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

PART A: GENERAL INFORMATION

Screening Date	**September 8, 2011**
EA Title	Environmental Impact Assessment for Marine 2D Seismic Reflection Survey Labrador Sea and Davis Strait Offshore Labrador By Multi Klient Invest AS (MKI)
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Part B: PROJECT INFORMATION

On January 17, 2011, Multi Klient Invest AS (MKI) submitted a project description entitled, *Project Description For 2D Marine Seismic Survey Offshore Northeast Coast of Canada Labrador Shelf"* (PGS/TGS NOPEC, December 2010) to the Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB), describing its plans to conduct a 2D seismic survey offshore Newfoundland in the offshore region of the Labrador Sea and Davis Strait. MKI may conduct 2D seismic surveys in one or more years within the 2011-2013 timeframe. MKI submitted the *Environmental Impact Assessment for Marine 2D Seismic Reflection Survey Labrador Sea and Davis Strait Offshore Labrador by Multi Klient Invest AS (MKI)* (RPS 2011a) on April 1, 2011. On June 3, 2011, the C-NLOPB requested additional information from MKI to respond to review comments on the April 1 submission. On June 28, 2011, MKI responded to the review comments, via the Addendum to the *Environmental Impact Assessment for Marine 2D Seismic Reflection Survey Labrador Sea and Davis Strait Offshore Labrador by Multi Klient Invest AS* (RPS 2011b). Additional comments on the Addendum to the *Environmental Impact Assessment*

for Marine 2D Seismic Reflection Survey Labrador Sea and Davis Strait Offshore Labrador by Multi Klient Invest AS were received and forwarded to MKI. On August 16, 2011 MKI responded to these comments in the form of a letter entitled, *"MKI's Response to Consolidated Comments on the EA Report Addendum on Multi Klient Invest Offshore Labrador 2D Seismic Program 2011-2013."* A response to additional comments was provided by MKI on September 6, 2011.

1 Description of Project

The Marine 2D Seismic Reflection Survey as proposed by MKI, is a 2D survey program in the Newfoundland and Labrador offshore area over a three year (2011 to 2013) period. The proposed Project is a ship-based seismic program which is designed to acquire 2D data in the Labrador Sea and Davis Strait area. The Project Area encompasses a 561,423 km^2 area including a 10 km buffer area for vessel turning. The proposed survey totals 9,600 kilometres of linear data in 2011. The duration of the proposed 2D seismic survey is estimated at 40 to 60 days, which is expected to occur between July and November in 2011 and subsequent years.

2 Description of Environment

The following sections provide a summary of the environmental factors described in the EA Report and Addendum. A complete description of the biological and physical environment can be found in that E Report (March 2011) and the subsequent Addendum (June 2011).

2.1 Physical Environment

The survey will be conducted in water depths ranging from 300 m to 3,000 m. Sea surface temperatures in the Labrador Shelf Area remain relatively cold in the north (typically -2°C to 0°C) throughout the year. South of 55°N temperatures range from approximately 0°C during the winter months to approximately 10°C during summer.

The typical daytime temperatures for January range between -10 and -15°C. The summer season is brief and cool along the coast because of the cold Labrador Current. July average temperatures are from 8 to 10°C along the coast. Precipitation is heaviest in the south and decreases northwards. A typical yearly fall of precipitation in Southern Labrador is 1000 mm with about 45% of this occurring as snow. Over much of Labrador 800 mm is a more typical amount, with about half of it snow.

Wind speed and direction data were chosen from nine (9) grid points; 14986, 14710, 14434, 14161, 13893, 13643, 13408, 13194, and 12995, to represent conditions within the Project Area. Wind speeds during the fall (October – December) and the winter (January – March) exceed 6 m/s with an upper limit of just below 12 m/s in January. Wind speeds decline in the spring (April – June) and summer (June – August) with a range of 5 m/s to 9 m/s. Maximum wind speed in the summer is approximately 22 m/s. Visibility is quite often affected by easterly winds in this area. These winds bring cool moist air closer inland resulting in decreased visibility from precipitation and fog. As fall and winter approach, visibility is affected by frequent snow flurries or extended periods of snowfall.

The Labrador Current, originating in the Davis Strait, is a combination of the West Greenland Current, the Baffin Island Current, and inflow from Hudson Bay. It flows along the Labrador coast and consists of two major streams, the inshore and offshore stream. The inshore stream, consisting of water from Hudson Strait and the Baffin Current, flows along the coast and in the Marginal Trough, located inside the banks. The offshore stream consists of water from the West Greenland current and flows along the outer edge of the banks and over the continental slope. Wave climate in the study area was assessed by using the MSC50 data for nine (9) grid points; 14986, 14710, 14434, 14161, 13893, 13643, 13408, 13194, and 12995, to represent conditions within the Project Area. The monthly wave statistics for the MSC50 grid points within the Study Area (values are based on 50 years of hindcast data) show the highest waves

typically occur from November to March. The maximum significant wave height of 12 m was recorded in November and January.

The mean annual number of weeks of pack ice found in the Project Area ranges from 2 weeks, in the far offshore, and up to more than 20 weeks near the coast. The average start of the ice season ranges from mid-November in the north, to December in the south. Ice growth typically continues until late spring, when the pack ice begins to melt and dissipate through the month of July. The ice season ends, on average, by late- June/early-July in the south but extends until late-July/early-August in coastal and northern regions.

The presence of easterly and northeasterly winds can strongly influence the numbers of icebergs that make their way to the Newfoundland coast, onto or off the Grand Banks, and through the Strait of Belle Isle into the Gulf of St. Lawrence. This combined with prevailing wind directions and sea and air temperatures will determine whether and for how long any icebergs stay in a particular region. The majority of icebergs on the East Coast will be present from March to June or July. By August in most years, the icebergs both along the coast and offshore Newfoundland will have drifted south of the Grand Banks or melted.

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, threatened or of special concern on Schedule 1 is included below.

