CANADA-NEWFOUNDLAND and LABRADOR OFFSHORE PETROLEUM BOARD
CEAA SCREENING REPORT

Part A: General Information

Screening Date	**May 4, 2009**
EA Title	Environmental Assessment of Petro-Canada Jeanne d'Arc Basin Exploration Drilling Program, 2009-2017
Proponent	Petro-Canada 235 Water Street, St. John's, NL A1C 1B6
Contact	Mr. Ian Delong, Manager Jeanne d'Arc Basin Subsurface and Exploration
C-NLOPB File No.	7705 P28-5
CEAR No.	08-01-42400
Referral Date	August 29, 2008
EA Start Date	October 16, 2008
Location	Jeanne d'Arc Basin Area, Northeastern Grand Banks

Part B: Project Information

On August 29 2008, Petro-Canada submitted a project description *"Petro-Canada Jeanne d'Arc Basin Exploration Drilling Program, 2008-2016 Project Description"* (Christian and Buchanan 2008) to the Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB), in support of its application to drill up to 18 single and/or dual side-track exploration wells and conduct geohazard/wellsite surveys and vertical seismic profiles (VSPs) on acreage held by the operator in the Jeanne d'Arc Basin area over a nine year period. A screening level environmental assessment was completed on November 19, 2008. The "*Environmental Assessment of Petro-Canada Jeanne d'Arc Basin Exploration Drilling Program, 2009-2017*" (Christian 2008) (herein referred to as the 2008 EA Report) provided an environmental assessment of a multi-well drilling program over a nine year period. The C-NLOPB provided review comments to Petro-Canada on March 12, 2009 to be addressed before a Screening Report could be issued by the C-NLOPB. The "*Environmental Assessment of Petro-Canada Jeanne d'Arc Basin Exploration Drilling Program, 2009-2017 Addendum*" (Christian 2009) was submitted on April 6, 2009 to address these comments.

In completing this Screening Report, information from the 2008 EA Report and the 2009 EA Addendum was summarized and included in the following sections.

1. Description of Project

Petro-Canada proposes to drill up to 18 exploration wells and conduct geohazard/wellsite surveys and VSPs at various locations in the Jeanne d'Arc Basin area from 2009 to 2017. The current land holdings in the Newfoundland Offshore held by Petro-Canada is provided in the 2008 EA Report. It is proposed that drilling operations will commence in 2009. The wells will be drilled using either a drill ship, semi-submersible, or a jack-up mobile operating drilling unit (MODU), depending on the time of year and location. The project includes marine support vessels – for anchor handling and shipping goods and personnel to the MODU, helicopter support, shore-based facilities (using existing facilities in St. John's), and abandonment. Vertical seismic profiling and testing, and geohazard/well site surveys may be required for any of the 18 wells drilled and geotechnical testing. An onsite Environmental Observer (EO) will be onboard the drilling unit to record and report weather, oceanographic and ice conditions. The EO will also conduct seabird and marine mammal observations on a daily basis in accordance with established protocols.

If a jack-up rig is to be used, the C-NLOPB will only authorize the rig to operate in a pre-determined operating window. The operating window will be determined annually by the C-NLOPB and will depend on the 'ice free period'[1] and weather conditions. Petro-Canada indicates that the wells will be drilled over a nine year period anytime throughout the year (for semi-submersible rigs and drillships). VSP and geohazard surveys may be carried out on an as-needed basis at any time of the year.

Water depths in the Project Area range from <100 m to 1,000 to 2,000 m, with maximum depths in the Study Area exceeding 4,000 m. Water based muds (WBM) will be used for vertical wells, where practicable. However, for deviated wells, synthetic based muds (SBM) may be used.

Drilling is scheduled to commence in 2009. It is anticipated that it will take approximately 80 to 100 days to drill, complete, test and abandon each well.

2. Description of Environment

2.1 Physical Environment

The 2008 EA Report (Christian 2008) provides a detailed description of the physical environment for the Jeanne d'Arc Basin area. Physical environment information can also be found in the recently completed StatoilHydro seismic and exploration and appraisal/delineation drilling EAs (LGL 2008a, 2009), the Husky White Rose Development Project: New Drill Centre Construction and Operations Program documents (LGL 2006 and 2007a), and the Husky delineation/exploration drilling EA (LGL 2007b).

The Project Area is located on the Northeastern Grand Banks, offshore Newfoundland, in water depths ranging from <100 m to 1,000 to 2,000m. Physical environmental conditions considered

[1] *Ice free season will be defined by the C-NLOPB annually, based on actual ice conditions, and will take into consideration ice data analysis provided in the "Characterization of Ice-Free Season for Offshore Newfoundland" (C-CORE 2005), commissioned by the C-NLOPB.*

in the environmental assessment include wind, waves and currents; air and sea temperatures; precipitation, visibility (fog); and sea ice and icebergs.

2.1.1 Wind, Waves and Currents

On average, winter winds are from the west to northwest and summer winds are southwesterly in the Project Area. Mean wind speeds are notably higher during the winter months, with the highest mean wind speeds occurring in the months of December, January and February (10.8 to 11.1 m/s) and the lowest in July (6.2 m/s).

Wave data presented in the 2008 EA Report show that the highest sea states occur in the Project Area during extra-tropical storms primarily during October through March. The lowest significant wave height in the area ranges from 1.7 m (monthly mean) in July to 4.0 m (monthly mean) in December and January. The maximum monthly mean significant wave heights measured are 6.4 m in July to 14.1 m in February.

Current data was described for four sub-areas in the Project Area. Sub-area 1 is in the section of the Grand Banks where Terra Nova is located and where water depths range from 0 to 100m. Results show that the maximum near-surface current speed measured 79.9 cm/sec in May. At mid-depth, the highest current speed was 73.6 cm/sec in September. At bottom, the maximum current speed measured 45.1 cm/sec in September. The data for Sub-area 2 (White Rose where the water depth is between 100 to 200m), Sub-area 3 (outside White Rose where the water depth is between 200 m and 400 m), and Sub-area 4 (western side of the Flemish Pass just outside the Project Area where the water depth is more than 400m) is included in the 2008 EA Report.

2.1.2 Air and Sea Temperatures

Mean sea surface temperatures range from 0.8^{o}C in March to 12.2^{o}C in August. Mean air temperatures range from -0.4^{o}C in January and February to 13^{o}C in August.

2.1.3 Visibility

Reduced visibility on the Grand Banks occur primarily to fog in the warmer months, whereas snow reduces visibility in the winter months. On average, reduced visibility occurs most often in the month of July with fair to poor visibility reported in 68% of observations. The lowest incidence of reduced visibility occurs during October with fair to poor visibility reported in just 23% of observations.

2.1.4 Sea Ice and Icebergs

The proposed Project Area occurs close to the extreme southern limit of the regional ice pack with sea ice covering part of the Grand Banks about one in every three years. In typical years, the ice edge reaches the Grand Banks in mid-February and the pack ice at the Project Area generally reaches annual peak coverage in March. The duration of coverage ranged from one to five weeks. Ice concentrations in the southerly edge are usually at the lower end of ice coverage, ranging from 2/10ths to 6/10ths. Only a small proportion (41) of icebergs would have passed through the Project Area during the last ten years. The average annual number sighted within the Project Area was 41 mostly between the months of March and June.

2.2 Biological Environment

A summary of information presented in the 2008 EA Report and 2009 EA Addendum is presented below.

2.2.1 Plankton

Phytoplanktons generally undergo explosions in populations, commonly referred to as blooms. These usually occur in the spring (April/May) and, for some species, again in the fall-early winter (October/January) of the year. There may be areas of enhanced production in the Study Area, similar to other slope areas that have been studied.

2.2.2 Benthos

The benthic community is very diverse and includes within the Project Area a number of invertebrate species such as polychaete worms, bivalve molluscs, echinoderms, crustaceans, and corals. Substrate type and water depth determine the composition of benthic community structures. Species known to occur in the Flemish Pass as well as likely to occur in the Project Area are marine worms (polychaetes, oligochaetes, and nematodes). Data obtained from DFO Newfoundland Region identified the occurrence of corals along the eastern Slope region of the Grand Bank, the Slope region proximate to the Bonavista Cod Box, and along the northern slope of the Flemish Cap. The DFO RV surveys in 2006 and 2007 collected deep-water coral data within the Project Area. Corals collected consisted of large gorgonians, small gorgonians, soft corals, and sea pens. Sea pens (*Pennatula* spp.) and some soft corals (*Capnella* spp., *Gersemia rubiformis*) were distributed from relatively shallow Continental Shelf waters to deep Continental Slope waters, but were generally found associated with Slope areas. Other corals, such as the small gorgonian (*Radicipes gracilis*) and the soft coral (*Anthomastus grandiflorus*), appeared confined to Continental Slope waters deeper than 846 m. A single sample of the large gorgonian (*Paragoria arborea*) was collected at a depth of 155 m within the Project Area.

