Hibernia Drill Centres Construction and Operations Program
Hibernia Management and Development Company (HMDC)

Canadian Environmental Assessment Act
Screening Report

Prepared by:
Canada-Newfoundland and Labrador Offshore Petroleum Board
Environment Canada
Fisheries and Oceans Canada

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Part A: General Information

Screening Date	**September 15, 2009**
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Proponent	Hibernia Management and Development Company St. John's NL A1C 1B6
Contact	Mr. Robert Dunphy Senior Environment Advisor
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Location	Northeastern Grand Banks

Part B: Project Information

In August 2008, Hibernia Management and Development Company Ltd. (HMDC) submitted a project description *"Hibernia Drill Centres Construction and Operations Program Project Description"* (HMDC 2008) to the Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB), in support of its application for the construction, installation, operation, maintenance, modification, decommissioning and abandonment of up to six drill centres within glory holes adjacent to the currently active GBS platform from 2009 through to 2036. The "*Screening Report Hibernia Drill Centres Construction and Operations Program Hibernia Management and Development Company (HMDC)*" (Jacques Whitford 2008) provided an environmental assessment (EA) of the development of up to six drill centres. The effects assessment is focused primarily on potential effects associated with drilling operations and subsea development. The production operations were assessed in the original Hibernia Environmental Impact Assessment (Mobil 1985) and it was determined at that time that the project was not likely to cause significant adverse environmental effects. These predictions remain valid. Regulatory review comments on the 2008 EA Report were provided to HMDC on March 2, 2009. HMDC provided responses to these review comments on April 27, June 17, and July 24, 2009. This response was incorporated into the EA Report and the EA Report was revised on July 24, 2009 (herein referred to as the EA Report).

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

1. Description of Project

Hibernia Management and Development Company proposes to drill up to six new drill centres within glory holes. The six subsea developments and associated glory holes may be located at any point within Production Licence Areas (PLs) 1001 and 1005, Exploration Licence Areas (ELs) 1092 and 1093, and Significant Discovery Licence Areas (SDLs) 1001, 1002, 1003, 1004, 1005 and 1041 at any point in time over the life of the field. The six drill centres include up to 11 wells each originating from one or more subsea templates or manifolds, which would be connected to the gravity based structure (GBS) via subsea flowlines. The subsea equipment will be located in glory holes to prevent impacts with icebergs and to provide ease of access for inspection, testing, repair, replacement, or removal. The configuration of the wells in each of the six drill centres will vary between drill centres.

The first planned subsea development is the Hibernia South Extension (HSE) development, which will be located just south of PL1001 and inside of PL1005. Project activities are scheduled to commence in 2009. Other glory hole installations are not in active planning stages and remain subject to the identification of economically recoverable reserves. The development of these wells will occur in the following phases: construction, operations and maintenance, production, and abandonment.

Subject to confirmation of soil conditions by a geotechnical survey, glory holes will be excavated with a trailing suction hopper dredge (TSHD) or acceptable alternate dredging technology (e.g., clam dredge). This type of dredge is a self-propelled ship that fills its hold or hopper during dredging while following a pre-set track. Material is lifted through the trailing pipes by one or more pumps and discharged into a hopper contained within the hull of the dredge. When the hoppers are full, the TSHD sails to an approved disposal area and either dumps the material through doors in the hull or pumps the material out of the hoppers. The glory hole(s) will be excavated to a sufficient depth (approximately 10 m below existing seabed level). The length and width of each glory hole will be approximately 30m x 30m or 70m x 70m, depending on one or two manifolds. Approximately 159,300 m^3 (70m x 70m x 10m) of seabed sediment per glory hole will be moved and dumped at an approved disposal location. The location of the dredge spoils disposal site will be selected to ensure spoils will not re-enter the glory hole, pose a hazard to navigation and provide an obstruction to future operations. The dredge vessel approaches the centre of the disposal area and releases the material via gates on the underside of the vessel. The disposal pile designated for the HSE glory hole will be considered for re-use for disposal of all future glory hole dredge spoils. It will take approximately 30 working days for a 30m x 30m and 45 working days for a 70m x 70m glory hole. The dredging vessel hold is expected to be filled to capacity every second day.

The Project includes all activities associated with the construction, operations and maintenance, and production and abandonment activities. It involves the use of mobile operating drilling units, construction and diving vessels, marine support vessels, helicopter support and existing shore based facilities in St. John's Harbour. The new drill centres will be tied-back to the GBS through subsea flowlines. Geohazard/well site surveys and vertical seismic profiling (VSP) using an airgun array may be required on an as-needed basis at any time of the year. Once preconstruction geohazard surveys are completed, project construction activities will likely begin with glory hole excavation at the HSE during the 2011 construction season. Five wells are

expected to be drilled over approximately two years at HSE. Each well is expected to take 128 days on average.

It is proposed that preconstruction geotechnical and geophysical investigations will commence in the summer of 2009. Initial construction operations will start with glory hole excavation at HSE during the 2011 construction season. Drilling and subsea construction operations and tie-ins to the Hibernia GBS may then follow beginning in 2012. It is likely that the glory hole construction, installation and tie back operations will occur in summer and fall in any one year. Drilling activities will occur year round. Production operations will be continuous up to 2036. Abandonment may occur at any time of the year.

Glory holes and drill centres will occur in water depths ranging from 75 m to over 100 m. Water based muds (WBM) will be used where possible, usually during the first sections of each well. Synthetic-based muds (SBM) will be used to drill the majority of each well.

2. Description of Environment

2.1 Physical Environment

The EA Report provides a detailed description of the physical environment. Physical environment information can also be found in recent completed EAs for programs such as the StatoilHydro Canada Seismic and Geohazard Program (LGL 2008a), StatoilHydro Canada Exploration and Appraisal/Delineation Drilling Program (LGL 2008b), Husky Exploratory Drilling Program (LGL 2002, 2003, 2005, 2006a, 2006b , 2007a, 2007b), and the SDL 1040 Delineation Drilling Screening (Husky and Norsk Hydro 2006).

The Project Area is located on the Grand Banks, offshore Newfoundland, approximately 350 km east-southeast of St. John's in water depths ranging from 75 m to over 100 m. Physical environmental conditions considered in the environmental assessment include wind, wave and currents; air and sea temperatures; visibility (fog); sea ice and icebergs; and seabed characteristics.

2.1.1 Wind, Waves and Currents

The Grand Banks experiences predominately southwest to west flow throughout the year. On average, winter winds are from the west to northwest in the project area. A prevailing southwest wind occurs in the summer months. Wind speeds are higher in the winter months, with maximum wind speeds measured in the MSC50 data set at 30.2 m/s in February.

Wave data presented in the EA Report show that the highest sea states occur in the Project Area during storm events, which typically occur from October to March. The lowest significant wave height in the area ranges from 1.7 m (monthly mean) in July to 3.9 m (monthly mean) in December and January. The maximum monthly mean significant wave heights measured are 6 m in July to 13.6 m in December/January/February.

Current data at Hibernia (1980-1984) show that the maximum near-surface current measured 127 cm/s in September, with a mean range of 13.54 to 21.33 cm/s. At mid-depth the highest current

was 119 cm/s in November, with a mean range of 10.91 to 20.24 cm/s. At bottom, the maximum current measured 72 cm/s in November, with a mean range of 11 to 15.25 cm/s.

2.1.2 Air and Sea Temperatures

Monthly average air temperatures are typically just below 0°C (-0.6°C) at the coldest time of the winter (i.e. February) and approximately 14.1°C at the warmest time of summer (i.e. August). The range of sea surface temperatures is similar to air temperatures. In winter (i.e. February and March), the average sea surface temperature is 0.5°C and in the summer (i.e. August) the average sea surface temperature is 14.0°C.

2.1.3 Visibility

Reduced visibility on the Grand Banks occur primarily by mist and fog in the warmer months, whereas snow or snow showers reduces visibility in the winter months. On average, July reports the highest number of low visibility days with poor visibility reported in 63.8% of reports, primarily due to advection fog. October has the highest number of reported good visibility at 78.3%.

2.1.4 Sea Ice and Icebergs

Data for the ice environment surrounding the Hibernia Field drilling and exploration site was recorded over the last 10 years since the GBS was installed in 1997.

The pack ice cover over the 2007 season reached the maximum southerly extent of the pack on March 14th when it was 82 miles northwest of Hibernia and consisting of 50 percent ice cover. Pack ice incursions into the ice monitoring zone around Hibernia have been recorded in two years (2003 and 2008) since the installation of the GBS.

Between 2002 and 2008, a total of 473 icebergs were tracked of which 129 icebergs required management operations such as iceberg net, single vessel tow, or water cannon. Icebergs were sighted between the months of March and June. Hibernia has never had to interrupt operations due to iceberg threats.

2.1.5 Seabed Characteristics

The seabed in the Project Area slopes gently to the east-northeast to an average of 0.05 degrees. The seabed within areas of the proposed HSE drill centre location consists of predominately gravel substrate with a discontinuous veneer of surficial sand. The surficial sediments of the proposed dredge spoil disposal location are comprised of predominantly sand substrates (66%) and gravel/cobbles/boulders with minor sand (34% of the disposal area). Results from the 2007 Hibernia EEM program chemical analyses indicate that all Hibernia sediment chemistry concentrations from 2007 are lower than both the probable effects levels (PEL) and the Interim Sediment Quality Guideline (ISQG). The 2007 hydrocarbon concentrations in sediment have decreased to concentrations comparable to the 1998 data or 1994 baseline data. Sediment chemistry samples were collected from the proposed HSE glory hole location and the dredge spoils disposal site in September 2008. Most available metal concentrations were below the reportable detection limit and well below the Ocean Disposal Guidelines.

2.2 Biological Environment

The information presented in the EA Report is presented below, and updated where additional information has been provided.