SPECIES	SARA Status	COSEWIC Status
Blue Whale (*Balenoptera musculus*)	Schedule 1 – Endangered (May 2002)	Endangered (May 2002)
North Atlantic Right Whale (*Eubalaena glacialis*)	Schedule 1 – Endangered (May 2003)	Endangered (May 2003)
Fin Whale (*Balaenoptera physalus*)	Schedule 1 – Special Concern (May 2005)	Special Concern (May 2005)
Leatherback Turtle (*Dermochelys coriacea*)	Schedule 1 – Endangered (May 2001)	Endangered (May 2001)
Ivory Gull (*Pagophilia eburnea*)	Schedule 1 – Endangered (April 2006)	Endangered (April 2006)
Eskimo Curlew (*Numenius borealis*)	Schedule 1 – Endangered (November 2009)	Endangered (November 2009)
Northern Wolffish (*Anarhichas denticulatis*)	Schedule 1 – Threatened (May 2001)	Threatened (May 2001)
Spotted Wolffish (*Anarhichas minor*)	Schedule 1 – Threatened (May 2001)	Threatened (May 2001)
Atlantic Wolffish (*Anarhichas lupus*)	Schedule 1 – Special Concern (May 2000)	Special Concern (November 2000)
Harlequin Duck (*Histrionicus histrionicus*)	Schedule 1 – Special Concern (May 2001)	Special Concern (May 2001)
Barrow's Goldeneye (*Bucephala islandica*)	Schedule 1 – Special Concern (May 2011)	Special Concern (May 2011)
Sowerby's beaked whale	Schedule 1 – Special Concern	Special Concern (November

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

Blue Whales are regular visitors in the waters off eastern Canada. During spring, summer, and fall, these whales occur along the north shore of the Gulf of St. Lawrence and off eastern Nova Scotia and in summer are also observed off the southern coast of Newfoundland and in the Davis Strait, between Baffin Island and Greenland (COSEWIC 2002; Beauchamp *et al.* 2009). Between 20 and 105 individuals are observed annually in the Gulf of St. Lawrence in photo identification studies, though the actual size of the Atlantic population is not known, it is unlikely that the number of mature animals in the population exceeds 250 individuals according to expert's estimates (Beauchamp *et al.* 2009). 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 the North Atlantic Right Whale currently numbers about 350 individuals and their presence is considered to be very low 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 are no complete population estimates for Fin Whales in the western Northwest Atlantic Region but partial estimates are available for Newfoundland and Labrador of between 459 and 2,654 in 2003 (Lawson 2006 as cited in C-NLOPB 2008). Fin Whales may occur within the Study Area year-round, but higher frequency of summer sightings of this species in nearshore areas suggests that Fin Whales are more likely to occur closer to the coast (COSEWIC 2005).

The Leatherback sea turtle is the largest and most wide ranging sea turtles. There are an estimated 26,000 to 43,000 individuals globally. Adult turtles occur annually in Atlantic Canadian waters to forage, with the majority of turtles present between June and November. Peak occurrences in Canadian waters occur during August and September, but there are records for most months of the year (ALTRT 2006). Leatherbacks have been recorded off the coast of Newfoundland and Labrador, including within the Study Area (ALTRT 2006). Adult leatherbacks are considered regular summer visitors to eastern Newfoundland, with the northernmost records occurring off Labrador at nearly 54°N. 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 times 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%. This species has been sighted within the bounds of the Study Area.

The Eskimo Curlew is a migratory bird that typically migrated through the Labrador Shelf area in the fall. The species was once found from Newfoundland and Labrador to Alberta to the Northwest Territories and it is possible that this species has become extinct as efforts to locate individuals have been unsuccessful (COSEWIC 2009). The Recovery Strategy specifies measures that can be implemented under Canadian jurisdiction to promote the recovery goal of achieving the long-term viability. The supporting objectives of the Recovery Strategy currently note that they are not aware of the existence or location of any Eskimo Curlews and as such recovery is not technically or biologically feasible for this species at this time (COSEWIC 2009).

The Northern Wolffish and the Spotted Wolffish are primarily distributed on Newfoundland's Grand Banks and areas to the north, while Atlantic Wolffish has a wider distribution in the Gulf of St. Lawrence, Scotian Shelf, Bay of Fundy and Georges Bank, where the other two species are rare. The Northern and Spotted Wolffish are estimated to be one million and 2.7 million individuals, respectively (C-NLOPB 2008). A large decline in wolffish numbers was observed between 1980 and 2001 in the Labrador Shelf SEA Area, particularly in the mid-1990s (Kulka *et al.* 2008). All three species are likely to be found within the Study Area, though all three are expected to be found at varying depths. 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).

The Harlequin Duck (eastern population) breeds on inland rivers and streams from northern New Brunswick to Nunavut. It winters in coastal areas from Newfoundland, south to Maryland, as well as southwest Greenland. This species has been sighted at several nearshore and offshore locations within the Study Area, and is known to have breeding and moulting sites in the area as well, specifically at the Gannet Islands (Environment Canada 2007). Population trends are not available for the breeding population of eastern North America; however, local Aboriginal knowledge from Innu elders of Utshimassit suggests that Harlequin Duck populations in central Labrador declined considerably in the 1980s and early 1990s (Environment Canada 2007). The Eastern Canada population of the Barrow's

Goldeneye, is a small wintering population that is estimated at approximately 4,500 individuals. Though the range of the population in Eastern Canada is still unknown, data indicate that breeding is exclusive to Canada, with the only confirmed breeding records being from Quebec. Specific population trends are unknown, but it is believed that the population declined during the twentieth century and may still be declining. Observations of the Barrow's Goldeneye have been documented at several coastal locations along the length of the Study Area while reports of moulting birds and recent satellite telemetry studies confirm Nain Bay on the coast of Labrador as a moulting site (C-NLOPB 2008). Sightings appear to be limited to nearshore locations and have not been documented within the Project footprint.

Sowerby's beaked whales are common to the North Atlantic. However, their distribution, abundance, and biology are generally not well known. The northern limit of confirmed sightings and strandings in Canadian waters is Notre Dame, Newfoundland, however it is expected this species may extend further north into the Labrador Shelf area. Their habitat is thought to be deep water and the Continental Shelf and slopes.

2.2.2 Fish and Fish Habitat

A detailed description of the plankton and benthos communities can be found in the EA Report and Addendum.

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. The species that have typically made up more than 99% of the Study Area harvest in recent years are described below. Other species are described in the EA Report and Addendum.

