Husky Energy Exploration Drilling Project Environmental Impact Statement Summary

Stantec

Prepared for:
Husky Energy

Prepared by:
Stantec Consulting Ltd.
141 Kelsey Drive
St. John's, NL A1B 0L2
Tel: (709) 576-1458
Fax: (709) 576-2126

Husky Control Doc No. ED-HSE-RP-0031

File No: 121413837

REVISED REPORT IN RESPONSE TO CEA AGENCY CONFORMITY REVIEW

September 2018

Table of Contents

LIST OF TABLES

LIST OF FIGURES

Abbreviations

bbl	barrel
BOP	blowout preventer
bopd	barrels of oil per day
CEAA 2012	*Canadian Environmental Assessment Act 2012*
CEA Agency	Canadian Environmental Assessment Agency
C-NLOPB	Canada-Newfoundland and Labrador Offshore Petroleum Board
CNSOPB	Canada-Nova Scotia Offshore Petroleum Board
CO_{2eq}	carbon dioxide equivalent
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CWS	Canadian Wildlife Service
DFO	Fisheries and Oceans Canada
DP	dynamic positioning
DST	drillstem test
EA	Environmental assessment
EBSA	Ecologically and Biologically Significant Areas
EEM	environmental effects monitoring
EIS	Environmental Impact Statement
EL	Exploration Licence
EPCMP	Environmental Protection and Compliance Monitoring Plan
EPP	Environmental Protection Plan
FSC	food, social and ceremonial
GHG	greenhouse gas
Husky	Husky Oil Operations Limited
km	kilometre
m	metre
MARPOL	International Convention for the Prevention of Pollution from Ships
MODU	mobile offshore drilling unit
NAFO	Northwest Atlantic Fisheries Organization
NEB	National Energy Board
OSV	offshore supply vessel
OWTG	Offshore Waste Treatment Guidelines
PBGB-LOMA	Placentia Bay-Grand Banks Large Ocean Management Area
ROV	remotely operated vehicle
SARA	*Species at Risk Act*
SBM	Synthetic-based [drilling] mud
SOCP	Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment
TVD	total vertical depth
VC	Valued Component
VME	Vulnerable Marine Ecosystem
VSP	vertical seismic profile
WBM	water-based [drilling] mud

1.0 INTRODUCTION AND ENVIRONMENTAL ASSESSMENT CONTEXT

Husky Oil Operations Limited (Husky) proposes to conduct exploration drilling activities within a Project Area that includes exploration licences (ELs) on the Grand Banks, located approximately 350 km east of St. John's, Newfoundland and Labrador (NL), in the Northwest Atlantic Ocean.

The Project is defined as a multi-well exploration drilling program on EL 1151, EL 1152, and EL 1155 (Figure 1-1). The Project includes up to ten wells to be drilled at any time between 2019 and 2027. An Environmental Impact Statement (EIS) has been prepared to be submitted to the Canadian Environmental Assessment Agency (CEA Agency) to fulfil the requirements of the Guidelines issued December 9, 2016 (as amended on April 27, 2017 and updated on May 31, 2018), under the *Canadian Environmental Assessment Act, 2012* (CEAA 2012). This document is a summary of the EIS and has been prepared to facilitate review and consultation by members of the public, stakeholders, and Indigenous people.

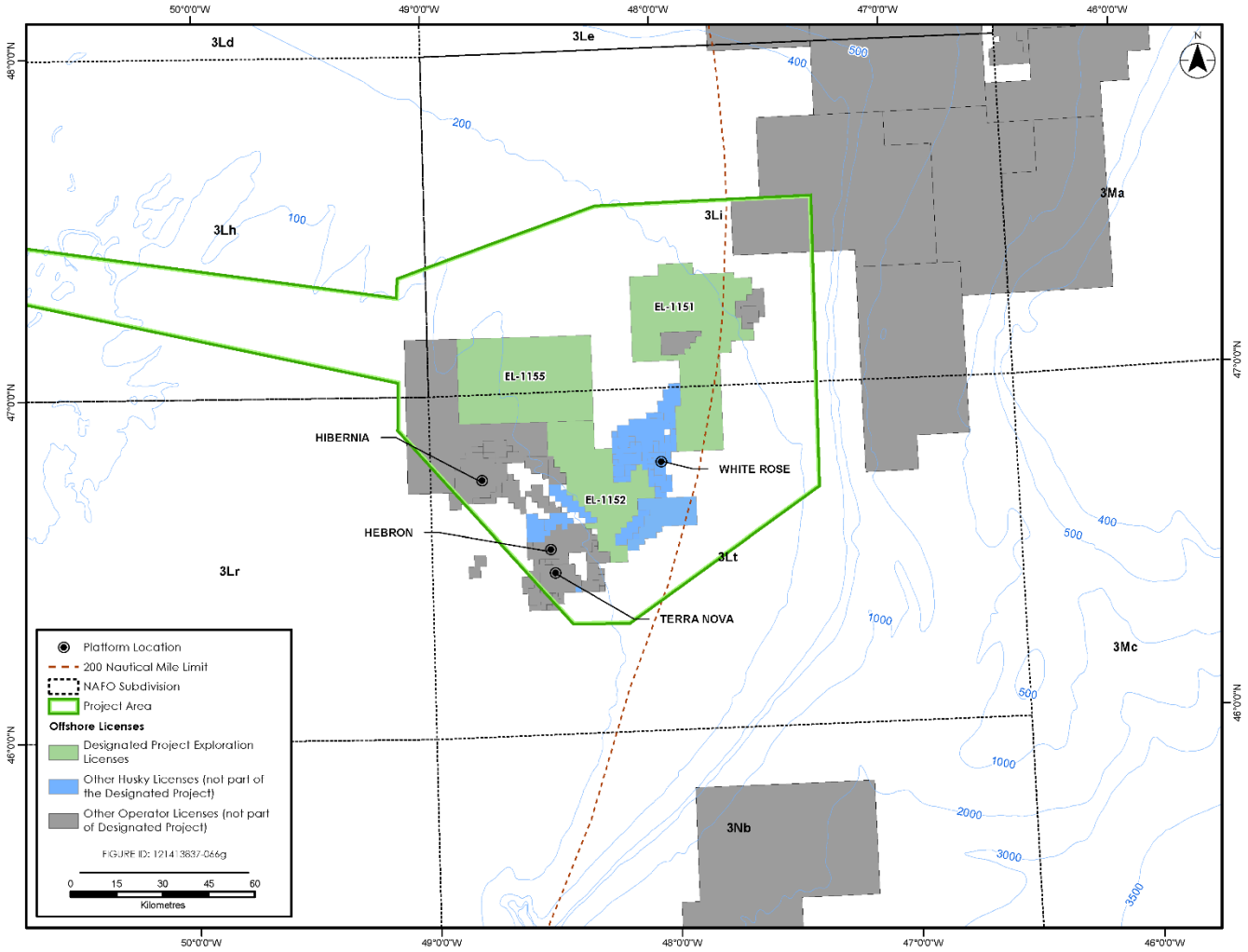

Figure 1-1 Proposed Exploration Drilling Project Area and Designated Project Exploration Licences

The Project will involve exploration drilling and activities associated with exploration drilling within the Project Area delineated within Figure 1-1. The Project includes up to ten wells to be drilled at any time between 2019 and 2027. More than one well may be drilled concurrently. Activities associated with a drilling program may include:

- exploration drilling using a mobile offshore drilling unit (MODU) (either a semi-submersible, drillship or jack-up rig)
- vertical seismic profiling (VSP), wellsite surveys, well testing, well completions, workovers/data logging and geohazard/environmental surveys
- decommissioning and abandonment of wells

The Project activities described herein are standard components of an offshore drilling program; however, not all details surrounding the Project have been finalized, such as drilling platform type, selection of service and supply contractors, and location of wells.

Husky's existing infrastructure will support these activities, including Harvey's Marine Base, offshore support vessels (OSVs), and helicopters. OSVs and helicopters will continue to use established travel routes to and from the Project Area, as they have since 2002.

1.1 Project Need and Justification

Husky is proposing to conduct exploration drilling activities within the Project Area. Within these ELs, Husky holds exclusive rights to drill and test for the presence of hydrocarbons, and to apply for and obtain a Significant Discovery Licence (SDL)/Production Licence (PL) to develop these areas if exploratory drilling proves to be successful.

Exploration drilling is required to determine the presence, nature, and quantities of the potential hydrocarbon resources within the ELs and to fulfill Husky's work expenditure commitments that must be met over the term of the licence period. The Project is expected to provide Newfoundland and Labrador, and Canada with economic benefits, including a contribution to energy supply. Exploration activities are required to enable continued oil and gas discoveries to maintain production and meet the ongoing demand for energy.

1.2 Project Location

The Project Area (Figure 1-2) is intended to encompass all activities associated with exploration drilling on ELs 1151, 1152, and 1155. Water depths in these areas range from 87 to 211 m. The southern boundary of the Project Area is approximately 180 km long; the northern boundary is approximately 270 km long; and each side is approximately 95 km long, with a corridor extending approximately 226 km from the western boundary back to St. John's. These coordinates create a total area of approximately 19,366 km².

There are other existing ELs, PLs, and SDLs in the Project Area; but these are not part of this Designated Project. The Designated Project is on submerged federal lands.

The proposed Study Area (Figure 1-2) for this assessment has been determined by recent oil spill modelling originating within the Project Area (Husky Energy 2012). The model boundaries were determined by a worst-case blowout scenario lasting 120 days (https://www.cnlopb.ca/wp-content/uploads/whiterose/oilfate.pdf).

1.3 Project Components

The key Project components are:

- drilling platform
- drilling program (up to ten exploration wells)

All logistical support components (e.g., shore base) associated with the Project (see Section 1.4.8) are the same as those used for past and/or ongoing offshore oil and gas projects for Husky and other operators.

1.3.1 Drilling Platform

A MODU will be used to carry out exploration drilling activities. Three different MODU alternatives may be considered during the duration of the Project:

- semi-submersible
- drillship
- jack-up rig

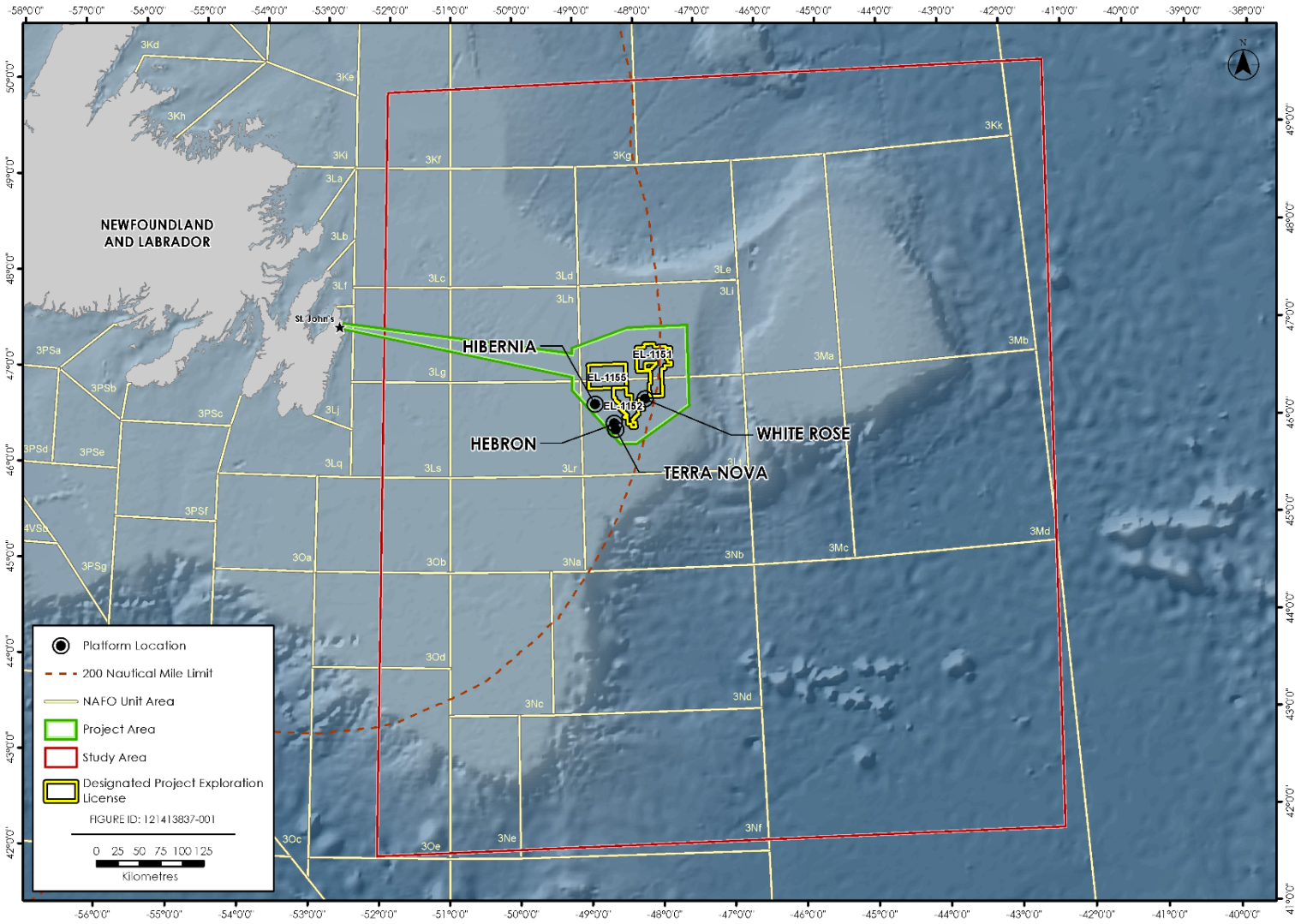

Figure 1-2 Project and Study Areas of the Designated Project

The specific MODU to be used for each well has not yet been selected and will depend on suitability and availability. Key components of a MODU include:

- dynamic positioning (DP) system, available on some units, used to maintain position while drilling. In addition to monitoring the MODU's position, DP systems also monitor environmental conditions with wind sensors, satellite global positioning system, and gyroscopes
- drilling derrick or mast (housing the drilling equipment)
- maintaining stability through ballast control
- power supplied through diesel generation
- helideck with refueling capabilities
- storage for drilling materials (fuel oil, drilling muds, cement) and equipment (casing)
- storage for subsea equipment (including well control equipment and marine risers)
- waste management facilities including treatment (for offshore disposal) or temporary storage for shipment to shore
- emergency and life-saving equipment, including lifeboats and rafts for emergency evacuation
- accommodations for up to 200 persons on board, depending on the unit

As per the *Newfoundland Offshore Petroleum Drilling and Production Regulations* (Section 71), Husky establishes a safety zone around all exploration drilling operations. The safety zone typically extends to 500 m beyond the outermost physical footprint of a DP MODU or jack-up rig, or 50 m around the anchors for a semi-submersible.

1.3.2 Offshore Exploration Wells

Up to ten single vertical and/or dual side-tracked wells are proposed within the Project Area (see Figure 1-2). The drilling schedule will depend upon exploration priorities and the term of the licences, which extend to 2027 for ELs 1151, 1152, and EL 1155. The number of wells to be drilled is contingent upon geophysical/geotechnical surveys and drilling results. More than one well may be drilled concurrently.

1.4 Project Activities

1.4.1 Wellsite/Geohazard/Geotechnical Surveys

Wellsite/geohazard/geotechnical surveys are conducted in advance of initiating drilling to identify and avoid unstable areas and hazards or potential hazards (such as seabed instability, obstacles, and shallow gas) in the immediate vicinity of proposed well locations. A small air source array is typically used in a restricted area for a 12- to 18-hour period. Geohazard surveys may also include sonar. Geotechnical surveys are conducted to determine that substrate is suitable for positioning a jack-up rig or anchor placement. A borehole(s) is typically drilled at each potential wellsite to collect sediment samples and determine sediment conditions.

1.4.2 Drilling

The casing setting depths and sizes vary for each well, but an overview of the associated steps for offshore drilling is provided below. As the Project is related to exploratory drilling and associated activities, commercial production of oil from these drill sites is not within the scope of this assessment.

The drilling of an exploration well can be broken into riserless drilling (i.e., an open water operation with no conduit for returns back to the MODU) and riser drilling (i.e., closed loop system with fluid returns back to the MODU). During riserless drilling, there is no closed loop system in place to return drill cuttings and fluid back to the MODU during the drilling of the initial sections of the well. As a result, the associated drilling fluids, excess cement, and cuttings are released directly to the seafloor. The initial well sections (conductor and surface strings) are drilled using water-based drilling mud (WBM) to cool the drill bit as well as transport the cuttings to the seabed. Activities during riserless drilling include:

- drilling the conductor section to approximately 100 m below sea floor
- inserting the drill string into the conductor pipe and drilling a surface hole section to approximately 800 to 1,700 m below sea floor. The surface casing is then lowered into the wellbore and cemented in place
- placing a blow-out preventer (BOP) stack at the end of the drilling riser; the BOP is connected to the wellhead via the surface casing, creating a connection between MODU and well via the marine riser system

A riser system is required for drilling the additional sections to target depth. Once the BOP stack is installed, the riser system transports the associated drilling fluids and cuttings back to the MODU for further processing. The remaining well sections are drilled to total vertical depth (TVD) using either a WBM or synthetic-based drilling mud (SBM). Intermediate casing is set at established depths to reinforce the wellbore, based on assessment of geological and pore pressure parameters. The casing is cemented in place at each intermediate section.

Specific section depths and associated casing sizes have not yet been determined and will require review and approval by the Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB) for each well prior to drilling activities. Technical details are provided to the C-NLOPB as part of an Authorization to Drill a Well application submitted in association with the Project.

Each well is anticipated to take up to approximately 80 days to drill to TVD but can be completed much quicker. Drilling is a 24-hour operation, and the MODU will be lit to the extent required to maintain safe operations. More than one well may be drilled simultaneously.

1.4.3 Waste Discharges and Emissions

All operational discharges during drilling will be in compliance with Husky's Environmental Protection and Compliance Monitoring Plan (EPCMP) for the drilling installation, which are based on the OWTG (NEB et al. 2010). Any wastes, residues, or discharges that are not identified in the EPCMP are not permitted for discharge.

In addition to the OWTG, the International Convention for the Prevention of Pollution from Ships (MARPOL) and the *Canada Shipping Act* and its regulations will apply to offshore waste discharges from ships associated with the Project.

As part of the Operations Authorization (OA) required from the C-NLOPB, and as outlined in Sections 6(d) and 9 of the *Newfoundland Drilling and Production Regulations*, an operator is required to prepare an Environmental Protection Plan (EPP), which includes detailed information regarding waste management. Some operators choose to prepare separate Waste Management Plans and Environmental Compliance Monitoring Plans to support their EPPs. EPPs and supporting documents are required to be submitted to the C-NLOPB for their review and approval as part of the OA application.

Wastes that will be disposed onshore (either through treatment, recycling, and/or disposal) will meet the requirements of Part V (Waste Management; sections 18 to 21) of the *Newfoundland and Labrador Environmental Protection Act* (chapter E-14.2) and will comply with any applicable municipal by-laws. Onshore waste management and disposal will be handled by a third-party contractor.

A combination of WBM and SBM will be used to drill a well. Wastes generated from drilling include drilling mud and cuttings that retain a portion of the drilling muds. Until the riser is connected, WBM cuttings are transported to the seabed and disposed in place. Once the riser is connected, SBM are typically used and associated cuttings are transported back to the MODU, where they are separated from the drilling fluid for management and disposal through the use of shale shakers, mud recovery units, and centrifuges. Once treated, cuttings will be discharged to the sea in accordance with Husky's EPCMP. The recovered drilling mud is reconditioned and reused. Once spent, SBM is returned to shore for disposal at an approved facility.

Other wastes include cement used to set the drill casing strings in place; cement may return to the seafloor from the annulus at an estimated volume of 25 m^3. Other discharges associated with the operation of a MODU during the drilling program include bilge water, deck drainage, cooling water, produced water, BOP fluid, grey/black water, and ballast water. All operational discharges during drilling will be in compliance with Husky's EPCMP for the drilling installation. Any substances, wastes, residues, or discharges not identified in the EPCMP are not permitted for discharge.

Atmospheric, noise, and light emissions will also be produced as a result of the Project. The primary source of atmospheric emissions for the Project are exhaust emissions from the combustion of fuel during the operation of the MODU, OSVs, and helicopters. Well testing could also result in

atmospheric emissions through the potential flaring of produced gas. Flaring activities will be kept to a minimum, reflecting only those tests necessary to determine reservoir parameters (including produced gas and fluids). An estimate of emissions of greenhouse gasses (GHGs) (CO_2 equivalent units (CO_{2eq})) from the operation of the MODU, OSV, and helicopter and flaring during the multi-well exploration drilling could be 74,164 tonnes CO_{2eq}/yr (see Table 2.7 of the EIS). These emissions represent 0.70% of the total reported provincial GHG emissions (10,600,000 tonnes CO_{2eq}) for 2014 and 0.01% of the national emissions (732,000,000 tonnes CO_{2eq}) (Environment and Climate Change Canada 2016).

Emissions will comply with the Newfoundland and Labrador *Air Pollution Control Regulations, 2004*, the National Ambient Air Quality Objectives under *the Canadian Environmental Protection Act*, the Canada Wide Standard for fine particulate matter (particulate matter less than 2.5 microns in diameter), and any relevant regulations/limits under MARPOL. Potential flaring will occur in accordance with the Drilling and Production Guidelines (C-NLOPB and Canada-Nova Scotia Offshore Petroleum Board [CNSOPB] 2011).

Atmospheric and underwater noise is generated from various activities associated with exploration drilling, including the operation of helicopters, OSVs, and the drill rig. Light emissions will be generated from lights on the MODU and OSV, which operate 24 hours per day). Light (and heat) is also generated during flaring. Flaring only occurs during well testing, which may be required in one of every four or five exploration wells over 1.5 to 2 days at the end of the exploration drilling operations.

1.4.4 Chemical Selection and Management

All chemicals used as part of the Project will be screened and selected as per the Offshore Chemical Selection Guidelines for Drilling and Production Activities on Frontier Lands (National Energy Board (NEB) et al. 2009), and Husky's chemical management and screening program.

1.4.5 Vertical Seismic Profiling

VSP is used to further assist in defining a petroleum resource, by using measurements from a seismic array to correlate drilled strata in a borehole with surface seismic data. These methods help obtain images of higher resolution than surface seismic images and may be used for collecting data ahead of the drill bit.

VSP uses a number of different configurations based on the positioning of the associated source and receivers (hydrophones typically placed within the wellbore), including: zero-offset VSP; offset VSP; and walkaway VSP. An imaging toolstring is run in the wellbore and is anchored at successive points as required to cover the entire recording depth. With a zero-offset VSP, a seismic source array is deployed over the side of the drilling platform. The source is activated three to five times to create a sonic wave that is picked up by the geophones in the toolstring. A walkaway VSP is a type of VSP in which the source is moved to progressively farther offset at the surface and receivers are held in a fixed location, providing more continuous coverage than an offset VSP.

VSP uses equipment similar to that used in seismic operations (i.e., a source array); however, the associated size and volume of the array are much smaller than a traditional surface seismic survey. The VSP is focused around a wellbore; therefore, sound effects are localized. VSP activity will be conducted in consideration of the Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment (SOCP) (Fisheries and Oceans Canada (DFO) 2007a), according to Husky Procedure EC-M-99-X-PR-00121-001 Vertical Seismic Profiles and Wellsite Surveys - Environmental Requirements.

1.4.6 Well Testing

The flow testing of hydrocarbons is an activity addressed under section 34(1) of the C-NLOPB's *Newfoundland Offshore Petroleum Drilling and Production Regulations*. Wells may be tested by multiple methods to gather additional details on a potential reservoir and to assess the associated commercial potential of a discovery. Based on historical records, two drillstem tests (DST) may be expected to be required from 10 exploration wells.