2.2.3 Fish and Invertebrates

There are a number of fish species that are commercially harvested in the North Atlantic Fisheries Organization (NAFO) Unit Areas (UAs) 3Lh, 3Li, 3Lr, and 3Lt (the Project Area) and 3L, 3M, and 3N UAs (the Study Area). A description of these species is provided in the 2008 EA report.

Based on commercial fishery landings data for the period 2005-2007, invertebrate and fish species in the Study Area include snow crab (*Chionoiecetes opilio*), Northern shrimp (*Pandalus borealis*), Atlantic halibut (*Hippoglossus hippoglossus*), Greenland halibut (*Reinhardtius hippoglossoides*), yellowtail flounder (*Limanda ferruginea*), American plaice (*Hippoglossoides platessoides*), roughhead grenadier (*Macrourus berglax*), Stimpson's (Arctic) surf clam (*Mactromeris polynyma*), Greenland cockle (*Serripes groenlandicus*), ocean quahaugs (*Arctica islandica*), northern propeller clam (*Cyrtodaria siliqua*), Iceland scallop (*Chlamys islandica*), and redfish (*Sebastes spp*.).

Snow crab (*Chionoecetes opilio*) prefer water temperatures ranging from -1^{o}C to 4^{o}C. Soft bottom substrates and water depths over 70 m are primarily habitat for larger snow crabs. Smaller crabs prefer hard substrates. Mating occurs in early spring with the females carrying the fertilized eggs for two years. Hatching occurs in early spring, with larvae remaining in the water

column for up to 15 weeks before settling on the bottom. All of the 2006 harvesting in the Project Area occurred within 50 km inside of the 200m isobath.

Northern shrimp spawn in the shallower inshore waters in late summer. Eggs remain attached to the female for one year. Data presented in Orr *et al.* (2007) show greatest occurrences of 3LNO shrimp occurred in 3L particularly in the Continental Slope area.

Atlantic halibut is typically found along the slopes of the continental shelf between deep and shallow waters avoiding temperatures below 2.5^{o}C. The fertilized eggs are slightly positively buoyant and disperse naturally and only gradually float toward the ocean's surface. After a few weeks of feeding, they metamorphose from a bilaterally symmetrical larva to an asymmetrical flatfish, and are ready to assume a bottom-living habit. Atlantic halibut have been caught consistently between 1999 and 2005 in the Scotian Shelf and Southern Grand Banks, including the Southeast Shoal region in the south-western part of the Study Area.

Greenland halibut (turbot) is a deepwater flatfish preferring water temperatures from -0.5 to 6.0^{o}C, and are typically harvested at water depths greater than 450 m. Spawning is likely to occur in the Davis Strait in the winter and early spring. Spawning may also occur in the Laurentian Channel and Gulf of St. Lawrence in the winter months. Turbot are widely distributed along the deep slopes of the shelf and in the deep channels, primarily in NAFO areas 2GH and 2J3K. Recent 2005 and 2006 DFO RV fall surveys had smaller catches of Greenland halibut in the 3L and 3N portions of the Study Area compared to catches in 2001.

Yellowtail flounder inhabit the continental shelf of the Northwestern Atlantic Ocean from Labrador to Chesapeake Bay at depths ranging from 10 to 100 m. Yellowtail spawning on the Grand Bank generally occurs between May and September with peaks during the latter part of June. It tends to occur at depths less than 100 m and at water temperatures exceeding 2^{o}C. The eggs, larvae and early juvenile stages of yellowtail are pelagic. Results of Spanish surveys conducted in the portion of Division 3N outside of the EEZ (south-western Study Area) have indicated a constant biomass index for yellowtail flounder since 1998.

American plaice typically inhabits depths ranging from 70 to 275m, although it also occurs in shallower and deeper areas. Generally, this flatfish lives on soft substrate. American plaice in the Newfoundland Region have no specific spawning areas, but rather spawn over the entire area in which they occur. Spawning occurs in the spring, often in April-May in Divisions 3LNO and in early April on the Flemish Cap. Fertilization is external and the developing eggs are buoyant and occur near the water's surface. Time to larval hatch is temperature dependent but typically occurs within two weeks of fertilization. The larvae are planktonic during development until settlement to bottom occurs. During bottom trawl surveys on the Flemish Cap in June and July 2006, the densest American plaice distribution was found at the shallowest portion of the Flemish Cap where water depth was less than 150 m. American plaice were also caught in areas where depth ranged up to 1,000 m.

Roughhead grenadier typically inhabits depths ranging from 200 to 600 m. It is thought that spawning by this dioecious deepwater species occurs in winter/early spring. Fertilization is

external. Based on results of bottom trawl surveys on the Flemish Cap from 1991 to 2005, the highest estimated biomass occurred in areas where water depth exceeded 540 m.

2.2.4 Commercial Fisheries

Based on the 2005-2007 commercial fishery data, the principal fisheries (by quantity of harvest) within both the Study Area and the Project Area are for northern shrimp and snow crab. These together accounted for 99% of the harvest weight within the Project Area during the 2005-2007 period. The small remainder of the catches in the Project Area during that period were accounted for by Stimpson surf clams, cockles and cod. In the offshore area of NAFO Division 3L, both effort and landings in the snow crab commercial fishery have increased between 2001 and 2007. Most of the fish harvesting within and near the Study and Project Area is concentrated on the Shelf slope. Much of this is in depths between 200 and 500 m. During the 2005-2007 period, more than half of all Study Area harvests (i.e., 65%) were taken with pots and shrimp trawls. Dredges and bottom otter trawls were used to harvest most of the remainder. During 2005-2007, harvesting effort in the Study Area was highest during May to July with a secondary peak during November to January. In the Project Area, harvesting effort was also highest during May to July with a secondary peak in December of 2006 and 2007.

2.2.5 Marine Mammals and Sea Turtles

There are at least 18 species of cetaceans and three species of seals that are known to occur in and near the Study Area (Christian 2008). Baleen whales most likely to be found in the Study Area include the blue (*Balaenoptera musculus*), fin (*B. physalus*), sei (*B. borealis*), humpback (*Megaptera novaeangliae*), minke (*B. acutorostrata*) and North Atlantic right (*Eubalaena glacialis*). Toothed whales include the sperm (*Physeter macrocephalus*), northern bottlenose (*Hyperoodon ampullatus*), Sowerby's beaked (*Mesoplodon bidens*), killer (*Orcinus orca*), long-finned pilot (*Globicephala melas*) whales, the short-beaked common (*Delphinus delphis*), Atlantic white-sided (*Lagenorhynchus acutus*), white-beaked (*Lagenorhynchus albirostris*), Bottlenose (*Tursiops* truncates), Risso's (*Grampus griseus*), striped (*Stenella coeruleoalba*) dolphins, and the harbour porpoise (*Phocoena phocoena*). Seal species likely in the area are the grey (*Halichoerus grypus*), harp (*Phoca groenlandica*) and hooded (*Cystophora cristata*) seals.

There are three species of sea turtles known to occur in the Study Area. These include the Leatherback turtle *(Dermochelys coriacea)*, the loggerhead turtle *(Caretta caretta)*, and the Kemp's Ridley turtle (*Lepidochelys kempii)*. The Leatherback turtle is listed as Endangered under the *Species at Risk Act*. Leatherback and juvenile loggerhead turtles may be seasonally common in Canadian and international waters beyond the shelf break over the southern Grand Banks and Newfoundland Basin (McAlpine *et. al*. 2000).

Data collected during recent (2004-2007) seismic and CSEM monitoring programs for Petro-Canada's proposed 2009-2017 drilling program indicates that humpback whales were the most commonly sighted whales. The Department of Fisheries and Oceans (DFO) database also indicated that humpback whales accounted for most sightings in the Study Area followed by minke whales, fin whales, long-finned pilot whales, and sperm whales. The database indicated that there are relatively few sightings of dolphins and harbour porpoise recorded in the Study Area.

2.2.6 Marine Birds

The Grand Banks of Newfoundland have been identified as important habitat for many species of marine birds (Christian 2008). Over 27 marine birds have been identified as occurring in the Study Area. These include species of *Alcidae* (Dovekie, Murres – Common and Thick-billed, Razorbill and Atlantic puffin), *Stercorariidae* (Skuas – Great and South polar; Jaegers – Pomarine, Parasitic, and Long-tailed; *Laridae* (Gulls – Herring, Lesser Black-backed, Iceland, Glausous, Great Black-backed, and Ivory; Black-legged Kittiwake and Arctic Tern), *Sulidae* (Northern Gannet), *Hydrobatidae* (Wilson's and Leach's Storm-Petrels); *Phalaropodinae* (Phalarope – Red and Red-necked), and *Procellariidae* (Northern Fulmar and Greater, Sooty and Manx Shearwater). Specific information can be found in the 2008 EA Report. Since 2004, seabird data have been collected in areas located within the Study Area and Project Area during research expedition and various oil and gas industry-related exploration surveys.