Distributions of Northern or pink shrimp (*Pandalus borealis*) in the Northwest Atlantic range from the Davis Strait to the Gulf of Maine. They occupy soft muddy substrates up to depths of 600 m in temperatures of 1°C to 8°C. As with most crustaceans, northern shrimp grow by moulting their shells. During this period, the new shell is soft, causing them to be highly vulnerable to predators such as Greenland halibut (turbot), cod, Atlantic halibut, skates, wolfish, and harp seals (*Phoca groventandica*).

Snow crab (*Chionoecetes opilio*) occurs over broad depths in the Northwest Atlantic, from Greenland to the Gulf of Maine. Distribution is widespread on the Newfoundland and Labrador shelves. Commercial-size crabs commonly occur on mud or sand substrates at depths of 70 to 280 m at temperatures of -1°C to 5°C. There are indications that snow crabs move from gravel bottom to mud bottom, usually in deeper waters, as they reach maturity. Snow crabs grow by moulting their shells in the spring. There is little or no information on the offshore snow crab migrations. Offshore mating is known to occur during the late winter or spring; however the actual area is unknown.

Greenland halibut (*Reinhardtius hippoglossoides*), commonly known as turbot, is a deepwater flatfish preferring temperatures of 0°C to 4.5°C. In the Northwest Atlantic, their range extends from Greenland to the Scotian Shelf and most are taken from depths greater than 450 m. Their depth range is from 90 to 1,600 m, with larger individuals occurring in deeper waters. Unlike most flatfishes, the Greenland halibut spends much of its time off the bottom, behaving as a pelagic fish. The spawning grounds of Greenland halibut are believed to be located southwest of Iceland and cover an extended area from Davis Strait, south of 67°N to south of Flemish Pass off Newfoundland between 800 and 2,000 m depths.

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*), Arctic cod (*Boreogadus saida*), Rock cod (*Gadus ogac*), Witch flounder (*Glyptocephalus cynoglossus*), Lumpfish (*Cyclopterus lumpus*), Atlantic salmon (*Salmo salar*), Arctic char (*Salvelinus*

alpinus), Herring (*Clupea harengus*), Iceland scallops (*Chlamys islandica)*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 divisions 2G, 2H, 2J, 3K, 0B and 1F. The domestic harvest within the Study Area, between 2005-2009, is very largely northern shrimp (average 31,567,502 t between July and November), with much lesser quantities of snow crab (average 7,504.4 t from April to August) and Greenland halibut (average20 t between July and December). 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 21 marine mammals, including 14 cetacean and 6 seal species, and the polar bear 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 are uncommon in the Study Area, but they may be present in summer and fall, with two 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 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.

Six species of baleen whales occur in the Study Area. Blue whales and bowhead whales are considered rare. The four more common baleen whales are the Fin Whale, 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.

Eight 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 eight species include the: Sperm Whale (*Physter macrocephalus*), Northern bottlenose whale (*Hyperoodon ampullatus*), Sowerby's beaked whale; Killer whale (*Orcinus orca*); Long-finned pilot whale (*Globicephala melas*), Atlantic white-sided dolphin (*Lagenorhynchus acutus*), White-beaked dolphin (*Lagenorhynchus albirostris*), and Harbour porpoise (*Phocoena phocoena*).

Six species of seals occur in the Study Area, including; harp (*Phoca groenlandicus*); ringed (*Phoca hispida*); bearded (*Erignathus barbatus*); harbour (*Phoca vitulina*); grey (*Halichoerus grypus*) and hooded (*Cystophara cristata*).

Two species of sea turtles may occur in the Study Area. They are the leatherback and loggerhead (*Caretta caretta*) turtles. The leatherback sea turtle is listed as endangered under SARA and is discussed in Section 2.2.1. Atlantic loggerhead sea turtles are the most common sea turtle in North American waters and the largest hard-shelled sea turtles in the world. They are found from coastal areas to more than 200 km out to sea. The North American population is declining, and has been estimated to be between 9,000 and 50,000 adults. Information from fishery by-catch suggests the loggerhead is present in waters on and east of the 200 m isobath off the Grand Banks (captures peak in September), where there is a high concentration of their prey species.

Polar bear (*Ursus maritimus*) distribution and range is primarily limited to terrestrial environments. The proposed seismic program is greater than 40 km from shore.

2.2.5 Marine Birds

In the summer, there are two main seabird communities in Labrador: the surface-feeding omnivorous gulls and the mostly fish-eating diving auks. The area is used by both communities for breeding in summer, as well as for migration, moulting, and, in a few cases, overwintering. Seabird density peaks in the spring and summer months in eastern Canada because of a large number of breeding species and migrants. All areas of the Labrador shelf are used, though the shelf edge and Hawke Channel show notable high densities, and areas around colonies such as Funk Island will also have unusually high densities during breeding season. There are approximately 27 species of birds known on the Labrador Shelf area.

Most of the seabirds in the Labrador Shelf area, including the Study Area, are colonial nesters, sharing breeding space with others of the same species and often with other species. Razorbill (*Alca torda*), Atlantic Puffin (*Fratercula arctica*), Common and Thick-billed Murres (*Uria aalge* and *Uria lomvia*) and Black Guillemot (*Cepphus grille*) nest along islands along the Coast of Labrador. Large numbers of Common and Thick-billed Murres winter on the Grand Banks and in the Labrador Sea. In eastern Canada, they breed in densely packed colonies, with the Atlantic populations of both species estimated at 16-25 million breeding birds. The largest colony of Razorbills in eastern North America, with an estimated 5,400 pairs (almost a third of the eastern North American population) is located on the Gannet Islands. Northern Fulmars (*Fulmarus glacialis*) spend most of the year at sea, and are known to breed on the Gannet Islands and have a tendency to stay in the Labrador Sea (between 50° and 55° N) from December to March. Fulmars are found at the highest densities during winter in the Labrador and Newfoundland Shelves Region. Virtually all of the world's population of Greater Shearwaters (*Puffinus gravis*) spends the non-breeding season in the northwest Atlantic. Sooty Shearwaters (*Puffinus griseus*) use the waters off the coast of Labrador during migration. The Leach's Storm Petrel (*Oceanodroma leucorhoa*) breeds in the north Atlantic and overwinters in the tropical Atlantic and the less common Wilson's Storm-Petrel (*Oceanites oceanicus*), which breeds in the Antarctic, summers in the north Atlantic. Petrels are known to breed, albeit in low numbers, on islands off Labrador. The Manx Shearwater (*Puffinus puffinus*) spends most of its life in the water, only coming ashore to breed at offshore nesting colonies. Great Cormorant (*Phalacrocorax carbo*) is known to winter along the coast of southern Labrador, while the Double-crested Cormorant (*Phalacrocorax auritus*) will summer at the same location. Of the six major breeding colonies of the Northern Gannet (*Morus bassanus*) in North America, three exist on the Atlantic coast of Newfoundland, with the colony on Funk Island (50 km northeast of Cape Freels) being the closest to the Study Area. In Newfoundland and Labrador, Northern Gannets are most commonly observed in the highest densities close to shore, near their nesting colonies during the spring and summer months. Sightings are rare aside from these locations. In fall, gannet distribution shifts to the south, and few to no gannets have been sighted off the coast of Labrador in the fall and winter.