2.2.1 Plankton

Plankton are found in the Study Area. 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 late fall-early winter (October/January) of the year. Phytoplankton on the Grand Banks is normally found in the upper 30 to 50 m of the water column. The diatoms species *Chaetoceros decipiens* and *Thalassiosira* spp. are the most dominant phytoplankton species during the spring and fall blooms. The Atlantic Zone Monitoring Program (AZMP) reported some indications of an increase in the magnitude of the spring phytoplankton bloom in 2007 compared to previous years and the duration was the longest on record.

Zooplankton are most abundant on the northern Grand Banks during late spring and summer, with copepods representing over 80 percent of the zooplankton. During the 1990s, fish larvae (ichthyoplankton) have been found to be most abundant to the north of the Grand Banks on the northeast Newfoundland Shelf, while the lowest densities were reported on the eastern part of the Grand Banks. Capelin, sand lance and redfish are the most abundant ichthyoplankton species in the area during August and September.

2.2.2 Benthos

The benthic community is very diverse and includes a number of invertebrate species such as polychaete worms, molluscs and crustaceans, and certain fish species (e.g. flatfish). Substrate type and water depth determine the composition of the benthic community. An ROV survey was conducted in October 2008 within the proposed HSE's glory hole dredge site and dredge spoils disposal location. At the disposal site, snow and toad crab were observed occasionally, but were more abundant when the dominant substrate was sand. Approximately 60 snow crab and 26 toad crab were observed during the 1 km survey. Sand dollars and clams were also observed but again were more numerous when the dominant substrate was sand. Water depth through the area is about 83 metres. At the glory hole location, approximately 38 snow crab and 23 toad crab were observed. Sand dollars and clams were abundant when substrate was sandy but scallops were scarce on the sandy substrate. Water depth is approximately 81 metres.

Deep-water corals are found primarily below the 200 m depth contour along the edge of the continental slope, in canyons or in channels between banks. Some soft corals do occur in shallower areas on the continental shelf, but none are expected within the Project Area.

2.2.3 Fish and Invertebrates

Proposed activities in the Project Area will occur in the North Atlantic Fisheries Organization (NAFO) Unit Area (UA) 3Lt. Within this area and the larger Study Area UAs 3Lh, 3Li, 3Lr, 3Lt, 3Ld, 3Le, 3Ma, 3Mb, 3Mc, 3Md, 3Na, 3Nb, 3Nc, and 3Nd, there are a number of fish species that are commercially harvested. A detailed description of these species was provided in the EA Report and additional information.

Fish and invertebrate species in the Study Area include: snow crab (*Chionoecetes opilio*),

northern shrimp (*Pandalus borealis*), Stimpson's surf clam (*Mactromeris polynyma*), Greenland cockle (*Serripes groenlandica*), Atlantic halibut (*Hippoglossus hippoglossus*), American plaice (*Hippoglossides platessoides*), Thorny Skate (*Raja radiata*), Arctic cod (*Boreogadus saida*), yellowtail flounder (*Limanda ferruginea*), Greenland halibut (turbot) (*Reinhardtius hippoglossoides*), sand lance (*Ammodytes* spp.), capelin (*Mallotus villosus*), and large pelagics such as swordfish (*Xiphias gladius*) and various tuna species (*Thunnus* spp.

Greenland cockle can be found in the northwestern Atlantic from Greenland to Cape Cod in subtidal depths exceeding nine metres. They have been found on sandy substrate at various Labrador locations ranging in depth from 6 to18 m. It has also been observed on substrates consisting primarily of mud. Spawning occurs at water temperatures of -0.4 to 8°C and 0 to 10°C. In the last five years, the Greenland cockle has become a valuable bycatch in the Arctic surfclam fishery in eastern Canada. It is the primary prey of sea stars, groundfish and marine mammals.

Yellowtail flounder can be found along the continental shelf at depths ranging from 10 to 100m. Juvenile and adult yellowtail are generally concentrated on the southern Grand Bank, on or near the Southeast Shoal where the substrate consists primarily of sand, primarily in UA 3Nc. There are occurrences on the slope region of UAs 3Nd and 3Nf. Spawning occurs between May and September on the Grand Bank and peaks during the latter part of June. Spawning occurs at depths less than 100m and at water temperatures exceeding 2°C. The eggs, larvae and early juvenile stages of yellowtail flounder are pelagic. The diet consists of polycheates, amphipods, shrimp, cumaceans, isopods, and small fish.

Snow Crab prefer water temperatures ranging from -1°C to 4°C. Soft bottom substrates (mud or mud/sand) and water depths between 70 m and 280 m are primarily habitat for larger snow crabs. Smaller crabs can be found on soft or hard substrates. Mating occurs in early spring with the females carrying the fertilized eggs for one to two years. Hatching occurs in late spring to early summer, with larvae remaining in the water column for up to 15 weeks before settling on the bottom. Snow crab feed on fish clams, polychaete worms, brittle stars, shrimp, and crustaceans, including smaller snow crab.

Northern shrimp occur primarily in areas where the substrate is soft mud and bottom water temperatures range from 1° to 4°C typically in waters offshore of Newfoundland and Labrador where depths range between 150 and 600 m. They spawn in the shallower inshore waters in the late summer and fall. Eggs remain attached to the female for one year. During the day, shrimp are benthic and feed on detritus, phytoplankton, worms and small crustacean. At night, shrimp move up into the water column and feed on detritus and zooplankton.

Stimpson's Surf Clam are found along the western Atlantic coast. It is a deep water bivalve mollusc that can be found in sand, mud, or gravel from low-tide line to water 107 m deep. External fertilization by this clam results in pelagic larvae that remain in the upper water column for a few weeks prior to settling in suitable habitat. Substrate comprised on medium to coarse sand is preferred and water temperatures less than 15°C. Spawning typically occurs in July and juveniles settle on the seabed a few weeks later. Stimpson's surf clams have been found in

benthic communities that also include Greenland cockles and northern propeller clams. Predators of this clam include sea stars, waved whelks, crabs, and various groundfish.

2.2.4 Commercial Fisheries

The harvest from 2005 to 2007 in the Study Area NAFO UAs included cockles, yellowtail flounder, snow crab, northern shrimp, and clams as the dominant species respectively by weight, accounting for 94.5 percent of the total harvest. The majority of the harvesting occurs from April through to July, but there is activity year round. Within the Project Area, the majority of the fishery in UA 3Lt is for snow crab, with a clam and cockle harvest in one of the past three years. Very little fishing has occurred in the past three years and none in 2007. Total harvest from within the Project Area accounted for 0.18% of the landings for 3Lt from 2005 to 2007. Within 3Lt, harvesting occurs almost exclusively from April to July because snow crab comprises more than 99 percent of the overall harvest. Fisheries within 3Lt are conducted almost entirely using crab pots.

2.2.5 Marine Mammals and Sea Turtles

There are 20 species of marine mammals that may occur in the Study Area, including 17 species of cetaceans and three species of seals that are known to occur in the area (JWE 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*), and minke (*B. acutorostrata*). Toothed whales include the sperm (*Physeter macrocephalus*), northern bottlenose (*Hyperoodon ampullatus*), Sowerby's beaked (*Mesoplodon bidens*), killer (*Orcinus orca*), long-finned pilot (*Globicephala melaena*) whales, the bottlenose (*Tursiops truncatus*), common (*Delphinus delphis*), Atlantic White-sided (*Lagenorhynchus acutus*), white-beaked (*Lagenorhynchus acutus*), Risso's (*Grampus griseus*), striped (*Stenella* coeruleoalba) dolphins, and the harbour porpoise (*Phocoena phocoena*). Seal species that are likely to occur 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 Project 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 Schedule 1 of the *Species at Risk Act* and the most likely to occur in the Study Area.

Primary sources of new information on marine mammal distribution and abundance in and near the Study Area include the results of marine mammal sightings data available from DFO and environmental monitoring programs conducted in the Jeanne d'Arc Basin and north of the Study Area in the Orphan Basin. Results are summarized in the EA Report and additional information. The data indicated that the most common cetacean in and near the Study Area is the humpback whale followed by long-finned pilot whale, fin, and minke whales, respectively. There are relatively few sightings of dolphins and harbour porpoise recorded in the Study Area. Humpback whales have been sighted frequently in the eastern slopes of the southern Grand Banks during winter months making it likely that they occur in the Project Area. Pilot whales were the only marine mammal recorded in the DFO database from within the Project Area during January, February, and March. Sightings during April, May, and June included the minke, fin, killer, and humpback whales.

2.2.6 Marine Birds

The Grand Banks of Newfoundland have been identified as important habitat for many species of marine birds (LGL Limited 2006). 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), *Laridae* (Skuas – Great and South polar; Jaegers – Pomarine, Parasitic, and Long-tailed; Gulls – Herring, Iceland, Glaucous, Great Black-backed, and Ivory; Black-legged Kittiwake and Arctic Tern), *Sulidae* (Northern Gannet), *Hydrobatidae* (Wilson's and Leach's Storm-Petrels); *Phalaropodinae* (pharlarope – Red and Red-necked), and *Procellariidae* (Northern Fulmar, Greater, Sooty and Manx Shearwaters). Information specifics can be found in the EA Report and additional information.

The abundance and distribution of marine birds varies depending on the season. The Northern Fulmar (*Fulmaris glacialis)* is common throughout the year, whereas the Greater Shearwater (*Puffinus gravis*) and Sooty Shearwater (*Puffinus griseus*) is common from June to October, and absent from January to March. Leach's Storm-petrels (*Oceanodroma leucorhoa*) are common from May to October. Dovekies (*Alle alle*) and Thick-billed Murre (*Uria lomvia*) are most numerous in Newfoundland waters during the winter and migration periods.

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 the species likely to be present and their SARA and COSEWIC listing. SARA listed species are described below.