The abundance and distribution of marine birds varies depending on the season. For instance, the Northern Fulmar (*Fulmaris glacialis)* is common throughout the year except in July and August, whereas the Greater Shearwater (*Puffinus* spp.) is common from June to October, and absent from December to April. Leach's Storm-Petrels are only present in November, whereas the Black-legged Kittiwake is common from October to April. Of all the species present, the Northern Fulmar and Black-legged Kittiwake are the most common throughout the year.

2.2.7 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 in the Project Area. The following table identifies SARA Schedule 1 and COSEWIC listed species that could potentially occur in the Study Area.

Species	SARA Status	COSEWIC Status
Blue Whale (*Balaenoptera musculus*) (Atlantic population)	Schedule 1 - Endangered	Endangered (May 2002)
North Atlantic Right Whale (*Eubalaena glacialis*)	Schedule 1 - Endangered	Endangered (May 2003)
Leatherback Seaturtle (*Dermochelys coriacea)*	Schedule 1 - Endangered	Endangered (May 2001)
Ivory Gull (*Pagophila eburnea)*	Schedule 1 - Endangered	Endangered (April 2006)
Northern Wolffish (*Anarhichas denticulatus)*	Schedule 1 - Threatened	Threatened (May 2001)
Spotted Wolffish (*Anarhichas minor)*	Schedule 1 - Threatened	Threatened (May 2001)
Atlantic (Striped) Wolffish (*Anarhichas lupus)*	Schedule 1 - Special Concern	Special Concern (November 2000)
Fin Whale (*Balaenoptera physalus*) (Atlantic population)	Schedule 1 - Special Concern	Special Concern (May 2005)
Atlantic cod (NL population) (*Gadus*		Endangered (May

Species	SARA Status	COSEWIC Status
morhua)		2003)
Porbeagle shark (*Lamna nasus*)		Endangered (May 2004)
White Shark (*Carcharodon carcharias*)		Endangered (April 2006)
Roundnose grenadier (*Coryphaenoides rupestris*)		Endangered (November 2008)
Cusk (*Brosme brosme*)		Threatened (May 2003)
Shortfin mako (*Isurus oxyrinchus*)		Threatened (April 2006)
Sowerby's beaked whale (*Mesoplodon bidens*)		Special Concern (November 2006)
Harbour porpoise (*Phocoena phocoena*)		Special Concern (April 2006)
Blue Shark (*Prionace glauca*)		Special Concern (April 2006)
Killer Whale (*Orcinus orca*) Northwest Atlantic/Eastern Arctic popultations		Special Concern (November 2008)
American eel (*Anguilla rostrata*)		Special Concern (April 2006)
Roughhead grenadier (*Macrourus berglax*)		Special Concern (April 2007)

Christian (2008) reports that there have been two sightings of blue whales in the Orphan Basin, within the Study Area, both of which occurred in August 2007 and in water depths of 2,366 m and 2,551 m. According to the DFO sightings database (DFO 2007), most sightings of blue whales in Newfoundland have occurred near the coast. There is a single confirmed blue whale sighting in the Study Area in June 1993 south of the Project Area. It is possible that blue whales may occur in the Jeanne d'Arc Basin but numbers are expected to be low. A Recovery Strategy is in place for the blue whale.

The North Atlantic right whale is among the most endangered whales in the northwest Atlantic. Population estimates indicate that there are approximately 300 individuals. Off Atlantic Canada, right whales typically concentrate in the Bay of Fundy and off southwestern Nova Scotia. Right whales were only recorded once in the Study Area on 27 June 2003.

Population estimates of Leatherback turtles are between 26,000 and 43,000 species worldwide (LGL 2006). Adult leatherback turtles are commonly sighted in the waters off Newfoundland from June to October, with peak abundance in August. Leatherback turtles have been caught incidentally during commercial fish harvesting in Newfoundland waters. Most of the captures

occur near the 200 m isobath from June to November. Two leatherbacks were sighted in mid-August 2006 in the Project Area during Husky's seismic program. A Recovery Strategy was finalized by DFO in December 2006.

The Ivory Gull may appear in low numbers in the Study Area. They are typically found on the edge of pack ice on the northern Grand Banks in late winter. Recent surveys in 2002 and 2003 of historic breeding sites in the Canadian Arctic showed an 80% decline in the numbers of nesting Ivory Gulls.

The likelihood of wolffish occurring in the Study Area is unknown, but assumed to be likely. Northern wolffish spawn in September and the fish remain near their eggs to guard them. They are known to be located at depths ranging from 150 to 600 m, but have been found in the shallower areas. Spotted wolffish occur at depths greater than 450 m and spawn during late-summer and early autumn. They are more abundant along the slope area of the Study Area in the fall, than in the spring. Atlantic wolffish can be found at depths up to 350 m, but is typically found further south than the northern or stripped species. Atlantic wolffish, like striped wolffish is more abundant along the slope area in the fall. A Recovery Strategy for northern and spotted wolffishes and a Management Plan for Atlantic wolffish were recently published.

There were 166 sightings of the fin whale within the Study Area based upon the DFO sightings database (DFO 2007). It was the second most abundant mysticete observed. Fin whales were commonly sighted in the Study Area during Husky's seismic monitoring programs in 2005 and 2006. There was also a single sighting of a fin whale during the Petro-Canada seismic monitoring program in 2007. It is likely that fin whales commonly occur in the Study Area during late spring to fall.

2.3 Research Surveys and Vessel Traffic

Vessel traffic with respect to fishing vessels is discussed in terms of amount of commercial fishing activity (see Section 2.2.4). In any year, there will be overlap between the Study Area, Project Area, and DFO research surveys in NAFO Divisions 3LMN. The preliminary 2009 schedule includes the spring survey within NAFO Division 3LNO between April and June and the fall survey within 3LMNO from early October to about mid December. There may also be smaller targeted surveys operating at various times throughout 2009. Petro-Canada will be required to communicate with DFO to avoid any potential conflict with research surveys that may be operating in the area.

2.4 Sensitive/Special Areas

Four of the Ecologically and Biologically Significant Areas (EBSAs) identified within the Placentia Bay-Grand Banks Large Ocean Management Area (LOMA) occur either partially or entirely within the Study Area. Only one occurs partially within the Project Area. The four EBSAs are: Northeast Shelf and Slope; Lilly Canyon-Carson Canyon; Virgin Rocks; and Southeast Shoal and Tail of the Banks. The Northeast Shelf and Slope is the EBSA which occurs partially within the Project Area. The depleted species identified in the Southeast Shoal and Tail of the Banks EBSA includes Atlantic cod, American plaice, capelin and leatherback sea turtles. Northern and spotted wolffishes were indicated as the depleted species in the Northeast

Shelf and Slope EBSA. Atlantic cod and American plaice were also the depleted species of the Virgin Rocks EBSA. None were indicated for the Lilly Canyon-Carson Canyon EBSA.

Part C: Environmental Assessment Process

3. Procedures

On August 29, 2008, Petro-Canada submitted a project description "*Petro-Canada Jeanne d'Arc Basin Exploration Drilling Program, 2008-2016 Project Description*" to the C-NLOPB, in support of its application to conduct an exploration drilling program. Pursuant to Section 12.2 (2) of the 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. Input was sought from federal and provincial regulatory agencies and interested stakeholders respecting the scope of project and environmental assessment review.

A Federal Coordination Regulations (FCR) notification was sent on 16 October 2008 regarding Petro-Canada's proposed program. Environmental Canada (EC) and DFO responded that they would participate as FAs in the EA review.

On 19 November 2008, the C-NLOPB notified Petro-Canada that a screening level of assessment was required and the proponent was provided with a Scoping Document.

Petro-Canada submitted the 2008 EA Report to the C-NLOPB on 30 December 2008. The C-NLOPB, as Responsible Authority (RA), forwarded the report on December 30, 2008 to the DFO, EC and the provincial Departments of Environment & Conservation, Fisheries & Aquaculture, and Natural Resources. The FFAW and One Ocean were provided a copy of the EA report to review. Comments were received from DFO and EC. On 12 March 2009, the C-NLOPB requested additional information from Petro-Canada in order to satisfy the requirements of the CEAA and to complete the Screening Report. Petro-Canada was requested to provide additional information on the physical and biological environments. Petro-Canada provided a response to this request on 06 April, 2009.

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

4. Environmental Assessment Review

Comments on the EA Report were received from DFO and EC.

Fisheries and Oceans Canada provided comments on February 12, 2009 and focused on the description of the physical environment, marine species, and the presentation of spill modeling

results. They also provided information on the Ecologically and Biologically Significant Areas (EBSAs).