Common Tern (*Sterna hirundo*) and Arctic Tern (*Sterna paradisaea*) colonies are known to occur off the coast of Labrador. There are also occasional records of the less common Caspian Tern (*Sterna caspia*). Several gull species are known to occur off the coast of Labrador including Black-legged Kittiwake (*Rissa tridactyla*), Great Black-backed Gull (*Larus marinus*), Herring Gull (*Larus argentatus*), Ring-billed Gull (*Larus delawarensis*), and Glaucous Gull (*Larus hyperboreus*). Herring and Black-backed Gulls are known to breed throughout the study area and in the Arctic in numbers reaching tens of thousands and can be found offshore year-round. Iceland Gull (*Larus glaucoides*), and Ivory Gull (*Pagophila eburnea*) do not nest in Labrador, but are non-breeding visitors moving down from Arctic breeding grounds. Sabine's gull (*Xema sabini*) may also use the offshore Labrador for migration, while a modest amount of reports exist to support this claim. The central Labrador Shelf has been identified as hosting particularly high concentrations of Kittiwakes during the fall.

The following species also use the Study Area as part of the long-distance migration between northern breeding grounds and southern wintering areas: Long-tailed Jaeger (*Stercorarius longicaudus*), Parasitic Jaeger (*Stercorarius parasiticus)*, Pomarine Jaeger (*Stercorarius pomarinus*), and the Red-necked Phalarope (*Phalaropus lobatus*). Dovekies (*Alle alle*) breed predominantly in high-arctic regions, particularly Greenland, with a few small breeding assemblages in northeastern Canada and the Bering Sea. The species winters in the low-arctic waters of the Labrador Sea, Grand Banks, and coastal Newfoundland. Great Skua (*Catharacta skua*) has a limited range but population trends appear to be stable. The species breeds in Europe (Norway, Faroe Islands, Scotland) but small numbers winter on the Grand Banks off Newfoundland.

2.2.6 Sensitive and Special Areas

Potential sensitive areas include: important bird areas (IBA); Marine Protected Areas (MPAs) identified pursuant to the *Oceans Act*; National Marine Conservation Areas (NMCAs); National Parks and Reserves; and Coral Protection and Conservation Areas.

There are a total of 16 IBAs bordering the Study Area along the Labrador coast, including the Gannett Islands. These areas, along with five IBAs located on the Newfoundland coast, are identified in the EA Report. The IBAs on the Labrador coast are: Bird Island; Cape Porcupine; Galvano Island; Gannet Islands; Goose Brook; Nain Coastline; Northeast Groswater Bay; Offshore Islands, Southeast of Nain; Quaker Hat Island; Seven Islands Bay; South Groswater Bay; St. Peter Bay; Table Bay; The Backway; The Tumbledown Dick Islands; and Stag Islands. The IBAs on the Newfoundland coast are: Fischot Islands; Northern Groais Island; Bell Island; Wadham Islands; and Funk Island.

Currently, there is one MPA found near the Study Area. Gilbert Bay Marine Protected Area, which has been protected under the *Oceans Act* since 2005, is 47 km^2 in size and located approximately 300 km from Happy Valley-Goose Bay on Labrador's southeast coast. Prohibitions are placed on fishing activity within various zones of the MPA to ensure the health of the cod population and its key habitats.

The Study Area has no designated NMCA, although two representative marine areas (RMA) have been identified near the Study Area. Hamilton Inlet, east of Lake Melville, extends offshore to include the Hamilton Bank and part of the Cartwright Saddle. Nain Bight, east of Natuashish, extends offshore into Nain Bank and the Hopedale Saddle.

The Torngat Mountains National Park is the sole National Park found adjacent to the Study Area. The park encompasses 9,700 km^2 of the Northern Labrador Mountains natural region, extending from Saglek Fjord in the south, including all islands and islets, to the very northern tip of Labrador. No exploration or production activities are allowed within the park boundaries, which includes Saglek Bay to Killinek Island near Cape Chidley in the marine environment. Battle Harbour is also managed by Parks Canada under the National Site Historic Program and is designated as a National Historic District because of its historic importance in the Labrador fishery.

The Gannet Islands Ecological Reserve is an archipelago of seven islands and surrounding marine component at the mouth of Sandwich Bay. The reserve is 22 km^2 in size, with 20 km^2 of that area being the marine waters surrounding the islands. It is the largest seabird colony in Labrador and has the largest Razorbill colony in North America. It also hosts important breeding populations of Atlantic Puffins and Common Murres, and is the largest known moulting site for Harlequin Ducks (listed under *SARA* as "special concern") in eastern North America. The reserve is located approximately west (inshore) of the Study Area.

Deep-sea corals are key components of benthic habitats because they give refuge for smaller species, forage and nursery areas for young, and provide cover for prey species. Coral species richness has been identified between Makkovik Bank and Belle Isle Bank. Hatton Basin and Saglek Bank are two areas known for large concentrations of slow-growing long-lived gorgonian corals (e.g. *Primnoa resedaeformis* and *Paragorgia arborea*). The majority of corals are found at depths greater than 200 m along the continental shelf edge and continental slope. An area approximately 14,000 km^2 in NAFO Division 3O was established as a coral protection zone in 2007, within which all bottom trawling is prohibited. An additional area of 12,500 km^2 in the northern Labrador Sea has been voluntarily designated a coral protection zone by the Groundfish Allocation Enterprise Council/Canadian Association of Seafood Producers. Sponges, like corals, are important parts of benthic habitats and are omnipresent in marine habitats. Coral can provide significant habitat at greater depths, improve species richness and diversity, and affect local fauna communities. Sponges have a motile larval stage, which becomes *sessile* at maturity. In the Labrador Shelf area, large catches of sponges in the Order Astrophorida have been recorded at a depths ranging from 900 to 1250 m, and sponges appear to exist in large congregations in this area.