Table 1 – Listing of SARA Species in Project Area

Species	SARA Status	COSEWIC Status (Last Examination)
Blue Whale (*Balaenoptera musculus*)	Schedule 1 - Endangered	Endangered (May 2002)
North Atlantic Right Whale (*Eubalaena glacialis*)	Schedule 1 - Endangered	Endangered (May 2003)
Leatherback sea turtle (*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	Endangered (May 2001)
Spotted Wolffish (*Anarhichas minor)*	Schedule 1 - Threatened	Threatened (May 2001
Atlantic (Striped) Wolffish (*Anarhichas lupus)*	Schedule 1 – Special Concern	Threatened (November 2000)
Fin Whale (*Balaenoptera physalus*)	Schedule 1 – Special Concern	Special Concern (May 2005)
Harbour porpoise (*Phocoena phocoena)* (Northwest Atlantic population)	Schedule 2 – Threatened	Special Concern (April 2006)
Atlantic Cod (*Gadus morhua)* (Newfoundland and Labrador	No Schedule – No Status	Endangered (May 2003)

Species	SARA Status	COSEWIC Status (Last Examination)
population)		
Porbeagle Shark (*Lamna nasus*)	No Schedule – No Status	Endangered (May 2004)
White Shark (*Carcharodon carcharias*)	No Schedule – No Status	Endangered (April 2006)
Shortfin Mako (*Isurus oxyrinchus*)	No Schedule – No Status	Threatened (April 2006)
Cusk (*Brosme brosme*)	No Schedule – No Status	Threatened (May 2003)
Blue Shark (*Prionace glauca*)	No Schedule – No Status	Special Concern (April 2006)

There is insufficient data to determine population trends of the Blue whale in the northwest Atlantic. In the north Atlantic, the population of the Blue whale may range from a few hundred in the west to approximately 1,400 individuals in the entire north Atlantic. One known area of blue whale concentration, as reported by JWE (2008), is the Gulf of St. Lawrence. In the waters off Newfoundland, very little is known regarding their presence or distribution. The inshore area on the south coast of Newfoundland, off Burgeo and Connoire Bay, is frequented by blue whales in late winter and early spring. The blue whale is rarely sighted on the Grand Banks, but there have been 55 sightings recorded within the Study Area since 1945. A Recovery Strategy is being developed under SARA.

The North Atlantic right whale is the most endangered species in the northwest Atlantic. COSEWIC (2003) estimates that there are 222-238 sexually mature individuals in the population. Right whales have been recorded five times within the Study Area since 1945. A draft Recovery Strategy (2009) is in place.

Population estimates of Leatherback turtles are between 26,000 and 43,000 species worldwide (JWE 2008). Adult leatherback turtles are commonly sighted in the waters off Newfoundland from June to November, 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. It is possible that leatherbacks may occur in the Project Area, however there is little documentation of their occurrence. There have been three unidentified sea turtles observed by a HMDC employee at the Hibernia site. A Recovery Strategy was released in February 2007.

The Ivory Gull may appear in low numbers in the Study Area when pack ice reaches the northern Grand Banks in late winter (February to April). They are typically found on the edge of pack ice. Recent surveys in 2002, 2003, 2004 and 2005 of historic breeding sites in the Canadian Arctic showed an 80% decline in the numbers of nesting Ivory Gulls. There have been no sightings of this species in or near the Study Area during recent seismic monitoring programs.

It is assumed that wolffish occur in the Study Area. Northern wolffish is the deepest residing species and Atlantic wolffish is the shallowest residing species. Based on spring and fall research vessel surveys between 1992 and 2000, spotted and striped wolfish occur in the general region of the Project Area, more so during the fall. Northern wolffish were most concentrated in areas where depths ranged from 500 to 1,000 m, shifting to slightly shallower areas from June to November. Northern wolffish spawn in September, and the fish remain near their eggs to guard

them. Spotted wolffish concentrations were highest in areas with water depths ranging from 200 to 750 m at all times of the year, peaking in 300 m areas from June to November. Spotted wolffish spawn during late summer and early autumn. Atlantic wolffish are most concentrated in areas with depths approximately 250 m at all times of the year. A final Recovery Strategy is in place but action plans have not been finalized.

The Study Area lies within the known range of the fin whale. There have been approximately 559 sightings since 1945 during late spring until fall and infrequent observation have been recorded in the Project Area. Little is known about their winter distribution although fin whales were observed incidentally during aerial surveys for seabirds during December and January on the Grand Banks. A Recovery Strategy has not been developed.

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). DFO conducts annual spring and fall surveys in NAFO Division 3L each year. Coverage of specific areas and times are usually decided two to four weeks ahead of the surveys. The schedule for 2008 was provided in the EA Report. Based on the 2008 survey season data, it can be assumed that multi-species surveys will be undertaken in the 3LNO, 3KLNO, and 3KLMNO areas in 2009. Prior to the commencement of construction activity, in any given year, HMDC will be required to communicate with DFO to avoid any potential conflict with research surveys that may be operating in the area.

Part C: Environmental Assessment Process

3. Procedures

In August 2008, HMDC submitted a project description *"Hibernia Drill Centres Construction and Operations Program Project Description"* (HMDC 2008) to the C-NLOPB. This was in support of its application for the construction, installation, operation, maintenance, modification, decommissioning and abandonment of up to six drill centres within glory holes adjacent to the currently active GBS platform from 2009 to 2036. The Project will require authorizations 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 Federal Coordination Regulations Section 5 Notification on August 28, 2008.

The Department of Fisheries and Oceans (DFO) responded on 25 September 2008 and indicated that an authorization pursuant to Section 35 (1) of the *Fisheries Act* will be required. Drill centre excavation activities will result in the harmful alteration, disruption or destruction (HADD) of fish habitat, which is prohibited unless authorized by Fisheries and Oceans Canada pursuant to subsection 35(1) of the *Fisheries Act*. Authorizations are issued under the condition that acceptable measures for any habitat loss are developed and implemented. In addition, Environment Canada (EC) responded on 29 September 2008 that the proposed project will require an ocean disposal permit pursuant to the *Canadian Environmental Protection Act* for the disposal of spoils associated with the construction of the drill centres. Therefore, the C-NLOPB,

DFO and EC are RAs for the environmental assessment. The C-NLOPB is the Federal Environmental Assessment Coordinator for this Screening.

Pursuant to Section 5(1)(d) of the *Canadian Environmental Assessment Act* (CEA Act), the C-NLOPB, EC and DFO are RAs and must undertake an environmental assessment of the Project. The project as proposed is described in the *Inclusion List Regulations* and therefore is subject to a screening level of assessment under the CEA Act.

On December 17, 2008, HMDC submitted the "*Screening Report Hibernia Drill Centres Construction and Operations Program Hibernia Management and Development Company (HMDC)*" (JWE 2008). The EA Report provides an environmental assessment of the development of up to six drill centres. The C-NLOPB forwarded the 2008 EA Report on 18 December 2008 to the DFO, EC, Natural Resources Canada, and the provincial Departments of Environment and Conservation, Fisheries and Aquaculture, and Natural Resources.

Comments on the EA Report were received from EC, DFO, and Natural Resources Canada. In order to address deficiencies in the EA Report, HMDC was required to provide a response to the EA Report comments. HMDC responded on April 27, 2009 and the C-NLOPB forwarded the response on 28 April 2009 to the DFO, EC, and Natural Resources Canada. HMDC's response to the EA Report review comments did not satisfy all of the information requirements. HMDC were asked on June 15, 2009 to address the outstanding comments. HMDC provided a response on June 17, 2009. HMDC's response did not satisfy all of the information requirements. HMDC was asked on July 23, 2009 to address the outstanding comments. HMDC provided a response on July 24, 2009 and revised the EA Report on July 24, 2009.

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 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 and additional information, it would constitute a single project for the purposes of section 15(2) of CEA Act. For the purposes of subsection 15(3) of CEA Act, the scoping exercise is complete because an assessment was conducted in respect of every construction, operation, modification, decommissioning, abandonment, or other undertaking proposed by HMDC that is likely to be carried out in relation to their proposed Project.

3.1 Scope of Project

The operator, HMDC proposes to drill up to six new drill centres with glory holes that contain the equipment necessary to support the extraction of petroleum resources. This includes subsea flowlines and associated infrastructure to enable flow to and from the existing GBS in the Hibernia oil field. HMDC currently uses a single fixed GBS platform to complete drilling of oil production, water injection and gas injection wells through a total of 64 drill well slots. All production from the new drill centres(s) will be processed through the Hibernia facility, however production rates will not substantially increase due to the fact that the platform is currently producing below its maximum capacity. Production operations associated with these six new drill centres would occur between 2012 and 2036 but may be extended. The temporal scope of the project is from 2009 through to the end of 2036. The timing of the various project phases is

as follows: geotechnical and geophysical investigation from summer to fall 2009; glory hole excavation from summer to fall 2011; subsea equipment installation from summer to fall 2012; drilling to commence summer 2012 to fall 2014 and be completed year round over several years; production operations to commence in fall 2012 and extend to 2036; vsp/checkshot surveys may occur any time of the year during drilling and production phases; and abandonment after 2036.

Glory holes will most likely be dredged using a TSHD vessel. Approximately 159,300 m^3 (70m x 70m x 10m) of seabed sediment per glory hole will be moved and disposed of at an approved disposal location. HMDC is proposing that initial construction operations will start with glory hole excavation at HSE in summer – fall 2011. The six drill centres include up to 11 wells each originating from one or more subsea templates or manifolds, which would be connected to the GBS via subsea flowlines. The configuration of the wells in each of the six drill centres will vary between drill centres.

The Project includes all ancillary activities in support of a construction and operation of drill centres, drilling activities, production operations and abandonment: a TSHD vessel, a MODU, marine support supply vessels, helicopter support, operation of shore-based facilities, and the undertaking of geotechnical, vertical seismic profiling, and geohazard/wellsite survey programs.

At the time of application for subsequent program authorizations or permits in the Study Area, HMDC will be required to provide information to the Responsible Authorities that outlines the proposed activities, confirms that the proposed program activities fall within the scope of the previously assessed program, and indicates if with this information, the EA predictions remain valid. In addition, HMDC will be required to provide information regarding the adaptive management of requirements of the *Species at Risk Act* (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 of project, or information becomes 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. In addition, there may be information requirements to satisfy permitting requirements related to project activities.