Collecting a fluid sample is a key objective of well testing; drillstem testing (DST) generally requires perforating casing that has been set across the hydrocarbon-bearing reservoir. Once the casing and reservoir have been perforated, reservoir fluids are allowed to flow into and up the wellbore to the MODU, which will have a temporary DST facility installed to handle the flow of any fluids from the wellbore. The hydrocarbons in the reservoir fluids are measured and separated from any produced water. If hydrocarbon flow to surface occurs, it will be flared using a high-efficiency burner for approximately 1.5 to 2 days. A seawater spray through a series of high pressure nozzles is used during a DST to dissipate the heat between the flare and the MODU. This seawater curtain is likely to deter birds near the flare. Once DST is complete, the associated test string is removed from the well and the well is abandoned in accordance with the Newfoundland Offshore Petroleum Drilling and Production Regulations.

1.4.7 Decommissioning and Abandonment

Well abandonment will follow industry standard abandonment procedures and practices in accordance with C-NLOPB regulations. Two possible scenarios exist for an exploratory well: suspension or abandonment. For a suspended well, a suspension cap is installed to protect the wellhead connector. The suspension cap protrudes above the seabed. Proper notification via Notice to Shipping is made to identify the subsea obstruction until it is removed. To abandon a well, all subsea infrastructure is removed upon completion of the well; there are no protuberances above the seabed. Well abandonment would include plugging the well with a cement mixture to isolate the wellbore and removing the wellhead and any associated equipment to below the seafloor with mechanical cutters. The plugs are placed at varying depths in the wellbore and the well casing is typically cut just below the surface of the seal.

Husky's preferred method of wellhead severance and recovery is to use a mechanical cutting system, and well head designs make provision for this kind of removal. Wellheads may be removed by the drill rig or by remotely operated vehicle (ROV). However, circumstances can arise when

mechanical cutting cannot effectively perform the task of wellhead severance. In such instances, shaped charges must be used. Use of charges will only be used after the Drilling Superintendent, the C-NLOPB and any of its relevant advisory agencies thoroughly review the application; approval is granted on a case-by-case basis.

1.4.8 Supply and Servicing

Husky has a third-party contract to transport supplies (and sometimes personnel) from the supply base to the *SeaRose FPSO* and any MODUs. Depending on location of the exploration activity and operating conditions, one to three OSVs may be required. During drilling activities, the OSV responsible for transporting supplies will require one to three trips per week from the supply base to the MODU. One OSV is always on standby with the MODU if it is operating outside the White Rose field. A third OSV may occasionally be required for ice management.

OSVs follow established vessel traffic lanes (a straight-line approach to and from port). Once in the vicinity of the field, the OSV will select the route most appropriate for reaching the destination. OSV transit is a routine and ongoing activity among all operators in the region, operating within an existing regulatory regime and best management practices.

Drilling activities will require helicopter support for crew transfer and light supply transport. During drilling activities, it is anticipated that an average of five trips per week from St. John's to the MODU will be required. Helicopter support will also be used in the event that emergency medical evacuation from the MODU is necessary during drilling activities. Helicopters file flight plans and follow set flight paths to and between the fields. Helicopter transit is a routine and ongoing activity among all operators in the region, operating within an existing regulatory regime and best management practices.

1.5 Project Schedule

Project planning is currently ongoing. Stakeholder and regulator engagement has been initiated and will continue throughout the life of the Project. Regulatory approvals will be obtained as necessary for each well drilled in the Project Area. Exploration drilling could occur any time within the term of the licences (2019 to 2027); well testing could also occur at any time (dependent upon drilling results). Wells could be decommissioned and abandoned at any time during the temporal scope of the environmental assessment (EA) and applicable permits.

It is currently anticipated that exploration drilling activities would commence in 2019, and potentially continue intermittently until 2027. Drilling activities will not be continuous over the nine years and will be in part determined by rig availability and previous years' results. Drilling may occur year-round if conducted using a semi-submersible or drill-ship, and during the ice-free season only if using a jack-up rig.

Abandonment or suspension activities will be conducted either following drilling and/or well testing activities.

2.0 ALTERNATIVE MEANS OF CARRYING OUT THE PROJECT

As required under Section 19(1)(g) of CEAA 2012, every environmental assessment of a designated project must consider the alternative means of carrying out the project that are technically and economically feasible and consider the environmental effects of any such alternative means. Consideration of alternative means of carrying out the Project was undertaken with reference to the Operational Policy Statement: Addressing "Purpose of" and "Alternative Means" under the *Canadian Environmental Assessment Act, 2012* (CEA Agency 2016a).

As per the criteria outlined in the EIS guidelines by the CEA Agency, the analysis of alternative means considers the following alternative means of carrying out the Project:

- drilling unit selection;
- drilling fluid selection (i.e., WBM or SBM);
- drilling waste management;
- water management; and,
- platform lighting and flaring options.

A consideration of legal compliance, technical feasibility and economic feasibility, as well as the environmental effects (where applicable) of each alternative means is summarized below. More detailed assessment follows in the Valued Component (VC) chapters for the preferred options (e.g., WBM/SBM use, flaring).

2.1 Drilling Unit

The specific MODU to be used for the Project has not yet been selected and will depend on suitability and availability. The options being considered (semi-submersible, drill ship and jack-up rig) are described in Section 1.3.1. As the discharges are substantially the same from each type of MODU, all three alternatives are being considered and are assessed in the EIS.

2.2 Drilling Fluid

A combination of WBM and SBM are typically used in drilling activities in offshore Newfoundland. A comparison of both drilling fluids is provided in Table 2.1. Using WBM only is not usually technically feasible for most wells to date in the Newfoundland offshore. A combination of both WBM and SBM is preferred depending on different segments of the drilling sequence. If WBM were used for the entire well, borehole stability would be an issue, with added downtime as well as additional chemical and various compositions required for the riser portion of the drill (Shell 2014).

In offshore Newfoundland, all exploration (and production) drilling uses PureDrill IA35-LV as the base for the SBM. PureDrill IA35-LV (a Suncor Energy product) is readily biodegradable, has low toxicity, and is not highly bioavailable (PureDrill IA-35LV Fact Sheet; Petro-Canada no date). The product meets the United Kingdom's Centre for Environment, Fisheries and Aquaculture Science

offshore "E" classification criteria, representing a chemical with the least potential for environmental harm.

Table 2.1 Summary of Drilling Fluid Alternatives

Option	Legally acceptable?	Technically feasible?	Economically feasible?	Environmental Issues	Preferred option?
WBM only	Yes	Not technically preferred for certain areas or segments of the drilling sequence	Yes; however, increased costs from potential operation delays if problems with drill fluids encountered	No substantive difference in environmental effects between WBM and WBM/SBM assuming OWTG are followed with respect to SBM discharges.	No
SBM/WBM	Yes	Yes	Yes	All exploration (and production) drilling offshore NL uses PureDrill IA35-LV as the base for the SBM as it is readily biodegradable, has low toxicity, and is not highly bioavailable.	Yes

2.3 Drill Waste Management

Offshore disposal treatment and management is described in Section 1.4.3. Alternatives to offshore disposal include ship-to-shore and offshore reinjection. A summary of the comparison between the alternatives is presented in Table 2.2.

Reinjection, the grinding or slurrifying of cuttings and injecting them into designated reinjection well, is not considered technically or economically feasible and a designated reinjection well is not planned for this Project.

Onshore disposal is technically and economically feasible and reduces offshore effects associated with drilling waste discharge; however, transport of drill wastes to shore results in additional transit emissions and safety exposure along with the potential effects of onshore waste disposal (e.g., terrestrial habitat and land use effects associated with the development and use of onshore disposal facilities).

Discharge to the water column, following treatment to OWTG standards, is the preferred option for management of cuttings and has been assessed as part of the Project.

Table 2.2 Summary of Drilling Waste Management Alternative Means

Option	Legally acceptable?	Technically feasible?	Economically feasible?	Environmental Issues	Preferred option?
Offshore disposal (following treatment)	Yes	Yes	Yes	Some localized effects are expected on the seafloor from discharge of cuttings	Yes
Ship-to-shore	Yes	Yes	Yes; however, associated additional costs plus risk to personnel and equipment	Onshore disposal would have less environmental effect on marine environment; however, an increase in air emissions are expected from increased transportation, and some onshore effects from transportation and onshore disposal of waste	No
Offshore reinjection	Yes	No	No	N/A (not technically or economically feasible)	No

2.4 Water Management

Bilge and ballast water/deck drainage/cooling water/fire control system test water will be discharged according to the Husky EPCMP. There is currently no alternative means to water management planned for this Project, as containing the waste water onboard the MODU to be shipped back to shore is not economically feasible.

2.5 MODU Lighting and Flaring

Lighting and flaring at night and periods of low visibility for the duration of the Project may attract migratory birds, particularly Leach's storm-petrels, and may result in strandings and/or harm from flaring. Lighting on the MODU is required by the C-NLOPB for safe 24-hour operation. A summary of the comparison between the alternatives is presented in Table 2.3.

As described in Section 1.4.6, well testing may be required by the C-NLOPB to gather additional details on potential reservoirs and to assess the associated commercial potential of a discovery. When well flow testing is carried out, flaring is required to safely dispose of hydrocarbons that may come to surface. Restricting the initiation of flaring activity to daylight hours does reduce night-time flaring. However, data gathered during the well test could be compromised if the well flow was restricted during the test period (i.e., restricted to daylight hours or certain weather conditions); therefore, this is not the preferred option.

Table 2.3 Summary of Lighting and Flaring Alternative Means

Option	Legally acceptable?	Technically feasible?	Economically feasible?	Environmental Issues	Preferred option?
Standard lighting	Yes	Yes	Yes	Some localized effects as lighting may attract migratory birds causing strandings and/or harm from flaring	Yes
Spectral modified lighting	Yes	No, (not readily available for commercial use at this time)	No	N/A (not technically or economically feasible)	No
Timing restrictions on flaring	Yes	Yes; however, may compromise data	Yes; however, may be additional operational cost from scheduling	Some localized light and atmospheric emissions	No
Flaring as required	Yes	Yes	Yes	Some localized light and atmospheric emissions. Could be an additional attractant to birds if carried out in low visibility conditions	Yes

3.0 SCOPE OF THE PROJECT AND ASSESSMENT

3.1 Scope of Assessment

The scope of the Project to be assessed under CEAA 2012 and pursuant to the *Canada-Newfoundland Atlantic Accord Implementation Act*, and the *Canada-Newfoundland and Labrador Atlantic Accord Implementation Newfoundland and Labrador Act* includes the following Project activities and components (refer to Section 1 for details):

- presence and operation of MODU (presence of structure; safety zone; lighting; drilling; air emissions; noise emissions; chemical use and management; operation of seawater systems; water management, well testing; cementing and completing wells)
- drilling-associated surveys (VSP and wellsite surveys; geotechnical/geophysical/ environmental surveys; diving surveys; ROV surveys)
- waste management (WBM and SBM cuttings discharge; domestic waste; sanitary waste; oily water treatment; cooling water; deck drainage; bilge water; BOP fluid; cement; vent and flare system)
- supply and servicing (operation of helicopters and supply/support/standby/tow vessels within the Project Area)
- well abandonment (plugging, suspending, and abandoning of wells)

The assessment focuses on the potential environmental effects associated with these activities, which reflect the scope of the Project as outlined in the Final EIS Guidelines and represent routine physical activities that will occur throughout the life of the Project. Potential environmental effects that could occur in the event of an accident or malfunction are assessed separately.

3.2 Environmental Assessment Methods

The method used to conduct the EA for the Project is consistent with international best practices for conducting environmental impact assessments, and is structured to:

- identify the issues and potential effects that are likely to be important
- consider key issues raised by Indigenous peoples, stakeholders, and the public
- integrate engineering design and programs for mitigation and follow-up into a comprehensive environmental planning process

This method is focused on the identification and assessment of potential adverse environmental effects of the Project on Valued Components (VCs). VCs are environmental attributes associated with the Project that are of particular value or interest because they have been identified to be of concern to Indigenous peoples, regulatory agencies, Husky, resource managers, scientists, key stakeholders, and/or the general public.

It is noted that "environment" is defined to include not only ecological systems but also human, social, cultural, and economic conditions that are affected by changes in the biophysical environment. VCs therefore include ecological, social, and economic systems that comprise the environment.

The potential environmental effects from Project activities and components are summarized in Section 5 using a standard framework to facilitate assessment of each VC. Residual environmental effects (those effects that remain after planned mitigation measures have been applied) are characterized for each chosen VC using VC-specific analysis criteria (e.g., magnitude, geographic extent, duration, frequency, reversibility, and context). The significance of residual Project-related environmental effects is then determined based on pre-defined standards or thresholds.

3.3 Identification of VCs

The VCs discussed for this EIS, and their rationale for inclusion or exclusion of assessment are presented in Table 5.1 of the EIS. The VCs chosen for assessment in the EIS include:

- fish and fish habitat
- commercial fisheries
- marine mammals and sea turtles
- migratory birds
- special areas
- Indigenous people and community values

This list of VCs is consistent with other recent offshore exploration drilling EAs (e.g., Shelburne Basin Venture Exploration Drilling Project [Shell 2014], the Scotian Basin Exploration Drilling Project [BP 2016], the Flemish Pass Exploration Project [Statoil 2017], the Eastern Newfoundland Offshore Exploration Drilling Project [ExxonMobil 2017], and the Flemish Pass Exploration Drilling Project [Nexen 2018]). Additional information on the VC selection process is provided in Table 5.1 of the EIS.

3.4 Spatial and Temporal Boundaries of the Project

Environmental effects are evaluated within spatial and temporal boundaries. The spatial boundaries, which are consistent for each VC, reflect the geographic range over which the Project's potential environmental effects may occur, recognizing that some environmental effects will extend beyond the Project Area. The temporal boundaries, which may vary among VCs, identify when an environmental effect may occur. The temporal boundaries are based on the timing and duration of Project activities and the nature of the interactions with each VC.

The spatial boundaries for the Project to be assessed are defined below with respect to Project activities and components.

Project Area: The Project Area (Figure 1-2) encompasses the immediate area within which Project activities and components may occur. Well locations have not been identified but will occur within ELs in the Project Area. The Project Area includes EL 1151, EL 1152, and EL 1155. The spatial boundary of the Project Area has been delineated to account for all activities related to drilling a well, including transit of offshore OSV and helicopter traffic to/from St. John's and vessel traffic associated with geohazard/environmental surveys.

Study Area: The Study Area (Figure 1-2) is the area within which residual environmental effects from operational activities and accidental events may interact cumulatively with the residual environmental effects of other past, present and future (certain or reasonably foreseeable) physical activities.

The temporal boundaries for the Project to be assessed encompass all Project phases, including well drilling, testing and abandonment. Up to 10 exploration wells will be drilled over the term of the ELs (i.e., between 2019 and 2027), and each well is anticipated to take up to approximately 80 days. It is assumed that Project activities could occur year-round, with one or more wells potentially being drilled simultaneously.

4.0 PUBLIC CONSULTATION AND ENGAGEMENT WITH INDIGENOUS GROUPS

Husky recognizes the importance of public consultation and Indigenous engagement and has developed a plan to engage the public, stakeholders, and Indigenous communities in its environmental and socio-economic assessments of the Project. Husky also recognizes the importance of consultations with federal and provincial regulatory agencies. The focus of Husky's consultation program was the geographic regions most likely to be affected by the Project. Husky has met and will continue to meet with various stakeholders to provide information on the Project and solicit feedback from stakeholders.

4.1 Public Consultation

4.1.1 Stakeholder Consultation Activities

Husky's consultation program included meetings with:

- the C-NLOPB;
- federal government departments (with invitations to meet extended to provincial government departments);
- commercial fisher groups; and,
- invitations to meet extended to environmental non-governmental organizations.

Table 4.1 provides a summary of Husky's stakeholder engagement efforts on the Project since March 2016. Accidental event models conducted for Husky's White Rose Extension Project (WREP) environmental assessment were presented as appropriate representation of accidental event scenarios for this project, given the proximity and similarity between projects.

Table 4.1 Summary of Stakeholder Engagement Conducted for the Project

Organization	Date	Topic Discussed
Government Agencies		
DFO	March 24, 2016	Project overview and WREP modelling review
	January 24, 2017	Project update and EIS overview
Environment and Climate Change Canada	April 7, 2016	Project overview and WREP modelling review
Newfoundland and Labrador Department of Fisheries and Aquaculture	January 17, 2017	Notification of Project (including relevant figures) and CEAA 2012 process with invitation to meet
Newfoundland and Labrador Department of Environment and Climate Change	January 17, 2017	Notification of Project (including relevant figures) and CEAA 2012 process with invitation to meet

PUBLIC CONSULTATION AND ENGAGEMENT WITH INDIGENOUS GROUPS
September 2018

Organization	Date	Topic Discussed
Newfoundland and Labrador Department of Natural Resources	January 17, 2017	Notification of Project (including relevant figures) and CEAA 2012 process with invitation to meet
CEA Agency, DFO, Environment and Climate Change Canada, Health Canada, Natural Resources Canada, C-NLOPB	March 2, 2016	Update on EIS approach, key findings, and spill modelling
CEA Agency, DFO, Environment and Climate Change Canada, Health Canada, Natural Resources Canada, C-NLOPB	March 24, 2016	Details on oil spill models to be used in the EIS
CEA Agency, DFO, Environment and Climate Change Canada, Health Canada, Natural Resources Canada, C-NLOPB	June 13, 2018	Husky Drilling EIS update to regulators, including presentation on modelling approach
Fisheries Organizations		
Fish, Food & Allied Workers Union (FFAW-Unifor)	January 13, 2017	Project overview and spill modelling review
One Ocean	March 16, 2016	Project overview and spill modelling review
OCI (also representing Canadian Association of Prawn Producers)	March 16, 2016	Project overview and spill modelling review
Atlantic Seafood Producers	March 16, 2016	Presentation provided to representative
Groundfish Enterprise Allocation Council	January 19, 2017	Notification of Project (including relevant figures) and CEAA 2012 process with invitation to meet
Non-Government Organizations		
Nature Newfoundland and Labrador	January 17, 2017	Notification of Project (including relevant figures) and CEAA 2012 process with invitation to meet
	March 7, 2017	Meeting to discuss EIS approach, key findings, and spill modelling
NL Environment Network	January 17, 2017	Notification of Project (including relevant figures) and CEAA 2012 process with invitation to meet
World Wildlife Fund	January 17, 2017	Notification of Project (including relevant figures) and CEAA 2012 process with invitation to meet
Sierra Club Canada Foundation	January 17, 2017	Notification of Project (including relevant figures) and CEAA 2012 process with invitation to meet
CPAWS-NL	January 17, 2017	Notification of Project (including relevant figures) and CEAA 2012 process with invitation to meet

Additional consultation opportunities were provided by the CEA Agency through direct stakeholder contact and ongoing postings of project developments on the Agency's website.

4.1.2 Questions and Comments from Stakeholders

No public comments specific to the Husky Project were received during the Project Description review period or the Draft Guidelines review period. As Statoil Canada Limited is also assessing an exploration drilling project, the CEA Agency provided comments they had received from the public on the Statoil project for Husky to consider in the preparation of their assessment. A summary of key issues potentially relevant to the Husky Project that have been raised during the Statoil public comment period under CEAA, 2012 and how they have been addressed by Husky is described below.

Historic Cod Fishery Locations

Concern was expressed regarding historical cod fishery locations in relation to the Project, as the potential exists for a commercial cod fishery to begin again during the lifetime of the Project. As described in Section 4.3 of the EIS, the historical cod fishery was conducted in the offshore areas of the eastern Grand Bank (3LMN). It should be noted that before the moratorium (e.g., 1984 to 1990), Unit Area 3Lt (Project Area) usually accounted for just over 2% of the NAFO 3L groundfish harvest, including cod (Husky Energy 2012).

Regional Predictive Current Modelling

Husky will look into the applicability of regional predictive current modelling for future applications.

4.2 Engagement with Indigenous Groups

4.2.1 Indigenous Groups/Organizations

There are five Indigenous communities and/or governing bodies within Newfoundland and Labrador, including:

- Miawpukek First Nation;
- Qalipu Mi'kmaq First Nation;
- Nunatukavut Community Council;
- Labrador Innu (Innu Nation); and,
- Labrador Inuit (Nunatsiavut Government).

Miawpukek First Nation and Qalipu First Nation are located on the Island of Newfoundland; Nunatukavut Community Council, Innu Nation, and Nunatsiavut Government are in Labrador.

In addition to the Indigenous groups within Newfoundland and Labrador, correspondence from the CEA Agency on April 27, 2017 identified Indigenous groups in Nova Scotia, New Brunswick, Prince Edward Island, and Quebec that may be affected by the Project. The letter noted potential adverse impacts of the Project on potential or established rights of Aboriginal people under

section 35 of the *Constitution Act, 1982*, and potential effects of changes to the environment on Aboriginal peoples pursuant to paragraph 5(1)(c) of CEAA 2012 related to the migration of Atlantic salmon between the Project Area and areas where Indigenous groups have potential or established section 35 rights, and commercial communal licences held by Indigenous groups. These include:

Nova Scotia

- 11 Mi'kmaq First Nation groups represented by Kwilmu'kw Maw-klusuaqn Negotiation Office (KMKNO):
  - Acadia First Nation
  - Annapolis Valley First Nation
  - Bear River First Nation
  - Eskasoni First Nation
  - Glooscap First Nation
  - Membertou First Nation
  - Paq'tnkek Mi'kmaw Nation
  - Pictou Landing First Nation
  - Potlotek First Nation
  - Wagmatcook First Nation
  - We'koqma'q First Nation
- Millbrook First Nation
- Sipekne'katik First Nation

New Brunswick

- Eight Mi'gmaq First Nations represented by Mi'gmawe'l Tplu'taqnn Inc. (MTI):
  - Fort Folly First Nation
  - Eel Ground First Nation
  - Pabineau First Nation
  - Esgenoôpetitj First Nation
  - Buctouche First Nation
  - Indian Island First Nation
  - Eel River Bar First Nation
  - Metepnagiag Mi'kmaq First Nation
- Elsipogtog First Nation
- Five Maliseet First Nation groups represented by Wolastoqey Nation in New Brunswick (WNNB):
  - Kingsclear First Nation
  - Madawaska Maliseet First Nation
  - Oromocto First Nation
  - St. Mary's First Nation
  - Tobique First Nation
- Woodstock First Nation
- Peskotomuhkati Nation at Skutik (Passamaquoddy)

Prince Edward Island

- Two Mi'kmaq First Nation groups represented in consultation by Mi'kmaq Confederacy of PEI (MCPEI):
  - Abegweit First Nation
  - Lennox Island First Nation

Quebec

- Three Mi'gmaq First Nation groups represented by Mi'gmawei Mawiomi Secretariat (MMS):
  - Micmas of Gesgapegiag
  - La Nation Micmac de Gespeg
  - Listuguj Mi'gmaq Government
- Les Innus de Ekuanitshit
- Première Nation des Innus de Nutashkuan

4.2.2 Indigenous Engagement Activities

Letters were sent to the five Indigenous groups in Newfoundland and Labrador on June 3, 2016, to initiate engagement in the assessment of the Project by providing an overview of the Project and inviting questions and concerns; no comments or concerns were received from these letters. The CEA Agency also solicited engagement from the five groups and received response from all but the Miawpukek First Nation. Engagement was also solicited during the review period for the Project Description (no comments were received from Indigenous groups) and during the review period for the draft Guidelines (comments were received from Qalipu Mi'kmaq First Nation and the Nunatsiavut Government).

Upon receipt of the final Guidelines, Husky sent letters on January 6, 2017, updating the five Indigenous groups on the status of the Project, including information collected on traditional use species that could be affected in the event of a spill. Nunatsiavut Government provided a response indicating their intent to continue engagement as the Project progresses through the CEAA 2012 review.

