid areas with high concentrations of fishing gear and vessels. The "new" 3M cod fishery and the concern about potential impacts on cod, as well as other species was discussed. The Fishery Liaison Officer (FLO) and guide vessels were also discussed.

It was reported by Ocean Choice International's (OCI) that they had recently obtained a 200 tonne allocation of 3M cod from foreign interests outside 200 miles and that it plans to fish this cod in 2011 in the April to May period, however they could not provide the location of this activity at that time.

It was reported by the Groundfish Enterprise Allocation Council (GEAC) that the Canadian offshore sector (i.e., vessels > 100 feet) have competitive quotas of 3M redfish and 3M cod and expects to harvest these species commencing in 2011, probably during the spring-summer period.

The C-NLOPB are satisfied that the consultations carried out by Chevron, and reported on in the EA Report, included all elements of the Project, and that Chevron has addressed substantive concerns about the proposed Project.

4.2 Review of the March 2011 EA Report

The C-NLOPB forwarded the EA Report on March 15, 2011 to DFO, EC, DND, and the provincial Departments of Environment and Conservation, Fisheries and Aquaculture, and Natural Resources. The FFAW and One Ocean also were provided a copy of the EA Report to review.

DFO provided comments on the EA Report on 28 April 2011. Their comments focused on the SOCP, MMOs and the conduct of DFO scientific surveys. They also had a number of specific comments pertaining to the accuracy of fish data/landings, SARA information and sensitive areas.

DND provided comments on the EA Report on 28 April, 2011 which reflected the fact that comments provided by DND and previously forwarded to Chevron were absent in the EA Report. *On May 20, 2011 DND replied that Chevron's response in the EA Addendum to this comment in the EA Addendum was satisfactory.*

The FFAW provided comments on the EA report on 08 July 2010. The key issues were: regular communication between the two industries; clarification on the handling of fishing gear; the unknown long-term effects of seismic on fish; the dynamics of the fishing industry; and the possible use of a Fisheries Guide Vessel.

EC provided comments on the EA Report on 02 May 2011 and requested that Chevron collect seabird data and provided the protocol for proper bird-handling.

The consolidated review comments were provided to Chevron on May 11, 2011. Chevron responded on May 19, 2011 in the form of an EA Addendum. Chevron's May 19, 2011 response was forwarded to reviewers for assessment that the EA Addendum was an adequate response to their comments. DFO provided further comments on the EA Addendum and these were provided to Chevron on June 3, 2011. DFO provided with Chevron's response on June 6, 2011 and were satisfied that their comments had been adequately addressed. The C-NLOPB believes that all substantive comments within the scope of the EA have been satisfactorily addressed.

5. Environmental Effects Analysis

5.1 Methodology

The C-NLOPB reviewed the environmental effects analysis presented by Chevron in its EA Report. A Valued Ecosystem Component (VEC) based assessment, based on the interaction of project activities with VECs, was used in assessing environmental effects, including cumulative effects and effects due to accidental events. The environmental assessment methodology and approach used by the Proponent is acceptable to the C-NLOPB.

Potential adverse environmental effects, including cumulative effects, were assessed with respect to:

- magnitude of impact;
- geographic extent;
- duration, likelihood, and frequency;

- reversibility;
- ecological, socio-cultural and economic context; and
- significance of residual effects following implementation of mitigation measures.

The potential effect significance of residual effects, including cumulative effects, for each VEC was rated in this environmental screening report as follows:

- 0 = No Detectable Adverse Effect*
- 1 = Detectable Effect, Not Significant*
- 2 = Detectable Effect, Significant*
- 3 = Detectable Effect, Unknown*

These ratings, along with the likelihood of the effect, were considered in determining overall significance of residual effects.

In the EA Report, Chevron presented information regarding the potential effects of the seismic survey program activities on fish and fish habitat, commercial fisheries, seabirds, marine mammals and sea turtles, species at risk, and sensitive areas. A summary of the effects assessment follows.

5.2 Valued Ecosystem Components/ Potential Environmental Effects

5.2.1 Fish and Invertebrates

1

The seismic and geohazard survey program will not result in any direct physical disturbance of the bottom substrate. During seismic and geohazard surveys, survey equipment is not expected to come in contact with the seafloor and deep-water corals and sponges. Therefore the negligible residual effects on fish habitat (i.e., water and sediment quality, phytoplankton, zooplankton, and benthos) are predicted to be not significant.