3.2 Boundaries

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

Boundary	**Description**
Temporal	Year-round from 2009 to 2036 for activities associated with the development of up to six new drill centres. Year-round from 2012 to 2036 or longer for production operations. After 2036 for abandonment activities.
Project Area	Where project activities will occur in any given year within PL's 1001 and 1005; SDL's 1001, 1002, 1003, 1004, 1005 and 1041; and EL's 1092 and 1093 (See Figure 1.1, JWE 2008). Within coordinates (decimal degrees) NW -48.96328; 46.95912; NE -48.38654; 46.94740; SE -48.40412; 46.59246; and SW -48.97538; 46.60422.

Study Area	Based on the boundary of the Grand Banks as defined in the Hibernia, Terra Nova and White Rose project EAs. The area potentially affected by an accidental event for the Commercial Fisheries.

For seismic programs (VSPs, geohazard/well 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.

3.3 Scope of Assessment

For the purpose of meeting the requirements of the CEA Act the factors that were considered to be within the scope of an environmental assessment are those set out in subsection 16(1) of the CEAA and those listed in the "*Hibernia Drill Centres Construction and Operations Program Scoping Document*" (C-NLOPB 2008).

4. Consultation

4.1 Consultation carried out by Hibernia Management and Development Company

Hibernia Management and Development Company, as reported in the EA Report, contacted the following: Department of Fisheries and Oceans, Environment Canada, One Ocean, Fish, Food, and Allied Workers Union (FFAW), Natural History Society, the Association for Seafood Producers, and the World Wildlife Fund Canada. All consultations were held to inform the stakeholders about the proposed new drill centres construction and operations program and to identify issues or concerns that should be considered in the EA. The EA Report provides a summary of the issues and comments raised during the stakeholder consultation. HMDC will maintain ongoing consultations.

The RAs are satisfied that the consultations carried out by HMDC, and reported on in the EA Report, during the preparation of the environmental assessment included all elements of the Project. The RAs are not aware of any public concerns with respect to the environmental effects of the project, and does not require that further consultations be undertaken.

4.2 Consultations with other Federal Authorities and Other Government Departments

In accordance with the CEA Act and the *Regulations Respecting the Coordination by Federal Authorities of Environmental Assessment Procedures and Requirements* and the C-NLOPB's environmental assessment procedures, various federal and provincial government departments were notified on 28 August 2008 regarding HMDC's proposed program. Regulatory Authorities and Federal Authorities were provided the 2008 EA Report on December 18, 2009 for review and comment. The following agencies were notified:

Department of Fisheries and Oceans (DFO);

Environment Canada;
Natural Resources Canada;
Newfoundland and Labrador Department of Environment and Conservation;
Newfoundland and Labrador Department of Fisheries and Aquaculture; and
Newfoundland and Labrador Department of Natural Resources.

Environment Canada responded on 16 February 2009. Environment Canada requested further information on subsea flowlines/umbilicals and associated equipment as well as dredge spoils disposal. They provided several comments regarding HMDC's discussion on: air emissions, effects on migratory birds, wind and wave climatology, ice and icebergs, and the effects of the environment on the project.

DFO provided comments on 23 February 2009. DFO requested further information on discharges. They also questioned the discussion provided in the EA Report regarding species at risk, physical environmental data, and project effects on marine mammals and sea turtles.

NR Can responded on 3 March 2009. NRCan requested further information on seabed scour density, scour severity and scour frequency as well as the geological information used to quantify the amount of fines to be excavated from the glory holes.

For the other agencies contacted, either no response was received, or they responded that they did not have any environmental assessment requirements for the proposed drilling program.

The C-NLOPB provided comments to HMDC on 2 March 2009. HMDC provided a response to these comments on 27 April 2009 and the C-NLOPB forwarded the response on 28 April 2009 to DFO, EC and Natural Resources Canada. HMDC's response to the EA Report review comments did not satisfy all of the information requirements and they were asked on June 15, 2009 to address the outstanding comments. HMDC provided a response on June 17, 2009. The RAs required further clarification on the following issues: identification, characterization, quantification and modeling of discharges; produced water from production operations; and the potential zone of influence for drilling waste on benthic habitat. Again, on July 23, 2009, HMDC were requested to address outstanding comments on produced water and cuttings reinjection. HMDC provided a response on July 24, 2009. Based on a review of this information the C-NLOPB, DFO and EC have completed their review of the environmental assessment report and have sufficient information to complete the screening report.

5. Environmental Effects Analysis

5.1 Methodology

The RAs (C-NLOPB, EC, DFO) reviewed the environmental effects analysis presented by HMDC in the 2009 EA Report and additional information. The environmental assessment methodology and approach used by the Proponent are acceptable to the RAs. The following environmental effects analysis uses the information presented by the Proponent (in JW 2009) and takes into consideration mitigation proposed by the Proponent and those required by the RAs, to assess the potential for residual environmental effects.

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

- magnitude of impact
- scale of impact (geographic extent);
- duration and frequency;
- reversibility; and
- 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

Upon review of the information of the effects assessment presented by HMDC in the EA Report and additional information provided in the revised 2009 EA Report, including proposed mitigations, the effects assessment follows.

5.2 Effects of the Environment on the Project

The variable and sometimes harsh climate on the Grand Banks and the potential for sea ice and icebergs during the winter and spring months can pose significant challenges to drilling operations. Effects of the environment on the Project include those caused by visibility, geohazards, wind, ice and icing, waves, currents and biofouling. The physical variables were described in the EA Report (JW 2009) and additional information, and in the "*Physical Environment at Hibernia Southern Extension*" report in Appendix B (Oceans 2008). Effects of the environment will be mitigated by state-of-the-art weather forecasting, ice surveillance and management procedures, operating limits, timing, selection of suitable rigs and vessels, properly designed equipment, risk assessment processes and personnel trained to work offshore safely and responsibly. As part of its monitoring program, HMDC will have marine weather observers observing weather on a 24 hour basis. HMDC has an active ice management plan for ongoing production activities that will be amended as required to reflect operational procedures that are implemented in the event of an iceberg threat to the new subsea flowlines. The ice management plan includes mitigations to prevent impacts from sea ice and icebergs during drilling activities. All these should ensure that effects from the environment can be minimized. Therefore the effects of the environment on the project will be **not significant**.

5.3 Presence of Structures

Surface structures will include the dredging vessel and drill rig(s) either a semi-submersible rig or a drill ship. Subsea structures will include diving vessels, glory holes, and subsea infrastructure (e.g. flow lines, umbilicals, subsea manifolds with control system components). The Hibernia safety zone will require an increase in size. A temporary safety zone would extend approximately 500 m from a drill ship and approximately 1.25 or 1.65 km from the drill centre

for a semi-submersible rig, depending on the anchor arrangement. Thus, the safety zone will range from 1 to 5 or 8.2 km^2 in total area, per drill rig. A safety zone of 500 m would be required on either side of all flowlines and drill centre(s) post drilling. The current safety zone around the Hibernia GBS and OLS would be expanded and modified as each drill centre is constructed.

5.3.1 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. Alternatively, the safety zone and presence of the rig could have a potential positive effect on juvenile and adult fish by excluding other users from the area, including commercial fishers. A drilling rig may also create a reef effect, whereby local populations of fish and benthos are attracted to the equipment and become concentrated, thereby providing increased food and shelter for a more diverse assemblage of marine organisms. Safety zones would provide some protection against damage to the seabed by trawlers and shellfish dredges and perhaps lower fish mortality from commercial fisheries. Increased predation by fish, which are attracted to the structures, and by invertebrate predators (such as starfish), which are attracted by the presence of epifaunal prey, may also causes changes in the benthic communities.

The reef effect, the exclusion zone and the temporary alteration of habitat would have a duration of 128 to life of the project for subsea equipment, a low magnitude and <1 km geographic extent effect on fish populations with an overall effect on fish and fish habitat as **not significant**.

The cumulative effects of the drill centres project with other on-going projects on the Grand Banks is deemed to be **not significant** given that the predicted environmental effects on marine fish and fish habitat are localized and reversible.

5.3.2 Marine Birds 1

The effect due to presence of structures on marine birds is most likely associated with lights and flares. The physical structures are present primarily during the construction and drilling activities. The subsea structures required for the project operation are not expected to interact with marine birds. A drilling rig may create an artificial reef effect, as noted above, and will likely see an increase in marine birds in the area due to an increase in prey abundance. See Section 5.4.2 for a discussion on the effects of lights and flares on marine birds. HMDC has indicated that the environmental officer on board the rig will also be responsible for monitoring and observing seabirds and marine mammals, using established protocols. Environmental/Ice Observers are present on the drilling rigs and will conduct seabird and marine mammal observations on a daily basis in accordance with established protocols. It is not expected that there will be any significant change in regional bird populations due to the presence if drilling rigs, which are present for only a short term. Based on a low magnitude, < 10 km geograpic extent and a duration of 128 and 45 days, respectively to life of the project for subsea equipment, the environmental effects of the project for construction, operation, and abandonment each activity that will potentially interact with marine birds are predicted to be **not significant**.

The closest activity is approximately 6.25 km away from the HSE drill centre. As well, during production, all project infrastructure will be subsea. The cumulative effects of the drill centres

project with other on-going projects on the Grand Banks is deemed to be **not significant** given that the predicted environmental effects on marine birds are localized and reversible.

5.3.3 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. However, noise related to the physical presence of structures, such as from the dredging vessel, drill unit, supply boats and VSP surveys might have an effect. See Section 5.7.3 for a discussion of the effects of noise on marine mammals and sea turtles.