On April 27, 2017 the CEA Agency identified an additional 36 Indigenous groups from the Maritimes and Quebec to be engaged by Husky as part of the EIS Guidelines. On November 17, 2017 Husky sent letters to each of the Indigenous groups identified to introduce and outline the Project and summarize potential environmental effects. Husky then followed up with each Ingenious group as outlined in Table 4.2.

Husky is also part of a committee of five oil and gas exploration companies that are all pursuing exploration opportunities in offshore Newfoundland and Labrador. In April 2018, the group held three workshop-style engagement meetings, organized and sponsored by the CEA Agency in Moncton (April 13), Quebec City (April 18) and St. John's (April 20). There were 38 of 41 Indigenous communities represented at those workshops. In addition, Husky continues to engage with Indigenous groups to provide information so that Indigenous groups have an opportunity to express their concerns and interests directly. Follow-up workshops are planned in October 2018 to

discuss various concerns and interests related to oil spill modelling, emergency preparedness and response, communications, and well abandonment.

Table 4.2 Summary on Indigenous People Engagement (to date as of August 31, 2018)

Date	Means of Engagement	Purpose
Miawpukek First Nation		
June 3, 2016	Letter	Initiation of engagement and overview of the Project
January 6, 2017	Letter	Project update
January 10, 2017	Phone call	Confirming letter was received
January 17, 2017 February 6, 2017 February 9, 2017 February 20, 2017 March 1, 2017	Email Voicemail	Follow-up
July 27, 2017	Letter (MFN)	Letter from MFN outlining concerns
September 20, 2017	Email	Notification of the preparation of EIS, inviting input, and referring funding requests to CEAA.
November 30, 2017 January 16, 2017 January 16, 2017	Letter Email Email (SVS/MFN)	Summary of potential effects for review and comment Follow-up Follow-up – MFN to participate in CEAA process.
February 7, 2018	Letter (MFN)	Outlining concerns/interests, request for funding.
April 5 – July 3, 2018	Letters/Emails	Series of correspondence requesting a meeting on behalf of Husky (and 4 other operators)
April 20, 2018 April 28, 2018	Workshop Email	CEAA-sponsored workshop on offshore exploration projects (5) Follow-up from workshop
June 5, 2018 June 11, 2018	Email Email	Draft EIS community profile sent for comment Unable to comment on community profile - capacity
June 5, 2018	Email	Update on status of all offshore exploration projects in NL/Labrador
June 19, 2018	Email	Provided information regarding amendment to include EL 1155 in Project Description / ELs 1121 and 1134 removed.
July 17, 2018	Meeting in Conne River	Meeting to provide overview and discuss initial concerns (with 4 other operators)
Qalipu Mi'kmaq First Nation		
June 3, 2016 January 6, 2017	Letter Letter	Initiation of engagement and overview of the Project. Project update
January 10, 2017	Phone call	Confirming letter was received
January 17, 2017 February 6, 2017 February 20, 2017 March 1, 2017	Email Voicemail	Follow-up

Date	Means of Engagement	Purpose
April 20, 2018 April 28, 2018	Workshop Email	CEAA-sponsored workshop on offshore exploration projects (5) Follow-up from workshop
June 5, 2018 June 13, 2018	Email Email (Qalipu)	Draft EIS community profile sent for comment. Feedback on community profile received.
June 5, 2018	Email	Update on status of all offshore exploration projects in NL/Labrador
June 19, 2018	Email	Provided information regarding amendment to include EL 1155 in Project Description / ELs 1121 and 1134 removed.
NunatuKavut Community Council		
June 3, 2016	Letter	Initiation of engagement and overview of the Project
January 6, 2017	Letter	Project update
January 10, 2017	Phone call	Confirming letter was received
January 17, 2017 January 27, 2017 February 6, 2017 February 20, 2017 March 1, 2017	Email Voicemail	Follow-up
April 20, 2018 April 28, 2018	Workshop Email	CEAA-sponsored workshop on offshore exploration projects (5) Follow-up from workshop
June 5, 2018	Email	Draft EIS community profile sent for comment.
June 5, 2018	Email	Update on status of all offshore exploration projects in NL/Labrador
June 19, 2018	Email	Provided information regarding amendment to include EL 1155 in Project Description / ELs 1121 and 1134 removed.
Nunatsiavut Government		
June 3, 2016	Letter	Initiation of engagement and overview of the Project
January 6, 2017	Letter	Project update
January 10, 2017	Phone call	Confirming letter was received
January 17, 2017 January 19, 2017 January 27, 2017 February 6, 2017 February 7, 2017	Email Voicemail Phone Call Received email response from NG	Follow-up NG stated that our letter of 01/06 was reviewed and requested the information be included in the EIS
June 5, 2018 July 10, 2018	Email Email (NG)	Draft EIS community profile sent for comment. Feedback on community profile received.
June 5, 2018	Email	Update on status of all offshore exploration projects in NL/Labrador
June 19, 2018	Email	Provided information regarding amendment to include EL 1155 in Project Description / ELs 1121 and 1134 removed.

PUBLIC CONSULTATION AND ENGAGEMENT WITH INDIGENOUS GROUPS
September 2018

Date	Means of Engagement	Purpose
Innu Nation		
June 3, 2016	Letter	Initiation of engagement and overview of the Project
January 6, 2017	Letter	Project update
January 10, 2017	Phone call	Confirming letter was received
January 17, 2017 January 11, 2017 January 16, 2017 January 19, 2017 January 27, 2017 February 6, 2017 February 12, 2017 February 20, 2017 March 1, 2017	Email Voicemail Phone Call	Follow-up
April 20, 2018 April 28, 2018	Workshop Email	CEAA-sponsored workshop on offshore exploration projects (5) Follow-up from workshop
June 5, 2018	Email	Draft EIS community profile sent for comment.
June 5, 2018	Email	Update on status of all offshore exploration projects in NL/Labrador
June 19, 2018	Email	Provided information regarding amendment to include EL 1155 in Project Description / ELs 1121 and 1134 removed.
Nova Scotia: Assembly of Nova Scotia Mi'kmaq Chiefs/KMKNO (Representing: Acadia, Annapolis Valley, Bear River, Glooscap, Membertou, Potlotek, Paqt'nkek, Pictou Landing, Waycobah, Wagmatcook and Eskasoni First Nations)		
October 25, 2017	Phone call (KMKNO)	KMKNO Inquiring about proposed Project, and whether or not Husky will be engaging First Nations in NS.
November 17, 2017	Letter to KMKNO and 11 Chiefs/Councils	Provided overview of potential effects to salmon and swordfish.
January 12 – 26, 2017	Emails/phone calls	Inquiring whether KMKNO had feedback on overview.
January 31, 2018	Phone call	KMKNO confirmed they will be participating through the CEAA process once their consultants have reviewed the draft EIS.
April 12, 2018 April 28, 2018	Workshop Email	CEAA-sponsored workshop on offshore exploration projects (5) Follow-up from workshop
June 5, 2018	Email	Draft EIS community profile sent for comment.
June 5, 2018	Email	Update on status of all offshore exploration projects in NL/Labrador
June 19, 2018	Email	Provided information regarding amendment to include EL 1155 in Project Description / ELs 1121 and 1134 removed.
Nova Scotia: Sipekne'katik First Nation		
November 11, 2017 December 1 and 12, 2017	Letter Phone call	Overview of potential effects on salmon and swordfish. Confirming receipt of letter / re-sent

PUBLIC CONSULTATION AND ENGAGEMENT WITH INDIGENOUS GROUPS
September 2018

Date	Means of Engagement	Purpose
December 20, 2017	Letter (Sipekne'katik)	Response from Chief Sack requesting a meeting.
January 17, 2018	Email	Offer to meet to provide overview of Project and background on potential effects to salmon and swordfish.
June 11 – July 26, 2018	Emails	Offer to meet to provide Project overview and discuss potential effects of Project.
June 5, 2018	Email	Provide update on EA status for all offshore Eastern NL/Labrador projects (5)
June 5, 2018	Email	Provided draft EIS community profile for feedback/comment.
June 19, 2018	Email	Provided information regarding amendment to include EL 1155 in Project Description / ELs 1121 and 1134 removed.
Nova Scotia: Millbrook First Nation		
November 11, 2017 December 12, 2017	Letter Phone call	Overview of potential effects on salmon and swordfish. Confirmed receipt of letter. Millbrook will be participating through the CEAA process.
April 20, 2018 April 28, 2018	Workshop (St. John's) Email	CEAA-sponsored workshop on offshore exploration projects (5) Follow-up from workshop
June 5, 2018	Email	Provide update on EA status for all offshore Eastern NL/Labrador projects (5)
June 5, 2018	Email	Provided draft EIS community profile for feedback/comment.
June 19, 2018	Email	Provided information regarding amendment to include EL 1155 in Project Description / ELs 1121 and 1134 removed.
New Brunswick: Mi'gmawe'l Tplu'taqnn Incorporated (MTI) (Representing: Amlamgog (Fort Folly), Natoaganeg (Eel Ground), Oinpegitjoig (Pabineau), Esgenoôpetitj (Burnt Church), Tjipõgtõtjg (Bouctouche), L'nui Menikuk (Indian Island), Ugpi'ganjig (Eel River Bar), Metepenagiag (Red Bank) Mi'kmaw First Nations)		
August 11, 2017	Letter (MTI)	Outlined potential impacts of the Project on MTI member communities and requested capacity funding to study further.
September 20, 2017 October 12, 2017	Email Conference call	Advised that Husky is preparing an overview of potential effects on salmon and swordfish. Referred funding requests to CEAA. Informed Husky that MTI communities are also concerned about potential effects on the North Atlantic right whale and American eel.
November 11, 2017	Email (MTI)	Provided rationale for community engagement and Indigenous Knowledge Study.
November 17, 2017	Letter	Overview of potential effects on salmon and swordfish for review/comment.
November 28, 2017 – January 8, 2018	Series of emails/phone calls	Exchange of emails on overview of effects on salmon and swordfish.
April 12, 2018 April 28, 2018	Workshop: Moncton Email	CEAA-sponsored workshop on offshore exploration projects (5) Follow-up from workshop

PUBLIC CONSULTATION AND ENGAGEMENT WITH INDIGENOUS GROUPS
September 2018

Date	Means of Engagement	Purpose
June 5, 2018	Email	Provided update on EA status for all offshore Eastern NL/Labrador projects (Husky)
June 5, 2018 June 28, 2018	Email Email (MTI)	Provided draft EIS community profile for comment/feedback. Unable to comment due to capacity issues.
June 19, 2018	Email	Provided information regarding amendment to include EL 1155 in Project Description / ELs 1121 and 1134 removed.
New Brunswick: Elsipogtog Mi'kmaq First Nation		
November 17, 2017	Letter	Overview of potential effects of Project on salmon and swordfish.
December 1, 2017 – January 19, 2017	Emails/phone call	Requesting additional time and resources to review overview and provide comments.
March 28, 2018	Email	Offer to meet in community with four other companies undertaking exploration (BP, ExxonMobil, Nexen, and Equinor)
March 29 – April 10, 2018	Series of emails	Attempts to arrange a meeting between Elsipogtog First Nation and Husky (together with four other exploration proponents).
June 5, 2018	Email	Provided update on EA status for all offshore Eastern NL/Labrador projects (Husky)
June 5, 2018	Email	Provided draft EIS community profile for review and comment.
June 19, 2018	Email	Provided information regarding amendment to include EL 1155 in Project Description / ELs 1121 and 1134 removed.
June 26 – July 4, 2018	Email/Letters (to CEAA)	Clarification of attempts to meet with Elsipogtog First Nation in 2018.
New Brunswick: Wolastoqey Nation in New Brunswick (WNNB) (Representing: Kingsclear, Madawaska, St. Mary's, Tobique and Oromocto Maliseet First Nations)		
November 17, 2017	Letter to all WNNB member communities	Overview of potential effects of the Project on salmon and swordfish.
December 1, 2017	Email	Requesting confirmation of receipt of overview.
April 12, 2018 April 28, 2018	Workshop: Moncton Email	CEAA-sponsored workshop on offshore exploration projects (5) Follow-up from workshop
June 5, 2018	Email	Provided update on EA status for all offshore Eastern NL/Labrador projects (Husky)
June 5, 2018 July 13, 2018	Email Email	Provided draft EIS community profiles for review and comment. Received comments on draft EIS community profiles.
June 19, 2018	Email	Provided information regarding amendment to include EL 1155 in Project Description / ELs 1121 and 1134 removed.
New Brunswick: Woodstock Wolastoqey First Nation		
November 11, 2017	Letter	Provided overview of potential effects of the Project on salmon and swordfish.

PUBLIC CONSULTATION AND ENGAGEMENT WITH INDIGENOUS GROUPS
September 2018

Date	Means of Engagement	Purpose
December 1, 2017 – January 8, 2018	Series of emails	Confirmed receipt of overview and commented that Woodstock would participate through CEAA process and review of draft EIS.
June 5, 2018	Email	Provided draft EIS community profile for review and comment.
June 5, 2018	Email	Provided update on EA status for all offshore Eastern NL/Labrador projects (Husky)
June 19, 2018	Email	Provided information regarding amendment to include EL 1155 in Project Description / ELs 1121 and 1134 removed.
New Brunswick: Peskotomuhkati Nation at Skutik (Passamaquoddy)		
November 17, 2017	Letter	Overview of potential effects of the Project on salmon and swordfish.
December 1, 2017 – January 29, 2018	Series of emails/phone calls	Reached out to verify if they received the overview; Passamaquoddy requested meeting.
January 29, 2018	Phone call	Call with Bronte Thomas to discuss initial concerns: concern for groundfish, especially cod; noise effects on cetaceans. Intend to respond to the EIS once submitted.
April 12, 2018 April 28, 2018	Workshop: Moncton Email	CEAA-sponsored workshop on offshore exploration projects (5) Follow-up from workshop
June 5, 2018	Email	Provided update on EA status for all offshore Eastern NL/Labrador projects (Husky)
June 5, 2018	Email	Provided draft EIS community profile for review and comment.
June 19, 2018	Email	Provided information regarding amendment to include EL 1155 in Project Description / ELs 1121 and 1134 removed.
Prince Edward Island: Mi'kmaq Confederacy of Prince Edward Island (MCPEI) (Representing: Lennox Island and Abegweit Mi'kmaw First Nations)		
November 17, 2017	Letter	Overview of potential effects to salmon and swordfish from the Project.
December 1, 2017	Phone call	Confirmed receipt of overview.
December 4, 2017	Letter	Expressing general concern the Project may have on salmon migration; and citing distance between PEI and the Project, specific concerns were deferred to Indigenous Peoples of NL.
April 12, 2018 April 28, 2018	Workshop: (Moncton) Email	CEAA-sponsored workshop on offshore exploration projects (5) Follow-up from workshop.
June 5, 2018	Email	Provided update on EA status for all offshore Eastern NL/Labrador projects (Husky)
June 5, 2018 June 13, 2018	Email Email	Provided draft EIS community profile for review and comment. Received comments on community profile from MCPEI.
June 19, 2018	Email	Provided information regarding amendment to include EL 1155 in Project Description / ELs 1121 and 1134 removed.

PUBLIC CONSULTATION AND ENGAGEMENT WITH INDIGENOUS GROUPS
September 2018

Date	Means of Engagement	Purpose
Quebec: Mi`gmawei Mawiomi Secretariat (MMS) (Representing: Listiguj, Gespeg and Gesgapegiag Mi'kmaw First Nations)		
November 21, 2017	Letter	Overview of potential effects to salmon and swordfish from the Project.
December 5, 2017 – January 26, 2018	Emails / phone calls	Husky inquired about feedback on overview of potential effects to salmon and swordfish.
April 18, 2018 April 28, 2018	Workshop: Quebec City Email	CEAA-sponsored workshop on offshore exploration projects (5) Follow-up from workshop.
June 5, 2018	Email	Provided update on EA status for all offshore Eastern NL/Labrador projects (Husky)
June 5, 2018	Email	Provided draft EIS community profile for review and comment.
June 19, 2018	Email	Provided information regarding amendment to include EL 1155 in Project Description / ELs 1121 and 1134 removed.
July 23, 2018	Phone call	General update on the status of all NL offshore projects (5).
Quebec: La Premiere Nation des Innus de Nutashkuan		
November 21, 2017	Letter	Overview of potential effects of Project on salmon and swordfish.
December 5, 2017 – January 31, 2018	Emails/phone calls	Husky confirmed w Nutashkuan First Nation that they received the overview and will participate in the CEAA process after reviewing the draft EIS.
April 18, 2018 April 28, 2018	Workshop: Quebec City Email	CEAA-sponsored workshop on offshore exploration projects (5) Follow-up from workshop.
June 5, 2018	Email	Provided update on EA status for all offshore Eastern NL/Labrador projects (Husky)
June 5, 2018 June 11, 2018	Email Email	Provided draft EIS community profile for review and comment. Response provided by Nutashkuan First Nation on draft community profile.
June 21, 2018	Email	Provided information regarding amendment to include EL 1155 in Project Description / ELs 1121 and 1134 removed.
Quebec: La Premiere Nation des Innus de Ekuanitshit		
November 21, 2017	Letter	Provided overview of potential effects on salmon and swordfish.
December 12, 2017 – January 29, 2018	Emails / phone calls	Attempts to confirm receipt of overview, and when comments might be received.
February 5, 2018	Phone call (Ekuanitshit)	Confirming overview received. Letter sent to Husky on January 21, 2018 was re-sent (original not received).
April 18, 2018 April 28, 2018	Workshop: Quebec City Email	CEAA-sponsored workshop on five offshore exploration projects. Follow-up to workshop.
June 5, 2018 July 4, 2018	Email Email	Provided draft EIS community profile for review and comment. Received comments on community profile.

Date	Means of Engagement	Purpose
June 5, 2018	Email	Provided update on EA status for all offshore Eastern NL/Labrador projects (Husky)
June 21, 2018	Email	Provided information regarding amendment to include EL 1155 in Project Description / ELs 1121 and 1134 removed.

4.2.3 Comments from Indigenous Groups

A summary of key issues raised during engagement with Indigenous groups and how they have been addressed is provided in Table 4.3. Issues/concerns were raised either: directly during engagement with Husky Energy or the CEA Agency; through previous submissions to EIS review on similar offshore NL exploration drilling projects; and, at recent workshops held by Husky and others in April 2018 in St. John's, Moncton and Quebec City.

Table 4.3 Questions and Comments Raised During Engagement with Indigenous Groups and Where they are Addressed in the Environmental Assessment

Comment	Husky Response	EIS Section Reference
Noted use of fishing boats on the northeast coast of Newfoundland. Concern raised regarding movement of vessels and the potential effects to commercial fishing	Husky will implement its Vessel Traffic Management Standard (AR-M-99-R-PR-00003-001), which includes procedures for management and communication relevant to the movement of OSVs, survey vessels, and MODU during Project-related activities. All communications between Husky, operators, and fishers will adhere to this standard. Any Project-related damage to fishing gear will be compensated in accordance with the Compensation Guidelines Respecting Damages Relating to Offshore Petroleum Activity (C-NLOPB and CNSOPB 2017), any Husky internal practices and policies.	Section 4.3.1 (Commercial Fishing) Section 6.6 (Indigenous People and Community Values)
Would like to remain informed about Project activities	Husky will develop an Indigenous Fisheries Communications Plan with Indigenous groups to provide continued information-sharing throughout the lifecycle of the Project.	Section 6.6 (Indigenous People and Community Values)
Interested in information about spill modelling	Section 7.2 of this EIS provides a description of the potential accidental events to be assessed within the Study Area, including an oil spill (both operational batch and blowout). Given the geographic and environmental consistencies, the WREP EA (Husky Energy 2012) and the SL Ross Modelling Report (SL Ross 2012) have been referenced extensively in this analysis. Husky and other offshore NL proponents will be holding a series of technical workshops in	Section 7.2 (Identification of Accidental Event Scenarios)

Comment	Husky Response	EIS Section Reference
	October 2018 to provide opportunity for Indigenous groups to receive more information about oil spill modelling and provide comments and feedback.	
Would like to understand what are the potential impacts to Treaty rights	Husky has studied the potential for impacts to Treaty rights and have not identified any Indigenous group whose potential or established Aboriginal or Treaty rights may be adversely affected by the Project. Husky continues to engage with Indigenous groups to further understand if there are any potential adverse impacts to Aboriginal and/or Treaty rights.	Section 6.6 (Indigenous People and Community Values)
Concern for harvestable species that pass through the Project Area and reach the near shore which could be impacted	Information regarding species of interest that may be present in the Project Area and Study Area, including migratory species, are described in Section 4.2 of the EIS. Potential effects to these species from routine Project activities are described in Section 6.1 (Fish and Fish Habitat), Section 6.3 (Marine Mammals and Sea Turtles), and Section 6.4 (Migratory Birds) of the EIS. Potential effects of routine Project activities on traditionally hunted species by Indigenous communities are described in Section 6.6 (Indigenous People and Community Values) of the EIS.	Section 4.2 (Marine Biological Environment) Section 6.1 (Fish and Fish Habitat) Section 6.3 (Marine Mammals and Sea Turtles) Section 6.4 (Migratory Birds) Section 6.6 (Indigenous People and Community Values)
Concerns regarding potential cumulative effects of having numerous proposed exploration wells within geographic proximity of one another, layered on top of other current oceans uses, such as fishing and transportation.	Chapter 9 in the EIS provides an assessment on cumulative effects. As discussed in Section 9.2.4 of the EIS, in consideration of the various physical activities that have been, are being, and will be carried out in the Study Area, the Project is expected to result in a relatively small, incremental increase in cumulative residual environmental effects on commercial fisheries in comparison with the future scenario without the Project. Standard practices for at-sea communication among marine users, including the issuance of Notices to Mariners and Notices to Shipping (as appropriate), is expected to mitigate potential conflicts with fisheries as well as other ocean users.	Section 9.2.4 (Assessment of Cumulative Environmental Effects on Commercial Fisheries)
Concerns that emergency preparedness and response is not robust enough; and, that options such as capping stacks should be located in NL.	Husky's spill prevention and response measures are detailed in Section 7.1 of the EIS. Husky is prepared to effectively respond to an oil spill in offshore Newfoundland and Labrador in the event that one should occur and is equipped with various response tools and strategies. Contingency plans are in place to detail the associated practices and procedures for responding to different emergency scenarios. All plans surrounding response to accidental events such as an oil spill are submitted for	Section 7.1 (Spill Prevention and Response)

Comment	Husky Response	EIS Section Reference
	review and approval by the C-NLOPB as part of regulatory authorizations to conduct drilling activities.	
Concerns regarding potential impacts on commercial communal fisheries.	Potential effects to commercial communal fisheries is assessed in Section 6.6 (routine activities) and Section 7.3.6 (accidental events) of the EIS. It was concluded in the Section 6.6.11 that, with the application of proposed mitigation and environmental protection measures, the residual environmental effects commercial communal fisheries is predicted to be not significant. Given the extensive nature of the worst-case, unmitigated blowout event, a significant effect is conservatively predicted for commercial communal fisheries; however, this significant effect occurring is considered low, given the very low potential for a blowout to occur.	Section 6.6 (Indigenous People and Community Values) Section 7.3.6 (Indigenous People and Community Values – Accidental Events)
Concerns were expressed regarding the inclusion, level, frequency of monitoring and follow-up programs for marine mammals, fish and fish habitat and migratory birds.	Given the nature of the Project (i.e., exploration drilling) and the existing knowledge of potential environmental effects related to this type of activity gained through existing environmental effects monitoring (EEM) and existing literature, monitoring and follow-up requirements for the proposed Project, including cumulative effects, is limited. Monitoring programs for various VCs recommended during certain activities associated with the Project are discussed in the relevant VC sections (see Section 6 of the EIS). In summary, these include the following: • Marine Mammal Observers (MMOs) will be employed to monitor and report on sightings of marine mammals and sea turtles as required in the Geophysical, Geological, Environmental and Geotechnical Program Guidelines (C-NLOPB 2017a) (see Section 6.3.10.2). • Routine checks for stranded birds on the MODU and OSVs (with handling as per the Environment Canada (2015) and Williams and Chardine (1999) protocol) and compliance with the requirements for documenting and reporting any stranded birds (or bird mortalities) to the Canadian Wildlife Service during the drilling program.	Section 11.4 (Monitoring and Follow-up)

5.0 SUMMARY OF ENVIRONMENTAL EFFECT ASSESSMENT

5.1 Fish and Fish Habitat

Fish and fish habitat was selected as a VC for this EIS in consideration of the ecological value this VC provides to marine ecosystems, the socio-economic importance of commercial fish species both domestically and internationally, requirements set out in the EIS Guidelines, and the potential for interactions with Project activities and components. Issues raised during engagement with Indigenous groups include migration routes of certain fish species that are used for traditional purposes. Traditional use of resources by Indigenous groups is discussed in Section 5.6.