Environment Canada responded on February 19, 2009 and focused on the description of the physical environment and its effects on the project. They provided information on sea ice and icebergs and references for the physical environment description.

Comments were provided to Petro-Canada on 12 March 2009 for a response before the Screening Report could be issued.

5. Scope of Project

The operator, Petro-Canada, proposes to drill up to 18 single and/or dual side-track exploration wells and conduct geohazard/wellsite surveys and VSPs on acreage held by them in the Jeanne d'Arc Basin area over a nine year period. The temporal scope of the project is year-round from 2009 through to the end of 2017.

Either a drill ship or semi-submersible operating year round, or a jack-up rig operating within the designated ice-free period will drill the wells. Typically each well requires 80 to 100 days to drill, complete, test and abandon. Over the temporal scope of the Project, there is the possibility that Petro-Canada will use two MODUs for concurrent exploration drilling in the Project Area. The drilling program includes all ancillary activities in support of a drilling program, such as the use of a MODU (jack-up or semi-submersible), transportation of goods via supply boats, helicopter support, operation of shore-based facilities, and the conduct of vertical seismic profiling, geotechnical programs and geohazard/wellsite survey programs.

At the time of application for drilling activities to be undertaken beyond 2009 in the Project Area, Petro-Canada will be required to provide information to the C-NLOPB that outlines the proposed activities, confirms that the proposed program activities falls within the scope of the previously assessed program, and indicates if with this information, the EA predictions remain valid. In addition, Petro-Canada will be required to provide information regarding the adaptive management of requirements of the *SARA* into program activities (e.g., introduction of new species or critical habitat to Schedule 1; additional mitigations; implementation of recovery strategies and/or monitoring plans). If there are any changes in the scope or information available, which may alter the EA conclusions, then a revised EA will be required at the time of authorization renewal. The Canadian Environmental Assessment Registry will be updated as required.

5.1 Boundaries

The boundaries of the Project are defined in the 2008 EA Report and as follows and are acceptable to the C-NLOPB.

Boundary	**Description**
Temporal	Year-round from 2009 to 2017
Project Area	Project areas will be defined based upon drilling activities
Study Area	Based on the oil spill trajectory modeling using two release

	points; one inside and one outside the 200 m isobath
Affected Area	Geographic extent of a specific potential effect on a species or species group
Regional Area	The Study Area and the Grand Banks

For seismic programs (VSPs, geohazard surveys) undertaken, there would 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.

6. Consultation carried out by Petro-Canada

Petro-Canada undertook consultations with relevant government agencies, representatives of the fishing industry and other interest groups, local area residents, and local businesses. Copies of the Project Description describing the proposed drilling program were sent to all agencies and groups. Consultations were undertaken with DFO, EC, Natural History Society, One Ocean, Fish, Food and Allied Workers Union (FFAW), Association of Seafood Producers (ASP), Ocean Choice International Inc., Groundfish Enterprise Allocation Council (GEAC), Clearwater Seafoods, and Icewater Seafoods. All consultations were held to inform the stakeholders about the proposed drilling program, to identify issues or concerns, which should be considered in the EA, and to gather additional information relevant to the EA report. The results of those consultations, and issues identified are documented in the 2008 EA Report. There were no major concerns or issues about the proposed drilling program expressed during these consultations.

The C-NLOPB is satisfied that the consultations carried out by Petro-Canada, and reported on in the EA Report included all elements of the Project. The RA is not aware of any public concerns with respect to the environmental effects of the project, and does not require that further consultations be undertaken for the 2009 field season.

7. Environmental Effects Analysis

7.1 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 subsection 16(1) of the CEAA, and those listed in the "*Petro-Canada Scoping Document – Final Exploration Drilling Program – Jeanne d'Arc Basin - 2009-2017*" (C-NLOPB 2008).

7.2 Methodology

The C-NLOPB reviewed the environmental effects analysis presented by Petro-Canada in the 2008 EA Report. A VEC based assessment based on the interaction of project activities on those VECs was used in assessing environmental effects, including cumulative effects and accidental events. The environmental assessment methodology and approach used by the Proponent is acceptable to the RAs. The following environmental effects analysis uses the information

presented by the operator and takes into consideration mitigation proposed by the Proponent to assess the potential for residual environmental effects.

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

- magnitude of impact;
- geographic extent;
- duration and frequency;
- reversibility;
- ecological, socio-cultural and economic context; and

after taking mitigation measures into account,

- significance of residual effect.

The potential effect significance of residual effects, including cumulative effect, for each VEC is 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, are considered in determining overall significance of residual effects.

7.3 Effects of the Environment on the Project

Effects of the physical environment on the Project include those caused by wind, ice, waves, and currents. The variable and sometimes harsh climate on the Grand Banks and the potential for sea ice and icebergs during the winter and springs months can pose significant challenges to drilling operations. In typical years, the sea ice edge reaches the Grand Banks in mid-Febraury. The pack ice at the Project Area generally reaches annual peak coverage in March. Icebergs are observed drifting south of 48^{o}N from March through to September, with the highest numbers occurring in July (based on long-term averages of data by PAL from 1989 to 2007). As described in the 2008 EA Report, the number of icebergs reaching the Grand Banks each year varied from none in 1966 and 2006 to a high of 2,202 in 1984. The average annual number of icebergs to reach the Grand Banks during the last ten years is 474. Only a small proportion (41) of icebergs would have passed through the Project Area during the last ten years. As part of its monitoring program, Petro-Canada will have marine weather observers on board the rig, observing weather and ice conditions on a 24 hour basis. An Ice Management Plan will be submitted to the C-NLOPB as part of the DPA process and includes mitigations to prevent impacts from sea ice and icebergs during drilling activities. The jack-up rig will only operate during the ice-free season (as described in Section 1, above), and will be demobilized from site prior to the onset of heavy weather events. All these should ensure that impacts from the environment can be minimized. Therefore the effects of the environment on the project will be **not significant**.

7.4 Presence of Structures

The drill rig will be the only surface structure. Either a semi-submersible, a jack-up rig, or drillship will be used. Subsea structures include drill string and riser. Petro-Canada will establish a safety zone around the rig. The proposed safety zone could extend as much as 1.65 km from the drill centre for the semi-submersible rig (*i.e.*, 50 m beyond the anchor locations of a new type of semi-submersible with a larger anchorage area) or approximately 500 m from the platform of the jack-up rig. The maxium areas of the semi-submersible and jack-up rig safety zones would be about 8.6 km^2 and 1 km^2, respectively. Under the scenario of two MODUs concurrently drilling exploration/delineation wells in the Project Area, the maximum safety zone area at any one time due to this type of drilling would be 17.2 km^2.

7.4.1 Fish and Fish Habitat 1

The presence of the structures and a safety zone may alter the local abundance and distribution of fish in the area; however it will be for a short duration (generally 80-100 days). Alternatively, the safety zone and presence of the rig may create a reef effect, whereby local populations of fish and benthos are attracted to the structures and become concentrated. For jack-up rigs, there is also the covering of the seafloor associated with the spud cans for a 100 day duration. The reef effect, the exclusion zone and the temporary alteration of habitat would have an overall short term (duration 100 days), low magnitude and small geographic extent effect on fish populations. Therefore, the overall effect on fish and fish habitat is **not significant**. Cumulative effects are predicted to be **not significant**.

7.4.2 Marine Birds 0

The effect due to the presence of structures on marine birds is most likely associated with lights and flares. See Section 7.5.2 for a discussion on the effects of lights and flares on marine birds.

7.4.3 Marine Mammals and Sea Turtles 1

The physical presence of structures in the marine environment will have a negligible and **not significant** effect on marine mammals and sea turtles. Noise, however, from the drill unit, supply boats and VSP surveys may have an effect. See Section 7.6.3 for a discussion of the effects of noise on marine mammals and sea turtles.

7.4.4 Commercial Fisheries 1

The presence of structures and the corresponding safety zone (approximately 8.6 km^2 – semi submersible and 1 km^2 – jack-up) would prohibit commercial fishing activities in the drilling area. The exclusion zone around each well is very small compared to the entire fishing areas of the affected NAFO Unit Area. As indicated in the EA, northern shrimp and snow crab are the primary species harvested in Study Area. Petro-Canada has indicated that all reasonable efforts will be made to accommodate fishing in the licence areas when drilling is not occurring.

Only a very small proportion of the available grounds would be potentially affected by structures in any given year (1.65 km radius safety zone (8.6 km^2 in total)). The maximum safety zone area at any one time due to two MODUs concurrently drilling exploration wells in the Project Area would be approximately 17.2 km^2. The artificial reef effect would likely have positive effects on the commercial fishery. Based on possible mitigations identified in the 2008 EA Report to minimize negative effects of the physical presence of structures, the residual effects of the physical presence of structures on the commercial fishery would be **not significant**.