5.3.4 Commercial Fisheries 1

The presence of structures and the corresponding safety zone during all phases of the Project would prohibit commercial fishing activities in the project area. The exclusion zone around each well is very small compared to the entire fishing area of UA 3Lt. Other potential interactions between routine activities and commercial fisheries are interactions between fishing gear and vessels (fouling or losing gear, vessel conflicts) and fish "catchability" (issues related to scaring fish from a harvesting area or away from fishing gear). As indicated in the EA, crab is the primary species harvested, with harvesting typically executed from May to July. Based on the information presented in the EA, there is very little harvesting recorded within the Project Area in any month from 2005 to 2007, inclusive. The effect of the presence of structures on commercial fisheries will be of low magnitude, low geographic extent (<1 km) and a duration of 128 and 45 days, respectively for presence of structures during drilling and dredging operations to life of project for subsea equipment. Overall, taking mitigation measures into consideration, the effects from project activities during construction, operation and abandonment will be **not significant**.

Cumulative effects on fisheries could occur from operations at Hibernia, Terra Nova and White Rose, but the safety zones of the three projects will not overlap and their additive cumulative effect will not exceed the *not significant* rating. The following are safety zones associated with the White Rose project (93 km^2), Husky exploration (25.7 km^2), StatoilHydro drill centres (14 km^2), the Terra Nova exclusion zone (14 km^2) and safety zone (255 km^2), and Hibernia safety zone (6 km^2). A temporary safety zone would extend approximately 500 m from a drill ship and approximately 1.25 or 1.65 km from the drill centre for a semi-submersible rig, depending on the anchor arrangement. Thus, the safety zone will range from 1 to 5 or 8.2 km^2 in total area, per drill rig. A safety zone of 500 m would be required on either side of all flowlines and drill centres(s) post drilling. The current safety zone around the Hibernia GBS and OLS would be expanded. In addition, since the zones will be located in areas where commercial fishing does not typically occur, it is not expected to have an effect on fish harvesters. Given the relative area that fishing is actually restricted at any one time, compared to the available fishing area and the relatively little fishing activity that occurs near these projects, the cumulative effects of safety areas, both within and between projects, are considered **not significant**.

5.3.5 Species at Risk 1

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. However, the presence of additional structures is unlikely to pose a risk to fish, marine mammals or sea turtles, or marine birds protected under

SARA or listed by COSEWIC. Therefore, the impact on fish, marine mammal and sea turtle, and marine bird species at risk is considered to be **not significant**.

5.4 Lights and Flares

The dredging vessel, drill rig (semi-submersible rig or a drill ship), and supply and standby vessels will all be equipped with navigation and warning lights. Working areas will be illuminated with floodlights and drill rigs could conduct short-duration flaring should well testing be necessary.

5.4.1 Fish and Fish Habitat 0

Fish may be attracted to illuminated surface waters, due to the use of floodlights and flaring in working areas. The effect would be negligible and **not significant** due to the small area affected. The magnitude, geographic extent and duration of the potential effects on fish and fish habitat are low, <1 km, and 128 and 45 days, respectively for presence of structures during drilling and dredging operations to life of project for subsea equipment. Lights will be used during all project phases and there is potential for temporal overlap of this activity in different phases. However, they will not be large enough to change the overall effects rating and therefore there will be no cumulative effect.

5.4.2 Marine Birds 1

The illumination of rigs and supply vessels on the Grand Banks may attract night migrating and other night-active 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. There is potential for flaring to interact with marine birds, however this activity is relatively infrequent and of short duration during the drilling phase. The heat and noise generated by the flare may deter marine birds from the immediate area of the flare.

In terms of stranded birds, HMDC has committed to a recovery and release program for the rig and supply boats, consistent with the requirements of the Canadian Wildlife Service. HMDC has indicated that the environmental officer on board the rig will also be responsible for monitoring and observing seabirds and marine mammals in the area, using established protocols. There are no study results for the Grand Banks concerning the effects of lights and flares on marine birds, however, 52 Leach's Storm Petrels were recovered and released with no mortality observed during monitoring on board a Terra Nova vessel over a three-week period during the summer of 1998 (Husky Oil 2000 in JW 2009).

Lights are expected to interact with marine birds during all phases of the new drill centres project. Flaring is expected to interact with marine birds during the drilling and production phases of the Project. The effect on birds from lights and flaring is low and likely. However, given the mitigation of recovery and release, the effects on seabirds will be low in magnitude, with a <10 km geographic extent, and 128 and 45 days, respectively for presence of structures during drilling and dredging operations to life of project for subsea equipment resulting in a **not significant** effect.

Cumulative effects are not expected to exceed those expected for individual oil development

sites. Once the new drill centres are developed, there will be no additional lighting over what is currently at Hibernia. As well, during production, all project infrastructure will be subsea, resulting in only the existing level of lighting at the Hibernia Platform and associated supply vessels. The effects on seabirds regarding lights and flares for Terra Nova and White Rose production facilities were determined to be not significant in each of the projects environmental assessments. The implementation of mitigations at Hibernia, Terra Nova and White Rose facilities, as well as on seismic vessels operating to the north would reduce any cumulative effects associated with strandings. Cumulative effects therefore are **not significant.**

5.4.3 Marine Mammals and Sea Turtles 0

It is possible that lights and flares associated with vessels and rigs may attract prey for marine mammals. However, given the small areas where this may happen (<1 km), the effects on marine mammals and sea turtles are low and therefore, the effects of lights and flaring on marine mammals and sea turtles are considered to be **not significant**. Cumulative effects with respect to other activities on the Grand Banks are considered negligible.

5.4.4 Commercial Fisheries 0

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

5.4.5 Species at Risk 0

As in the case of populations of marine mammals and sea turtles, the effect of light from structures and flaring is predicted to be minimal for individual fish, marine mammals and sea turtles, and marine bird species at risk. Therefore, the effects are considered to be **not significant**.

5.5 Construction of Drill Centres

The glory hole(s) needed to support establishment of the drill centres will be excavated in order to protect the subsea wellheads and templates from iceberg scour. One to two glory holes will be constructed each year. Each glory hole will be excavated to a sufficient depth (approximately 10 m) below the existing seabed level. For the drill centres, the length and width will be approximately 30 m x 30 m, respectively, but may be larger (up to a nominal size of 70 m x 70 m) if two manifolds are required. Graded feed-in ramps will be constructed to allow the pipelines and umbilical to enter the glory hole. The estimated volume of material to be disposed at an approved disposal location from a single glory hole (70 m x 70 m x 10 m) is 159,300 m^3. Many project activities, such as dredging, are relatively short-term (approximately 45 days per glory hole). The flowlines will be laid on the seafloor with concrete mattresses or stitch rock dumping for stability. Both ends of the flowlines and umbilical will have weak links or break away connectors as a contingency for icebergs or other threats. Dropped object protection will be put in place for the flowlines near the GBS within the crane lifting zone.

5.5.1 Fish and Fish Habitat 1

Approximately 90% of the spoils at the HSE glory hole location consist of fine- to coarse-grained sand with minor gravel. The magnitude, geographic extent and duration of the potential effects of sediment excavation on fish and fish habitat are low, <10 km and 1-12 months (45 days per glory hole up to 6 glory holes). DFO has concluded that the glory hole excavation activities will result in the harmful alteration, disruption or destruction (HADD) of fish habitat.

Consequently, fish habitat compensation will be required to ensure that there is no net loss of productive fish habitat. As a result, HMDC, in consultation with DFO has initiated a fish habitat compensation strategy to mitigate the loss of fish habitat associated with this undertaking. As part of any finalized compensation requirements, HMDC will also be responsible for providing a detailed monitoring plan to assess the success of the compensation measures. The submission of the compensation plan, including monitoring requirements, is a requirement prior to issuing a subsection 35 (2) *Fisheries Act* Authorization. Following such mitigation, the potential residual effects of the construction of drill centres on fish and fish habitat are considered to be **not significant**.

Cumulative effects of drill centre construction would be **negligible** for fish and fish habitat due to the fact that no overlap of glory hole excavations is expected to occur during the new drill centres Project (this cumulative area represents less than 1% of the Project Area) and given the distance of the proposed project from any potential production and exploration drilling programs and current production programs.

5.5.2 Marine Birds 0

There should be no effect on marine birds due to the construction of drill centres. Therefore, cumulative effects from construction of drill centres on marine birds are predicted to be **not significant**.

5.5.3 Marine Mammals and Sea Turtles 0

The effects from the construction of drill centres on marine mammals and sea turtles would be low in magnitude, <10 km in geographic extent and 1-12 months in duration. The predicted effect would be **not significant**. Cumulative effects with respect to other activities on the Grand Banks are considered negligible.

5.5.4 Commercial Fisheries 0

The effects on the commercial fishery will be low in magnitude, <10 km in geographic extent and 1-12 months (45 day per year per glory hole (up to 6 glory holes) in duration. The effect would be negligible and **not significant** due to the small area affected.

Cumulative effects from construction of drill centres on commercial fisheries are predicted to be **not significant.**

5.5.5 Species at Risk 1

If due caution is exercised and mitigations as proposed are followed, then effects from the construction of drill centres on fish, marine mammals, sea turtles and marine birds protected under SARA or listed by COSEWIC are considered to be **not significant**.

5.6 Subsea Infrastructure, Installation and Tieback to GBS

Development of the new drill centres will involve installation of the following equipment: wellheads and Christmas trees (production and water injection); production and water injection manifolds; subsea distribution units; subsea umbical termination unit; flowlines (gas lift, stimulation, production, injection); jumpers; and rigid spools (to production and water injection xmas trees). Both ends of the flowlines and umbilical will have weak links or break away connectors. Subsea installations are expected to take 30 to 40 days.

5.6.1 Fish and Fish Habitat 0

Considering the relatively small amount of oily residue discharged, subsea valve control fluids that have low toxicity consisting primarily of glycol and water with acceptable OCMS ratings, mitigation such as flushing flowlines and the infrequency of discharge, the effects of oily residue discharge on fish habitat would be low in magnitude, <1 km in geographic extent and >72 months in duration with a **not significant** effect on fish and fish habitat.

The cumulative effects of the subsea infrastructure installation and tieback to the GBS and all other activities on the Grand Banks is deemed to be **not significant** considering the small amount of oily residue that will be discharged.