5.1.1 Existing Conditions

Marine benthic, demersal, and pelagic fish species and habitat are present throughout both the Project and Study Areas. Appendix B of the EIS provides life history details, including information on seasonal occurrence and sensitive periods, for various marine fish species that are likely to occur within the Project Area and Study Area and could potentially interact with the Project.

The Project Area is located on the northeastern edge of the Grand Banks, including the areas of the Jeanne d'Arc Basin, where water depths range from 87 to approximately 211 m. Surficial sediments are comprised of fine-to-medium-grained Adolphus sand that overlies a coarser, irregular substrate of sand and gravel. There is currently little sediment reaching the Flemish pass, as it is swept away primarily by the deep slope component of the Labrador Current (Kennard et al. 1990, in JWEL 2002). The benthic habitat is known to support a variety of species, such as sand dollars, anemones, clams, sea cucumbers, bryozoans, corals, urchins, worms and several crab species. Dominant species in varying densities are sea stars, brittle stars, and bivalves. Sea pens and cup corals are mostly found on soft mud substrates, while black corals, soft corals, and sea fans are found attached to bedrock and other hard surfaces. Sponges are more widely distributed, and high densities can be found along the eastern slope of the Grand Banks and around the Flemish Cap. Section 4.2.9 of the EIS describes special areas within the Study Area that provide important habitat for corals and sponges.

Fish and shellfish species common to the Project and Study Areas include both pelagic and demersal finfishes, as well as macroinvertebrates such as shrimp and crab. Tables 5.1 to 5.3 show the list of groundfish, pelagic, and invertebrate fish species of potential commercial, recreational, or Aboriginal value with the potential to occur in the Project Area.

Table 5.1 Groundfish of Commercial, Recreational, or Aboriginal Value with Potential to Occur in the Study Area

Common Name	Scientific Name	Potential for Occurrence in the Study Area[1]	Timing of Presence	Timing of Spawning
Acadian redfish[2]	*Sebastes fasciatus*	High	Year-Round	September to December
American plaice[2]	*Hippoglossoides platessoides*	High	Year-Round	April
Atlantic cod[2]	*Gadus morhua*	Moderate	Year-Round	Peaks during spring
Atlantic halibut	*Hippoglossus*	Moderate	Year-Round	December to June
Atlantic wolffish[2]	*Anarhichas lupus*	High	Year-Round	September to December
Barndoor skate	*Dipturus laevis*	Moderate	Year-Round	Winter
Cusk[2]	*Brosme*	Low	Year-Round	May to August
Deepwater redfish[2]	*Sebastes mentella*	High	Year-Round	September to December
Haddock	*Melanogrammus aeglefinus*	Moderate	Year-Round	January to June
Greenland halibut	*Reinhardtius hippoglossoides*	Moderate	Year-Round	July to October
Monkfish	*Lophius americanus*	Moderate	Year-Round	April to September
Northern wolffish[2]	*Anarhichas denticulatus*	High	Year-Round	October to December
Pollock	*Pollachius virens*	Low	Year-Round	September to March
Roughhead grenadier[2]	*Macrourus berglax*	High	Year-Round	Winter and early spring, potentially year-round.
Roundnose grenadier[2]	*Coryphaenoides rupestris*	High	Year-Round	Year-round
Sculpin	*Triglops* spp.	High	Year-Round	Fall to late winter
Smooth skate[2]	*Malacoraja senta*	Moderate	Year-Round	Year-round
Spotted wolffish[2]	*Anarhichas minor*	High	Year-Round	June to November
Thorny skate[2]	*Amblyraja radiate*	High	Year-Round	September to January
White hake[2]	*Urophycis tenuis*	Moderate	Year-Round	Spring to early summer

Common Name	Scientific Name	Potential for Occurrence in the Study Area[1]	Timing of Presence	Timing of Spawning
Witch flounder	*Glyptocephalus cynoglossus*	Moderate	Year-Round	March to June
Yellowtail flounder	*Limanda ferruginea*	Moderate	Year-Round	April to June

Source: Scott and Scott 1988; Anderson et al. 1999; Kulka et al. 2003; Maddock-Parsons 2006; DFO 2007b, 2010, 2013a, 2013b; COSWEIC 2010, 2011; Healey 2010; NOAA 2013a, 2013b; Amec 2014

Note:

1 This qualitative characterization is based on expert opinion and an analysis of understood habitat preferences across life-history stages, available distribution mapping, and catch data for each species within the Study Area.

2 Species at risk or species of conservation concern.

Table 5.2 Pelagic Fish Species of Commercial, Recreational, or Aboriginal Value with Potential to Occur in the Study Area

Common Name	Scientific Name	Potential for Occurrence in the Study Area[1]	Timing of Presence	Timing of Spawning/Birthing
Albacore tuna	*Thunnus alalunga*	Moderate	July to November	Outside Study Area
Atlantic bluefin tuna[2]	*Thunnus thynnus*	Moderate	June to October	Outside Study Area
Atlantic herring	*Clupea harengus*	Low	Year-round	Spring or Fall
Atlantic mackerel	*Scomber scombrus*	Low	Winter	June and July
Atlantic Salmon[2]	*Salmo salar*	Moderate	June to August	Outside Study Area
American eel[2]	*Anguilla rostrata*	Moderate	March to July - glass eels on the Grand Banks	Outside Study Area
Blue shark[2]	*Prionace glauca*	Moderate	June to October	Spring to Fall
Capelin	*Mallotus villosus*	High	Year-round	June to August
Porbeagle shark[2]	*Lamna nasus*	Moderate	Year-round	Spring
Shortfin mako shark[2]	*Isurus oxyrinchus*	Low	July to October	Outside Study Area
Swordfish	*Xiphias gladius*	Moderate	July to October	Outside Study Area
White shark[2]	*Carcharodon carcharias*	Low	July to October	Outside Study Area

Source: Scott and Scott 1988; Stokesbury et al. 2005; DFO 2013b; NOAA 2013c, 2013d, 2013e; Amec 2014

Note:

1 This qualitative characterization is based on expert opinion, and an analysis of understood habitat preferences across life-history stages, available distribution mapping, and catch data for each species within the Study Area.

2 Species at risk or species of conservation concern.

Table 5.3 Invertebrate Species of Commercial, Recreational or Aboriginal Value with Potential to Occur in the Study Area

Common Name	Scientific Name	Potential for Occurrence in the Study Area[1]	Timing of Presence	Timing of Spawning
American Lobster	*Homarus americanus*	Low	Year-round	July to September
Atlantic surf clam	*Spisula solidissima,*	Low	Year-round	June to August
Propeller clam	*Cyrtodaria siliqua*	High	Year-round	Spring
Green sea urchin	*Strongylocentrotus droebachiensis*	High	Year-round	March to April
Atlantic sea scallop	*Placopecten magellanicus*	Low	Year-round	Late Summer to Fall
Iceland scallop	*Chlamys islandica*	Moderate	Year-round	April and May
Northern shrimp	*Pandalus borealis*	High	May to September	April and May
Snow crab	*Chionoecetes opilio*	High	Year-round	Summer to Fall

Source: Kenchington et al. 2001; DFO 2013b; Amec 2014
Note:
1 This qualitative characterization is based on expert opinion, and an analysis of understood habitat preferences across life-history stages, available distribution mapping, and catch data for each species within the Study Area.

There are four fish species at risk (SAR), and 20 separate species of conservation concern (SOCC) that may occur within the Study Area. These species are outlined in Table 5.4.

Table 5.4 Fish Species at Risk and Species of Conservation Concern with Potential to Occur in the Study Area

Common Name	Scientific Name	SARA Status[1]	COSEWIC Designation[1]	Potential for Occurrence in the Study Area[2]	Timing of Presence
Acadian redfish (Atlantic population)	*Sebastes fasciatus*	Not Listed	Threatened	High	Year-round
American eel	*Anguilla rostrata*	Not Listed	Threatened	Low	March to July - Larvae and glass eels on the Grand Banks
American plaice (Newfoundland and Labrador population)	*Hippoglossus platessoides*	Not Listed	Threatened	High	Year-round

Common Name	Scientific Name	SARA Status[1]	COSEWIC Designation[1]	Potential for Occurrence in the Study Area[2]	Timing of Presence
Atlantic bluefin tuna	*Thunnus thynnus*	Not Listed	Endangered	Moderate	June to October
Atlantic cod (Newfoundland and Labrador population)	*Gadus morhua*	Not Listed	Endangered	Moderate	Year-round
Atlantic salmon (South Newfoundland population)	*Salmo salar*	Not Listed	Threatened	Moderate	March to November
Atlantic wolffish	*Anarhichas lupus*	Special Concern (Schedule 1)	Special Concern	High	Year-round
Basking shark (Atlantic population)	*Cetorhinus maximus*	Not Listed	Special Concern	Low	Year-round
Blue shark (Atlantic population)	*Prionace glauca*	Not Listed	Special Concern	Moderate	June to October
Cusk	*Brosme brosme*	Not Listed	Endangered	Low	Year-round
Deepwater redfish (Northern population)	*Sebastes mentalla*	Not Listed	Threatened	High	Year-round
Northern wolffish	*Anarhichas denticulatus*	Threatened (Schedule 1)	Threatened	High	Year-round
Porbeagle shark	*Lamna nasus*	Not Listed	Endangered	Moderate	Year-round
Roughhead grenadier	*Macrourus berglax*	Not Listed	Special Concern	High	Year-round
Roundnose grenadier	*Coryphaenoides rupestris*	Not Listed	Endangered	High	Year-round
Shortfin mako	*Isurus oxyrinchus*	Not Listed	Threatened	Low	July to October
Smooth skate (Laurentian-Scotian population)	*Malacoraja senta*	Not Listed	Special Concern	Low	Year-round
Smooth skate (Funk Island Deep population)	*Malacoraja senta*	Not Listed	Endangered	Low	Year-round

Common Name	Scientific Name	SARA Status[1]	COSEWIC Designation[1]	Potential for Occurrence in the Study Area[2]	Timing of Presence
Spiny dogfish (Atlantic population)	*Squalus acanthias*	Not Listed	Special Concern	Low	Year-round
Spotted wolffish	*Anarhichas minor*	Threatened (Schedule 1)	Threatened	High	Year-round
Thorny skate	*Amblyraja radiata*	Not Listed	Special Concern	High	Year-round
White shark	*Carcharodon Carcharias*	Endangered (Schedule 1)	Endangered	Low	July to October
White hake	*Urophycis tenuis*	Not Listed	Threatened	Moderate	Year-round
Winter Skate (Eastern Scotian Shelf-Newfoundland Population	*Leucoraja ocellata*	Not Listed	Endangered	Low	November to March

Sources: Modified from Husky Energy 2012 and BP 2016

Notes:

1 The *Species at Risk Act* establishes Schedule 1 as the official list of wildlife species at risk. However, note that while Schedule 1 lists species that are *extirpated*, *endangered*, *threatened* and of *special concern*, the prohibitions do not apply to species of conservation concern or those on Schedule 2 or 3 regardless of status.

2 This qualitative characterization is based on expert opinion, and an analysis of understood habitat preferences across life-history stages, available distribution mapping, and sightings data for each species within the Study Area.

5.1.2 Potential Environmental Effects

Potential environmental effects of the Project on fish and fish habitat are:

- change in risk of mortality, physical injury or health
- change in habitat quality

Fish, including eggs and larvae, within the Project Area may be subject to increased risk of mortality, physical injury, or health due to increased underwater noise levels from certain Project-related activities or components (i.e., MODU presence and operation, VSP surveys, and OSVs). VSP surveys are expected to produce the highest levels of underwater noise of any Project activity or component; however, these operations will be temporary, lasting only one day per well. Studies on exposure of cod to seismic air gun arrays noted that mortality and tissue damage to juvenile fish occurred only within 5 m of the sound source (Dalen and Knutsen 1986). Other studies have noted that mortality rates caused by exposure to seismic energy are so low compared to natural mortality, that the environmental effect of seismic activity on recruitment of fish stocks would be negligible (Saetre and Ona 1996). The US Fisheries Hydroacoustic Working Group proposes the dual criteria of a peak sound pressure level of 206 dB re 1 µPa (peak) and cumulative sound exposure (energy) level of 187 dB re 1 µPa2s for fish 2 grams or heavier. In consideration of the

criteria and the acoustic modelling completed for the White Rose field, physical injury effects to fish as a result of MODU operation would be localized to an area within metres of the sound source. Given that the majority of mobile fish species would generally be expected to avoid underwater sound at levels lower than those at which injury or mortality would occur, and mitigation measures such as gradually ramping up the seismic air gun array for VSP surveys, the risk of mortality, physical injury or health to fish species from underwater sound is expected to be low in magnitude.

A change in habitat quality may also result from underwater noise emissions from Project components and activities such as the MODU and VSP surveys, OSV operations, and well abandonment, that may change the swimming patterns of fish species or cause them to temporarily avoid a certain area. As these effects from underwater noise are localized, and temporary, the effects from underwater noise on habitat quality for fish species is expected to be low. Waste discharged in accordance with the OWTG may have a temporary effect on habitat quality. However, these effects are expected to be short-term in duration. Husky's ongoing Environmental Effects Monitoring (EEM) Program for the White Rose field monitors potential project effects on sediment chemistry, toxicology, and benthic community structure, and have found no significant effects on fish and fish habitat from project-related discharges (see Section 6.1.10.2 in the EIS for details on Husky's EEM results).

A change in mortality, physical injury or health could occur to benthic and slow-moving organisms, via smothering, from routine Project discharges such as drill muds and cuttings around the drill site. Based on dispersion modelling completed for the White Rose field, cutting deposition that may have potential to cause mortality are limited to within 100 to 200 m of the wellsite. In areas of deeper water, such as the Flemish Pass, drill muds and cuttings discharged from the MODU are dispersed more broadly due to the length of time it takes for the suspended cuttings to settle. This will cover a larger geographic area, but with a thinner cuttings patch than in shallower waters of the Jeanne d'Arc Basin.

In summary, the Project may result in adverse effects that cause a change in risk of mortality, physical injury or health and a change in habitat quality for fish and fish habitat. In consideration of the scientific literature, the effects monitoring programs, implementation of mitigation measures (see Section 6; Table 6.1), adherence to industry standards and regulations, the residual effect of a change in risk of mortality, physical injury or health for various Project components and activities is predicted to be low in magnitude. Residual project environmental effects for a change in risk of mortality, physical injury or health will be restricted to the Project Area and localized near the source. The duration of effects will vary from short-term regular events (i.e., one day per well for VSP survey or wellhead removal) to longer-term events such as waste management (i.e., residual effects from WBM/SBM and cuttings discharge). Residual effects on fish and fish habitat are not predicted to: (a) cause a significant decline in abundance or change in distribution of fish populations within the Study Area, such that natural recruitment may not re-establish the population(s) to its original level within one generation; (b) jeopardize the achievement of self-sustaining population objectives or recovery goals for listed species; (c) result in permanent and irreversible loss of critical habitat as defined in a recovery plan or an action strategy; or (d) result in serious harm to fish as defined by the *Fisheries Act* that is unauthorized, unmitigated, or not

compensated through offsetting measures in accordance with DFO's Fisheries Protection Policy Statement (DFO 2013c). With the application of proposed mitigation (see Section 6) and environmental protection measures, the residual environmental effects of a change in risk of mortality, physical injury and health and change in habitat quality on fish and fish habitat from Project activities and components are predicted to be not significant.

5.2 Commercial Fisheries

Commercial fisheries have been included as a VC for this assessment due to the cultural, economic, and commercial importance of commercial fishing to the Province of Newfoundland and Labrador, specific regulatory requirements of the *Fisheries Act*, requirements of the EIS Guidelines, stakeholder interests, and the potential for commercial fisheries to interact with Project Activities. Commercial fisheries are present throughout the Project Area and Study Area.

5.2.1 Existing Conditions

Commercial fishing activity is present throughout both the Project and Study Areas. The Project Area falls within Multiple Unit Areas of Northwest Atlantic Fisheries Organization (NAFO) Division 3L, while the Study Area encompasses Unit Areas in NAFO Divisions 3KLMNO. As the Project Area falls both within and outside of Canada's Exclusive Economic Zone, commercial fishing includes both domestic commercial fishing conducted by Canadian fleets inside the Exclusive Economic Zone (managed by DFO), and commercial fishing activity conducted by international enterprises (managed by NAFO).

Within the boundaries of the Study Area, northern shrimp and snow crab have collectively made up approximately 96% of all landings by weight and 99% by value between 2012 and 2016. The remaining fisheries are primarily groundfish, consisting of flounder and turbot (Greenland halibut), along with smaller quantities of large pelagic species (e.g., swordfish, tunas). There is also some fishing activity for deep-sea clams and bivalves. Surf clam were commercially harvested in the Lily Canyon area in 2013, which is outside the Project Area.

Commercial fishing for certain species is undertaken year-round, however the summer months have typically been the most intense for fishing activity within offshore Newfoundland and Labrador. Total landings by species category within NAFO Divisions 3KLMNO is shown in Table 5.5.

Table 5.5 Offshore Harvest within the Project Area and Study Area by Species, 2012 to 2016 Annual Total, Quantity (t)

Species	2012	2013	2014	2015	2016	Total
Project Area						
Crab, Queen/Snow	16,335	16,699	17,224	17,726	14,784	82,768
Shrimp, *Pandalus Borealis*	2,886	533	334	0	0	3,753
Cod, Atlantic	215	283	361	300	854	2,013

Species	2012	2013	2014	2015	2016	Total
Study Area						
Crab, Queen/Snow	25,632	25,315	26,186	25,466	24,632	127,231
Shrimp, *Pandalus Borealis*	7,978	7,820	3,290	644	538	20,270
Turbot/Greenland Halibut	2,181	1,845	1,843	1,510	1,847	9,226
Cod, Atlantic	215	283	361	300	854	2,013
Swordfish	114	0	139	0	146	399
Grenadier, Rough-Head	7	0	0	0	0	7
Redfish	14	10	1	1	2	27
Atlantic Halibut	336	31	361	163	496	1,787
Hake, White	0	34	0	0	0	34
Shark, Mako	3	0	5	0	4	12

Notes:
Landings data provided by DFO have been approved for public release in accordance with DFO confidentiality policies. This does not provide all fishing activity within the given area but shows publicly available information.
No commercial fishery for northern shrimp in the Project Area in 2015 due to the closure of the commercial shrimp fishery in NAFO Division 3L.

5.2.2 Potential Environmental Effects

The Project has potential to affect both the fisheries resource (i.e., direct effects on fish species that are considered commercially important), and on fishing activity (i.e., displacement from fishing areas, gear loss or damage, delays in fishing time and schedule). The effects of the Project on fish and fish habitat are assessed as a separate VC in the EIS and is inclusive of all fish species, including those that may be of commercial importance. Therefore, the assessment of commercial fisheries is focused on a change in availability of fisheries resources.

Effects on fish and fish habitat are summarized in Section 5.1.2, including potential effects on fish health and behaviour. It is anticipated that no serious harm to fish that are part of a commercial, recreational, or Aboriginal fishery, or their habitat, is predicted to occur as a result of the Project. A change in availability of fisheries resources for commercial fisheries may occur as a result of the presence and operation of the MODU (fisheries exclusions and underwater sound effects on commercially fished species), discharge of drill muds and cuttings (effects on water and sediment quality on fisheries species), drilling-associated surveys (underwater sound), waste management (effects on water and sediment quality on fisheries species), supply and servicing operations (underwater sound associated with vessel movement potentially causing behavioural effects on fisheries species), and well abandonment (the potential use of shaped charges and their effects on commercial fish health and behaviour).

Damage to fishing gear, and the resulting economic effects from loss of catch, can occur during regular OSV operations or other activities such as drilling-associated surveys. Most gear damage events would primarily include fixed gear (e.g., crab pots); mobile gear (e.g., shrimp trawls) is rarely

affected from these activities. In most cases, the owner of gear damaged by offshore petroleum activity is identified and compensated, after submitting a claim through gear compensation programs.

Temporary and localized changes to fisheries resources (e.g., sensory disturbances that may cause avoidance behaviour in fish species) may result in a change in catch rates for commercial fishers should they be fishing in proximity to the MODU, or vessels carrying out VSP operations. However, sound levels that cause behavioural disturbances in some fish species are localized to the drill site and there are no anticipated effects on catchability of the species from MODU operation. Depending on the type of MODU selected, a 500 to 1,500 m radius safety zone is expected to be in effect around a MODU to reduce potential interaction with fishing activity.

Any safety zone established around a MODU is an exclusion area for fishers, where commercial harvesting cannot occur. While this may temporarily restrict access to fishing grounds for fishers operating in the Project Area, the effects from this are expected to be low with the implementation of proposed mitigation measures such as early communication on Project plans with fishing enterprises. OSVs will follow established traffic routes to and from the Project Area, which are known and communicated to commercial fishers.

In summary, with the implementation of applicable mitigation measures, best practices, and adherence to industry standards (e.g., compliance with Husky's EPCMP and applicable C-NLOPB guidelines), the residual environmental effect on a change in availability of fisheries resources is considered low in magnitude for Project components and activities; occur within localized areas of the Project Area; be of short to medium-term in duration, reversible; and occur primarily within an disturbed ecological and socio-economic context. Residual effects on commercial fisheries are not predicted to cause: (a) local fishers to be displaced or unable to use portions of the areas currently commercially fished for all or most of a fishing season; (b) local fishers to experience a change in the availability of fisheries resources (e.g., fish mortality and/or dispersion of stocks) so that resources cannot continue to be used at current levels within the Study Area for more than one fishing season; or (c) unmitigated damage to fishing gear. With the application of proposed mitigation (see Section 6; Table 6.1) and environmental protection measures, the residual environmental effects of a change in availability of fisheries resources on commercial fisheries from routine Project activities and components are predicted to be not significant.

5.3 Marine Mammals and Sea Turtles

Marine mammals and sea turtles have been selected as a VC due to potential effects to marine mammals and some sea turtle species that migrate through, or forage for food in the Study Area. As high-level predators, marine mammals and sea turtles are important indicators of change in the marine ecosystem and are also valued culturally and economically.

The marine mammal and sea turtle VC includes cetaceans (whales, dolphins, and porpoises), pinnipeds (seals) and sea turtles. This VC considers secure species as well as species of marine mammals and sea turtles listed under *Species at Risk Act* (SARA) (i.e., species at risk) or considered

at risk by Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (i.e., species of conservation concern).

5.3.1 Existing Conditions

A total of 22 species of marine mammals, including 18 whale species and 4 species of seals, are known to occur within the Study Area. There are also three species of sea turtles that have the potential to occur within the Study Area. Of these 25 species, nine are designated as at risk by SARA or COSEWIC and are presented in Table 5.6. Currently, there is no SARA-protected critical habitat for marine mammals or sea turtles within the Study Area.