The Department of National Defence (DND) is likely to be transiting and conducting naval exercises within the Study Area during the July to November 2011 to 2013 timeframe. Unexploded ordinate (UXO) data is available for the Study Area so a search of the records was conducted to determine the possible presence of UXO. DND records indicate that the following four shipwrecks are present within the Survey Area: *Everoja; Flynerborg; Gretavale*; and *Empire Gemsbuck* from convoy SC-52 were sunk by German U-boats U-202 and 203 on 3 November 1941. Further, a vessel (*Mount Maycale*) from convoy SC-117 was sunk by U-boat U-413 on 22 January 1943. Records indicate that all five ships were carrying general cargo at the time; consequently, it is possible munitions were part of that cargo. One aircraft wreck, a B-24J Bomber, was reported to be present in the northern part of the survey area (approximately Long - 58.666667 Lat 59.216667). B24 aircrafts used in the Maritime Patrol role were typically of Very Long Range (VLR) configuration, carrying a maximum load of 2700lbs of torpedoes, depth charges, and 0.50 caliber machine gun ammunition. Consequently, it is possible that munitions were aboard. 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, MKI should not disturb/manipulate it, mark the location, and immediately inform the Coast Guard.

2.2.7 Research Surveys and Vessel Traffic

Fisheries research surveys conducted by Fisheries and Oceans Canada (DFO), and the fishing industry, are important to the commercial fisheries to determine stock status, as well as for scientific investigation. The Canadian Association of Prawn Producers in conjunction with DFO survey shrimp from water depths between 100 to 750 m in 2G. Since 2005, this annual survey runs from July 15 through the first week of. Similarly, the multispecies survey (groundfish, shellfish, benthos and oceanography) is conducted between late October to mid December annually in divisions 2J and 3K, while NAFO division 2H is surveyed every second year. 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, MKI will contact relevant DFO managers at the start of each program year to ensure that there are no timing conflicts.

The cruise ship routing in Labrador is mainly from south to north and return; however, the east to west routing from Europe ports via Iceland, Greenland, Baffin, and south to Labrador is being developed.

The DND is likely to be transiting and conducting navy exercises within the Study Area during the May to November 2011 to 2013 timeframe. It will be necessary for MKI to maintain contact with DND throughout each work season.

There are three other operators with planned seismic programs in the area: Husky Energy, Chevron Canada Resources and Investcan Energy Corporation.

Part C: ENVIRONMENTAL ASSESSMENT PROCESS

3. Review Process

On January 17, 2011, MKI submitted the project description "*Project Description For 2D Marine Seismic Survey Offshore Northeast Coast of Canada Labrador Shelf*"PGS/TGS NOPEC, December, 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 21, 2011 to: DFO; Environment Canada (EC); DND; Transport Canada (TC); Natural Resources Canada (NRCan); Health Canada; Canadian Environmental Assessment Agency (CEAA); National Energy Board (NEB); Nunatsiavut Government (NG); and the Newfoundland and Labrador Departments of Environment and Conservation, Fisheries and Aquaculture, and Natural Resources.

On March 10, 2011, the C-NLOPB notified MKI 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* (CEAA), 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 April 1, 2011, MKI submitted the *Environmental Impact Assessment for Marine 2D Seismic Reflection Survey Labrador Sea and Davis Strait Offshore Labrador by Multi Klient Invest AS (MKI)* (RPS 2011a). The C-NLOPB forwarded the EA Report on April 1, 2011 to DFO, EC, DND, NG, 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, NG and the FFAW. In order to address deficiencies in the EA Report, MKI was required to provide a response to the EA Report comments. MKI responded on June 28, 2011 with the Addendum to the *Environmental Impact Assessment for Marine 2D Seismic Reflection Survey Labrador Sea and Davis Strait Offshore Labrador by Multi Klient Invest AS* (RPS 2011b) and the C-NLOPB forwarded the responses to DFO, EC, DND, NG and the FFAW. On August 9, 2011 the C-NLOPB forwarded comments to MKI that had been received from reviewers. MKI responded on August 16, 2011 with a response to comments on the Addendum and the C-NLOPB forwarded the responses to DFO, EC, DND, NG and the FFAW. MKI was requested to provide a response to further review comments. This was submitted to the C-NLOPB on September 6, 2011.

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 MKI that is likely to be carried out in relation to their proposed Project.

3.1 Scope of Project

The survey in 2011 is located in the Labrador Sea and Davis Strait. The geographic extent of project activities includes the Project 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 40 to 60 day 2D survey in 2011. In 2011, MKI is proposing to acquire approximately 9,600 linear km of 2D seismic survey data within the Project Area. The components of a 2D survey include a seismic vessel, the source towed array (air source units); the receiver (hydrophone) towed array; a support vessel, and shore facilities. Helicopters may or may not be utilized depending on the type of helicopter available.

For the 2D surveys, typical ships are usually about 60 to 90 m long and tow a single source array 100 to 200 m behind the ship. Each source array is about 20 m long and 24 m wide. Following 100 to 200 m behind the source array is a single streamer between 8 and 10 km long. A tail buoy with radar reflectors is attached at the end of each streamer. At the end of the track, the ship will take two to three hours to turn around and start along another track. Spacing between tracks for the 2011 program will be 120 km. The seismic air guns have a working pressure of 2000 psi and the typical array is a single source array made up of 6 sub-arrays.

The seismic vessel utilizes the PGS GeoStreamer® which is a solid streamer. Solid streamers are less sensitive to weather related noise than liquid streamers and further minimize the environmental impact of fluid loss from breaks or tears in conventional fluid filled streamers.