5.6.2 Marine Birds 1

Considering the relatively small amount of oily residue discharged, the short period of release and the near-bottom release, the effects of discharges on marine birds are expected to be low in magnitude, <1 km in geographic extent, and 1-2 months (to install) and life of project duration with a **not significant** effect.

The combined discharge of oily residue from all offshore oil development sites on the Grand Banks will have the same potential effects rankings as those predicted for the project alone and will result in negligible cumulative effects.

5.6.3 Marine Mammals and Sea Turtles 0

There should be no interaction between marine mammals and sea turtles and the subsea infrastructure installation and tieback to the GBS.

5.6.4 Commercial Fisheries 0

As indicated above, there will be no significant effect on fish populations. Therefore, the magnitude of effects on commercial fisheries will be **not significant** with a low magnitude, a <1 km geographic extent, and 1-2 months (to install) and life of project duration. Cumulative effects will be **not significant** given the lack of harvesting recorded in areas close to most project activities.

5.6.5 Species at Risk 0

The subsea infrastructure installation and tieback to the GBS is predicted to be **not significant** for populations of fish, marine mammals, sea turtles and marine birds. The effect on individual fish, marine mammal, sea turtle and marine bird species at risk is also considered to be **not significant**.

5.7 Noise

Sources of noise include drilling activities (drill rig machinery and thrusters), marine traffic (supply/support boats), dredging and disposal activities, subsea construction vessels, echo sounders, geohazard/wellsite surveys, VSP surveys, and abandonment activities (wellhead severance using chemical explosives). Air-borne noise is normally associated with helicopters servicing the drill rig.

5.7.1 Fish and Fish Habitat 1

Noise will occur during all phases of the project and can potentially affect all life stages of fish.

Fish vary widely in their ability to hear sounds. In general, most fish show avoidance reaction to underwater noise 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 (JWE 2008). The effects will be low in magnitude, with a geographic extent of <10 km and duration of up to 128 days and therefore **not significant**.

Noise will be generated during geotechnical surveying for Glory Hole excavation. Due to the short timeframe of this activity, the effect will be **not significant**.

Noise is produced by all activities occurring on the Grand Banks. Cumulative impacts of noise on fish will be **negligible** given the fact that most fish are able to move away from any noise source before any chance of a physical effect. While eggs and larvae do not have the same capability of avoiding a noise source, it seems that exposure to very high sound energy levels is required before damage is done to these early life stages (JW 2008).

5.7.2 Marine Birds 0

Personnel and supplies will be transported to and from offshore structures via helicopter. During construction of the new drill centre(s), some additional helicopter flights may be required to transfer personnel from drilling rigs. During operations, the current helicopter requirements will remain the same as it is anticipated that no additional personnel will be required on the Hibernia platform. The presence of helicopters would occur in all phases of the project. 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 project area, 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. During all flights, the helicopters and aircraft will fly at minimum altitudes of 600 m whenever possible. In addition, aircraft will not come within eight km seaward and 3 km landward of major seabird colonies from April 1 to November 1. As well, supply vessels will maintain adequate distances (2 km) from any seabird colonies. Therefore, effects of noise from helicopters and supply vessels will be negligible and **not significant**.

Birds, which spend time underwater foraging, may be affected if they dive within a few metres of the airgun. Alcidae (Dovekie, Common Murre, Thick-billed Murre, Razorbill, Black Guillemot and Atlantic Puffin) may potentially be the most sensitive group due to their time spent underwater foraging for food. Noise produced by VSP is primarily a concern for biota occurring below the water's surface. Ramp up of the VSP array would likely scare birds from the area. Effects of seismic activity on marine birds are localized and exposure of marine birds would be limited. Effects are predicted to be of low magnitude, with a small geographic extent of <10 km, and duration of up to 128 days during construction. Therefore, the environmental effect is not likely and **not significant**.

Cumulative effects from sound produced from these sources on marine birds are predicted to be **not significant**.

5.7.3 Marine Mammals and Sea Turtles 1

There is a concern with the noise produced by supply ships, boats, helicopters, and dredging and drilling activities on marine mammals and sea turtles, as they depend on the underwater acoustic environment to communicate and to gain information about their surroundings. Sediment excavation via a suction-hopper dredge or clam dredge will occur only during the glory hole excavation installation phase of the project. Drilling noise will be present throughout the drilling phase of the project for a maximum duration of 128 days. Support vessels will be present for all phases of the project as well as regular supply boat trips per week (e.g., 18 trips per well during the drilling phase) to the project site. Helicopters will be used regularly during all project phases but mostly during production operations (124 months). The VSP (and geohazard) activities are typically less than those associated with typical, full-scale seismic surveys. The duration of VSP activities will be two days per well.

The passage of marine vessels may also affect marine mammals and sea turtles. For the duration of the drilling program, the effects from ships are likely to be low, of a duration of up to 128 days per drill centre, and within an area of <10 km. Effects may be reduced by supply boats maintaining a steady course and speed, and avoiding areas with large numbers of whales. Overall, the effects are **not significant**.

Low flying aircraft could cause low magnitude effects on marine mammals and sea turtles in the water. Helicopters will fly at an altitude of 600 m and are prohibited from flying over wildlife for passengers to view. These effects are predicted to be low, with a duration of up to 128 days per drill centre, in an area of <10 km and therefore **not significant**.

For seismic surveys, it is predicted that the overall effect on marine mammals and sea turtles will be less than that from a typical 2D or 3D seismic survey, given the smaller array, reduced duration, and area covered. In order to further reduce effects to marine mammals and sea turtles, HMDC will implement the following mitigation measures for the conduct of VSP surveys, as outlined, and required by the Board, 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 are predicted to be low, for a limited duration (up to 128 days), and in an area of <10 km. Therefore, the effects on marine mammals or sea turtles will be **not significant.**

Oil and gas activities ongoing on the Grand Banks include production operations at Hibernia, Terra Nova, and White Rose as well as StatoilHydro's proposal to drill a maximum of 27 single and/or dual side-track wells between 2008 and 2016, StatoilHydro/Husky's proposed exploration/delineation drilling program for the SDL 1040, Husky's proposal to develop four new drill centres at White Rose, Husky's proposed exploration/delineation drilling program, and future Hebron project activities. Supply vessels transit from St. John's to the production and drilling facilities offshore (up to 300 trips per year). In 2008, there were approximately 169 trips by oil tankers from the production facilities. The Canadian Coast Guard monitored in excess of 8,900 vessel movements on the east coast of the province. Locally, there may be an incremental increase in noise levels but the cumulative effects will be **not significant**.

5.7.4 Commercial Fisheries 0

As indicated above, there will be no significant effect on fish populations. Therefore, the magnitude of effects on commercial fisheries will be **not significant** with a low magnitude, a <10 km geographic extent, and a duration of 128 days per drill centre. Cumulative effects will be **not significant** given the lack of harvesting recorded in areas close to most project activities.

5.7.5 Species at Risk 1

If due caution is exercised and mitigations as proposed are followed, particularly for seismic and VSP activities, then effects of noise on individual fish, marine mammals, sea turtles and marine birds protected under SARA or listed by COSEWIC will be reduced and thus considered to be **not significant**.

5.8 Atmospheric Emissions

Air emissions will occur during all phases of the project. The potential emissions from offshore drilling include:

- burning of well fluids during production tests and clean-ups;
- engine, generator and heating exhausts from the dredging vessel, drilling rig, helicopters and supply vessels;
- mud, degassing and other mudroom exhausts; and
- fugitive emissions.

The air emissions of offshore drilling activities are within the range of those of fishing vessels, tanker traffic, and military vessels that routinely transit eastern Canadian waters. The offshore environment is windy and air emissions disperse quickly from the installations. Equipment will be similar in emissions to other industrial equipment in routine use, will be within the range of what is occurring now offshore, and mitigations will be employed. Fugitive emissions will be minimized through implementation of best management practices and preventative maintenance measures.

The quantity of air emissions from the existing Hibernia project is estimated annually and submitted to the C-NLOPB as per the OWTG (2002) and to the National Pollutant Release Inventory.

5.8.1 Fish and Fish Habitat 0

In general, emissions of potentially harmful materials will be small and of short duration and will rapidly disperse once released to undetectable levels. Effects on fish and fish habitat from atmospheric emissions will be low, with a geographic extent 1-<10 km, and a duration up to 128 days and therefore **not significant**. Cumulative effects will be negligible.

5.8.2 Marine Birds 0

The effects would likely be minimal because emissions of potentially harmful materials will be small and rapidly disperse to undetectable levels. Effects on marine birds from atmospheric emissions are predicted to be low in magnitude, 1-<10 km in geographic extent, and up to 128 days in duration resulting in a **not significant** effect.

Potential cumulative effects of atmospheric emissions released from the three oil development sites and their supply ships, seismic vessels, fishing vessels, and other ships in the study area will be **negligible** for marine birds. Emissions are not expected to be detectable beyond the immediate area of discharge, as they will rapidly disperse due to their volatility, temperature of emission and the exposed and often windy nature of the Grand Banks.

5.8.3 Marine Mammals and Sea Turtles 0

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

5.8.4 Commercial Fisheries 0

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

5.8.5 Species at Risk 0

There should be no interaction between atmospheric emissions and fish, marine mammals and sea turtles, and marine birds considered at risk. Therefore, the effect on species at risk is considered to be **not significant**.

5.9 Discharge of Drilling Muds and Cuttings

The discharge of drilling muds and cuttings will occur during the drilling phase of the project. HMDC is proposing to use water based (WBM) and synthetic based muds (SBM) for its drilling program. WBM, comprised primarily of water, bentonite (clay) and barite, will be directly discharged to the seafloor when drilling the initial sections of the hole, after that cuttings will be discharged from the rig at 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. The total quantity of mud and cuttings that would be deposited on the seabed would be in the order of 227 m^3 per well of the WBM material within a radius of approximately 10 m with a build-up of 2.5 m. The maximum deposition thickness would be approximately 1 m to 2 m taking slumping into account. Approximately 270 m^3 of SBM cuttings and residual mud may be released from the surface. The results of the Norsk Hydro model indicated that the SBM cuttings would be deposited on the seafloor within approximately 40 m of the drilling platform. The maximum thickness of the SBM cutting deposit was approximately 25 cm and would slump to an angle of up to 30 degrees.