Table 5.6 Marine Mammal and Sea Turtle Species at Risk and Species of Conservation Concern Found in the Study Area

Common Name	Scientific Name	SARA Schedule 1 Status	COSEWIC Designation	Potential for Occurrence in the Study Area[1]	Timing of Presence
Mysticetes (Baleen Whales)					
Blue whale (Atlantic population)	*Balaenoptera musculus*	Endangered	Endangered	Low	Year-round (highest concentrations from June to September)
Fin whale (Atlantic Population)	*Balaenoptera physalus*	Special Concern	Special Concern	High	Year-round (highest concentrations from June to October)
North Atlantic right whale	*Eubalaena glacialis*	Endangered	Endangered	Low	May to September
***Odontocetes* (Toothed Whales)**					
Sowerby's beaked whale	*Mesoplodon bidens*	Special Concern	Special Concern	Low	Year-round
Harbour porpoise (Northwest Atlantic population)	*Phocoena phocoena*	Not Listed	Special Concern	Low	Year-round (highest concentration from May to October)
Killer whale	*Orcinus orca*	Not Listed	Special Concern	Low	Year-round (highest concentration from June to October)

Common Name	Scientific Name	SARA Schedule 1 Status	COSEWIC Designation	Potential for Occurrence in the Study Area[1]	Timing of Presence
Northern bottlenose whale (1: Scotian Shelf population/ 2: Davis Strait-Baffin Bay-Labrador Sea population)	*Hyperoodon ampullatus*	1: Endangered 2: Not Listed	1: Endangered 2: Special Concern	Low	Year-round
Sea Turtles					
Leatherback sea turtle	*Dermochelys coriacea*	Endangered	Endangered	Moderate	June to November
Loggerhead sea turtle	*Caretta caretta*	Endangered	Endangered	Low	June to October

Source: Modified from Husky Energy 2012
Note:
[1]This is based on the analysis of habitat preferences during various life history stages, distribution mapping, and sightings data for each species within the Project Area. Appendix B provides life history information for each species found in the Study Area.

Four species of baleen whales (blue, fin, humpback, and minke whales) have potential to be found in the Study Area year-round. However, they have the greatest potential to be found in the Study Area, along with North Atlantic right and sei whales, during the summer and fall months. Toothed whales are also present in greatest numbers during the summer and fall, and multiple species remain in the Study Area throughout the year.

Grey and harbour seals can be found in the Study Area year-round, while harp and hooded seals are less likely to be present in the summer or fall, during migration periods to and from the Arctic (Park et al. 2011).

Three species of sea turtles can be found migrating through and foraging within the Study Area. Of these, the leatherback sea turtle is the most likely to occur, with the highest likelihood of a sighting in summer or fall. The presence of loggerhead and Kemp's ridley sea turtles in the Study Area is possible but considered unlikely. Critical habitat was not identified in the 2006 Recovery Strategy for the leatherback sea turtle; however, this recovery strategy is in the process of being updated and a draft version was released for public comment (DFO 2015a). Research has identified important areas for leatherback sea turtles foraging in Atlantic Canadian water (DFO 2013d, 2015a) and it is expected that these areas will be included as critical habitat in the updated Recovery Strategy, once finalized.

5.3.2 Potential Environmental Effects

Potential environmental effects of routine Project activities on marine mammals and sea turtles are related to and characterized by:

- change in risk of mortality of physical injury
- change in habitat quality and use

Marine mammals and sea turtles within the Project Area may be subject to an increased risk of mortality or physical injury due to auditory damage from underwater noise emissions during certain Project activities (i.e., MODU presence and operations and VSP surveys), and potential collisions with OSVs that transit through the Project Area. Responses to underwater sound emissions are highly variable and depend on a number of different factors (e.g., species, stage of life, ocean conditions). The responses to sea turtles from underwater sounds emissions are not well understood, but it is anticipated that marine mammals and sea turtles would both exhibit behavioural responses at lower sound thresholds than those that would cause physical injury or mortality. As a result, they would not approach the MODU, during operations such as drilling, at distances that would elicit physical injury or mortality. Marine mammals within a localized area of the drill site may be exposed to sound pressure levels that are high enough to cause auditory injury. VSP operations will emit impulsive sounds that may be higher than the threshold required to cause physical injury or mortality to marine mammals and sea turtles. However, as in the case of MODU operations, marine mammals and sea turtles are expected to exhibit avoidance behaviour at lower sound levels and would not approach the VSP source within distances that would cause physical injuries. With the proposed mitigation measures (e.g., gradually ramping up the VSP sound source and immediate shutdown on observation of SARA schedule 1 marine mammals in the area), effects from VSP surveys are expected to be low. The presence of OSVs moving through the Project Area potentially increase the risk of mortality of physical injury to marine mammals and sea turtles through collisions. The one to three OSVs required for the Project will represent a small incremental increase above current existing conditions. OSV transit will avoid concentrations of marine mammals and reduce speeds or change course to avoid potentially fatal collisions with marine mammals or sea turtles.

Underwater noise emissions from MODU operations, VSP surveys, and OSV operations, as well as routine operational discharges, may temporarily affect the quality of the marine environment in the Project Area, including habitat for Marine Mammals and sea turtles. This may result in sensory disturbances that may trigger behavioural changes such as avoidance of the area. Any change in habitat quality is expected to be low in magnitude, temporary, and be contained to within the Project Area. These effects are not expected to result in population effects in the long-term.

In summary, the Project may result in adverse effects that cause a change in habitat quality and use and a change in risk of mortality or physical injury for marine mammals and sea turtles. Based on the implementation of applicable mitigation measures (see Section 6; Table 6.1), best practices, and adherence to industry standards (e.g., compliance with SOCP), the residual effect of changes to habitat quality and use for various Project components and activities is considered to be low to moderate in magnitude. Effects will be restricted to the Project Area, and will be short- to medium-term in duration, continuous or irregular, reversible, and occur within a disturbed ecological and socio-economic context (from current sources of ambient noise [primarily shipping] in the Study Area). Similarly, changes in risk of mortality or physical injury for marine mammals and sea turtles are predicted to be low in magnitude, occur within the Project Area or Study Area, be short- to medium-term in duration, continuous or irregular, reversible, and occur within a disturbed context. Residual effects on marine mammals and sea turtles are not predicted to: (a) cause a decline in abundance or change in distribution of marine mammal or sea turtle

populations within the Study Area, such that natural recruitment may not re-establish the population(s) to its original level within one generation; (b) jeopardize the achievement of self-sustaining population objectives or recovery goals for listed SARA species; or (c) result in permanent and irreversible loss of critical habitat as defined in a recovery plan or action strategy. With the application of proposed mitigation (see Section 6) and environmental protection measures, the residual environmental effects of a change in habitat quality and use and change in risk of mortality or physical injury on marine mammals and sea turtles from Project activities and components are predicted to be not significant.

5.4 Migratory Birds

Migratory birds was chosen as a VC due to their ecological value to marine and coastal ecosystems, the potential for interaction with Project activities and components, and regulatory requirements set out in the EIS guidelines along with those in the *Migratory Birds Convention Act*, SARA, and the Newfoundland and Labrador *Endangered Species Act*. The migratory birds VC includes both pelagic (offshore) and neritic (inshore) seabirds, waterfowl, and shorebirds that are protected under the *Migratory Birds Convention Act*. Migratory birds are also valued as part of a traditional harvest.

5.4.1 Existing Conditions

Waters of the Grand Banks, which overlap with both the Project Area and Study Area, provide habitat for millions of migratory birds. Many of these species are pelagic that could occur in the Project Area, including gannets, phalaropes, gulls, petrels, alcids, and shearwaters. While many pelagic species live in the offshore area year-round, the summer season brings many migratory birds to the Study Area to forage and breed. The peak seabird density period is typically from July to September, with the highest densities occurring near the continental shelf edges. Although winter seems to be the season with the least number of seabirds in offshore Newfoundland, the area still supports hundreds of thousands of seabirds, including those that migrate to the area from the Arctic and subarctic of eastern Canada and Greenland. Data from Fifield et al. (2009) indicate that seabird concentrations on the Newfoundland and Labrador shelves during winter are higher than those on the Scotian Shelf. The waters of the Study Area are known to support approximately 19 species of pelagic seabirds, 17 species of neritic seabirds, 24 species of waterfowl, 24 shorebird species, and 6 landbird species of conservation concern. These are presented in Table 5.7.

Table 5.7 Birds of the Eastern Newfoundland Offshore Area and Adjacent Coast[1]

Common Name	Species Name	SARA Schedule 1	COSEWIC	NL ESA	Potential to Occur in Study Area[2]
Pelagic Seabirds					
Northern Fulmar	*Fulmarus glacialis*	-	-	-	Likely
Cory's Shearwater	*Calonectris diomedea borealis*	-	-	-	Likely

Common Name	Species Name	SARA Schedule 1	COSEWIC	NL ESA	Potential to Occur in Study Area[2]
Great Shearwater	*Puffinus gravis*	-	-	-	Likely
Sooty Shearwater	*Puffinus griseus*	-	-	-	Likely
Manx Shearwater	*Puffinus puffinus*	-	-	-	Likely
Wilson's Storm-Petrel	*Oceanites oceanicus*	-	-	-	Likely
Leach's Storm-Petrel	*Oceanodroma leucorhoa*	-	-	-	Likely
Northern Gannet	*Morus bassanus*	-	-	-	Likely
Pomarine Jaeger	*Stercorarius pomarinus*	-	-	-	Likely
Parasitic Jaeger	*Stercorarius parasiticus*	-	-	-	Likely
Long-tailed Jaeger	*Stercorarius longicaudus*	-	-	-	Likely
Great Skua	*Stercorarius skua*	-	-	-	Likely
South Polar Skua	*Stercorarius maccormicki*	-	-	-	Likely
Black-legged Kittiwake	*Rissa tridactyla*	-	-	-	Likely
Dovekie	*Alle alle*	-	-	-	Likely
Common Murre	*Uria aalge*	-	-	-	Likely
Thick-Billed Murre	*Uria lomvia*	-	-	-	Likely
Razorbill	*Alca torda*	-	-	-	Likely
Atlantic Puffin	*Fratercula arctica*	-	-	-	Likely
Neritic Seabirds					
Great Cormorant	*Phalacrocorax carbo*	-	-	-	Unlikely
Double-Crested Cormorant	*Phalacrocorax auritus*	-	-	-	Unlikely
Black-headed Gull	*Larus ridibundus*	-	-	-	Unlikely
Bonaparte's Gull	*Larus philadelphia*	-	-	-	Unlikely
Ring-billed Gull	*Larus delawarensis*	-	-	-	Likely
Herring Gull	*Larus argentatus*	-	-	-	Likely
Iceland Gull	*Larus glaucoides*	-	-	-	Likely
Glaucous Gull	*Larus hyperboreus*	-	-	-	Likely
Great Black-backed Gull	*Larus marinus*	-	-	-	Likely
Lesser Black-backed Gull	*Larus fuscus*	-	-	-	Likely
Laughing Gull	*Leucophaeus atricilla*	-	-	-	Likely
Sabine's Gull	*Xema sabini*	-	-	-	Likely
Ivory Gull	*Pagophila eburnea*	Endangered	Endangered	Endangered	Likely
Caspian Tern	*Hydroprogne caspia*	-	-	-	Likely

Common Name	Species Name	SARA Schedule 1	COSEWIC	NL ESA	Potential to Occur in Study Area[2]
Common Tern	*Sterna hirundo*	-	-	-	Likely
Arctic Tern	*Sterna paradisaea*	-	-	-	Likely
Black Guillemot	*Cepphus grylle*	-	-	-	Likely
Waterfowl, Loons, and Grebes					
Red-throated Loon	*Gavia stellata*	-	-	-	Unlikely
Common Loon	*Gavia immer*	-	-	-	Unlikely
Pied-billed Grebe	*Podilymbus podiceps*	-	-	-	Unlikely
Canada Goose	*Branta canadensis*	-	-	-	Unlikely
American Green-winged Teal	*Anas crecca*	-	-	-	Unlikely
American Black Duck	*Anas rubripes*	-	-	-	Unlikely
Mallard	*Anas platyrhynchos*	-	-	-	Unlikely
Blue-winged Teal	*Anas discors*	-	-	-	Unlikely
Northern Shoveler	*Anas clypeata*	-	-	-	Unlikely
American Wigeon	*Anas americana*	-	-	-	Unlikely
Ring-necked Duck	*Aythya collaris*	-	-	-	Unlikely
Greater Scaup	*Aythya marila*	-	-	-	Unlikely
Lesser Scaup	*Aythya affinis*	-	-	-	Unlikely
Common Eider	*Somateria mollissima*	-	-	-	Unlikely
Harlequin Duck	*Histrionicus histrionicus*	Special Concern	Special Concern	Vulnerable	Unlikely
Long-tailed Duck	*Clangula hyemalis*	-	-	-	Unlikely
Black Scoter	*Melanitta nigra*	-	-	-	Unlikely
Surf Scoter	*Melanitta perspicillata*	-	-	-	Unlikely
White-winged Scoter	*Melanitta fusca*	-	-	-	Unlikely
Common Goldeneye	*Bucephala clangula*	-	-	-	Unlikely
Barrows Goldeneye	*Bucephala islandica*	Special Concern	Special Concern	Vulnerable	Unlikely
Bufflehead	*Bucephala albeola*	-	-	-	Unlikely
Common Merganser	*Mergus merganser*				Unlikely
Red-breasted Merganser	*Mergus serrator*	-	-	-	Unlikely
Shorebirds					
Black-bellied Plover	*Pluvialis squatarola*	-	-	-	Unlikely
American Golden-Plover	*Pluvialis dominica*	-	-	-	Unlikely
Semipalmated Plover	*Charadrius semipalmatus*	-	-	-	Unlikely
Piping Plover (*melodus* subspecies)	*Charadrius melodus melodus*	Endangered	Endangered	Endangered	Unlikely

Common Name	Species Name	SARA Schedule 1	COSEWIC	NL ESA	Potential to Occur in Study Area[2]
Killdeer	*Charadrius vociferus*	-	-	-	Unlikely
Greater Yellowlegs	*Tringa melanoleuca*	-	-	-	Unlikely
Lesser Yellowlegs	*Tringa flavipes*	-	-	-	Unlikely
Willet	*Tringa semipalmata*	-	-	-	Unlikely
Hudsonian Godwit	*Limosa haemastica*	-	-	-	Unlikely
Spotted Sandpiper	*Actitis macularius*	-	-	-	Unlikely
Hudsonian Whimbrel	*Numenius phaeopus*	-	-	-	Unlikely
Ruddy Turnstone	*Arenaria interpres*	-	-	-	Unlikely
Red Knot *rufa* ssp.	*Calidris canutus rufa*	Endangered	Endangered	Endangered	Unlikely
Sanderling	*Calidris alba*	-	-	-	Unlikely
Semipalmated Sandpiper	*Calidris pusilla*	-	-	-	Unlikely
Least Sandpiper	*Calidris minutilla*	-	-	-	Unlikely
White-rumped Sandpiper	*Calidris fuscicollis*	-	-	-	Unlikely
Pectoral Sandpiper	*Calidris melanotos*	-	-	-	Unlikely
Purple Sandpiper	*Calidris maritima*	-	-	-	Unlikely
Dunlin	*Calidris alpina*	-	-	-	Unlikely
Buff-breasted Sandpiper	*Tryngites subruficollis*	-	Special Concern	-	Unlikely
Short-billed Dowitcher	*Limnodromus griseus*	-	-	-	Unlikely
Red-necked Phalarope	*Phalaropus lobatus*	-	Special Concern	-	Likely
Red Phalarope	*Phalaropus fulicarius*	-	-	-	Likely
Landbird Species of Conservation Concern[3]					
Short-eared Owl	*Asio flammeus*	Special Concern	Special Concern	Vulnerable	Potential during nocturnal migration
Peregrine Falcon	*Falco perigrinus anatum/tundrius*	Special Concern	Special Concern	Vulnerable	
Bank Swallow	*Riparia riparia*	-	Threatened	-	
Gray-cheeked Thrush	*Catharus minimus*	-	-	Vulnerable	
Olive-sided Flycatcher	*Contopus cooperi*	Threatened	Threatened	Threatened	
Bobolink	*Dolichonyx oryzivorus*	-	Threatened	-	

Notes:
1 Excludes rare transients/vagrants, except for species of conservation concern that are known to occasionally occur (e.g., buff-breasted sandpiper).
2 Spatial boundaries of the Study Area are shown in Figure 1-2; potential occurrence considers known spatial and temporal use of the waters near the Study Area; Unlikely: generally restricted to coastline and nearshore waters; Likely: regular occurrence in offshore waters and may be expected to occur in the Study Area during the breeding season (i.e., for feeding), migration, and/or overwintering.
3 Following Amec (2014), landbird species of conservation concern are listed if they are known to migrate over the offshore area, except those that migrate during the day because these are unlikely to become disoriented by marine artificial lighting.

The eastern coast of Newfoundland supports 1,473 seabird colonies and 17 IBA sites (refer to Section 4.2.7.4 and Figure 4-32 of the EIS); however, none of these are located in the offshore environment or overlap with the Project Area or Study Area. The nearest of these sites is located in St. John's (terminus of the Project Area) (IBA NV022: Quidi Vidi Lake).

5.4.2 Potential Environmental Effects

Potential environmental effects of the Project on migratory birds are:

- change in risk of mortality or physical injury
- change in habitat quality and use

Migratory birds occurring within the Project Area may be subject to an increased risk of physical injury or mortality from interactions with Project-related activities and components such as the presence and operation of the MODU, OSV and helicopter traffic to and from the MODU back to the supply base, and harm from flaring activities. The presence of potential attractants (e.g., Project-related lights, flares, sanitary wastes) may affect habitat quality and use, and further increase risk of mortality or physical injury.

Artificial lighting present on Project components such as the MODU and OSVs may indirectly result in an increased risk of strandings and collisions, increased opportunity of predation, and exposure to other vessel-based threats. Birds attracted to the MODU may experience injury or mortality through direct collision with equipment or may become disoriented by lights and become stranded. Short-duration flaring by the MODU during well testing may attract migratory birds and result in increased mortality risk through incineration or energy reserve depletion. Seabirds have been observed to circle flares for days, eventually dying of starvation (Bourne 1979). Studies have shown most bird mortality on offshore platforms or lighthouses to be related to collision injuries rather than energy reserve depletion (Bruinzeel and van Belle 2010).

Underwater noise from MODU operations, VSP surveys, and OSVs may temporarily affect the ambient sound conditions of migratory bird habitat and result in sensory disturbance that triggers behavioural responses in migratory birds with the Project Area. This is enhanced for migratory bird species that dive and swim underwater in order to find food. Operational discharges from the Project will comply with the OWTG and/or MARPOL as applicable; although these discharges may cause a temporary change in water quality within the Project Area, these discharges are not predicted to have a measurable effect on migratory birds.

In summary, the Project will result in adverse effects on migratory birds by causing a change in risk of mortality or physical injury and a change in habitat quality and use. In consideration of the implementation of applicable mitigation measures (see Section 6; Table 6.1), best practices, and adherence to industry standards (e.g., compliance with Husky's EPCMP), the residual effect of a change in risk of mortality or physical injury is considered to vary from negligible to moderate in magnitude for various Project components and activities, will be restricted to the Project Area, will be intermittent, short to medium-term in duration, reversible, and will primarily occur within an

undisturbed ecological and socio-economic context. Similarly, changes to habitat quality and use for migratory birds are predicted to be negligible to low in magnitude, restricted to the Project Area, intermittent, short to medium-term in duration, reversible, and to primarily occur within an undisturbed context. Residual effects on migratory birds are not predicted to: (a) cause a decline in abundance or change in distribution of migratory birds within the Study Area, such that natural recruitment may not re-establish the population(s) to its original level within one generation; (b) jeopardize the achievement of self-sustaining population objectives or recovery goals for listed SAR species; or (c) result in permanent and irreversible loss of critical habitat as defined in a recovery plan or action strategy. With the application of proposed mitigation (see Section 6) and environmental protection measures, the residual environmental effects of the Project on migratory birds (i.e., a change in risk of mortality or physical injury and a change in habitat quality and use) are predicted to be not significant.

5.5 Special Areas

Special areas has been chosen as a VC due to the ecological/socio-economic importance, stakeholder and regulatory interests, and potential to interact with Project activities. The special areas VC considers areas noted for their biological and ecological importance within the Study Area. These areas are important habitat for several marine species. Special areas identified have been designated as Ecologically and Biologically Significant Areas (EBSAs), VMEs, and NAFO Coral-Sponge areas. There are no designated Marine Protected Areas within the Study Area.

Special areas may offer unique habitat, high biodiversity, and may provide areas for feeding, mating, and nursing of various marine species. Therefore, the assessment of this VC is closely linked to the assessments of Fish and Fish Habitat, Marine Mammals and Sea Turtles, and Migratory Birds VCs.

5.5.1 Existing Conditions

A portion of the Northeast Shelf and Slope EBSA is located within the Project Area (see Figure 5-1). Table 5.8 lists the special areas within offshore Newfoundland and Labrador, and their approximate distance to the Project Area.

As part of the Integrated Management Plan for Placentia Bay-Grand Banks Large Ocean Management Area (PBGB-LOMA), DFO has identified 11 EBSAs in the area that may require specific management measures. EBSAs are identified according to pre-established criteria, including uniqueness, aggregation, fitness consequences, resilience, and naturalness (DFO 2004). Five of these 11 EBSAs are located within the Study Area (Figure 5-1): Southeast Shoal and Tail of the Banks; Orphan Spur; Northeast Shelf and Slope; Lily Canyon-Carson Canyon; and Virgin Rocks.