The approximate areas of the White Rose safety zone (including the proposed new drill centres), the Terra Nova exclusion zone and safety zone, and the Hibernia safety zone are 95 km^2, 14 km^2 and 255 km^2 (269 km^2) and 6 km^2, respectively. This amounts to a total of 370 km^2. There will be at least two exploratory drilling programs on the Grand Banks in 2009. Any cumulative effects on the Grand Banks ecosystem from drilling outside the proposed drilling area will probably not overlap in time and space and thus, will be additive but not multiplicative. This level of activity will not change the effects predictions when viewed on a cumulative basis. The actual area from which fishers are excluded is smaller (i.e. exclusion zone at Terra Nova), both within- and between-project cumulative effects associated with fishing grounds availability are predicted to be not significant. In addition, given that the residual effects of the presence of structures on the commercial fishery are predicted to be not significant, the cumulative effects on the commercial fisheries will be **not significant**.

7.4.5 Species at Risk 0

As indicated above, the presence of structures is predicted to be not significant for fish and marine mammals and sea turtles. Therefore, the impact on fish, marine mammal and sea turtle species at risk will be **not significant**.

7.5 Lights and Flares

Lights are used on the drill rig and supply/support vessels for navigation aids and work area illumination. Light and heat could also be emitted for short periods by flaring during well testing.

7.5.1 Fish and Fish Habitat 0

Fish and squid may be attracted to illuminated surface waters, due to the use of floodlights in working areas on the drill rig and supply vessels. The effect would be negligible and **not significant** due to the small area affected and the short duration of the project. There would be no cumulative effect.

7.5.2 Marine Birds 1

The illumination of rigs and supply vessels on the Grand Banks may attract marine birds to the structures. In particular, nocturnal seabirds, such as Leach's Storm-Petrels, may be at risk of attraction to offshore lights, particularly during their fall migration to offshore wintering grounds. The attraction of birds may result in some strandings on the rig.

The drilling program according to the schedule will be run for a period of approximately 100 days per well. Petro-Canada reports the presence of lights on the rig and supply boats would have a low effect within a 10 km^2 radius for the entire duration of the drilling program. There is continuous use of lights at night, but at daylight, there would be no such effect. Flaring will only occur if a well test has to be run. It has the potential to have a low effect within a 10 km^2 area for a short period of time during testing.

During the October-November 2005 and July-August 2006 Husky seismic programs in the Jeanne d'Arc Basin, the percentages of stranded Leach's Storm-Petrels released and believed to survive were 69% (74 of 107) and 55% (6 of 11), respectively. In terms of stranded birds, Petro-Canada has committed to a recovery and release program for the rig and supply boats, consistent

with the requirements of the Canadian Wildlife Service. Petro-Canada has indicated that the environmental observer on board the drilling rig will also be responsible for monitoring and observing seabirds and marine mammals in the area, using established protocols and overseeing mitigations such as seabird handling and documentation.

The effects on birds from lights and flares are low and likely. However, given the mitigation of recovery and release, the short period of flare operation, and the short time frame for a drilling operation, effects on seabirds will be **not significant**.

The presence of three production facilities (White Rose, Hibernia and Terra Nova), marine exploration (Husky Oil is currently planning an 18 well exploratory drilling program and StatoilHydro is proposing a 27 well exploration and appraisal/delineation drilling program of spatial and temporal scope similar to the one being proposed by Petro-Canada), commercial fishery activity, and marine transportation all have the potential to interact. The estimated between-project cumulative effect area represents less than 0.11% of the total area of the proposed Petro-Canada Project Area. If the maximum number of wells (54) associated with the Husky New Drill Centre Construction and Operations Program are considered, the estimated between-project cumulative effect area still represents less than 0.2% of the total area of the proposed Petro-Canada Project Area. Cumulatively, the effects may be additive and overlap however with the implementation of mitigations; the cumulative effect will be **not significant**.

7.5.3 Marine Mammals and Sea Turtles 0

There should be no interaction between lights and flares and marine mammals and sea turtles. The safety zone and artificial reef effect interactions could potentially result in the attraction of prey for marine mammals and sea turtles. Given the mitigations outlined in the 2008 EA report and the short time frame for a drilling operation, effects on marine mammals and sea turtles will be **not significant**.

7.5.4 Commercial Fisheries 0

There should be no impact on commercial fisheries due to lights and flares.

7.5.5 Species at Risk 0

As indicated above, the light from structures is predicted to be not significant for fish, marine birds, and marine mammals and sea turtles. Therefore, the impact on fish, marine birds, and marine mammal and sea turtle species at risk will be **not significant**.

7.6 Noise

Underwater noise may be caused by supply/support vessels, drill rig machinery and thrusters, echo sounders, VSP seismic array, and wellhead severance using chemical explosives. Approximately three to four supply boat transits will occur every week and one supply vessel will remain at the drilling location on standby. Air-borne noise is normally associated with helicopters servicing the drill rig. There may be approximately six helicopter flights per week.

7.6.1 Fish and Fish Habitat 1

In general most fish show avoidance reaction to underwater noise from vessels, and the avoidance reaction varies depending on the species, life history stage, behaviour, time of day, whether the fish have eaten, and the water's sound propagation characteristics (LGL 2008a). It

is also reported by LGL that effects of noise from supply ships on fish is transitory and similar to fishing vessels. Given the ambient noise in the area from commercial fishing activities, the addition of noise from supply vessels should be negligible. Mitigation such as minimization of VSP source level and ramp up of VSP air gun array will be in place during project activities. Based on predictions in other Environmental Assessments for projects in the Study Area that the residual effects of noise on fish and fish habitat would be not significant, the residual effects of the 9-year exploration drilling program on fish and fish habitat will be **not significant**.

Noise is produced by all activities occurring on the Grand Banks however, given the fact that most fish are able to move away from any noise source, it is likely that the cumulative effects of exposure to noise is negligible. Eggs and larvae do not have the capability of avoiding a noise source but exposure to very high sound energy levels would be required before damage is done. Cumulative effects of noise on fish and fish habitat will be **not significant**.

7.6.2 Marine Birds 0

There is concern of aircraft flying over colonies of seabirds, which may cause a panic response and result in eggs and flightless young being pushed off cliff edges. Helicopters, stationed in St. John's, will fly a direct path from the airport in St. John's to the rig, and generally will not come in contact with seabird colonies. As mitigation, aircraft will be directed to avoid colonies of seabirds, and will be instructed to avoid repeated overflights of concentrations of birds and their habitat. In addition, aircraft will not come within eight km seaward and 3 km landward of major seabird colonies from April 1 to November 1. Therefore, effects of noise from helicopters will be negligible and **not significant**.

The effects of seismic activity on marine birds are predicted to be negligible. Birds, which spend time underwater foraging, may be affected if they dive within a few metres of the airgun. Murres and shearwaters may be potentially the most sensitive group due to their time spent underwater diving for food. The effects are predicted to be of low magnitude, with a small geographic extent and of short duration. Therefore, the environmental effect is not likely and **not significant**. Cumulative effects are predicted to be **not significant**.

7.6.3 Marine Mammals and Sea Turtles 1

There is a concern with the noise produced by ships and drill rigs on marine mammals, as they depend on the underwater acoustic environment. The zone of influence of underwater noise, in addition to the drill sites, includes the zones produced by a VSP survey, and those around the shipping routes and helicopter flight paths. Effects of noise from drilling operations may be negligible to low and continuous throughout the drilling period, for a period of 80 to 100 days per well. Overall, the effects of noise on marine mammals and sea turtles from drilling operations will be **not significant**.

The passage of marine vessels may also affect marine mammals. There will be two or three supply boats per week operating between St. John’s and the drilling rig. For the duration of the drilling program (approximately 80 to 100 days total), the effects from vessels are likely to be negligible to low. Effects may be reduced as supply boats maintain a steady course, speed, and avoid areas with large numbers of whales. Overall, the effects are **not significant**.

Low flying aircraft could cause low magnitude effects on marine mammals in the water. These effects would occur intermittently throughout the drilling program. Helicopter support may consist of about six trips per week ferrying personnel and light supplies and equipment. Helicopters will fly at an altitude of 600 m. They are prohibited from flying over wildlife for passengers to view. Therefore, the effects will be negligible and **not significant**.

In order to reduce impacts to marine mammals and sea turtles, Petro-Canada will implement the following mitigation measures during the conduct of VSPs:

- ramp up of VSP air gun array;
- minimization of VSP sound source level;
- VSP temporal avoidance;
- VSP delay start/shut down/safety zone; and
- an Environmental Observer will monitor for marine mammals and turtles.