Results of the White Rose modelling of cuttings indicated that the biological 'zone of influence' (ZOI) is generally confined within approximately 500 m of the drilling area. Recent EAs (White Rose and Jeanne d'Arc Basin) have predicted a total area of impact of less than 1 km^2 from multi-well drilling based on modelling and published literature. The modelling results are considered applicable to this project and it is therefore reasonable to conclude that WBM and cuttings will cover an area of the seabed of about 0.8 km^2 to a thickness of at least 1 cm per well.

The proposed Project could have a maximum of six drill centres (70 m x 70 m each) each supporting up to 11 wells. The area of smothering is not predicted to increase incrementally with each well, as most of the depositional footprint will be re-covered with each subsequent well (i.e., the ZOIs will overlap). SBM associated cuttings tend to disperse less and fall closer to the

drilling rig, and therefore will not extend beyond the 0.8 km^2 area affected predicted from WBM and cuttings.

5.9.1 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 Comprehensive Study, whereby the fate of cuttings and muds were estimated from a discharge point at the center of the drill location, for cuttings the area covered would be approximately 0.2 km^2. The maximum thickness of deposition would be approximately 10 mm within a 200 m radius of the well. The EA Report indicates that smothering of benthos will occur if the thickness of the deposition layer is greater than 1 cm. Literature cited in the EA Report indicates that within months to years, benthos would recover once drilling stopped.

Water based muds are generally non-toxic. The primary additives are bentonite, barite and potassium chloride, with seawater as the main component. Chemicals, such as caustic soda, viscosifers and shale inhibitors are added to control mud properties. HMDC 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 HMDC are non-toxic, and they have the potential to biodegrade rapidly (JWE 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. All SBM cuttings will be treated in accordance to the OWTG prior to discharge.

It is predicted that the area of impact from 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.

Through its Offshore Chemical Management System, HMDC has indicated that it will ensure that all chemicals used in the offshore having the potential to be discharged to the marine environment must be assessed or screened in accordance with the C-NLOPB Offshore Chemical Selection Guidelines. Where chemicals are deemed to have unacceptable toxicity ratings, a substitution for that chemical is sought.

Based on mitigations indicated in the EA (e.g., cuttings treatment, chemical screening, compliance with 2002 OWTG) and the predicted recolonization of benthic species in the cuttings deposition area, the predicted effects of drilling muds and cuttings on fish and fish habitat will be a low magnitude, with a geographic extent <1 km, and a duration up to 128 days for each well. Therefore, the effects will be **not significant.**

Under the scenario of two MODUs concurrently drilling exploration/delineation wells in the Project Area, and assuming that WBM and cuttings will cover an area of the seabed of about 0.8 km^2 to a thickness of at least one centimetre per well, an approximate total of 1.6 km^2 of fish habitat could be concurrently smothered within the Project Area, representing about 0.09% of the total area of the Project Area.

Drilling of exploratory and development wells, placing platforms and constructing pipelines, discharging muds and cuttings are all activities, which affect marine fish habitat. It is assumed that the proposed Project could have a maximum of six drill centres each supporting up to 11 wells, resulting in the worst case scenario of 8.8 km^2 of seabed covered by a minimum of 1 cm of drill mud and cuttings. The cumulative affected area of 8.8 km^2 is an overestimation and represents less than 1% of the Project Area.

Currently there are three oil fields in production on the northeast Grand Banks. Drilling activities are ongoing in association with these programs. Hibernia began rejection of synthetic based cuttings in 2001 and 2002 and releases WBM and cuttings only. However, given the relatively small area potentially affected by each well relative to the total Grand Banks area and the apparent short duration of the smothering effect and the potential for recovery, cumulative effects are predicted to be **not significant**.

5.9.2 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 is 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 likelihood of sheens on the water surface. Therefore, the discharge of drill muds and cuttings are expected to be low in magnitude, <1 km^2 in geographic extent and up to 128 days for each well in duration resulting in a **not significant** effect on marine birds.

Cumulative effects, associated with other offshore facilities, will be negligible and **not significant**. There is little chance seabirds will interact with muds and cuttings; there is no likely pathway for significant exposure, and little chance that heavy metals will bioaccumulate to harmful levels.

5.9.3 Marine Mammals and Sea Turtles 0

The deposition of muds and cuttings on the seafloor are unlikely to produce concentrations of heavy metals. JW (2008) state that none of the marine mammals that regularly occur in the project area are known to feed on benthos in the area. Therefore, effects from deposition of drill muds and cuttings will be low, over a duration of 128 days for each well, in an area <1 km and therefore **not significant**. Given the relatively small area potentially affected by each drill centre relative to the total Grand Banks area, and the apparent short duration of smothering effect on benthos (JW 2008), cumulative effects will be **not significant**.

5.9.4 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.

5.9.5 Species at Risk 0

The discharge of drill cuttings is predicted to be not significant for populations of fish, marine

mammals, sea turtles, and marine birds. The effect on individual fish, marine mammal, sea turtle, and marine bird species at risk is also considered to be **not significant**.

5.10 Operational Discharges

Discharges associated with drilling include cement slurry and blowout preventer (BOP) fluid. 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 OWTG prior to discharge. Solid wastes, such as garbage, will be shipped to shore for proper disposal or recycling. Combustible materials such as oily rags and paint cans will be placed in separate hazardous materials containers and transferred ashore. HMDC indicated in the EA that it will implement an offshore chemical management system (OCMS) to screen all chemicals intended for use on the rig.

Produced water will be released during production operations. However, minimal, if any, produced water will be discharged during development drilling. All produced water will be treated to less than 30 mg/L and discharged as per the OWTG. During production operations, discharge rates of produced water are not anticipated to be greatly affected by this Project. A maximum daily discharge rate for produced water has been approved and approval will be required to exceed that rate. In 2006, an environmental assessment on the effects of produced water discharges up to 40,000 m^3/d, with a maximum allowable limit of 40 mg/l for the 30 day volume weighted rolling average, was conducted (HMDC 2006). Together with the produced water discharged from the Hibernia platform, the potential incremental increase in produced water resulting from this Project will be within the amount assessed in the Hibernia Produced Water EA.

5.10.1 Fish and Fish Habitat 0

It is predicted that for each well, approximately 26.4 m^3 of excess cement will be released to the marine environment. The discharge will result in the local smothering of benthos, but literature suggests that the cement will act as an artificial reef, and may be colonized by epifaunal animals and attract fish. The effect, while negative, is low in magnitude, <1 km in geographic extent and continuous in duration during each well, glory hole, and subsea installation resulting in a **not significant** effect.

The blowout preventer is required to undergo periodic testing, during which approximately 1 m^3 of BOP fluid is released. HMDC indicated that glycol-water mixes, with low toxicity will be used. The release of the BOP fluid will be low in magnitude, <1 km in geographic extent and continuous in duration during each well, glory hole, and subsea installation resulting in a **not significant** effect.

Cooling water will be released after being treated with chlorine for anti-fouling purposes. Deck drainage and bilge water would be collected and treated to 15 mg/L or less and discharged as per the OWTG. Ballast water is stored in dedicated tanks however if oil is suspected then it would be tested and, if necessary, treated so that oil concentrations in the discharge do not exceed 15mg/L, as required by the current OWTG. Sanitary waste will be macerated to a particle size of 6 mm or less as per the OWTG. All trash and garbage, including organic waste from galleys, will be containerized and transported to shore for disposal in approved landfills. Combustible

waste such as oil rags and paint cans will be managed as hazardous waste and transported to shore as per the Transportation of Dangerous Goods requirements. The effects would be negligible in magnitude, <1 km^2 in geographic extent and continuous in duration during each well, glory hole, and subsea installation resulting in a **not significant** effect.

Produced water discharges up to a maximum of 40,000 m^3/day were assessed in the Produced Water EA and determined to have no significant effect. Discharges of produced water will not exceed this maximum amount therefore, the effect will be **not significant**.

As indicated above, all chemicals will be screened through HMDC's OCMS, and all discharges will be treated in accordance with the 2002 OWTG prior to discharge. Therefore, overall, the effect on fish and fish habitat will be **not significant**.

5.10.2 Marine Birds 1

In compliance with the OWTG, sanitary waste from the rig will be macerated to 6 mm and will be released below the surface. There is concern that seabirds, particularly gulls, will be attracted to the particles. HMDC indicated that the small amount discharged below surface over a limited period of time will be unlikely to increase the gull population offshore. Associated with an increase in gull population is the possibility of an increase in gull predation on Leach's Storm Petrels. However, as indicated, there should not be an increase in offshore gull populations as drillings activities will be short term; therefore the impact on Leach's Storm Petrels should be minimal.

HMDC predicts that the effects of discharge of sanitary waste will be low and of short duration. The effects from other operational discharges are low (JW 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 low in magnitude, <1 km in geographic extent, and continuous in duration during each well, glory hole, and subsea installation with a **not significant** effect.

All rigs, production platforms, supply vessels and seismic vessels, treat operational discharges prior to discharge in compliance with regulations and guidelines. The combined discharge of the fluids and solids from all offshore oil development sites on the Grand Banks will have the same potential effects rankings as those predicted for the Project alone. The treatment of discharges will result in negligible cumulative effects on seabirds and will be **not significant**.

5.10.3 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. Cooling water discharges will be chlorinated and monitored as per the OWTG. A low volume of water will be discharged and the area of thermal effects will be small. Therefore, cooling water discharge effects will be low in magnitude, <1 km in geographic extent and continuous in duration during each well, glory hole, and subsea installation with a **not significant** effect. 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.