The energy source will be a dual air source array system. The produced broadband source level for a typical array is about 252 dB re 1 μPa-m, with the highest energies falling between 10 to 100 Hz.

For each air source unit, the amplitude (or loudness) of the seismic signal is a function of the volume and pressure of the air inside the cylinder and the cylinder's depth under the water surface. The larger the cylinder volume and the higher the internal air pressure, the louder the sound. The individual source unit volumes can range from 70 cubic inches to 290 cubic inches. The larger source units are positioned at the front of the array with progressively smaller volumes to the back of the array.

The duration of the proposed 2D seismic survey is estimated at 40 to 60 days. Survey activities will occur from July 1 to November 30 in 2011 to 2013.

3.2 Boundaries

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

Boundary	**Description**
Temporal	Between 1 July to 30 November, 2011 to 2013.
Project Area	Defined as a 561,423 km^2 area which includes a 10 km buffer area for vessel turning.
Affected Area	Defined as Project Area plus a 30 km buffer area.
Regional Area	The area extending beyond the "Affected Area" boundary within the Labrador Sea and Davis Strait.

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 *Multi Klient Invest Two Dimensional Seismic Survey Offshore Northeast Coast of Canada Scoping Document* (C-NLOPB 2011a).

4. Consultation

4.1 Consultation carried out by MKI

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

Sikumiut Environmental Management Ltd. (Sikumiut) was engaged by RPS Energy (Canadian Lead Consultancy for the Operator) to carry out a consultation program in support of the EA for a proposed seismic project to be conducted on the Labrador Offshore Shelf in 2011-2013. Contact was made with 105 stakeholders in communities on the north coast of Labrador from Nain to Rigolet; the upper Lake Melville towns of Happy Valley-Goose Bay, North West River and Sheshatshiu; and the south coast communities from Cartwright to Mary's Harbour. An information package was distributed to 105 stakeholders and follow-up contacts were made to each individual. Direct meetings were held with the FFAW and One Ocean and the Chairperson of the Labrador North Coast Fishers' Committee at their request.

Consultations and community engagements were held in Nain, Hopedale, Makkovik, Postville, Rigolet, Happy Valley – Goose Bay, and Port Hope Simpson. The public consultation meetings were held during April 11–April 15, 2011. These consultations were a follow-up of previous consultation efforts that were conducted by Sikumiut in February, 2011 and which involved introductory correspondence and information about the proposed Project, provided to over 100 stakeholders in the area followed by subsequent discussions via phone. In addition, a meeting was also held with the management of the Torngat Fish Producers Cooperative Society Ltd. in Happy Valley – Goose Bay on April 11.

Attendance at the individual meetings ranged from two to nine people for a total of 37 people in attendance at all meetings. The main discussions and concerns raised during the public meetings included:

- the sensitivity of the area in relation to the commercial fishery resources such as crab, shrimp, and turbot;
- concerns related to the effects of seismic surveys on fish, including commercial fisheries, and other animal populations;
- inquiries as to the compensation for damage to the environment and the fishery;
- requests for more effective communications between fishing operations and seismic operations;
- community benefits particularly in the context of employment;
- need for follow-up by the consultants in providing additional information about the Project; and
- involvement of Labradorians in any such projects activities that are conducted in Labrador, particularly in regards to employment opportunities (as raised by the vice chairman of the Combined Community Councils of Labrador).

Representatives of RPS Energy contacted several agencies and departments during the preparation of the EA Report. They include: EC; Canadian Wildlife Service (CWS); DFO; Parks Canada; and the Provincial Departments of Fisheries and Aquaculture, Natural Resources and Environment and Conservation.

MKI has committed to continuing to consult with interested stakeholders and to providing an annual report once its 2011 program is complete.
The C-NLOPB is satisfied that the consultations carried out by MKI, and reported on in the EA Report, included all elements of the Project, and that MKI 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 April 4, 2011 to DFO, EC, DND, NG 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.

DND provided comments on the EA Report on 05 May, 2011 which reflected the fact that comments provided by DND and previously forwarded to MKI were absent in the EA Report. On July 11, 2011 DND replied that MKI's response in the EA Addendum to this comment was satisfactory.

DFO provided comments on the EA Report on 16 May 2011. Their comments focused on the quality of the EA Report, which they deemed as low. They also had a number of specific comments pertaining to the accuracy of fish data/landings, SARA information, and sensitive areas, including corals. DFO provided comments on the EA Addendum on 8 August 2011. Comments included: the quality of information on the benthic, marine fish, mammal, SARA, sensitive coral areas, and commercial fisheries; the effects of the program: and mitigation of those effects.

The FFAW provided comments on the EA Report on 17 May 2011. The key issues were: inconsistencies in the document on their proposed procedures while operating their program; a perception that the proponent does not have a complete understanding of the commercial fishery; the unknown long-term effects of seismic on fish; inadequate consultations with their industry; the use of a Fisheries Liaison Officer (FLO); and the possible use of a Fisheries Guide Vessel. The FFAW provided comments on the EA Addendum 29 July, 2011. Comments included: the temporal scope of the project; clarity on fishing regulations, activity type and timing; the proponent's assumption that the seismic vessel always has the right of way (because of its decreased maneuverability); consultation; and referencing.

EC provided comments on the EA Report on 17 May 2011. The key issues were: the brevity of the marine bird section for multiple species; a lack of other activities that may be occurring in the area at the same time with particular reference to other seismic operations; a request that MKI collect seabird data and provided the protocol for proper bird-handling; and a reminder of federal regulations that the proponent must adhere. EC provided comments on the EA Addendum on 22 July 2011. Comments included: proper referencing; quantity of information in the marine bird section; and the possible effects of the project on marine birds.

The NG provided comments on the EA Report on 31 May 2011. Their comments included: clarity of the Project Area; impacts of seismic programs on catch rates for fisheries in the area; timing of the program to prevent overlap with fisheries in the area; the hiring of Inuit observers; quantification of impacts on marine mammals; absence of new research; and a quantitative assessment of cumulative effects. The NG provided comments on the EA Addendum on 27 July 2011. Their comments included: clarity of the project area; impacts of seismic programs on catch rates for fisheries in the area; timing of the program to prevent overlap with fisheries in the area; the hiring of Inuit observers; quantification of impacts on

marine mammals; a request to study the effects of seismic activity along the Labrador coast; and a quantitative assessment of cumulative effects.