The potential effects of exposure to sound on fish and marine invertebrates can be either physical (pathological and physiological) or behavioural. In the natural environment, fish have shown avoidance responses and swim away as an airgun array ramps up or as the survey slowly approaches. The airgun will be ramped-up, thereby allowing fish in the area to move away. Other studies referenced in the 2011 EA Report indicated that fish mortality did not result from exposure to seismic sound sources. Stress responses (physiological effects) to seismic exposure occur in fish but are temporary and reversible. Behavioural responses to seismic have been documented in a number of studies and are reported and discussed in the 2011 EA Report. In general, fish show startle response and change in direction and speed of swimming. In some studies looking at the effects on commercial catch rates, the change in swimming direction accounted for a decrease in catch rate. Some studies show that this effect was temporary, whereas other studies report that fish behaviour was altered for a number of days (LGL 2011a). The EA Report states that the temporary nature of these responses varies depending on the fish species and the sound source. Studies to determine effects on the auditory thresholds of fish have shown that Temporary Threshold Shift (TTS) can occur in fish exposed to seismic noise, under certain conditions. However, in the studies referenced by LGL (2011a) hearing sensitivity recovered within 14 days of exposure. To date, there have been no documented cases of acute mortality of juvenile or adult fish exposed to seismic sound characteristic of typical 2D and 3D seismic surveys. Limited data regarding physiological effects on fish indicate that they are both short-term and most obvious after exposure at close range (LGL 2011a).

Mitigations consistent with those outlined in the *Geophysical, Geological, Environmental and Geotechnical Program Guidelines* (C-NLOPB 2011b), will be implemented. Spatial and temporal avoidance of critical life history times (e.g., spawning aggregations) should mitigate the behavioural effects of exposure to airgun sound. The effects assessment concluded that physical effects on fish due to

project activities will be negligible to low in magnitude, in an area of less than 100 km², and of duration of one to 12 months. The likelihood of effects (behavioural and physical) is low and therefore **not significant**.

There is less knowledge of the effects of seismic sound on marine invertebrates, although some studies have been conducted on the sensitivity of certain invertebrate species to underwater sound. They may be capable of detecting vibrations but they do not appear to be capable of detecting pressure fluctuations. The limited studies done to date on the effects on marine invertebrates have not demonstrated any serious pathological or physiological effects. Studies referenced in the 2011 EA Report indicated that available experimental data suggest that there may be physical impacts on the fertilized eggs of snow crab and on the eggs of cod at very close range. The results indicated that effects are short-term and most obvious after exposure at close range. Spatial and temporal avoidance of critical life history times (e.g. spawning aggregations) should mitigate the behavioural effects of exposure to airgun sound. Snow crab, sensitive to the particle displacement component of sound only, will be at least 200 m from the airguns and will not likely be affected by any particle displacement resulting from airgun discharge. Any potential physical or behavioural impact to invertebrate species is considered to be negligible to low in magnitude, within an area of less than 100 km², over duration of one month to 12 months. The likelihood of effects (behavioural and physical) is low and therefore **not significant**.

5.2.2 Commercial Fishing and DFO Research Surveys

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Potential interactions with this VEC include the potential for a decrease in catch rates, interference with fishing gear and potential impact on DFO research survey trawls. As indicated above, seismic activity can result in a dispersion of fish species, and subsequently reduced catch rates for a short duration. Most of the Study Area is outside Canada's 200-NMi EEZ, overlapping portions of NAFO Divisions 3K, 3L and 3M. Most fishing for relevant species in the NAFO Convention Regulatory Area (RA) is conducted using mobile bottom tending trawls.

The data presented in the EA Report shows average annual catches (2003–2007) of NAFO managed species for each Division which overlaps the Study Area. It indicates the catch of these species separately for Canadian vessels and other Convention nations, the total, and the percent the Canadian portion represents of the total, by managed species. As the data indicate, the quantity and proportion of the foreign harvest of these species increases significantly moving north to south / southeast, with virtually no foreign harvest in 3K, 56% in 3L and nearly 100% in 3M. Within these three Divisions collectively, the largest NAFO-managed catches during this period were northern shrimp, redfish, squid and Greenland halibut.