In addition, during the conduct of VSP surveys, the Board will require that the Operator implement the mitigations outlined in the *Geophysical, Geological, Environmental and Geotechnical Program Guidelines* (2008) and implement a 500 m monitoring zone. Based on the information presented above, and the mitigations proposed, effects will be negligible to low. Therefore, the effects on marine mammals or sea turtles will be **not significant.**

The addition of the drill rig and supply vessels for the drilling program will not contribute to an increase in overall noise in the marine environment. Locally there may be an incremental increase in noise levels; however, given the predicted minimal effects of other projects/activities, the large size of the Project Area and the prediction that the residual effects of the proposed project's routine activities on marine mammals and sea turtles are not significant, the cumulative effects on marine mammals and sea turtles will be **not significant**.

7.6.4 Commercial Fisheries 0

As indicated above, there will not be a significant impact on fish populations; therefore the effect of noise on commercial fisheries will be **not significant**. Cumulative impacts will be **not significant**.

7.6.5 Species at Risk 0

As indicated above, the effects of noise from drilling operations and VSP surveys is predicted to be not significant for fish, marine birds, and marine mammals and sea turtles. Therefore, the effect on fish, marine birds, and marine mammal and sea turtle species at risk will be **not significant**.

7.7 Atmospheric Emissions

The potential emissions from offshore drilling include:

- burning of well fluids during production tests and clean-ups;
- burning of diesel fuel for power generation on the drill rig;
- engine, generator and heating exhausts from the rig, helicopters and supply vessels;
- mud, degassing and other mudroom exhausts; and
- fugitive emissions.

Fugitive emissions are not expected to be significant and will be minimized through implementation of best management practices and preventative maintenance measures.

7.7.1 Fish and Fish Habitat 0

Effects on fish and fish habitat from atmospheric emissions will be negligible and **not significant**. It is unlikely that routine activities associated with other marine exploration, marine transportation and existing production areas will have adverse direct effects on fish and fish habitat, therefore the cumulative effects on fish and fish habitat will be **not significant**.

7.7.2 Marine Birds 0

Effects on marine birds from atmospheric emissions will be negligible. Cumulative effects will be negligible.

7.7.3 Marine Mammals and Sea Turtles 0

There should be no interaction between marine mammals and sea turtles and atmospheric emissions.

7.7.4 Commercial Fisheries 0

There should be no interaction between commercial fisheries and atmospheric emissions.

7.7.5 Species at Risk 0

As indicated above, emissions from drilling operations is predicted to be not significant for fish, marine birds, marine mammals and sea turtles. Therefore, the impact on fish, marine birds, marine mammal and sea turtles species at risk will be **not significant**.

7.8 Discharge of Drilling Muds and Cuttings

Petro-Canada is proposing to use water based muds (WBM) and synthetic based muds (SBM) for its drilling program. WBM will be directly discharged to the seafloor when drilling the initial sections of the hole, after that cuttings will be discharged from the rig just below surface. When SBMs are used, all cuttings are treated in accordance with the *Offshore Waste Treatment Guidelines* (NEB 2002) prior to discharge. The muds are recycled and returned to shore for on-land disposal. For typical 3,500 m TVD (Jeanne d'Arc Basin) wells drilled with WBM, up to 483 m^3 of cuttings and 3,474 m^3 of WBM would be discharged over the course of a well. For wells drilled with SBM (intermediate and production hole sections), up to 336 m^3 of cuttings would typically be discharged. In the case of two MODUs concurrently drilling exploration/delineation wells in the Project Area, about 0.8 km^2 of seabed would be covered by mud and cuttings to a thickness of at least one centimetre per well. An approximate total of 1.6 km^2 of seabed could be covered by mud and cuttings, which represents about 0.003% of the total area of the Project Area.

7.8.1 Fish and Fish Habitat 1

The primary effects associated with the discharge of muds and cuttings is the smothering of benthos, toxicity (based on chemical constituents of the mud) and bioaccumulation. In modelling exercises conducted by Husky for the White Rose Development, whereby the fate of cuttings and muds are estimated from a discharge point at the center of the drill location, the zone of influence (ZOI) is generally confined within approximately 500 m of the drilling area. Study results show that smothering of benthos will occur if the thickness of the deposition layer

is greater than 1 cm and that benthos would recover within months to years once drilling stops.

Water based muds are generally non-toxic. The primary additives are bentonite (clay), barite and potassium chloride, with seawater the main component. Chemicals, such as caustic soda, viscosifers, soda ash, and shale inhibitors are added to control mud properties. Petro-Canada reports that many of the metals present in WBM are not in a bioavailable form and there have been few, if any, biological effects associated with the metals from these discharges. The SBMs to be used by Petro-Canada are non-toxic and have the potential to biodegrade rapidly (Christian 2008). SBMs typically require less mud for the same distance drilled and the discharged cuttings tend to clump together, resulting in less dispersion from the drill hole.

The results of model simulations of the settling and subsequent seafloor deposition of well cuttings, centrifuge barite and SBMs discharged near surface at the proposed Mizzen wellsite were discussed in the StatoilHydro drilling EA (LGL 2008a). The Mizzen site is located outside of the Project Area but within the Study Area at a water depth >1,000 m. The maximum thickness of discharged material deposited on the seafloor was predicted to be <0.25 mm. It is predicted that the area of impact for WBM, SBM, and cuttings depositions would be less than 1 km^2 for a multi-well program from a single drill centre, based on analysis used during the White Rose Comprehensive Review. Based on a ZOI radius from the well centre of 500 m, a thickness of one centimeter or greater would cover approximately 0.8 km^2 of the seabed. For two wells, an area of 1.6 km^2 could be smothered within the Project Area due to exploration drilling representing about 0.003% of the total Project Area. All SBM cuttings will be treated in accordance the OWTG prior to discharge.

Based on mitigations indicated in the EA (e.g., treatment of mud and discharge cuttings, mud recycling, chemical screening, compliance with 2002 OWTG), the predicted recolonization of benthic species in the cuttings deposition area, and the short duration of the program, the effects of drilling muds and cuttings on fish and fish habitat will be **not significant.**

Currently there are three oil fields in production on the northeast Grand Banks. Drilling activities are ongoing in association with these programs. There is potential for cumulative effects from drilling activities at Terra Nova and White Rose; however, cuttings are re-injected at Hibernia. Assuming the worst-case scenario of three exploratory wells being drilled concurrently in the Project Area; two by Petro-Canada using two MODUs and one by either Husky or StatoilHydro using one MODU, the mud and cuttings will cover an area of the seabed of about 0.8 km^2 to a thickness of at least one centimeter per well, an approximate total of 2.4 km^2 of fish habitat will be smothered at the same time within the Project Area. This represents about 0.005% of the total area of the Project Area. Both within- and between-project cumulative effects associated with the deposition of drilling mud and cuttings on the seafloor are predicted to be additive, with low magnitude, small geographic extent and **not significant**.

7.8.2 Marine Birds 0

There is concern that the discharge of cuttings will produce a sheen on the water, thereby creating the potential for oiling of marine birds. The drilling program will be using WBM and SBM, where required. Sheens are not likely associated with the discharge of WBM. For SBM, if they are used, mitigations such as treatment prior to release, and release of cuttings below

surface, will reduce the likelihood of sheens on the water surface. Therefore, the discharge of drill muds and cuttings will have a negligible and **not significant** effect on marine birds.

Cumulative effects, associated with other offshore facilities, will be negligible and **not significant**.

7.8.3 Marine Mammals and Sea Turtles 0

The deposition of muds and cuttings on the seafloor may have increased concentrations of heavy metals such as barium, arsenic, cadmium, copper, mercury, lead, and zinc, generally within 250 to 500 m of the drill site but occasionally farther. However, these metals, with a few exceptions, are not bioavailable and few if any biological effects have been associated with these increases in metals due to drill rig discharges. The recent Husky EEM reports have confirmed the conclusions of the White Rose work that routine drilling has no significant effect on the marine environment of the Grand Banks. Drilling activities are unlikely to produce concentrations of heavy metals in muds and cuttings that are harmful to marine mammals and sea turtles (Husky 2000). Therefore, effects from deposition of drill muds and cuttings on marine mammals and sea turtles will be negligible and **not significant**. Cumulative effects will be negligible.

7.8.4 Commercial Fisheries 0

As indicated above, the effect of fish and fish habitat from drill cuttings deposition is not significant, therefore the effect on commercial fisheries will be **not significant**. There will be no cumulative impact.

7.8.5 Species at Risk 0

As indicated above, the discharge of drill cuttings is predicted to be not significant for fish, marine birds, and marine mammals and sea turtles. Therefore, the impact on fish, marine birds, and marine mammal and sea turtle species at risk will be **not significant**.