The consolidated review comments were provided to MKI on June 3, 2011. MKI responded on June 28, 2011 in the form of an EA Addendum. MKI's June 28, 2011 response was forwarded to reviewers for assessment that the EA Addendum was an adequate response to their comments. Additional comments on the EA Addendum were provided to MKI on August 9, 2011. MKI responded on August 16, 2011 in the form of a letter entitled, *"MKI's Response to Consolidated Comments on the EA Report Addendum on Multi Klient Invest Offshore Labrador 2D Seismic Program 2011-2013."* MKI's August 16, 2011 response was forwarded to reviewers. A final set of comments were sent to MKI for clarification, in response to their letter, on August 31, 2011 and September 6, 2011. MKI responded to these comments on September 7, 2011.

The C-NLOPB believes that all substantive comments within the scope of the EA have been addressed.

5. Environmental Effects Analysis

5.1 Methodology

The C-NLOPB reviewed the environmental effects analysis presented by MKI 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, MKI presented information regarding the potential effects of the seismic survey program activities on marine finfish and shellfish, commercial fisheries, marine and migratory birds, 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 Shellfish 1

The seismic survey program will not result in any direct physical disturbance of the bottom substrate. During seismic 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 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. Studies referenced in the EA Report and Addendum indicated that fish mortality had not been shown to result from exposure to seismic sound sources. Several studies have shown that exposure to noise such as that produced by seismic airguns can result in temporary hearing loss and physical damage to the ear, however, there are substantial differences in the effects of airguns on the hearing thresholds of different species. 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. 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. There are documented observations of fish and invertebrates exhibiting behaviours that appeared to be in response to exposure to seismic activity like a startle response, a change in swimming direction and speed; or a change in vertical distribution, although the significance of these behaviours is unclear. 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 discussed in the EA Report and Addendum. In general, fish show a 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 several days. The EA Report and Addendum states that the temporary nature of these responses varies depending on the fish species and the sound source.

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. Any potential physical or behavioural effects on fish due to project activities will be negligible to low in magnitude, in an area of less than 10 km, and of duration of two weeks. 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. Crustaceans appear to be most sensitive to low frequency sounds, less than 1,000 Hz. Invertebrates 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. Benthic invertebrates are less likely to be affected by seismic activity because few invertebrates have gas-filled spaces and benthic species are usually more than 20 m away from the seismic source.Studies referenced in the EA Report and Addendum 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, less than a metre. 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 300 m from the airguns and will not likely be affected by any particle displacement resulting from airgun discharge. Mitigations consistent with those outlined in the *Geophysical, Geological, Environmental and Geotechnical Program*

Guidelines (C-NLOPB 2011b), will be implemented. Any potential physical or behavioural impact to invertebrate species is considered to be negligible to low in magnitude, within an area of less than 10 km, over a duration of two weeks. The likelihood of effects (behavioural and physical) is low and therefore **not significant**.

5.2.2 Commercial and Traditional Fisheries and DFO Research Surveys 1

Potential interactions 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 relatively short duration. The seismic survey vessel and project-related support vessel traffic will be present within 2G, 2H, 2J, 3K, 0B, and 1F.

Fisheries data presented in the EA Report and Addendum shows the average annual Canadian-landed harvest by species, 2005 to 2009, from within the Study Area from July to November, based on the geo-referenced DFO datasets. The domestic harvest in the Study Area has been dominated by shrimp throughout this period, in terms of quantity. Northern shrimp is the most significant species harvested within the Study Area in terms of quantity and value of harvest, accounting for, on average 31,567,502 t (more than 85-98% of the total harvest) between July and November in recent years. The Study Area overlaps with parts of Shrimp Fishing Area (SFA) 4, 5, and 6 and is managed by Canada's DFO. Snow crab is of high importance in the Study Area's fisheries, averaging 7,504.4 tonnes from April to August. The season is defined each year but typically runs in 2J north from June 15 to August 30 and in 2J south from May 1 to July 15, and in 3K from April to end of June. The fishery poses a potential for seismic / fishing gear conflicts in those areas where the two marine activities might overlap because the fishery uses fixed gear (crab pots). The Study Area overlaps with portions of crab fishing areas in 2H, 2J, and 3K. Greenland halibut (often called turbot) represents about 0.1% of the Study Area catch by quantity and value, an average of just over 20 t between July and December over the five year period. Most (about 99%) of this harvest in the Study Area is taken using fixed gear gillnets. Analysis of the average annual domestic harvest for all species (from 2005 to 2009) indicates, June, July and August were the most productive months during this period, accounting for more than 50% of the annual catch.

While adult fish could be injured by seismic arrays if they are within a few metres of an air source, this is not likely to happen as most fish disperse when the array ramps up and becomes active, or when the vessel approaches. Thus, the most likely type of effect will be on fish behaviour. Seismic surveys can result in reduced trawl and longline catches immediately following a survey as the fish temporarily move from the area. Although studies referenced in the EA Report and Addendum indicated some impacts on fish behaviour, they reached different conclusions about the duration of the change in behaviour and/or the degree of the effect on catch.

It is extremely important to the Nunatsiavut Government that the aboriginal fisheries, both offshore and nearshore, are not disturbed or adversely affected by the proposed seismic program in 2011 to 2013. The area proposed for seismic activity is important to the Nunatsiavut fishery.

MKI 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 (MKI has indicated that the survey will be scheduled such that the last lines shot are those closest to the NG Settlement Zone's eastern boundary and the lines will be run north to south); use of a Fisheries Liaison Officer (FLO) on the seismic 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; the use of a single point of contact (SPOC); and a fishing gear damage compensation plan. A scout vessel will

accompany the seismic survey vessel to provide advance warning of fishing activities in the area and for communications with other vessels. This vessel will meet similar criteria as the survey vessel. MKI is committed to ongoing Aboriginal stakeholder relations and will include all interested communities and organization that developed from the engagement meetings to be kept informed of all program developments and future surveys. MKI 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, MKI 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 ongoing communication and 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 1 to 10 km, and over duration of less than one month. Therefore, effects to the commercial fishery are not likely and **not significant**.