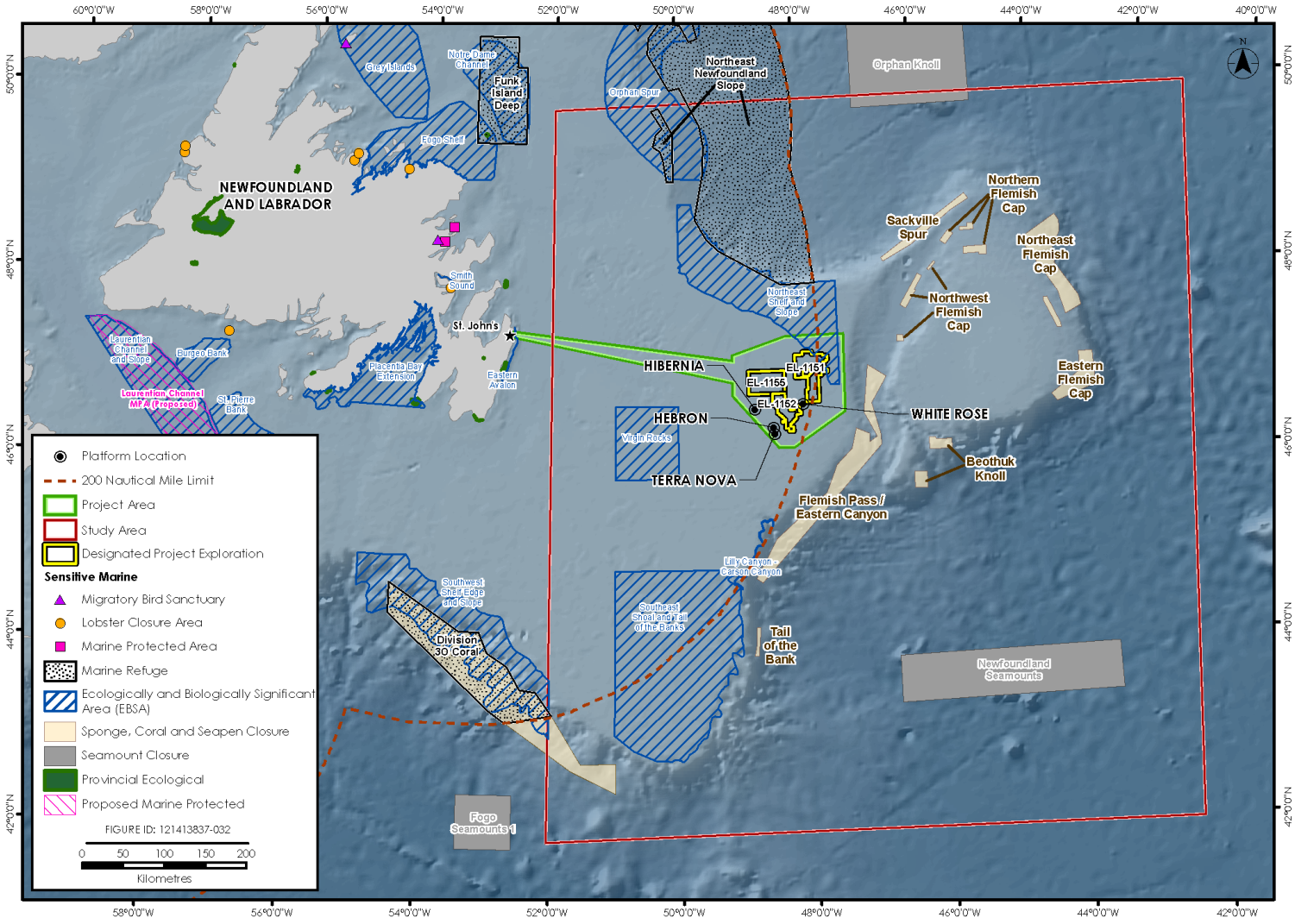

Figure 5-1 Special Areas in and Near the Study Area

Table 5.8 Proximity of Special Areas to the Project Area

Special Area	Distance to the Project Area* (km)	Rationale for Selection[1]
EBSA		
Northeast Shelf and Slope	0	• Supports spotted wolffish and Greenland halibut populations • Contains two important deep-water coral areas • Known feeding area for marine mammals (harp seals, hooded seals, and pilot whales)
Virgin Rocks	41	• Supports aggregations of capelin and marine birds • Provides spawning and breeding habitat for Atlantic cod, American plaice, and yellowtail flounder
Lilly Canyon-Carson Canyon	87	• Biologically important due to the abundance of Iceland scallop • Feeding and overwintering of marine mammals
The Southeast Shoal and Tail of the Banks	155	• High rates of primary production • Supports reproducing populations of groundfish and capelin • The only shallow, sandy offshore shoal in the PBGB-LOMA • Highest benthic biomass on the Grand Banks
Orphan Spur	209	• Several marine mammal and seabird species frequent this area, including the thick-billed murre, black-legged kittiwake, northern fulmar, greater shearwater, dovekie, storm-petrels, skuas, and jaegers
VME		
Beothuk Knoll	107	• Support habitat-structuring communities such as coral and sponges, and attract aggregations of deep-sea fishes
Seamount Closures		
Newfoundland Seamounts	284	• Support habitat-structuring communities such as coral and sponges • Attract aggregations of deep-sea fishes, as well as their predators • Important for the mating and spawning of some species
Orphan Knoll	275	
Coral and Sponge Closures		
Flemish Pass / Eastern Canyon	23	• High densities of coral and sponge
Northwest Flemish Cap	65	
Northwest Flemish Cap	78	
Beothuk Knoll	107	

Special Area	Distance to the Project Area* (km)	Rationale for Selection[1]
Beothuk Knoll	112	
Sackville Spur	100	
Northwest Flemish Cap	65	
Northern Flemish Cap	164	
Northern Flemish Cap	176	
Northern Flemish Cap	190	
Tail of the Bank	220	• High densities of coral and sponge
Northeast Flemish Cap	244	
Eastern Flemish Cap	247	
3O Coral Closure	333	• Coral and sponge area
Marine Refuge Areas		
Northeast Newfoundland Slope	63	• Protect corals and sponges and contribute to the long-term conservation of biodiversity

1 Additional detail on selection of these special areas is provided in Section 4.2.9 of the EIS.

Note: Those areas with a distance of 0 km to the Project Area indicate that portions of those areas overlap with the Project Area. These distances are approximations based on distances between area boundaries.

NAFO has identified VMEs with the goal of managing deep-sea fisheries and the potential environmental effects that such fishing could have. NAFO uses criteria that have received general consensus internationally (e.g., the Food and Agriculture Organization of the United Nations International Guidelines for the Management of Deep-Sea Fisheries in the High Seas) (NAFO 2008). Several VMEs have been designated by NAFO in the PBGB-LOMA, including many of the canyons along the shelf edge, seamounts, and knolls, the Southeast Shoal, cold seeps, carbonate mounds and hydrothermal vents.

DFO has developed the Coral and Sponge Conservation Strategy for Eastern Canada to identify the current state of knowledge of coral and sponges in this region, provide international and national context for coral conservation, and outline existing research and conservation efforts in this area (DFO 2015b). This strategy includes the identification of DFO and NAFO closures zones in areas of important coral and sponges. There are no DFO closure zones within the Study Area, but there are coral closures designated by NAFO.

5.5.2 Potential Environmental Effects

The potential environmental effects of the Project on special areas would result from a change in habitat quality. Effects on species (including species at risk and SOCC) that may occur within the special areas, and how species use these areas, are assessed within their respective VC chapters including: Section 5.1 (Fish and Fish Habitat); Section 5.3 (Marine Mammals and Sea Turtles); and Section 5.4 (Migratory Birds); and includes an assessment on change in habitat quality and use

and change in risk of mortality or physical injury. The assessment of these biological VC concluded the proposed Project is not predicted to result in significant effects from routine Project activities. Underwater noise emissions from routine Project activities such as the presence and operation of the MODU, surveys such as VSP and geohazard surveys, OSV and helicopter operations, and well abandonment have the ability to temporarily reduce the quality of habitat in special areas. This may result in sensory disturbances to marine species that use the areas and may cause behavioural effects such as avoiding the area. Artificial lighting used on Project components such as the MODU and OSVs, and the temporary degradation of water and sediment quality from routine operational discharges and emissions may similarly affect habitat quality and use by marine species. Drill muds and cuttings discharges have the potential to smother fixed or slow-moving marine organisms within a localized area of the drill site and have the potential to temporarily change the composition of the benthic environment nearby. Laboratory experiments indicate the potential for polyp mortality caused by drill cuttings (Larsson and Purser 2011) as well as alterations in feeding behaviours, coral physiology, and disruption of calcification (Dodge and Szmant-Froelich 1985). The tolerance of individual species to the constituents of drill cuttings has also been found to be highly variable (Rogers 1990). Larsson et al. (2013) concluded that the cold-water coral *Lophelia pertusa* can deal with enhanced particle deposition rates and suspended matter concentrations and even in high particle concentrations can maintain positive growth. The majority of special areas fall outside of the Project Area and are not expected to interact with routine Project activities.

In summary, there is potential for interactions between Project activities and special areas, the Project has potential to result in adverse residual effects through a change in habitat quality for special areas that exist within the Project Area, including the Northeast Shelf and Slope EBSA. With the implementation of applicable mitigation measures see Section 6; Table 6.1) and adherence to industry standards for offshore oil and gas activities in Newfoundland and Labrador, the residual adverse environmental effects are considered to be negligible to low in magnitude, short to medium-term in duration, reversible, and primarily occur within an undisturbed ecological and socio-economic setting. Residual effects on special areas are not predicted to: (a) alter the valued habitat physically, chemically or biologically, in quality or extent, to such a degree that there is a decline in abundance lasting more than one generation of key species (for which the special area was designated) or a change in community structure, beyond which natural recruitment (reproduction and immigration from unaffected areas) would not sustain the population or community in the special area and would not return to its original level within one generation; or (b) result in permanent and irreversible loss of critical habitat as defined in a recovery plan or an action strategy. With the application of proposed mitigation (see Section 6) and environmental protection measures in place and implemented, residual environmental effects on special areas are not significant.

5.6 Indigenous People and Community Values

Indigenous people and community values was selected as a VC in recognition of the cultural, social, and economic importance of marine life and fishing to Indigenous peoples, the

requirements of the EIS Guidelines, and in recognition of potential or established Aboriginal and Treaty rights. As the Project Area does not intersect with any claimed Indigenous traditional territory, this VC includes consideration of social, cultural, or spiritual value to the Indigenous communities, with a focus on commercial communal fisheries and hunted migratory bird species, marine mammals, and other species (e.g., Atlantic salmon) with potential to occur or migrate through in the Study Area.

5.6.1 Existing Conditions

There are five Indigenous communities and/or governing bodies within Newfoundland and Labrador, including Miawpukek First Nation, Qalipu Mi'kmaq First Nation, Nunatukavut Community Council, Innu Nation, and Nunatsiavut Government. Indigenous communities have a long-established respect for and reliance on the resources of the land and water including fish, sea mammals, birds, and caribou.

The Miawpukek First Nation, Qalipu Mi'kmaq First Nation Band, NunatuKavut Community Council, Innu Nation, and the Nunatsiavut Government hold commercial communal fishing licences within the Study Area, including within NAFO Area 3L (D. Ball, DFO, pers. comm.). These licences are issued under *Aboriginal Communal Fishing Licences Regulations* (SOR/93-332) of the *Fisheries Act*. Although the licences are issued, the Aboriginal groups may not execute all fisheries. For example, groundfish is still under moratoria (3L cod, haddock, redfish, American plaice, witch founder, and grenadier) and the northern shrimp is closed in SFA 7, while other licences in 3L may be traded for licences off Labrador. There is no identified food, social and ceremonial (FSC) fisheries within the Study Area (D. Ball, DFO, pers. comm.). NunatuKavut Community Council, Innu Nation, and the Nunatsiavut Government hold FSC fishing licences for species that may migrate between the Project Area and the Labrador coast.

Beneficiaries of the Labrador Inuit Land Claims Agreement have treaty rights pertaining to harvesting species throughout the Labrador Inuit Settlement Area (CEA Agency 2016b). Innu Nation asserts its right to fish, hunt and gather throughout its traditional territory (CEA Agency 2016c). NunatuKavut Community Council asserts its right to fish, hunt and gather throughout its traditional territory (CEA Agency 2016d). The location of these three areas is greater than 500 km northwest of the Project Area (CEA Agency 2016b, 2016c, 2016d).

The CEA Agency identified 5 Indigenous groups in Newfoundland and Labrador, 13 groups in Nova Scotia, 16 groups in New Brunswick, 2 groups in Prince Edward Island and 5 groups in Quebec that have the potential to be affected by Project activities. Some communities hold commercial communal licences in or near the Study Area, and/or participate in FSC fisheries for species that may migrate through the Study Area.

Species harvested for commercial communal purposes in the Study Area include capelin, groundfish, herring, mackerel, seal, shrimp, snow crab, swordfish, tuna, and whelk. Commercial fishing gear used in offshore Newfoundland and Labrador are unique to the species that is being harvested except for groundfish, which typically uses a combination of stern otter trawls, mobile

or fixed gillnets, or longlines (e.g., baited hooks). Crab pots are used in the snow crab fishery and shrimp trawls for northern shrimp. Most harvesting occurs between the months of April and August, with some activity occurring year around. In addition to species commercially fished by the Newfoundland and Labrador Indigenous groups, Indigenous groups within the Maritime provinces may hold commercial communal licences within the Study Area (e.g., swordfish and tuna). Very few of the species harvested during a FSC fishery or a traditional migratory bird harvest have the potential to occur within the Husky Study Area. Harvested species that may transit through the Project and Study Areas include:

- Atlantic salmon
- American eel
- harp seal
- murres (turrs)

Salmon

North American Atlantic salmon (*Salmo salar*) breed and spend the early part of their life cycle in freshwater systems throughout Atlantic Canada, eastern Québec, and the northeastern seaboard of the United States. Salmon are an important food source for Ingenious communities. The subsistence salmon fishery in Labrador harvested an estimated 13,236 fish (39.5 t) in 2016 (Veinott et al. 2018) This is similar to the previous generation mean (2010-2015) of 14,264 salmon (38.3 t). Subsistence fishery harvests have been increasing since 2000 (DFO 2016a), and salmon harvested in Labrador subsistence fishery originate primarily in Labrador (DFO 2015c). Salmon native to rivers in Labrador typically migrate north and are therefore not likely to interact with the Project. Bradbury et al. (2016) analyzed the genetic makeup of the Labrador subsistence fishery. They found that 96% to 97% of the contributing fish were from adjacent stocks, and any stocks from Quebec or Newfoundland were rare, primarily in southern Labrador via pathways through the Strait of Belle Isle. The subsistence salmon fishery in other regions in the Atlantic are currently closed.

American Eel

The American eel (*Anguilla rostrata*) (*Katew)* is a catadromous (i.e., migrating down rivers to the sea to spawn) fish that lives primarily within freshwater and estuarine environments and has a broad distribution throughout the Northwest Atlantic Ocean, stretching from Venezuela to Greenland and Iceland (COSEWIC 2012). There is little information available on specific migration patterns of American eel, and if American eel were to occur within the Project Area, it is likely that they would be carried by currents on their way to either Greenland, Iceland, or Newfoundland and Labrador. The American eel is assessed by COSEWIC as threatened because of dramatic declines over a substantial portion of its distribution (COSEWIC 2012). Various factors have been identified as threats to the American eel including habitat loss, dams, overfishing, disease, and possibly global warming (COSEWIC 2012; UNIR 2015a; Parks Canada 2017). A relatively new threat is an exotic swim bladder nematode parasite that may also be adversely affect the eel (COSEWIC 2012; Parks Canada 2017).

Harp Seal

The Jeanne d'Arc Basin and adjacent areas overlap with regions where harp seals have been observed during January and February (Lacoste and Stenson 2000, in Husky Energy 2012). During years when pack ice extends to the Northern Grand Banks, harp seals may use the region for spring pupping, mating and moulting.

The harp seal is found throughout the North Atlantic and Arctic Ocean, from the Gulf of St. Lawrence to Russia (Jefferson et al. 2008, in Husky Energy 2012). Harp seals are the most abundant seal in the Northwest Atlantic, with an estimated population size of 8 million in 2008 (DFO 2011d, in Husky Energy 2012). The Northwest Atlantic population of harp seal summers in the eastern Canadian Arctic and Greenland and undergo an annual southward migration in the fall to Atlantic Canadian waters to birthing (whelping) locations in the Gulf of St. Lawrence or off northern Newfoundland, where they give birth on pack ice during late February or March (see Figure 4-68 in the EIS) (DFO 2016b). Dedicated at-sea surveys and data from satellite-tagged animals indicate that harp seals spend most of their time in offshore areas of southern Labrador and eastern Newfoundland during the winter (Stenson and Sjare 1997, in Husky Energy 2012; Lacoste and Stenson 2000, in Husky Energy 2012). Older seals also aggregate to moult off northeastern Newfoundland and in the northern Gulf of St. Lawrence in April and May before migrating northward (DFO 2000, in Husky Energy 2012).

This population of harp seals are hunted for commercial and subsistence purposes by Inuit in Labrador, Arctic Canada, and Greenland. Most of the approximately 80,000 subsistence animals are harvested in Greenland. A five-year (2014 to 2018) management plan regulates the commercial harvest, which removes less than 100,000 seals per year since 2009, using 12,000 licences (DFO 2016b).

Murres

Most murres harvested off the coast of Labrador north of Groswater Bay are Thick-billed Murre which breed in the Arctic and migrate either to or from breeding grounds along the coast of Labrador (S. Wilhelm, Canadian Wildlife Service (CWS), pers. comm.). Most birds are harvested during this migration. The Canadian Arctic is estimated to host 1,080,000 breeding Thick-billed Murres, of which 178,399 (16.5%) may over-winter on the Grand Banks (Frederiksen et al. 2016).

For murres harvested south of Groswater Bay, in addition to the Arctic Thick-billed Murre breeders, murres taken in a traditional harvest may originate from Common and/or Thick-billed Murre colonies in Groswater Bay and the Gannet Islands. While tracking data for birds breeding in Groswater Bay are not available (S. Wilhelm, CWS, pers. comm., 2016), tracking data of Thick-billed and Common murres from the Gannet Islands show that they primarily over-winter on the Grand Banks (McFarlane Tranquilla et al. 2014, 2015). CWS is currently studying the species composition of the migratory bird harvest along the Labrador coast, but results are not expected to be available for three to five years (R. Wells, CWS, pers. comm.).

5.6.2 Potential Environmental Effects

Routine Project activities can interact with commercial communal fisheries resources either directly or indirectly through effects on the species fished and/or fishing activity itself (e.g., through displacement from fishing areas, gear loss or damage). Although there is no known FSC fishing occurring in the Project Area, routine Project activities may interact with migratory species, including marine fish, marine mammals, and marine birds, traditionally and currently harvested by Indigenous communities at their traditional harvesting sites. While Indigenous groups have expressed an interest in all marine species and habitat, specific concerns have focused on the potential Project interaction with American eel and Atlantic salmon. Routine Project activities may also interact with migratory bird species traditionally and currently hunted by Indigenous communities. There are predicted Project interactions with migratory birds because of potential attraction to the lights and flares associated with the presence and operation of the MODU and underwater sound emissions from drilling-associated VSP surveys. Indigenous people in Labrador primarily hunt harp seals, ringed seals, and harbor seals. The harp seal is the only one of these species known to occur within the Study Area during the winter months. Although potentially present within the Project Area, no effects on the harp seal are anticipated from routine Project activities.

A change in commercial communal fisheries and/or change in current use of lands and resources for traditional purposes may occur as a result of the presence and operation of the MODU (fisheries exclusions and underwater sound effects on commercially fished species), discharge of drill muds and cuttings (effects on water and sediment quality on fisheries species), drilling-associated surveys (underwater sound potentially causing behavioural effects on fisheries species), waste management (effects on water and sediment quality on fisheries species), supply and servicing operations (underwater sound associated with vessel movement potentially causing behavioural effects on fisheries species), and well abandonment (the potential use of shaped charges and their effects on fish health and behaviour).

In addition to the effects to the commercial communal and FSC fisheries, there is potential for indirect social, cultural, and economic effects to the Indigenous communities. Revenue generated from commercial communal fishing activity is also a main source of revenue for many Indigenous communities; therefore, indirect socio-economic impacts are also qualitatively considered in this assessment. It also considers the social, spiritual, and cultural value of the FSC fishery to the Indigenous communities; however, it is difficult, if not impossible, to express the importance of this fishery as a monetary value, because it reflects the very nature of Indigenous culture. A qualitative assessment of social and cultural value is provided based on the potential impacts to the current use of lands and resources for traditional purposes.

Migratory birds (e.g., murres) may be influenced by Project activities during operations due to sound, lights, and flaring emissions from the MODU and/or OSVs; the presence of hydrocarbons and suspended solids within the water column from the discharge of drill muds and cuttings; the release of emissions and other discharges; underwater sound from geophysical surveys; and disturbance from helicopter transportation.

In consideration of the implementation of applicable mitigation measures (including mitigation measures identified for fish and fish habitat, commercial fisheries, and migratory birds; see Section 6; Table 6.1), best practices, and adherence to industry standards (e.g., compliance with OWTG and applicable C-NLOPB guidelines), the residual environmental effect on a change commercial communal fisheries and change in current use of lands and resources for traditional purposes is considered low in magnitude for Project components and activities; occur within localized areas of the Project Area; of short to medium-term in duration; reversible; and occur primarily within a disturbed ecological and socio-economic context. Associated social, cultural, and economic effects are also therefore predicted to be low from routine Project activities. Residual effects on Indigenous people and community values are not predicted to cause: (a) loss of access to areas relied on for traditional use practices or the permanent loss of traditional use areas within a large portion of the Study Area for a season; (b) adverse effects on socio-economic conditions of affected Indigenous communities, such that there are associated, detectable, and sustained decreases in the quality of life of a community; (c) a decrease in established employment and business activity in commercial communal fisheries (e.g., due to fish mortality and/or dispersion of stocks) such that there is a detectable adverse effect upon the economy of the affected Indigenous community; or (d) unmitigated damage to fishing gear. With the application of proposed mitigation (see Section 6) and environmental protection measures, the residual environmental effects on Indigenous people and community values from Project activities and components are predicted to be not significant.

5.7 Accidental Events

This section provides an overview of Husky's procedures to assess and manage the risk of accidental events and the oil spill response plan, should an incident occur. A summary of oil spill risk and probabilities is provided, as well as a description of models used to determine the fate, behaviour and trajectory of spilled oil. Also included in this chapter is an assessment of the environmental effects of accidental events on each of the VCs. Additional detail is provided in Section 7 of the EIS.

5.7.1 Spill Prevention and Response

Husky's Environmental Management System is embedded within the Husky Operational Integrity Management System (HOIMS) and is applied to all of Husky's projects and operations to manage operational integrity through the life-cycle of assets. Risk Management is Element 3 within HOIMS. The objective of this Element is to identify and manage risks by performing comprehensive risk assessments and to develop and implement plans to manage significant risks and impacts to As Low As Reasonably Practicable (ALARP) levels. Risk is managed by identifying hazards and major accident scenarios, assessing their consequences and probabilities, and evaluating and implementing prevention, detection, control and mitigation measures to ensure that residual risk levels are tolerable and are ALARP. Risk assessments are conducted to identify and address potential hazards to personnel, environment, assets, and the public. Risk assessments are performed by qualified personnel within the business unit or from specialized contractors, as necessary. A clear process is established by procedures to prioritize risks to personnel, environment,

assets, and the public to enable appropriate management of the risk. A follow-up process is in place to ensure that risk management decisions and mitigation measures are implemented. Risk assessments are documented, auditable, and appropriate for the complexity of the activity.

Husky's plans, policies and procedures are assessed against the regulations and the guidance during the review of the Operations Authorization (OA) application. An OA is required before an operator can undertake any activity in the offshore Newfoundland and Labrador jurisdiction. Approval for a drilling operation involves an OA and an Approval to Drill a Well. These applications are reviewed by the C-NLOPB's technical staff to ensure they meet all regulatory requirements. The regulatory approval process for drilling programs therefore requires a two-tier approval process.

Relevant regulatory approvals within the context of the OA include a Project-specific EA, a Certificate of Fitness, an Operator 's Declaration of Fitness, a Letter of Compliance from Transport Canada, Safety Plans, an Environmental Protection and Compliance Monitoring Plan and Contingency Plans.

Safety Plans are an important component of regulatory requirements. Operators must provide a detailed report specifying how safety-related items will be managed and mitigated. These plans include hazard identification, risk management, training and competency of personnel, details of systems and equipment (including maintenance, inspection and testing), operating procedures and processes, a Joint Occupational Health and Safety Committee (JOHSC), incident reporting and investigation, management oversight, and monitoring.

In addition to Safety Plans, a Contingency Plan is required to act as a preliminary plan of action in the event of a spill or significant incident. The contingency plan covers numerous areas of concern with respect to safety. Several of the plans covered within the scope are Offshore and Onshore Emergency Preparedness and Response Plans, Oil Spill Response Plans, Ice Management Plans and Relief Wells Plans. More information on spill prevention and response is outlined in Section 7.1 of the EIS.

5.7.2 Accidental Events Scenario

This section provides a description of the potential accidental events to be assessed within Project Area, including an oil spill (both operational batch and blowout). The primary accidental event model used for the assessment of effects from a blowout was originally presented in the WREP EA (Husky Energy 2012). The WREP EA model originates near the middle of the current Project Area, using known oil properties and reservoir parameters from the White Rose field. The modelling of the continuous releases of gas and oil from well blowouts has been completed using the gas and oil flow rates shown in Table 5.9. Further details on accidental event modelling can be found in Section 7.2 of the EIS.