The Canadian fisheries in the eastern Grand Banks area were dominated until the early 1990s by groundfish harvesting using stern otter trawls, primarily harvesting Atlantic cod, American plaice and a few other species. Today, in this area, snow crab harvesting (fixed gear) tends to be focused in areas along the shelf break and slope. Northern shrimp (mobile gear) trawling overlaps some of these areas but the gears have a potential to conflict, and thus do not typically overlap in time or location. Shrimp harvesting tends to extend into deeper water in the Study Area and farther eastward into the international waters, where it is also fished by several nations besides Canada within the general area of the Study Area.

Analysis of the average annual domestic harvest for all species (from 2003 to 2009) indicates, June, July and August were the most productive months during this period, accounting for more than 50% of the annual catch. Northern shrimp is the most significant species harvested within the Study Area in terms of quantity and value of harvest, accounting for, on average, some 5,670 t (more than 97% of the total harvest) between May and November in recent years. The Study Area overlaps with parts of Shrimp Fishing Area (SFA) 7 and 3M. Shrimp Fishing Area 7 (which corresponds to Division 3L) and 3M are

managed through NAFO. This fishery is confined to a well-defined zone in the southwestern part of the Study and Project areas.

Snow crab has occupied a distant second place in importance in the Study Area's fisheries, averaging just 2.5% by quantity and 6.2% by value since 2003, with just over 143 t harvested on average from May to November. Nevertheless, because the fishery uses fixed gear (crab pots), the fishery poses the greatest potential for seismic / fishing gear conflicts in those areas where the two marine activities might overlap. The Study Area overlaps with portions of Crab Fishing Areas (CFA) 3Lex (from 170 miles to 200 miles from shore) and 3L200 (beyond 200 nautical miles), both of which are within Division 3L. The EA Report indicates that the harvesting locations are predominantly in the southwest corner of the Project Area.

Greenland halibut (often called turbot) represents less than half of 1% of the Study Area catch by quantity and value, an average of just over 15 t a year. Most (about 99%) of this harvest in the Study Area is taken using fixed gear gillnets. In NAFO Division 3L and 3M, the fishery is managed by NAFO, and by DFO in 3K (and north), but quotas/TACs are set in all areas based on science advice provided through NAFO. For 2011, the 3LMNO Greenland halibut quota is 12,734 t for all of 3LMNO; of this 1,910 t is allocated for Canada, an increase over 2010. The EA Report indicates that the Study Area domestic harvest in May to November is quite focused inside the EEZ, mainly within 4Li.

There is potential for interaction between seismic operations (streamers) and fishing gear, especially fixed gear such as crab pots. The potential for impacts on fish harvesting will depend on the location of the surveying activities in relation to fishing areas in any given season. If the survey work is situated away from fishing areas, the likelihood of any effects on commercial harvesting will be greatly reduced.

Chevron has indicated that a number of mitigations, consistent with those outlined in the *Geophysical, Geological, Environmental and Geotechnical Program Guidelines* (C-NLOPB 2011b), will be implemented. These include: avoidance of heavily fished areas; use of a Fisheries Liaison Officer (FLO) on the vessel to be a communication link between the two industries and to help ensure effective communication between petroleum operators and fishers at sea; communication with fishers (via a Notice to Mariners and a Notice to Fishers) and scheduling of surveys to reduce interference with DFO research vessels; single point of contact (SPOC), and a fishing gear damage compensation plan. A picket vessel will accompany the seismic survey vessel to provide advance warning of fishing activities in the area and for communications with other vessels, and this vessel will meet similar criteria as the survey vessel. Chevron will also coordinate with the FFAW to avoid any potential conflicts with survey vessels. The potential for impacts on fish harvesting will depend on the location of the surveying activities in relation to fishing areas in any given season. If the survey work is situated away from fishing areas, the likelihood of any effects on commercial harvesting will be greatly reduced.

To avoid potential conflict with DFO Research surveys, Chevron will maintain communications with DFO personnel to keep up-to-date on the timing of planned research surveys. In addition, a temporal and spatial buffer zone will be implemented, in consultation with DFO, to reduce any potential interference with fish behavioural patterns. The impact of both noise and the seismic streamer on DFO research surveys will be negligible and **not significant**.