5.10.4 Commercial Fisheries 0

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

5.10.5 Species at Risk 0

If due caution is exercised and mitigations as proposed are followed for operational discharges from drilling activities, then effects on individual fish, marine mammals, sea turtles and marine birds protected under SARA or listed by COSEWIC will be reduced and thus considered to be **not significant**.

5.11 Well Abandonment

Upon completion of its drilling program, it is HMDC's intent to abandon and remove all wells, in accordance with the C-NLOPB regulations, using mechanical separation. In the event that mechanical separation fails, HMDC 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 HMDC to undertake a marine mammal observation program during the abandonment program. An authorization for Abandonment and Decommissioning from the C-NLOPB will also be required.

5.11.1 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 HMDC, 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**.

5.11.2 Marine Birds 0

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

5.11.3 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 charges 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, well

severance using chemical explosives will have a **not significant** effect on marine mammals and sea turtles.

5.11.4 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 commercial fisheries would be negligible and **not significant.**

5.11.5 Species at Risk 0

If due caution is exercised and mitigations as proposed are followed for abandonment activities, then effects of activity and noise on individual fish, marine mammals, sea turtles and marine birds protected under SARA or listed by COSEWIC will be reduced and thus considered to be **not significant**.

5.12 Accidental Events

During development drilling or production operations, unintentional release of hydrocarbons (i.e., blowouts and batch spills) are the possible accidental events that may affect the environment. Based on 66 development wells, the spill frequencies estimated for the Drilling Phase of the development of new drill centres is estimated to be 1 in 570 for spills greater than 150,000 bbl, 1 in 284 for spills greater than 10,000 bbls and 1 in 303 for spills greater than 1000 bbl (JW 2008). The absence of shallow gas deposits and Hibernia's drilling experience and understanding of the reservoir characteristics developed over the past 12 years in the drilling of over 60 wells, supports the unlikelihood of blowouts occurring during the Project (JW 2008).

The characteristics of Hibernia crude show that the crude is relatively light, it will not immediately emulsify and it will keep relatively non-viscous for many hours. Data from spill trajectory modeling conducted for the Hibernia EIS (as reported in JW 2009), show that oil on the water would tend to move offshore to the east and northeast. Only during four months of the year (November, December, January, and March) is there any chance of shoreline contact (predicted to be <0.6%). However, given that the recent crude characteristic data differs from that used in the original trajectory modeling work, it is reasonable to conclude that the actual probability of shoreline impact is less and the survival time of the slick on the water surface is also less that originally predicted. While the trajectory analysis predicts the track of oil, it cannot predict the state of the oil (e.g. consistency, particle size, patch). The original Hibernia EIS assumed a batch spill from a pipeline would release 3000 m^3 for one hour. The other potential source of a batch spill could be the drilling vessel or support/standby vessel.

5.12.1 Fish and Fish Habitat 1

Juvenile and adult fish can and probably will avoid any crude oil by swimming from the blowout/spill region. Effects of oil spills on adult and juvenile fish are predicted to be negligible. Fish eggs and larvae are more likely to be affected by oil spills. Eggs and larvae present in the area will be exposed to hydrocarbons from spill events. Recruitment to a population would not be affected unless more than 50 percent of the larvae in a large portion of the spawning area were lost. In the White Rose comprehensive study, Husky evaluated the impact of the eggs and larvae of eight species (some of which are the same as above) 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.

The environmental assessments for the Hibernia, Terra Nova, and White Rose production projects and the exploratory drilling programs all predicted not significant effects from accidental events. For this project, therefore, the effects would be negligible to low magnitude, localized to the Study Area geographic extent and a short term duration. Mitigation measures such as spill prevention and remediation would reduce overall impacts. Therefore, impact on fish and fish habitat would be **not significant**.

5.12.2 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. While spilled oil may reach land, it is extremely unlikely, based on the spill trajectory predictions that oil will affect seabird colonies. Oil spill trajectory models are presented in the EA Report. However, birds in the area of the rig would be at risk.

Depending on the time of the year, sea conditions, location of seabirds with the Study Area, volume and type of oil spilled and type of spill (i.e., surface or subsurface), and the extent of the spill, the magnitude of the effects will range from negligible to high. Blowouts will have a larger geographic extent (>10,000 km^2) than batch spills (1,001 to 10,000 km^2) with a long term duration. While the likelihood of an event occurring is **low** (less than one event per year) the effects would be **significant and adverse**. Countermeasures such as bird scaring devices would reduce some birds from oiling. However, overall, 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. HMDC's Oil Spill Response Plan will be in effect for the Project and it includes the implementation of an Oil Spill EEM when necessary.

5.12.3 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, but would be reversible. However, whales are present in the area in low numbers and only at certain times of the year. Seals are not normally present in large numbers during the months when drilling is planned. Depending on the time of year, location of whales and seals in the study area, and volume of oil spilled, effects could range from negligible to low magnitude, localized for batch spills and the Study Area for blowouts, with a short term duration. However, even though there could be an effect, the likelihood of a spill is very small, there are mitigations in place to prevent spills from occurring and oil spill countermeasures should reduce the number of marine mammals exposed to oil. Therefore, the conclusion is that effects are likely **not significant**.

5.12.4 Commercial Fisheries 1

Commercial fisheries could be impacted if there is an effect on eggs and larvae. In the event of a large spill (greater than 10,000 bbls), an oil spill would not cause significant effects on fish or result in fish taint. 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. With the application of the appropriate mitigative measures, the potential effect on commercial fisheries is reduced and therefore **not significant**.

5.12.5 Species at Risk **1**

An accidental event is predicted overall to be not significant for populations of fish, marine mammals, sea turtles, and marine birds. Although an accidental event could have a greater significance for individual species at risk, for which population numbers are low, the likelihood of a spill is very small, mitigations are in place to prevent spills from occurring and oil spill countermeasures should reduce the number of species exposed to oil. Therefore, the conclusion is that effects are likely **not significant**.

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

The C-NLOPB, DFO and EC will require HMDC to undertake follow-up monitoring, as defined in the CEA Act.

DFO will require monitoring of the stability/movement of glory hole dredge spoil piles using post-construction seabed surveys in order to determine whether the disposal of material from the new glory hole(s) remains contained within the area where HADD has been previously authorized. DFO will also require HMDC to carry out compensation and monitoring measures as outlined in any Fish Habitat Compensation Agreement related to the project.

The C-NLOPB will require HMDC to undertake environmental effects monitoring of its development drilling and production activities associated with the new drill centres. The environmental effects monitoring is to confirm or validate environmental assessment predictions and to ascertain environmental effects from offshore petroleum production activities. Therefore, HMDC will be required to modify its existing EEM program to incorporate drilling and production activities of the Project.

6. Other Considerations

Mitigations presented by HMDC in its environmental assessment for the Hibernia Drill Centres Construction and Operations Program Hibernia Management and Development Company (HMDC) (JW 2008, revised in 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 HMDC 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 RAs are satisfied with the environmental information provided by HMDC regarding the potential adverse environmental effects, which may result from the proposed drilling program, and are satisfied with the operator's proposed monitoring and mitigative measures.

The RAs are 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 RAs are of the view that if the proposed environmental mitigative measures outlined in the

revised 2009 EA Report, and those listed below are implemented, the Project is not likely to cause significant adverse environmental effects.

6.1 Recommended Conditions and/or Mitigations

For authorizations issued by the C-NLOPB, it is recommended that the following conditions be appended, if the Project is approved.

For any authorizations issued by the C-NLOPB

- *HMDC 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 "Screening Report Hibernia Drill Centres Construction and Operations Program Hibernia Management and Development Company (HMDC)"* (JW revised in 2009).

For Drilling (including Geotechnical Programs) and Production Operations

- *HMDC will be required to submit to the Chief Conservation Officer an amended EEM design that incorporates drilling and production activities associated with the six new drill centres, and tie-back to the GBS. The amended EEM Plan should be consistent with the strategy in the Hibernia Development EEM Design Report, discuss any changes that may be required to existing sampling stations, and consider the necessity for collection of baseline data at any or all of the new drill centre locations. Drilling or production operations at an individual drill centre will not be authorized until an acceptably amended EEM plan in respect of that location is in place.*

- *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.*

For VSP and/or Wellsite Surveys

- *HMDC 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 1 of SARA), including the North Atlantic right whale, Blue whale, and leatherback turtle, is observed within 500 m of the airgun array.*

For authorizations issued by the Department of Fisheries and Oceans, it is recommended that the following conditions be appended, if the Project is approved.

For Glory Hole Construction/Subsea Equipment Installation

- *HMDC 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 "Screening Report Hibernia Drill Centres Construction and*

Operations Program Hibernia Management and Development Company (HMDC)" (JW revised in 2009).

- *To compensate for the loss of productive fish habitat associated with the excavation of glory holes and deposition of glory hole dredge spoils associated with the proposed expansion and operation of the Hibernia offshore oil development on the Grand Banks, HMDC will agree to terms as presented in its subsection 35(2) Fisheries Act Authorization as well as carry out compensation and monitoring measures as outlined in any Fish Habitat Compensation Agreement related to the project.*

For permits issued by Environment Canada, it is recommended that the following conditions be appended, if the Project is approved.

- *HMDC 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 "Screening Report Hibernia Drill Centres Construction and Operations Program Hibernia Management and Development Company (HMDC)"* (JW revised in 2009).

Part D: Screening Decision

7. Decision/Decision Date

The Canada-Newfoundland and Labrador Offshore Petroleum Board, Fisheries and Oceans Canada and Environment Canada are of the opinion that, taking into account the implementation of proposed mitigation measures set out in the conditions above and those committed to by Hibernia Management and Development Company, 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 Elizabeth Young Date: September 15/09

Elizabeth A. Young
Environmental Assessment Officer
C-NLOPB

Responsible Officer Date: 16/9/09

I.R. Geoffrey Mercer
Regional Director
Environmental Protection Operations Division
Environment Canada

Responsible Officer Carole Brant A/Div. Mgr. Date: Sept 17/09

Tilman Bieger
for Regional Manager
Habitat Protection Division
Fisheries and Oceans Canada

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