7.9 Operational Discharges

Discharges associated with drilling include cement slurry and blowout preventer (BOP) fluid. However, BOP fluid is not discharged from a jack-up rig. Wastes and discharges from the rig include deck drainage, cooling water, sanitary and domestic waste, garbage and other solid waste, ballast water, bilge water, and produced fluids. All wastes will be treated in accordance with the *Offshore Waste Treatment Guidelines* (OWTG) (NEB *et al*. 2002) prior to discharge. Solid wastes, such as garbage, will be containerized and shipped to shore for disposal in an approved manner or recycling. Petro-Canada indicated in the EA that it currently utilizes an Offshore Chemical Management System (OCMS), similar to that in use by White Rose, Terra Nova and Hibernia, whereby all drilling utility or production chemicals that have the potential to reach the environment that are used in the offshore are screened. Where chemicals are deemed to have unacceptable toxicity ratings, a substitution for that chemical is sought.

In exploration drilling programs, produced water would only be discharged once the well is tested for production. However, if any produced water is encountered during the well test, it is likely that it will be atomized with hydrocarbons and flared. If flaring must be carried out, the resulting greenhouse gas emissions are in the order of 1,650 tonnes CO_2E per test. If the flare capacity is exceeded, then small amounts of treated produced water will be brought ashore for

disposal. If produced water must be disposed of at sea, it will be treated in accordance with the OWTG prior to discharge at sea.

7.9.1 Fish and Fish Habitat 0

It is predicted that cement will be used 2 to 4 times per well, resulting in the release of cement to the marine environment. The discharge will result in the local smothering of benthos. If the cement remains in a pile, it may act as an artificial reef, be colonized by epifaunal animals, and attract fish. The effect, while negative, is negligible with the residual effect of cement on fish habitat of **not significant**.

The blowout preventer is required to undergo periodic testing, during which approximately 1 m^3 of BOP fluid is released by semi-submersible rigs per test. Function or pressure testing is conducted approximately once per week. Leakage and intermittent BOP troubleshooting will increase the volume of BOP fluid discharged. A typical annual discharge is approximately 100 m^3. The effect of periodic releases of this small amount of glycol on fish and fish habitat would be negligible in magnitude. The residual effects of BOP fluid on fish and fish habitat will be **not significant**.

As indicated above, all chemicals will be screened through Petro-Canada's OCMS, and all discharges will be treated in accordance with the 2002 OWTG prior to discharge. Therefore, overall, the effect of operational discharges on fish and fish habitat will be **not significant**. Effects will be additive with other projects but the cumulative effect will be **not significant**.

7.9.2 Marine Birds 1

In compliance with the OWTG, sanitary waste from the rig will be macerated to 6 mm particle size or less and released at depth. There is concern that seabirds, particularly gulls, will be attracted to the particles. Petro-Canada indicates that gulls may be attracted to the sanitary waste, but the short duration of the drilling program should not increase the gull population offshore. It is predicted that the effects of discharge of sanitary waste will be low and of short duration. The effects from other operational discharges are negligible (Christian 2008). Other discharges, particularly oily waste and bilge water may cause sheening on the water surface. However, as indicated previously, all discharges are treated prior to release and discharged at-depth, thereby reducing potential for sheening. The overall effect of operational discharges on seabirds will be **not significant**.

All rigs, production platforms, supply vessels and seismic vessels, treat operational discharges prior to discharge in compliance with regulations and guidelines. Each production operation and drilling program is separated geographically from each other and do not overlap. Given the short duration of the drilling program, the cumulative effect of operation discharges on marine birds will be **not significant**.

7.9.3 Marine Mammals and Sea Turtles 0

Operational discharges from the rig should have a negligible and **not significant** effect on marine mammals and sea turtles. Water from closed systems will be tested prior to discharge and will comply with the OWTG. A low volume of water will be discharged and the area of thermal effects will be small. Therefore, the effects of the discharge of these small amounts of

cooling water on marine mammals and sea turtles would be negligible resulting in a rating of the residual effects of cooling water on marine mammals and sea turtles of **not significant**. Treatment of all discharges for all production facilities and rigs operating on the Grand Banks will result in a **not significant** cumulative effect on marine mammals and sea turtles. The cumulative effects of operational discharges on marine mammals and sea turtles will be **not significant**.

7.9.4 Commercial Fisheries 0

As indicated above, any effects on fish and fish habitat will be of short duration, and low magnitude, and therefore not significant. Subsequently effects on commercial fisheries will be negligible and **not significant**. The cumulative effects of operational discharges on the commercial fisheries will be **not significant**.

7.9.5 Species at Risk 0

As indicated above, operational discharges from drilling activities are predicted to be not significant for fish, marine birds, and marine mammals and sea turtles. Therefore, the impact on fish, marine birds, and marine mammal and sea turtle species at risk will be **not significant**.

7.10 Well Abandonment

Upon completion of its drilling program, it is Petro-Canada's intent to abandon and remove all wells, in accordance with the C-NLOPB regulations, using mechanical separation. Abandonment of each well will require three to seven days to complete. In the event that mechanical separation fails, Petro-Canada will use directed chemical charges to sever the wellhead. In the event that chemical explosives are required for well abandonment, the C-NLOPB will require Petro-Canada to undertake a marine mammal observation program during the abandonment program. An authorization will be required. On some occasions, the wells may be suspended for future re-entry. This is similar to the abandonment process but the wellhead is not removed. A suspension cap is installed to protect the wellhead connector. If the wellhead is to be left in place for any period of time after completion of well, the C-NLOPB will be advised and proper notification of the fishing industry will be made.

7.10.1 Fish and Fish Habitat 1

The effects of using directed chemical charges underwater are dependent on the magnitude and timing of the explosion. In previous EAs reviewed by the C-NLOPB, it is noted that fish and invertebrates nearest the explosion will be affected. For fish, those nearest the blast center might sustain damage to their sensory epithelia. In a study cited in the previous EAs, surface observations of killed fish were noted in three of 15 blasts, in a wellhead severance program in the North Sea. In the event chemical explosives are required in the well abandonment program, the C-NLOPB will implement a monitoring program and investigate, in consultation with Petro-Canada, possible mitigations to reduce impacts to fish and fish habitat. The effects on fish and fish habitat, will be of short duration, low magnitude and low frequency, and therefore **not significant**. The cumulative effects of well abandonment on fish and fish habitat will be **not significant**.

7.10.2 Marine Birds 0

There should be no interaction between marine birds and well abandonment (mechanical or directed charges), and therefore no environmental effect.

7.10.3 Marine Mammals and Sea Turtles 1

Mechanical severance using chemical explosives may result in injury to marine mammals present in the area. Explosives have rapid rise times, which are related to the extent of biological injury. Previous EAs report that a 2 kg TNT charge has a source level of 271 dB re 1µPa-m $_{0\text{-peak}}$ and that a 20 kg charge has an equivalent source level of 279 dB re 1µPa-m $_{0\text{-peak}}$ in water depths of 60 m. There is little information available regarding the effects of underwater explosions on marine mammals. If chemical wellhead severance is required, mitigation measures such as marine mammal observations within a set radius around the rig installation prior to wellhead severance will be required. With the implementation of mitigations and the short duration of the activity, well severance using chemical explosives will have a **not significant** effect on marine mammals and sea turtles. The cumulative effects of well abandonment on marine mammals and sea turtles will be **not significant**.

7.10.4 Commercial Fisheries 0

There should be no impact on commercial fisheries associated with well abandonment. As indicated above, impacts on fish and fish habitat are predicted to be not significant, therefore, it can be expected that effects on fisheries would be negligible and **not significant**. The cumulative effects of well abandonment on the commercial fisheries will be **not significant**.

7.10.5 Species at Risk 0

The impact on fish, marine birds, and marine mammal and sea turtle species at risk resulting from well abandonment operations will be **not significant**. The cumulative effects of well abandonment on fish, marine birds, and marine mammal and sea turtle species at risk will be **not significant**.

7.11 Accidental Events

During exploration drilling programs the possible accidental events, which may affect the environment, include blowouts and batch spills. For the proposed drilling program, the probability of a blowout during the drilling of an exploration well is estimated to be 1 in 17,544 for spills greater than 150,000 bbl, 1 in 5834 for spills greater than 10,000 bbls and 1 in 10,000 for spills greater than 1,000 bbl (Christian 2008). The probability of platform-based spills has been estimated to be 1 in 1.1 for spills less than 49.9 bbls.

The results of two oil spill fate and behaviour modeling exercises were used in support of the 2008 EA report. Details can be found in the 2008 EA Report and the 2009 EA Addendum. They included the modeling conducted in support of the Husky 2007 Drilling EA and in support of the the Petro-Canada Flemish Pass Exploration Project. White Rose crude oil property data was used for the Husky project. The characteristics of White Rose crude show that the crude is very waxy and if spilled in water, would form near-solid particles and persist for weeks, up to months on the surface. Terra Nova crude oil property data was used for the Petro-Canada project. One of the release locations (Tuckamore) used in the above-surface blowout, subsea blowout, and batch spill fate and behaviour modeling occurs in the Flemish Pass portion of the

Study Area. Three of the release locations used in the spill trajectory modeling for Petro-Canada occur in the proposed Study Area; Gambo near the western border of the Project Area, Mizzen in the northern Flemish Pass and Annieopsquatch in the southern Flemish Pass. Gambo also occurs within the Project Area. None of the spill trajectory modeling results indicated any oil contact with the Newfoundland coast. Blowout modeling was conducted using various crude flow rates at release locations during both summer and winter, and batch spill modeling was conducted using various diesel and crude volumes in both summer and winter. While the trajectory analysis predicts the track of oil, it cannot predict the state of the oil (e.g. consistency, particle size, patch). Estimates for the geographic extent of an above-surface blowout, subsea crude oil blowout, and batch diesel spill are presented in the 2008 EA Report and 2009 EA Addendum. Generally, spill trajectory modeling results indicated a tendency for oil to move east and southeast, regardless of release location with winter trajectories tending to extend further than those in the summer.