Given the application of mitigation measures, including the avoidance of fishery activity, it is predicted that the effects of seismic activity, including vessel movement, will be negligible to low in magnitude, within an area of 10 to 100 km², over duration of less than one month to 12 months. Therefore, effects to the commercial fishery are not likely and **not significant**.

5.2.3 Marine Mammals and Turtles

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A potential effect of the proposed operation upon marine mammals and sea turtles, which may be present in the area, may be from the sound pulses from the survey equipment. Marine mammals and sea turtles could likely exhibit certain behavioural reactions, including displacement from an area around an airgun array. The size of the displacement area will likely vary amongst species, during different times of the year, and even amongst individuals within a given species. There is also a risk that marine mammals and sea turtles that are very close to the seismic array may incur hearing impairment. The 2011 EA Report describes in more detail the numbers and the species of cetaceans which have been observed in, or which are considered likely to frequent, the Study Area. A review of the potential effects of the proposed seismic survey on marine mammals and sea turtles in the Study Area is provided in the EA Report. The review includes: the hearing abilities of marine mammals and sea turtles; the potential for masking by seismic surveys; disturbance effects of seismic surveys; the possibility of hearing impairment by seismic surveys; and the possibility of physical and non-auditory physiological effects.

Overall, odontocete reactions to large arrays of airguns are variable and, at least for delphinids and some porpoises, seem to be confined to a smaller radius than has been observed for some mysticetes. However, other data suggest that some odontocetes species, including belugas and harbour porpoises, may be more responsive than might be expected given their poor low-frequency hearing. Visual monitoring from seismic vessels has shown only slight (if any) avoidance of airguns by pinnipeds, and only slight (if any) changes in behaviour. These studies show that many pinnipeds do not avoid the area within a few hundred metres of an operating airgun array. Although baleen whales often show only slight overt responses to operating airgun arrays, strong avoidance reactions by several species of mysticetes have been observed as far as 20 to 30 km from the source vessel when large arrays of airguns were used.

The limited available data indicate that sea turtles will hear airgun sounds. Based on available data, it is likely that sea turtles will exhibit behavioural changes and/or avoidance within an area of unknown size near a seismic vessel. There are no specific data that demonstrate the consequences to sea turtles if seismic operations do occur in important areas at important times of year. Sea turtles are likely to show avoidance behaviour during seismic surveys. The discontinuous nature of sonar pulses makes significant masking effects unlikely, however, the extent of avoidance is unknown. Sea turtles might experience temporary hearing loss if the turtles are close to the airguns.

There is some risk for collision between marine mammals and sea turtles and the seismic and geohazard vessels. However, given the slow surveying speed of the vessel, the risk is minimal with avoidance.

In summary, marine mammals and sea turtles will likely exhibit certain behavioural reactions, including displacement from an area around a seismic and some geohazard acoustic sources and as stated above, the size of this displacement area will likely vary amongst species, during different times of the year, and amongst individuals within a given species. There are a number of mitigations (e.g. ramping up of airguns, use of observers, shut-down procedures) which, when applied, can reduce impacts to marine mammals and sea turtles in the vicinity of a seismic survey. The 2011 EA Report lists a number of mitigations that will be implemented during the seismic program, some of which are consistent with the mitigations recommended in Appendix 2 of *The Geophysical, Geological, Environmental and Geotechnical Program Guidelines* (C-NLOPB 2011b).

The effects on marine mammals are predicted to be negligible to low magnitude, within an area less than 1 km² to 1000 km² and over a duration of less than one month to 12 months. With the application of mitigation measures, the likelihood of effects occurring is low, and effects will be **not significant**.

The effects on sea turtles are predicted to be of negligible to low magnitude, within an area less than 1 km² to 100 km² and over duration of one month to 12 months. With the application of mitigation measures, the overall likelihood of effects occurring is low, and effects will be **not significant**.