5.2.3 Marine Mammals and Turtles 1

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 varies 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 EA Report and Addendum 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 and Addendum. 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. Baleen whales generally avoid an operating air gun, but the avoidance radii appear to be quite variable. Baleen whales, like the listed fin and blue whales, may deviate from a migratory route, suspend feeding or avoid the area. The biological significance of such a change in behaviour is considered slight since there are no uniquely significant habitats (feeding, nursery, mating) identified within the Study Area and there are alternate feeding areas. Fin whales are expected to avoid the area of 160 dB and higher. The Addendum cites a study by Miller *et. al.* 2005 where migratory bowhead whales may began to avoid a seismic source 35 km away, but continue feeding until the sound source comes to within 3 km.

The limited available data indicate that sea turtles will hear airgun sounds. 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 vessel. 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 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 EA Report and Addendum 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 low to medium in magnitude, within an area less than 500 m, and over a duration of one month. 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 500m, and over duration of one month. 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 1

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. There is a lack of scientific evidence which shows the relationship between physiological damage to birds from seismic activity and the proximity of the birds to the seismic source. 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 they 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 Alcids 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. Offshore observers record seabird sightings relative to the vessel, yet they have not reported any mortalities or injuries associated with the surveys. Shearwaters have been observed within 30 m of seismic array with their heads underwater and demonstrating no response.

A seabird data collection program shall be undertaken aboard the seismic vessel by experienced biologists. An Environmental Observer will be onboard to record marine bird (and marine mammals) sightings during the program. The protocol will follow CWS's Standardized Protocols For Pelagic Seabirds Surveys From Moving and Stationary Platforms for the Hydrocarbon Industry: Interim Protocol – June 2006. MKI will ensure that CWS is provided field data collection, including in raw data format,

with respect to marine birds. Marine bird data reports will be provided following this survey and any other subsequent seismic surveys.

The effect of noise on marine birds is predicted to be of negligible to low magnitude, within an area on the order of 10s of metres, and over a duration of less than one month. 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**.

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. MKI's procedure for handling stranded birds is based on those outlined in the Leach's Storm Petrel Mitigation Program developed by Williams and Chardine in 1999. MKI will obtain a valid Live Seabird Handling permit from CWS. The effect of vessel lighting on marine birds is predicted to be of low magnitude, within an area 1-10 km, and over duration of less than two months. Therefore, the effect of vessel lighting on marine birds is deemed **not significant**.

5.2.5 Species at Risk 1

The EA Report and Addendum indicates that the area for potential surveys has no unique habitat or spawning areas required by fish species at risk. 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**.

Leatherback sea turtles may occur in the Study Area in the summer and fall but there is no known critical habitat. There is some risk to marine turtles from collision with seismic vessels. As they are submerged for the most part and may avoid seismic arrays, the risk of mortality or serious injury is anticipated to be low. Physical harm is expected to be mitigated by using ramp-up or soft-start procedures which will encourage sea turtles to move from the area. 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. Fin whales may occur within the Study Area year-round, but higher frequency of summer sightings of this sp3ecies in nearshore areas suggests that Fin Whales are more likely to occur closer to the coast. . A dedicated Marine Mammal Observer will be onboard the seismic vessel. With the implementation of mitigation measures, 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**.

With the exception of the Ivory Gull, it is unlikely that the bird SAR will interact with the Project, as the species are found either in rivers (Harlequin Duck), along shorelines (Barrows Goldeneye) or are believed to be extirpated (Eskimo Curlew).The Ivory Gull is unlikely to occur in the Study Area, particularly during the summer when seismic surveys are likely to be conducted. There are no known nesting grounds for the Ivory Gull in the Study Area, and any presence in the area is expected to be incidental. 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 Sensitive Areas 0

There are several areas and locations near the Study Area that have been identified as sensitive areas. The NMCAs, National Parks and Historic Sites, Ecological Reserves, IBAs and MPAs (actual and proposed) should not be affected by this program because of the geographical separation.

Corals are widely distributed throughout the Labrador Sea and Davis Strait, and are extremely important to the benthic community. Corals are often damaged by bottom-fishing gear, and may be increasingly susceptible to global warming and associated ocean acidification. Hatton Basin and Saglek Bank are two areas known for large concentrations of slow-growing long-lived gorgonian corals and the northern boundary of the Study Area does extend into the southern portion of Hatton Basin and includes all of Saglek Bank. There are two interim closures in the Newfoundland and Labrador region. The first is the Voluntary Coral Protection Zone in NAFO division 2G-0B off Cape Chidley, Labrador. The second is the CAD-NAFO Coral Protection Zone, on the slope of the Grand Bank in NAFO Division 3O between 800 and 2000 m within which all bottom-fishing activity is prohibited. Only the southern portion of the Voluntary Coral Protection Zone occurs in the Study Area. MKI should be aware that there is a possibility that conservation measures to protect deep sea corals could be adopted in the future for the Newfoundland and Labrador region.

The effects on sensitive areas are predicted to be low, within an area between 500m and 10 km, and over duration up to 2 months. With the application of mitigation measures, including avoidance of sensitive areas, the overall likelihood of effects occurring is low, and effects will be **not significant.**

5.2.7 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 because of the length of the survey program. A licensed waste contractor will be used for any waste returned to shore. The effect of the seismic 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. Good coordination between programs to minimize potential acoustic interference will also be needed. MKI has committed to communication with other marine users 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 MKI AS'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 MKI 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 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 Impact Assessment for Marine 2D Seismic Reflection Survey Labrador Sea and Davis Strait Offshore Labrador by Multi Klient Invest AS (MKI) (RPS March 2011), the Addendum to the "Environmental Impact Assessment for Marine 2D Seismic Reflection Survey Labrador Sea and Davis Strait Offshore Labrador by Multi Klient Invest AS" (RPS June 2011) and MKI's Response to Consolidated Comments on the EA Addendum (August 15 and September 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).*

- *No later than January 31, 2012, the Operator shall submit a report to the C-NLOPB describing the progress and potential environmental effects of its 2011 2D seismic program. It shall include, but not be limited to, copies of the Fisheries Liaison Officer (FLO) reports and the marine mammal observer (MMO) reports that were produced during the program.*

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 Multi Klient Invest AS, 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 Elizabeth Young Date: September 8, 2011

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

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