Table 5.9 Spill Flow Rates and Volumes Used in Modelling

Spill Type	Source	Flow	Gas-to-Oil Flow Ratio (m^3/m^3)
Crude Oil Well Blowout (Max Flow at Start of Blow)	Subsea	6,435 m^3/day (40,476 bopd)	138
	Platform	6,435 m^3/day (40,476 bopd)	138
Batch Oil Spills	Transfer	1.6 m^3 (100 bbl)	na
	Transfer	0.16 m^3 (10 bbl)	na
	Vessel Accident	100 m^3 (630 bbl)	na
	Vessel Accident	350 m^3 (2,200 bbl)	na
Source: Husky Energy 2012b na = not applicable			

It is anticipated that certain stages of the drilling operations will involve the use of SBMs, due to their unique performance characteristics, as well as their low toxicity and relatively low environmental effects compared to oil-based muds. To characterize possible accidental SBM releases, a review was conducted of the latest scientific literature and industry spill databases from Atlantic Canada and the United States Outer Continental Shelf (OCS) to determine the most probable modes of accidental release. Four potential release spill scenarios were selected:

- Surface tank discharge
- Riser flex joint failure (two scenarios, two fall velocities)
- BOP disconnect

A dispersion study was conducted for the WREP environmental assessment to predict the potential seasonal footprints of SBM spills on the seafloor for each of the four scenarios. The maximum predicted distances from the release site are those for the winter surface dispersion scenario and the first riser flex joint scenario (high-speed jet, low fall velocity), where the maximum concentrations of the footprint were found at 1,061 and 1,008 m from the release site, respectively. For the other dispersion scenarios, the spill footprints remain within a maximum distance of 201 m (second riser flex joint scenario, high fall velocity), and 108 m (BOP disconnect scenario). The largest footprint areas were found for the first riser flex joint scenario, which had the lowest fall velocity and the longest release period of 3 h. The single largest SBM spill area in this scenario was observed in the winter season, and represented an area spanning approximately 579 m long by 40 m wide. The majority of the spill footprints were 1,800 m^2 or smaller, corresponding to spill areas measuring 30 m by 60 m.

5.7.3 Spill Risk and Probabilities

Spill frequencies are best expressed in terms of a risk exposure factor such as number of wells drilled. On a world-wide basis, approximately 35,000 exploration wells were drilled as of 2008 (LGL 2008), with approximately 7,200 exploration wells drilled between 2009 and 2016 (Oil and Gas

International 2016). Internationally, there have been two extremely large spills (>150,000 bbl) during offshore exploration drilling, resulting in a frequency of 4.7 x 10^{-5} blowouts per exploration well drilled (2/42,200). There have been four very large spills (>10,000 bbl), resulting in a frequency of 9.5 x 10^{-5} spills per exploration well drilled (4/42,200).

Small spills are the most probable spill events that could occur during a drilling program. These spills could include crude oil, hydraulic oil, SBM, diesel, diesel and formation fluids, and mixed oil. Production in Newfoundland and Labrador waters commenced in 1997 at the Hibernia location, with Terra Nova coming on stream in 2001, White Rose in 2005 and North Amethyst in 2010. The C-NLOPB data for spills in NL (from both production and exploration) begin in 1997. An overview of spill statistics from exploration platforms (MODU) for the Newfoundland and Labrador Offshore area is provided in Tables 5.10 to 5.12. These spills include spills of SBM, crude, diesel, and other hydrocarbons. Half of the 1 to 49.9 bbl spills occurred in the first three years that spills were recorded.

Table 5.10 Frequency of Exploration Platform Spills from 1 to 49.9 bbl, 50 to 99 bbl, and 99.1 to 500 bbl (Newfoundland and Labrador Waters, 1997 to 2016)

Spill Size Range	Number of Spills
1 to 49.9 bbl	14
50 to 99 bbl	1
99.1 to 500 bbl	2
As of April 27, 2016	
Source: Husky Energy 2012; C-NLOPB 2016a	

Table 5.11 Frequency of Exploration Platform Spills from 1 to 49.9 bbl, 50 to 99 bbl, and 99.1 to 500 bbl (Newfoundland and Labrador Waters, 2000 to 2016)

Spill Size Range	Number of Spills
1 to 49.9 bbl	7
50 to 99 bbl	1
99.1 to 500 bbl	2
As of April 27, 2016	
Source: Husky Energy 2012; C-NLOPB 2016a	

Table 5.12 Small and Very Small Spills during Exploration in Newfoundland and Labrador Waters, 1997 to 2016

Year	Spills Greater than 1 L and Less than 159 L (1 bbl)		Spills of 1 L and Less [1]	
	Number	Total Volume (L)	Number	Total Volume (L)
1997	1	40.0	0	0

Year	Spills Greater than 1 L and Less than 159 L (1 bbl)		Spills of 1 L and Less [1]	
	Number	Total Volume (L)	Number	Total Volume (L)
1998	1	45.0	3	1.6
1999	16	385.9	9	4.72
2000	0	0	2	1.1
2001	0	0	8	4.2
2002	0	0	19	5.2
2003	3	147.0	9	2.5
2004	0	0	30	9.0
2005	0	0	28	9.0
2006	3	16.0	27	9.2
2007	0	0	34	4.3
2008	0	0	23	3.9
2009	2	8.1	30	9.15
2010	1	2.7	15	3.42
2011	5	98.1	7	4.26
2012	0	0	4	1.004
2013	0	0	5	0.250
2014	0	0	7	3.154
2015	0	0	1	0.100
2016	1	2.0	1	1.00
Total	**33**	**744.8**	**262**	**77.058**

Source: Husky Energy 2012; C-NLOPB 2016a
Note:
1 includes all spills (exploration and production) 1 L or less

5.7.4 Spill Fate and Behaviour

At the exploration stage it is not possible to define all possible factors needed to calculate blowout rates, blowout duration and expected release volume. To calculate expected release rates and volumes one needs a specific well design and expected reservoir and fluid properties. Such detail is generally not available at the outset of an exploration program. Standard practice to assess potential release volumes for a multi-year exploration program is to compare likely field and reservoir parameters in the area to be explored to analogous areas where reservoir properties are known from previous drilling programs.

The full extent of the modelling area is illustrated in Figure 5-2. Each of the models have consistently demonstrated a tendency to disperse in a northeasterly to southern direction, regardless of point of origin. This tendency has also been predicted in the oil spill trajectory models conducted for the three recently submitted exploration drilling assessments in the region (ExxonMobil 2017; Statoil 2017; Nexen 2018).

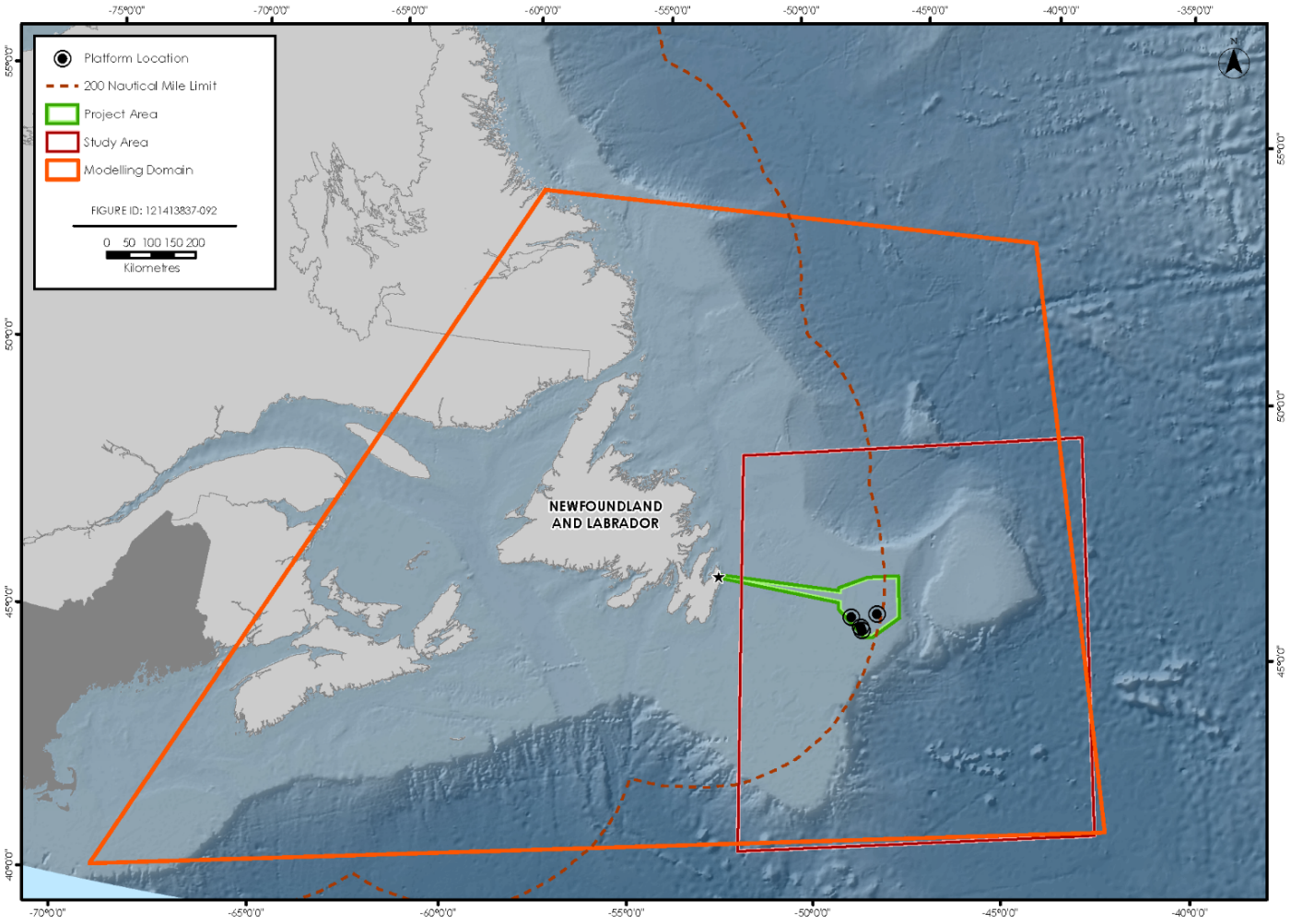

Figure 5-2 Project Area and Study Area in Relation to the White Rose Extension Project Oil Spill Modelling Domain

The primary accidental event model used for the assessment of effects from a blowout in this EIS was originally presented in the WREP EA (Husky Energy 2012). The WREP EA model originates near the middle of the current Project Area, using measured oil properties and reservoir parameters from the White Rose field. The WREP spill model used the White Rose field as the hydrocarbon release point. The centre of EL 1152 is just 45 km northwest from the modelled spill source. Shifting the spill source by a distance of only 45 km would not demonstrably affect the spill trajectories and would have no effect on the weathering behaviour of spilled oil. There would be no change in the conclusions of the modelling if the spill source were moved to an adjacent EL. Modelling for other projects in the region also predict slick trajectories to be predominantly to the east (e.g., Statoil 2017). Given the proximity and similar water depths and oceanography between the White Rose field and adjacent ELs, the model inputs would not change for a new model. As a worst-case accidental event scenario, a subsea and surface blowout rate of 40,476 bopd for 120 days was used based on reservoir data from the White Rose field. A duration of 120 days was selected as the worst-case scenario since it is the estimated time required to drill a relief well, which would be necessary only after all other attempts to shut in the well have failed. The flow rate of a surface blowout may differ from the subsurface blowout rate by type of drilling unit used, but in all cases would not exceed the subsurface rate, so the subsurface rate is a conservative worst-case. The WREP EA model uses the maximum worst case flow rate for each scenario. Oil properties were determined from lab analysis of samples from the White Rose field and used as inputs to the model. These oil property data remain the most current and relevant characteristics for modelling oil spill trajectories in adjacent ELs.

Trajectories were run for 120 days or until the oil evaporated and dispersed from the surface, or the average oil concentration on the surface dropped below 1 gram per 25 m^2. This level of contamination of highly weathered crude is considered innocuous to wildlife (French-McCay 2004). The WREP EA modelling report (SL Ross 2011) is available in Appendix E of the EIS.

Given the geographic scale and duration of a blowout scenario, the water currents used in the model are seasonal mean current fields developed by the Ocean Sciences Division, Maritimes Region (Atlas of Ocean Currents in Eastern Canadian Waters, Wu and Tang 2011) and by the Biological and Physical Oceanography Section, Northwest Atlantic Fisheries Centre (Han 2012). These water currents were combined with 3% of the average winds to determine the surface water currents influencing the initial formation and movement of the oil slicks. Water currents below the surface layer have a negligible effect on the spill model given the directional force of oil from a shallow water blowout.

The WREP EA model used 57 years of wind data, dating from 1954 to 2010. Six-hourly wind speed and direction data were extracted from the full MSC 50 data set at grid points with 0.5 degree spacing over the entire Study Area. The model results show a relatively consistent movement of the oil to the east and southeast out into the Atlantic Ocean over the 120 days. The persistent oil slicks generally travel to the east and southeast from the offshore spill site due to the prevailing winds and surface water currents.

5.7.5 Potential Environmental Effects

The potential accidental event scenarios identified above have the ability to affect fish and fish habitat, commercial fisheries, marine mammals and sea turtles, migratory birds, special areas, and the Indigenous people and community values VCs.

Although serious accidental events are considered unlikely, such an event could occur at any time of year, throughout the life of the proposed Project. Therefore, a conservative approach has been taken and the assessment considers the potential environmental effects of a credible worst-case accidental event originating within the Project Area.

5.7.5.1 Fish and Fish Habitat

A batch spill will create a temporary and reversible degradation in habitat quality; however, based on modelling, diesel spills are not likely to result in biological effects on fish (including fish SAR and SOCC) over a large area. With respect to a change in habitat quality, a portion of the diesel from a MODU or OSV spill will evaporate (the winter scenarios lose about 25% to 27% and summer discharges lose 36% to 38% to evaporation) from the surface within 13 to 37 hours in winter and 25 to 62 hours in summer, depending on initial volume spilled. A diesel fuel spill was estimated to have a slick survival time of 48 hours (SL Ross 2012). This will create a temporary and reversible degradation in habitat quality and possibly some mortality to early life stages (eggs and larvae) near the surface. Potential environmental effects on the nearshore areas are expected to be limited, given that the trajectory for a diesel spill in all seasons is away from shore (Section 7.2; see Figure 7-6 in EIS) and will dissipate within 120 hours (during the autumn and winter) and 240 hours (during spring and summer). Residual environmental effects could include localized mortality and sub-lethal effects to fish eggs, larvae, and juveniles.

With respect to a change in risk of mortality, physical injury or health, diesel is known to have immediate toxic effects on many benthic organisms (Stirling 1977; Simpson et al. 1995; Cripps and Shears 1997). Sessile and early life stages (eggs, larvae) are the most at risk given they are unable to actively avoid the diesel and/or are during sensitive life-stage development periods. Dissolved hydrocarbons from spilled diesel would be limited to the surface and mixed layer of the water column, therefore the potential risk to benthic organisms and corals and sponges is considered low. The implementation of oil spill containment and recovery operations will reduce residual effects on fish and fish habitat associated with total dissolved hydrocarbons.

Following a blowout scenario, the geographic extent of effects on change in habitat quality would extend into the Study Area. The winter zone of influence is smaller than in summer due to strong, persistent westerly winds in the winter, creating a tighter trajectory. The summer wind direction is more variable and the modelled slick moves over a wider area. Overall, a release of crude oil from the Project Area would persist and surface slicks would remain for several weeks. Just 0.04% of slicks were predicted to reach the shore between 45 to 92 days after the hydrocarbon release.

In the unlikely event of a blowout scenario, there would be a temporary decline in the abundance of phytoplankton, possibly affecting zooplankton communities in the area. Adult finfish will most likely be able to avoid exposure via temporary migration away from the area. If the spill encompasses areas where fish eggs or larvae are present in the mixed surface layer of the water column, lethal or sub-lethal effects can occur. These effects are expected to be localized, and will be temporary and reversible as the spill begins to dissipate due to mitigation (e.g., containment or recovery or dispersal; see Section 6; Table 6.1) and natural weathering processes.

In consideration of the information presented above, the predicted residual environmental effects from any of the accidental event scenarios on fish and fish habitat is likely not to result in a measurable decline in abundance or change in fish population within the Study Area, would not jeopardize the achievement of self-sustaining population objectives for listed species, or result in serious harm to fish as defined by the *Fisheries Act*. An accidental event is predicted to be reversible and is not expected to cause an adverse effect on fish and fish habitat resulting in a decrease in abundance or alteration in distribution of the population over more than one generation or so that natural recruitment would not reestablish the populations(s) to baseline conditions within several generations. Significant residual effects from a spill are therefore considered unlikely. Husky will adhere to safety and risk management systems, management of change procedures and global standards. This includes the implementation of spill prevention that will be incorporated into the design and operations for all Project activities as part of contingency planning for each well.

5.7.5.2 Commercial Fisheries

Accidental events that might affect commercial fisheries in Study Area are mostly related to the unplanned release of hydrocarbons, whether refined or crude product. The EIS concludes that biophysical effects on fish from a batch spill or blowout will be not significant. However, a change in availability of fisheries resources including economic impacts might still occur if a spill prevented or impeded a harvester's ability to access fishing grounds (because of areas temporarily closed to fishing during the spill or spill clean-up), caused damage to fishing gear (through oiling), or resulted in a negative effect on the marketability of fish products (because of market perception resulting in lower prices).

Modelling results for the WREP indicate that diesel batch spill from the MODU are not likely to result in effects on fish over a large area, and therefore potential effects on a change of availability of fishery resources is unlikely. Potential environmental effects from a diesel spill in the nearshore areas from an OSV spill are expected to be limited, and not expected to impact the shoreline (Section 7.2; see Figure 7-6 in EIS) and will dissipate within 120 hours (during the autumn and winter) and 240 hours (during spring and summer). In the case of a diesel spill, this risk of exposure and subsequent contamination could be greater where there could be a higher density of fisheries resources, especially to pelagic species. Diesel fuel is considered to result in a moderate to high risk of seafood contamination given the relatively high content of water-soluble aromatic hydrocarbons (Yender et al. 2002). However, because of the high evaporation rates (see Section

7.2 of the EIS), exposure of fisheries resources to the diesel would be short-term, thereby reducing risk of contamination of fisheries resources.

In the case of an unmitigated subsea or surface blowout, a slick could reach an active fishing area. In such a scenario, it is likely that fishing would be halted because of the possibility of fouling gear. If the release site is some distance from snow crab fishing grounds, there would be time to notify fishers of the occurrence and prevent the setting or hauling of gear and thus prevent or reduce gear damage.

Fishery closure in the spill area would be expected to be short-term, as typical sea and wind conditions in the Project Area would promote evaporation and weathering of the slick, and fishing vessels would likely be able to return once the spill has ended (e.g., potentially within several days for a batch spill, or longer for a blowout). A crude oil blowout of 3,963 to 6,435 m^3/day would have a slick survival time of more than 30 days; a subsea blowout would have a thinner, but wider slick (up to 2.8 km) than a surface blowout (up to 3.4 mm thick and 160 m wide) (SL Ross 2012). If fishers had to cease fishing, harvesting might be disrupted (though, depending on the extent of the slick, alternative fishing grounds might be available in a nearby area). An interruption could result in reduced catches, or extra costs associated with relocating set gear.

Effects due to market perceptions of poor product quality (no buyers or reduced prices) are more difficult to predict, since the actual (physical) effects of the spill might have little to do with these perceptions. It would only be possible to quantify these effects by monitoring the situation if a spill were to occur and if it were to reach harvesting areas.

In consideration of the information presented above, the predicted residual environmental effects from a diesel batch spill on commercial fisheries is not significant, where local fishers are unlikely to be displaced or unable to use portions of the areas currently commercially fished for all or most of a fishing season; experience a change in the availability of fisheries resources (e.g., fish mortality and/or dispersion of stocks) so that resources cannot continue to be used at current levels within the Study Area for more than one fishing season; or unmitigated damage to fishing gear. A small spill offshore is unlikely to measurably affect fisheries occurring outside the Project Area.

Given the extensive nature of the worst-case, unmitigated blowout event, a significant effect is conservatively predicted for commercial fisheries for this scenario. The likelihood of this significant effect occurring is considered low, given the very low potential for a blowout to occur (see Section 7.2 of the EIS) and given the response measures that would be in place to mitigate potential effects. Husky will adhere to safety and risk management systems, management of change procedures, and global standards. This includes the implementation of spill prevention that will be incorporated into the design and operations for all Project activities as part of contingency planning. Spill response planning is described in detail in Section 7.1 of the EIS.

5.7.5.3 Marine Mammals and Sea Turtles

All the accidental events scenarios described above have potential to result in a change in risk of mortality or physical injury and change in habitat quality and use for marine mammals and sea turtles. In the unlikely event of a large oil spill in the Study Area, marine mammals and sea turtles could be adversely affected, particularly by oil fouling and ingestion with water, contaminated food, or absorbed through the respiratory tract. The extent of the potential effects on marine mammals and sea turtles depends on level of exposure to the toxic components of the oil.

Modelling results indicate that diesel spills from the MODU or OSV (on the offshore or nearshore) are not likely to result in biological effects over a large area. A diesel fuel spill was estimated to have a slick survival time of 13 to 37 hours in winter and 25 to 62 hours in summer (SL Ross 2012) and would thus have reduced effects on marine mammals and sea turtles compared to a crude oil spill. Potential environmental effects from a diesel spill in the nearshore areas are expected to be limited, and not expected to impact the shoreline (Section 7.2; see Figure 7-6 in EIS). With respect to a change in habitat quality and use for marine mammals and sea turtles, a diesel spill from either the MODU or OSV (either offshore or nearshore) will create a temporary and reversible degradation in habitat quality. These effects would be short-term in duration until the slick evaporates and disperses and is not expected to create permanent or irreversible changes to habitat quality and use.

With respect to change in risk of mortality or physical injury, the accidental release of diesel fuel has the potential to affect various physical and internal functions of marine mammals and sea turtles (Geraci and St. Aubin 1990). Diesel fuel would disperse faster than crude oil, limiting the potential for surface exposure, although there would be increased toxicity associated with this hydrocarbon and risk of inhalation of toxic fumes is present for either type of spill (crude oil or diesel). It is probable that only a small proportion of a species population would be within the area affected by the spill. Given the information listed above, marine mammals and sea turtles are not considered to be at high risk from a diesel spill.

A blowout incident has potential to result in a change in risk of mortality or physical injury and change in habitat quality and use for marine mammals and sea turtles. The extent of the potential effects depends on how the spill trajectory and marine mammals and sea turtles overlap in space and in time.

A crude oil blowout of 3,963 to 6,435 m³/day would have a slick survival time of more than 30 days; a subsea blowout would have a thinner, but wider slick (up to 2.8 km) than a surface blowout (up to 3.4 mm thick and 160 m wide) (SL Ross 2012). The spill would most likely be dispersed to a southerly to northeasterly direction, away from the shore. According to the spill modelling (SL Ross 2012), oil is highly unlikely to reach the shore if a spill occurs in the Project Area. The probability of a crude oil spill reaching shore was zero for December through February and April through September, and less than 1% for March, October, and November (SL Ross 2012).

Marine mammals and sea turtles exposed to heavy doses of hydrocarbons for prolonged periods could experience mortality. Chronic exposure to hydrocarbons, either through surface contact or ingestion, may occur in cetaceans, seals, and sea turtles. Hydrocarbon toxicity could result in physiological damage, such as lesions and effects on blood and enzyme chemistry.

There is potential for a change in habitat quality and use as a hydrocarbon spill may indirectly reduce the amount of habitat available to marine mammals or sea turtles by rendering it temporarily unsuitable for foraging and other activities. Since oil is not expected to reach the shore if a spill occurs in the Project Area, hauled out seals are not expected to be affected.

For marine mammals and sea turtles, it is probable that only small proportions of populations are at risk at any one time in the Study Area. Oil spill prevention measures, along with typical oil spill countermeasures (refer to Section 7.1 of the EIS) will reduce the number of animals exposed to oil.