7.11.1 Fish and Fish Habitat 1

All potential interactions between an accidental event and fish habitat are likely to result in a negative effect, however mitigation such as preventative measures and a proper spill response plan would reduce any effects. Fish eggs and larvae are more likely to be affected by oil spills because they are less resistant to effects of contaminants than are adults because they are not physiologically equipped to detoxify them or to actively avoid them. Eggs and larvae present in the area will be exposed to hydrocarbons from spill events. In the White Rose Development Project: New Drill Centre Construction and Operations Program EA and Addendum (LGL 2006 and 2007a), Husky evaluated the impact on eggs and larvae and determined that the effects of an oil spill would be *adverse* due to the potential lethal and sublethal effects to the sensitive life stages. However, the residual effect of an accidental event on fish habitat, fish eggs, and larvae would be negligible to low in each blowout/spill scenario. The geographic extents for blowout and batch spill scenarios range from 1-10 km^2 for a batch diesel spill to 101-10,000 km^2 for batch crude spill and crude blowouts. The predicted frequency of large spills is much less than one event/year and predicted duration is <1 to 1-12 months. Mitigation measures such as spill prevention and remediation would reduce overall impacts. Therefore, in all scenario-life stage component interactions, the residual effects of accidental events on fish and fish habitat would be **not significant.**

7.11.2 Marine Birds 2

Oil on water is a threat and potential impact to marine birds. Significant numbers and concentration of birds occur on the Grand Banks. Any oil spill could cause bird mortality. As indicated above, the waxy nature of the White Rose crude slows evaporation and dispersion. As a result, the oil maintains its volume and persists on the water's surface, and may last for months at a time. It is unlikely, based on the spill trajectory predictions, that oil will affect seabird colonies. However, birds in the area of the rig would be at risk.

Depending on the time of the year, location of seabirds within the Study Area, the type of accidental event, and the extent of the spill, the magnitude of the effects will range from low to high, a geographic extent of 1 to >10,000 km^2, with a duration from <1 to 1-12 months. While the likelihood of an event occurring is **low** (less than 1 event per year) the effects would be **significant and adverse**. Countermeasures such as bird scaring devices would reduce some

birds from oiling. Overall, however, oil spill countermeasures would more than likely be ineffective at reducing the effect. Note, however, that even though there would be a significant effect on birds, the likelihood of a spill is very small, as there are mitigations in place to prevent spills from occurring. Although the residual effects on individual birds are likely irreversible, the residual effects on seabirds at the population level are deemed reversible in all scenarios.

7.11.3 Marine Mammals and Sea Turtles 1

Marine mammals and sea turtles exposed to oil from a spill could suffer sublethal effects through oiling of mucus membranes or the eyes if they swim through a slick. These effects are reversible and would not cause permanent damage to the animals. Based on available marine mammal data for the Jeanne d'Arc Basin area and the biology of marine mammals known to occur in the area, the Project Area is not likely an exclusive feeding or breeding area. Whales are present in the area in low numbers and at certain times of the year. Seals are present on or near Jeanne d'Arc Basin for at least part of the year. Sea turtles may be seasonally common in the Study Area. Depending on the time of year, location of marine mammals and sea turtles within the affected area, and type of oil spilled, effects could range from negligible to low magnitude. A geographic extent of 1,001-10,000 km^2 is predicted for all subsea and above-surface blowout scenarios, which were modeled. A geographic extent of 1-1,000 km^2 is predicted for all modeled batch spill releases, with a duration of 1-12 months for all spill scenarios. Oil spill countermeasures may reduce the number of marine mammals and sea turtles exposed to oil resulting in a **not significant** effect from accidental events on marine mammals and sea turtles.

7.11.4 Commercial Fisheries 1

Commercial fisheries could be impacted if there is an effect on eggs and larvae. In the event of a large (greater than 10,000 bbls) oil spill or blowout on the eastern Grand Banks, effects on fish and fish habitat would be not significant and would not result in fish tainting. Gear may be damaged, but compensation to fishers would reduce that impact. However, the marketability and the perceived commercial value of the fish may be impacted. Such an impact would be considered significant in economic terms. However, compensation to the fishers could lessen the significance. Overall, with mitigation, the chance of an accidental event is extremely low with effects on the commercial fisheries **not significant**.

7.11.5 Species at Risk 1

It is predicted that accidental events will not have significant effects on fish, marine birds, and marine mammal and sea turtle species. Although all potential interactions between an accidental event and the SAR likely to be present are likely to result in negative effects. Proper mitigation such as spill response plans and preventative measures would reduce the reversible effects at a population level. For fish, marine birds, and marine mammal and sea turtle species at risk likely to be present in the area, the effects from accidental events therefore, will be **not significant**.

7.12 Follow-up Monitoring **Required** **Yes**☐ **No**☒

The C-NLOPB does not require Petro-Canada to undertake follow-up monitoring, as defined in the CEA Act.

8. Other Considerations

Mitigations presented by Petro-Canada in its environmental assessment and addendum for the

Jeanne d'Arc Basin Exploration Drilling Program (Christian 2008, 2009) are sufficient to prevent or reduce environmental impacts. If chemical explosives are required during wellhead abandonment, a biological observation program will be required. Specific details of the monitoring program will be discussed with Petro-Canada at the time of application for the well abandonment program. Depending on the timing of the well abandonment program, additional mitigations or monitoring protocols may be required.

The C-NLOPB is satisfied with the environmental information provided by Petro-Canada regarding the potential adverse environmental effects, which may result from the proposed exploration drilling program, and is 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.

The C-NLOPB is of the view that if the proposed environmental mitigative measures outlined in the 2008 EA Report and 2009 EA Addendum, and those listed below are implemented, the Project is not likely to cause significant adverse environmental effects.

8.1 Recommended Conditions and/or Mitigations

The C-NLOPB recommends that the following conditions be included in any authorization(s) if the Project is approved.

For drilling/geotechnical programs:

- *Petro-Canada 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 "Environmental Assessment of Petro-Canada Jeanne d'Arc Basin Exploration Drilling Program, 2009-2017* (Christian 2008) *and "Environmental Assessment of Petro-Canada Jeanne d'Arc Basin Exploration Drilling Program, 2009-2017 Addendum* (Christian 2009).
- *A marine mammal monitoring protocol shall be developed in consultation with the C-NLOPB at the time of application for approval to terminate the well(s) with the use of chemical explosives.*
- *Drilling activities, including moorings, shall not occur within 100 m of coral colonies without the prior approval of the Chief Conservation Officer. A coral colony is defined as:*
  - *Lophelia pertusa reef complex; or*
  - *5 or more large corals (larger than 30 centimeters in height or width) within a 100 square metre area.*

For VSP and/or Wellsite Surveys

- *Petro-Canada 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 "Environmental Assessment of Petro-Canada Jeanne d'Arc Basin Exploration Drilling Program, 2009-2017* (Christian 2008) *and "Environmental Assessment of Petro-Canada Jeanne d'Arc Basin Exploration Drilling Program, 2009-2017 Addendum* (Christian 2009).
- *Petro-Canada shall implement or cause to be implemented the mitigation measures outlined in the Geophysical, Geological, Environmental and Geotechnical Program Guidelines (C-NLOPB 2008), respecting VSP and wellsite surveys.*
- *During ramp-up, and/or when the airgun array is active, the airgun(s) shall be shut down, if a marine mammal or sea turtle, listed as **Endangered** or **Threatened** (as per Schedule 1of SARA), including the North Atlantic right whale, Blue whale, and leatherback turtle, is observed within 500 m of the airgun array.*

Part D: Screening Decision

9. Decision/Decision Date

The Canada-Newfoundland and Labrador Offshore Petroleum Board is of the opinion that, taking into account the implementation of proposed mitigation measures set out in the conditions above and those committed to by Petro-Canada, the Project **is not likely to cause significant adverse environmental effects.** This represents a decision pursuant to Section 20(1)(a) of the CEA Act.

Responsible Officer *Original signed by E. Young* Date: *May 4, 2009*
Elizabeth A. Young
Environmental Assessment Officer

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