5.2.4 Marine Birds

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The sound created by airguns is focused downward below the surface of the water. Above the water the sound is reduced to a muffled shot that should have little or no effect on birds that have their heads above water or are in flight. Most species of seabirds that are expected to occur in the Study Area feed at the surface or at <1 m below the surface of the ocean Northern Gannets plunge dive to a depth of 10 m. They are under the surface for a few seconds during each dive so would have minimal exposure to underwater sound. Greater Shearwater, Sooty Shearwater and Manx Shearwater feed mainly at the surface but also chase prey briefly beneath the surface down to a distance of 2-10 m below the surface There is only one group of seabirds occurring regularly in the Study Area that require relatively considerable time under water to secure food. They are the *Alcidae* (Dovekie, Common Murre, Thick-billed Murre, Razorbill and Atlantic Puffin). From a resting position on the water they dive under the surface in search of small fish and invertebrates. An average duration of dive times for the five species of *Alcidae* is 25 to 40 seconds reaching an average depth of 20-60 m, but Murres are capable of diving to 120 m and have been recorded underwater for up to 202 seconds. The effects of underwater sounds on *Alcidae* are unknown. The sound created by airguns is focused downward below the surface of the water. In air, the sound is reduced to a muffled shot that should have little or no effect on birds that have their heads above water or are in flight. A seabird data collection program will be undertaken aboard the seismic vessel by experienced biologists. Survey methods will closely follow the Eastern Canada Seabirds at Sea (ECSAS) Standardized Protocol for Pelagic Seabird Surveys for Moving and Stationary Platforms (Wilhelm et al. 2010 unpublished). Seabird data will be provided to CWS and a seabird (and marine mammal) monitoring report will be submitted to the C-NLOPB in accordance with the “*Geophysical, Geological, Environmental and Geotechnical Program Guidelines*” (C-NLOPB 2011b).

The effect of noise on marine birds is predicted to be of negligible to low magnitude, within an area less than 1 km², and over duration of less than one month to 12 months. With the implementation of all mitigation measures outlined in the EA Report and Addendum and the *Geophysical, Geological, Environmental and Geotechnical Program Guidelines* (C-NLOPB 2011b), the effects of sound emissions on Marine Birds are deemed **not significant**.

Since lighting is required at night for safety purposes, mitigation will include routine checks for stranded birds and implementation of appropriate procedures for release that will minimize the effects of vessel lighting on birds in the Project Area. Deck lighting will be minimized (if safe and practical to do so) to reduce the likelihood of stranding. The effect of vessel lighting on marine birds is predicted to be of low magnitude, within an area 1-10 km², and over duration of less than one month to 12 months. Therefore, the effect of vessel lighting on Marine Birds is deemed **not significant**.

5.2.5 Species at Risk

1

Wolffish species at risk are known to occur in the Study Area. DFO RV surveys conducted in 2008 and 2009 caught wolffish at mean water depths ranging from 77 m to 1243 m. Mitigation measures include a gradual increase in intensity of air gun discharge to allow fish to avoid the source of sound, and avoidance of seismic activities during known sensitive areas and timeframes. Effects on wolffish species at risk therefore are likely to be **not significant**.

The EA report indicates that leatherback sea turtles are not expected to occur regularly in the Study Area and the area contains no known critical habitat. A recovery strategy for leatherback sea turtles is available. With the implementation of mitigations as indicated above, effects on the leatherback sea turtle are not likely to be adverse and therefore **not significant**.

Blue and North Atlantic Right whales are not expected to occur regularly in the Study Area and thus, interaction with project activities is unlikely. The Fin whale is likely to be common in the study area. Nonetheless if these marine mammals were in the project area, the mitigations described above would reduce any impact. A dedicated Marine Mammal Observer will be onboard the seismic vessel. With the implementation of mitigations, including those outlined in the *Geophysical, Geological, Environmental and Geotechnical Program Guidelines* (C-NLOPB 2011b), effects on marine mammal species at risk are likely to be **not significant**.

The Ivory Gull is unlikely to occur in the Study Area, particularly during the summer when seismic surveys are likely to be conducted. The foraging behavior would not likely expose it to underwater sound and the risk of hearing impairment to Ivory Gull from seismic activity is low. As indicated above, effects on marine birds are likely to be not significant, therefore, effects on the marine bird species at risk are not likely to be adverse and therefore **not significant**.

5.2.6 Water Quality/Discharges

0

Routine discharges, which are likely to occur during operation, are similar to those associated with many typical vessel operations. The vessels proposed for the survey will meet all Canadian regulations and standards to work in Canadian waters. Ship operations will adhere to Annex I of the *International Convention for the Prevention of Pollution from Ships* (MARPOL 73/78). Hydrocarbon concentrations associated with ship discharges are not generally associated with formation of a surface slick. They are therefore not likely to have a measurable effect on the marine environment. The waste generated by the survey vessels will be limited due to the length of the survey program. A licensed waste contractor will be used for any waste returned to shore. The effect of the seismic and geohazard program operations on marine water quality should be undetectable and **not significant**.

5.3 Cumulative Environmental Effects

1

Potential cumulative environmental effects external to the project include seismic program(s) by other operators, commercial and traditional fishing, marine transportation and tourism/recreation. The potential exists that other seismic survey(s) could occur concurrently, resulting in a temporal overlap with the Project. There would be no spatial overlap as there must be enough distance between streamers as to avoid interfering with data acquisition by individual vessels. In order to avoid acoustic interference with other seismic programs, seismic vessels will remain at least 40 km apart during surveying. Good coordination between programs to minimize potential acoustic interference will also be needed. Chevron has committed to ongoing communication with other operators in the Study Area. Therefore, there is some potential for cumulative environmental effects with the seismic program in this context but vessels not associated with the seismic program are restricted from being close to the seismic vessel during the seismic survey. The residual cumulative environmental effect with noise and traffic external to the seismic program will be negligible. Compared to existing vessel traffic in the area, the incremental amount of vessel traffic, because of this seismic program, will be negligible. Cumulative environmental effects resulting from any of the seismic program activities will not be additive or cumulative because the seismic program activities are transitory. With the implementation of mitigative measures, the limited temporal scope, and overlap with other projects and activities, the cumulative environmental effect of the seismic program in conjunction with other projects and activities is predicted to be **not significant**.

5.4 Accidents and Malfunctions

Accidental discharge of oil into the marine environment may result from improper operational procedures (e.g., improper draining of streamer reel trunks), loss of streamer fluid due to breakage, or, as a worst case, as a result of total vessel loss.

The vessel is required to carry a "Shipboard Oil Pollution Emergency Plan" pursuant to MARPOL 73/78.

The Plan contains a description of procedures and checklists which govern operations involving hydrocarbons, adherence to which should prevent unintended releases. The vessel will also carry a copy of Chevron Canada Limited's "Spill Response Plan". Inspections of seismic equipment will be conducted regularly and where feasible, solid streamers will be used. Solid streamers will be deployed in the 2011 program.

Effects due to accidental spills associated with the proposed operation, therefore, are considered, overall, to be detectable if they occur, but neither significant nor likely.

5.5 Follow-up Program Required Yes No

The C-NLOPB does not require follow-up monitoring, as defined in the CEA Act, to be undertaken for this Project.

6. Other Considerations

The C-NLOPB is satisfied with the environmental information provided by Chevron regarding the potential adverse environmental effects which may result from the proposed project, and are satisfied with the operator's proposed monitoring and mitigative measures.

The C-NLOPB is of the view that the environmental effects from the project, in combination with other projects or activities that have been or will be carried out, are **not likely** to cause significant adverse cumulative environmental effects.

7. Recommended Conditions and /or Mitigations

The C-NLOPB recommends that the following conditions be included in the authorization if the seismic/geohazard survey program is approved:

- *The Operator shall implement or cause to be implemented, all the policies, practices, recommendations and procedures for the protection of the environment included in or referred to in the Application and in the "Environmental Assessment of Chevron's North Grand Banks Regional Seismic Program, 2011-2017" (LGL March 2011) and "Addendum to the Environmental Assessment of Chevron's North Grand Banks Regional Seismic Program 2011-2017" (LGL May 2011), and Chevron Canada Limited letter response to DFO comments(June 6, 2011).*
- *The Operator, or its contractors, shall shut down the seismic airgun array if a marine mammal or sea turtle listed as **Endangered or Threatened** (as per Schedule 1 of SARA) is observed in the safety zone during ramp- up procedures and when the array is active. The safety zone shall have a radius of at least 500 m, as measured from the centre of the air source array(s).*

Part D: Screening Decision

8.1 C-NLOPB Decision

The C-NLOPB is of the opinion that, taking into account the implementation of the proposed mitigation measures set out in the conditions above and those committed to by Chevron Canada Limited, the Project **is not likely to cause significant adverse environmental effects**. This represents a determination pursuant to Section 20(1) (a) of the CEA Act.

Responsible Officer *Original signed by E. Young*

Date: **June 10, 2011**

Elizabeth Young
Environmental Assessment Officer
Canada-Newfoundland and Labrador Offshore Petroleum Board

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