In consideration of the present knowledge of Jeanne d'Arc Basin and Flemish Pass, the modelling exercises, and on past monitoring experience with large spills (e.g., Deepwater Horizon, *Exxon Valdez*, Arrow and others), the predicted residual environmental effects from any of the accidental event scenarios on marine mammals and sea turtles are not likely to be significant (i.e., not predicted to cause a decline in abundance or change in distribution of marine mammal or sea turtle populations within the Study Area, jeopardizes the achievement of self-sustaining population objectives or recovery goals for listed SARA species, or results in permanent and irreversible loss of critical habitat).

Depending on the time of year, location of animals within the affected area, and type of oil spill, the effects of an offshore oil release on the health of marine mammals and sea turtles are not expected to cause a decline in abundance or change in distribution of marine mammal or sea turtle populations within the Study Area; or jeopardize the achievement of self-sustaining population objectives for listed SARA species. Residual adverse effects from a spill are therefore not considered likely.

5.7.5.4 Migratory Birds

All of the identified accidental event scenarios (i.e., diesel batch spill, and blowout incident) can result in a change in risk of mortality or physical injury and change in habitat quality and use for migratory birds. Migratory birds are the most visible and among the first species affected by oil spills. Diving species such as black guillemot, murres, Atlantic puffin, dovekie, eiders, long-tailed duck, scoters, red-breasted merganser, and loons are considered to be the most susceptible to the immediate effects of surface slicks (Leighton et al. 1985; Chardine 1995; Wiese and Ryan 1999; Irons et al. 2000). A change in risk of mortality or physical injury can occur through: oiling of feathers, which can result in death from a combination of heat loss, starvation, and drowning; exposure of eggs from oiled birds returning to nests, causing high mortality of embryos; or ingestion of oil as a result of preening.

Diesel spill modelling within the Project Area indicates that a batch spill was estimated to have a slick survival time of 48 hours (SL Ross 2012) and would thus have reduced effects on migratory birds compared to a large-scale crude oil spill. Potential environmental effects from a diesel spill in the nearshore areas are expected to be limited, and not expected to impact the shoreline (Section 7.2; see Figure 7-6 in EIS) and will dissipate within 120 hours (during the autumn and winter) and 240 hours (during spring and summer). A batch spill will result in a temporary and reversible degradation in habitat quality. Depending on the location and extent of the spill, it could directly and indirectly reduce the amount of habitat available to migrating birds at sea; however, effects would be short-term in duration until the slick evaporates and disperses.

A crude oil blowout of 3,963 to 6,435 m³/day over 120 days would have a slick survival time of more than 30 days; a subsea blowout would have a thinner, but wider slick (up to 2.8 km) than a surface blowout (up to 3.4 mm thick and 160 m wide) (SL Ross 2012). The spill would most likely be dispersed to a northeasterly to southern direction, away from the shore. Oil is highly unlikely to reach the shore if a spill occurs in the Study Area. The probability of a crude oil spill reaching shore was zero for December through February and April through September, and less than 1% for March, October, and November (SL Ross 2012).

The presence of hydrocarbons may temporarily affect habitat quality for birds. Prey availability may be reduced and/or migratory birds may react by avoidance of affected habitat. Sublethal effects of hydrocarbons ingested by migratory birds may affect their reproductive rates or survival rates. Sublethal effects may persist for several years, depending upon generation times of affected species and the persistence of any spilled hydrocarbons.

Regarding a change in risk of mortality or physical injury, a spill may affect migratory birds through direct contact; however, it is predicted that the number of birds affected would be restricted given the short time and small area where the diesel would be on the water's surface. Exposure to hydrocarbons frequently leads to hypothermia and death of affected migratory birds. Although some may survive these immediate effects, long-term physiological changes may eventually result in death. Adult birds foraging offshore to provision their young may become oiled and bring hydrocarbons on their plumage back to the nest to contaminate their eggs or nestlings, causing embryo or nestling mortality. However, in the remote possibility that hydrocarbons released at the MODU through an unmitigated blowout or from a vessel spill reached the exposed coast, a slick would likely be rapidly weathered and dispersed on the high energy, rocky coastline.

A subsea blowout in July would have the greatest effect on shearwaters, storm-petrels, and murres with up to 49,000 birds affected, representing 0.3%, 0.2%, and 0.04% of the target populations, respectively. Dispersants (either applied to the surface slick or injected subsea) would reduce the number affected to 9,000 birds affected, representing 0.06%, 0.04%, and <0.01% of the target populations, respectively. A subsea blowout in January would have the greatest risks both in terms of numbers and proportion of the population murres (0.3%), dovekies (0.6%), and fulmars (0.8%). A surface application of dispersants would reduce the potential effect to 0.08% (murres) and 0.2% (dovekies and fulmars). While surface dispersant operations may not be 100% effective, subsea injection of dispersants can be expected to be more effective. Even if dispersant operations are

only 50% to 70% effective, they will reduce the anticipated large impact on birds by 50% to 70% (SL Ross and LGL Limited 2013 (draft)).

Based on the information above, Infrequent batch spills would be not significant for migratory birds. A precautionary conclusion is drawn that the residual adverse environmental effect of a blowout incident is predicted to be significant for migratory birds (i.e., could cause a decline in abundance or change in distribution of migratory birds within the Study Area); however, these effects are considered to be unlikely given the low probability of such an event. These environmental effects are predicted to be reversible at the population level.

5.7.5.5 Special Areas

The nature and extent of the effects of an accidental event on habitat quality of special areas varies considerably depending on the type and magnitude of event, the proximity to the special area, the time of year, and the ecological importance of the area. All the accidental scenarios identified above, including batch spills from the MODU and vessel and a subsea and surface blowout, can interact with special areas, resulting in a change in habitat quality. Potential adverse effects on special areas may degrade the ecological components of the area for which it is valued and thus designated (e.g., protection of commercially important or sensitive species).

Due to the limited and temporary nature of any surface oiling because of a batch spill (either in the offshore or nearshore area), it is not expected to result in permanent alteration or destruction of habitat quality for special areas within the Study Area. Of particular concern for special areas is the potential effect on coral conservation areas. Following the Deepwater Horizon incident, healthy coral communities were observed at all sites more than 20 km from the spill site; however, at one site, coral was found to exhibit signs of physiological stress, including tissue loss, sclerite enlargement, excess mucous production and bleached ophiuroids (commensal species), and were covered by brown flocculent material. Any decline in productivity is not expected to be at a level beyond which natural recruitment would not return to the population to former levels within several generations. The effects would most likely be on habitat quality for other species such as fish, marine mammals and sea turtles, and migratory birds that may use these special areas. As migratory birds are vulnerable to oiling from even thin sheens, a small spill could still result in a measurable effect depending on the location, time of year, and if there are a large number of seabirds aggregating in the area.

A blowout scenario has the greatest potential for environmental effects to special areas, with the level of effect dependent on the duration and volume of spill, as well as the environmental conditions at the time of the spill. With the exception of the special areas located within the Project Area (Northeast Slope and Shelf EBSA, Flemish Pass/Eastern Canyon Closure Zone, and the Beothuk Knoll VME), most trajectory modelling has resulted in low probabilities of an oil spill interacting with special areas located outside of the Project Area. As oil spill modelling predicts oil slicks to move in a southeast direction, the special areas most vulnerable are those that are located in a southeast direction from the Project Area (i.e., Beothuk Knoll).

The residual environmental effect of a change in habitat quality for special areas for a surface or subsea blowout, and batch spill scenarios is predicted to be not significant. In the highly unlikely event of a large spill offshore, spill modelling predicts that the dispersed oil will have a low to moderate chance of interacting with special areas. But in no case is it predicted that the special areas would be affected on a permanent basis, nor is it predicted that the resident species would be affected in such a way that natural recruitment is unable to return the population or community to its former level.

5.7.5.6 Indigenous People and Community Values

An accidental event such as a spill or blowout has the potential to affect the commercial communal fisheries and current use of lands and resources for traditional purposes through the effects of a spill on resources currently harvested for traditional purposes in the Study Area (i.e., commercial communal fisheries, harp seal, and migratory bird species). An accidental event could affect the fisheries resource (direct or indirect effects on fished species affecting fisheries success), and fishing activity (displacement from fishing areas, gear loss or damage), as well as a change in risk of mortality or physical injury for migratory birds, and/or change in habitat quality and use for marine mammals resulting in a change in traditional use. The indirect effects to socio-economic conditions are also considered in this assessment, including the socio-economic impacts to the Indigenous communities due to effects on commercial communal and FSC fishing. As with all commercial fishery licence holders, a large-scale spill could have an adverse effect on Indigenous fisheries.

Modelling indicates that smaller scale diesel batch spills are not likely to result in effects on fish over a large area (described in Section 7.2), nor is there expected to be any shoreline contact from a nearshore spill (Section 7.2; see Figure 7-6 in EIS). Diesel will dissipate within 120 hours (during the autumn and winter) and 240 hours (during spring and summer); therefore, potential effects on a change in commercial communal fishing resources is unlikely. A commercial communal fisheries licence for NAFO division 3L extends to the shoreline of Newfoundland; therefore, in the case of a nearshore OSV diesel spill, this risk of exposure and subsequent contamination of a commercial fishery is possible. However, in the unlikely event of a diesel spill from an OSV, evaporation rates would be high, the exposure of fisheries resources to the diesel would be short-term, and the resulting risk of contamination of commercial fisheries resources would be low.

In the case of a subsea or surface blowout, a slick would likely reach an active commercial communal fishing area, resulting in the closure of current fisheries in the area. The licence holders will be affected by loss of income, fouling of gear within the spill and possibly increased cost associated with having to relocate harvesting effort. During recent engagement, the importance of the commercial communal fishery was emphasized by the communities as being culturally important, beyond the economics of financially supporting the community. For some Indigenous communities the fishery is one of its primary contributors to sole source revenue, providing important gap funding for many community programs. It is the perception from the communities, that in the event of a blowout, there would be an adverse effect to the commercial communal fishery, with impacts to the quality of life within Indigenous communities.

In the very unlikely event of a very large oil spill (9.5×10^{-5} per exploration well drilled), there is a possibility of salmon being exposed to hydrocarbons if they happen to be migrating through the area of the spill and make no effort to avoid the hydrocarbons. Based on the available data on the number of salmon potentially migrating through the area and their migration routes and the low probability of a large-scale oil spill, the probability that Atlantic salmon would be affected is very low.

Of the migratory bird species hunted by Indigenous communities, the murre is the only species hunted by Indigenous people that is known to occur in the Study Area and potentially affected by an accidental event. A change in risk of mortality or physical injury for migratory birds exposed to hydrocarbons can occur through three main pathways: external exposure to oil (resulting in coating of oil on feathers); inhalation of particulate oil and volatile hydrocarbons; and ingestion of oil (see Section 5.7.5.4 for additional detail). Diving species (such as murres) the most susceptible to the immediate effects of surface slicks (Leighton et al. 1985; Chardine 1995; Wiese and Ryan 1999; Irons et al. 2000). As described Section 5.7.5.4, a batch spill will result in a temporary and reversible degradation in habitat quality on migratory birds and the resulting risk to traditionally harvested migratory birds is low. A large-scale spill associated with an unmitigated blowout is predicted to have a significant adverse effect on migratory birds. The potential effect on traditionally harvested bird species will depend on the presence of the species during the time and location of the spill, although it is considered to be unlikely given the low probability of such a spill and interaction with the harvested species. Additional details on potential effects of a batch spill or blowout on migratory birds is provided in Section 5.7.5.4 of this document and Section 7.3.4 of the EIS.

Indigenous communities are also known to hunt seals; in particular, the harp seal is known to be hunted by indigenous people and occurs within the Study and Project Areas. All the accidental events scenarios described above (Section 5.7.2), and in Section 7.2 of the EIS, could potentially result in a change in risk of mortality or physical injury and change in habitat quality and use for marine mammals. In the unlikely event of an oil spill in the Project Area, marine mammals, including the harp seal, could be adversely affected. With respect to a change in habitat quality and use for harp seal, most diesel from a spill from either the MODU or OSV will create a temporary and reversible degradation in habitat quality. As described in Section 5.7.5.3, these effects would be short-term until the slick evaporates and dissipates and is not expected to create permanent or irreversible changes to habitat quality and use. With respect to change in risk of mortality or physical injury, the accidental release of diesel fuel has potential to adversely affect harp seal. However, diesel fuel would evaporate and disperse faster than crude oil, limiting the potential for surface exposure, although there would be increased toxicity associated with the risk of inhalation of toxic fumes and ingestion. In terms of traditionally harvested species that may migrate through the area affected by a spill, only a small proportion of the harp seal population would be at risk from a diesel spill. A blowout incident has the potential to result in a change in risk of mortality or physical injury and change in habitat quality and use for harp seal. The extent of the potential effects will depend on the spill trajectory and overlap with an individual harp seal. Harp seal are not considered to be at high risk from the effects of oil exposure; but harp seal pups may succumb to exposure if oiled during the spring. Adult harp seals are only present during the winter. With a

population estimate of 7 to 9 million, there is little chance of a population level effect on harp seals.

The FSC fishery has also been identified as being culturally important. Although traditional food may currently be a small portion of the community's diet, some community members face food insecurity and traditional food is highly important to their diet (BP 2017). It is the perception from the communities that in the event of a blowout, there would be an adverse effect to the FSC fishery, with effects to the quality of life within the communities.

In summary, in the event of a diesel spill (either in the offshore or nearshore area), adverse environmental effects are predicted to be not significant for Indigenous people and community values. Commercial communal fisheries will not be displaced from the areas traditionally or currently fished for all or most of a fishing season and migratory species harvesting activities will not be widely affected. However, given of the widespread nature of the worst-case, unmitigated blowout incident, a significant effect is conservatively predicted for Indigenous people and community values, based on the closure of commercial fisheries in the area. The likelihood of this significant effect occurring is considered low, given the very low potential for a blowout incident to occur and the response measures that would be in place to mitigate potential effects. Husky will adhere to safety and risk management systems, management of change procedures and global standards. This includes the implementation of spill prevention that will be incorporated into the design and operations for all Project activities as part of contingency planning.

5.8 Effects of the Environment on the Project

5.8.1 Environmental Considerations

Elements of the environment that may affect the Project include:

- marine geology (sediment and seafloor stability; landslides)
- atmospheric and physical oceanography environment (extreme weather conditions; visibility; and seismic events and tsunamis)
- sea ice and icebergs

Slope instability, seismicity, sediment loading, venting of shallow gas, gas hydrates, seabed instabilities, and ice scour are common offshore geohazards. Avoidance of geohazards associated with sediment and seafloor instability is critical to the success of drilling programs and to reduce the risk of accidental events. Sediment and seafloor instability could cause damage to, or failure of, essential Project components/infrastructure such as the drill string, wellhead, and/or BOP.

Extreme wind and waves have the potential to increase stress on surfaces, superstructures and vessels and disrupt scheduling of marine operations. High wind and wave conditions could delay loading and offloading of cargo to the MODU, or the operation of the MODU itself or in the unlikely

event of a spill, it could also potentially affect spill response operations, including the availability and effectiveness of response methods.

Environmental conditions resulting in poor visibility (i.e., fog, mist, drizzle, freezing rain and snow) can hinder offshore supply vessel and helicopter transportation, potentially resulting in delay of supply and personnel movement to and from the MODU. Poor visibility can also increase the risk of an accidental event (e.g., a vessel or helicopter collision potentially resulting in a spill).

A seismic event could disrupt Project activities and increase the risk of potential accidental events (e.g., spills) and could also contribute to sediment and seafloor instability.

The accumulation of ice on a ship's superstructure can raise the centre of gravity, lower vessel speed, and cause difficulty in maneuvering. It can also create problems with cargo handling equipment. Superstructure icing can cause delays because operations are slowed or suspended to remove or avoid ice accumulations.

Icebergs and sea ice are hazards to navigation that can hinder offshore supply vessel transportation, potentially resulting in delay of supply and personnel movement to and from the MODU. The MODU can also be affected by icebergs. For example, drill rigs have been taken off site to avoid being struck by an iceberg, should alternative ice management strategies fail. Sea ice and icebergs can also increase the risk of an accidental event (e.g., a vessel collision potentially resulting in a spill).

Additional details on environmental considerations and potential effects to the Project is described in Section 8.2 of the EIS.

5.8.2 Mitigation

Mitigation for potential effects of the environment on the Project is described in Section 8.3 of the EIS. The primary means of mitigating effects of the environment upon project operations is through adherence to certification standards to ensure all assets are fit for purpose. All engineering design adheres to national/international standards. These standards document the proper engineering design for site-specific normal and extreme physical environmental conditions and provide design criteria that the regulatory agencies consider satisfactory for withstanding the potential physical environmental conditions.

As part of the C-NLOPB authorizations required to conduct the drilling program, and in accordance with the *Newfoundland Offshore Certificate of Fitness Regulations,* Husky will obtain a Certificate of Fitness from an independent third party Certifying Authority for the MODU prior to commencement of drilling operations. The Certifying Authority reviews installations to confirm they are fit for purpose, function as intended, can be operated safely without polluting the environment, and meet the requirements of the regulations. The regulations require that all offshore installations are designed, constructed, transported, and installed or established in accordance with Parts I to III of the *Newfoundland Offshore Petroleum Installations Regulations,*

which stipulate that every installation and every component of an installation shall be designed in accordance with good engineering practice.

Part II of the *Newfoundland Offshore Petroleum Installations Regulations* also requires that the design of an installation be based on analyses, model tests, and/or simulations to determine the behaviour of the installation, and of the soils that support the installation or anchoring systems, under all foreseeable transportation, installation and operating conditions. The Certificate of Fitness provides third party verification that the MODU has been properly designed to operate safely within the wide range of environmental conditions known to occur in the Project Area.

5.8.3 Residual Effects Summary

The key environmental factors that may affect the Project include reduced visibility, high winds and waves, sea ice and icebergs, and sediment and seafloor instability. However, engineering design, operational standards and procedures, geohazard assessments, and other mitigation measures discussed above will reduce the potential adverse effects on, and risks to, the Project.

Husky will only hire MODUs fit for purpose and ensure they have appropriate certificates of fitness. Potential effects from seismic events and tsunamis are unlikely given their low probabilities of occurrence, the distance offshore and water depths at which Project activities and components will be located, the limited duration of offshore activities (i.e., approximately 80 days to drill each individual well (up to 10 wells) between 2019 and 2027), and the absence of fixed offshore infrastructure for the Project. Fog, extreme weather conditions, and superstructure icing are also unlikely to adversely affect the Project given that the MODU is/will be designed for harsh weather conditions, meteorological conditions are monitored, and stop-work procedures are implemented should conditions become unsafe.

With the implementation of appropriate engineering, environmental design standards, and operational procedures; and adherence to the Offshore Physical Environment Guidelines (NEB et al. 2008), the adverse residual effects of the physical environment on the Project are not predicted to cause damage to Project infrastructure resulting in harm to Project workers or the public or cause damage to Project infrastructure such that the well has to be temporarily abandoned in order to conduct repairs and/or damage resulting in repairs that cannot be technically or economically implemented. Therefore, residual adverse effects are predicted to be not significant.

5.9 Cumulative Environmental Effects

Projects and activities identified as having potential to act in combination with the Project to result in cumulative environmental effects were evaluated in the context of each VC. These include consideration of: current offshore oil and gas development projects in offshore Newfoundland and Labrador; commercial fishing activity; other ocean users (e.g., shipping, marine research, military operations); and other proposed or active seismic survey projects in offshore Newfoundland and Labrador.

The residual environmental effects of the Project on each VC (i.e., fish and fish habitat, commercial fisheries, marine mammals and sea turtles, migratory birds, special areas, and Indigenous peoples and community values) could overlap temporally with the residual environmental effects of each past, present, and future (i.e., certain or reasonably foreseeable) physical activities identified. Exploration activities by other operators in offshore Newfoundland and Labrador, such as Statoil Canada Ltd and ExxonMobil Canada Ltd., are planned to occur within a similar temporal scope of the Project (2018 to 2028, and 2018 to 2030, respectively). These projects involve similar activities as those associated with the Project, and the residual environmental effects from those projects could overlap temporally with the Project. Geophysical programs identified to either currently being conducted or scheduled to conduct in the future are proposed to be carried out at least partially in the temporal scope of 2019 to 2027. Residual environmental effects from these activities have the potential to overlap with residual environmental effects from the Project. Other activities such as commercial fishing and other ocean uses have been conducted in offshore Newfoundland and Labrador for decades and will continue in the foreseeable future. As a result, residual environmental effects from commercial fishing activities and other ocean uses are expected to temporally overlap with residual environmental effects from the Project.

Spatially, the residual environmental effects from routine Project activities on each VC are expected to be limited to within the Project Area. Based on reviews of seismic and geophysical programs identified as occurring or will occur partially in the same temporal scope as the Project, residual environmental effects from these surveys are predicted to spatially overlap with residual environmental effects from the Project. Offshore exploration and production activities are predicted to occur within the temporal scope of the Project and there will be some spatial overlap, including the locations of all current and planned production fields located within the Project Area, and EL 1135 of ExxonMobil being partially located within the Project Area. Project-related effects are expected to spatially overlap with effects from other oil and gas exploration and production activities on the selected VCs.

Even for projects not expected to spatially overlap with the Project Area, such as Statoil, certain VCs may nonetheless be affected by sequential exposure to the residual environmental effects of the Project and offshore exploration drilling and production projects in the Study Area. The life cycles of several species of fish, marine mammals, sea turtles, and migratory birds include long-distance movement within the Study Area, and there is potential for individuals of these species to be affected by the combined residual environmental effects of the Project and other offshore exploration drilling and production projects (i.e., the same individuals may be exposed to the residual environmental effects of multiple physical activities during the course of their migrations within the Study Area). Because the customary fishing grounds of any given commercial fisher may encompass a broad area or include multiple areas, there is potential for some fishers to be adversely affected by the combined residual environmental effects of the Project and fisheries and other ocean users (i.e., the same fishers may be exposed to the residual environmental effects of multiple physical activities during the course of their harvesting activities within the Study Area). Other ocean use is similar, in that it can occur anywhere in the Project or Study Areas, outside of the minimum 500 m exclusion zone around a MODU. Activities associated with other ocean users

have potential to occur anywhere else in the Project Area. Residual environmental effects related to underwater sound, emissions of artificial night lighting, and operational discharges originating from the vessels of other ocean users in proximity to the Project Area also have potential to interact cumulatively with the residual environmental effects of the Project on marine species.

According to the CEA Agency's Operational Policy Statement, Assessing Cumulative Environmental Effects Under the *Canadian Environmental Assessment Act, 2012*, "the environmental effects of accidents and malfunctions must be considered in the assessment of cumulative environmental effects if they are likely to result from the designated project in combination with other physical activities that have been or will be carried out" (CEA Agency 2015).

Accidental event scenarios described in Section 5.7.2 of this summary and Section 7 of the EIS are considered unlikely to occur, with small batch spills being most likely. While small spills could cause residual environmental effects to various VCs, it would be unlikely to interact with residual environmental effects of discharges from seismic or geophysical programs, other offshore exploration or production activities, commercial fisheries, and other ocean users in such a way that would cause a cumulative environmental effect. The potential of residual environmental effects from a small spill to enhance or interact with the residual environmental effects of other physical activities in the Project or Study Area is not considered a likely scenario.

In summary, residual effects from the Project as well as from other third party physical activities could combine to result in cumulative adverse effects including changes in risk of mortality or physical injury and/or a change in habitat quality and use for marine fish, migratory birds, marine mammals, and sea turtles. Given the generally low magnitude and temporary nature of Project residual effects, the Project's contribution to cumulative adverse effects is low. It is concluded therefore that no additional mitigation measures beyond those in place to mitigate the Project's direct effects are needed to address potential cumulative effects on marine fish, migratory birds, marine mammals, and sea turtles.

Cumulative effects on availability of fisheries resources and traditional use will also be of low magnitude given the nature of residual effects (e.g., small safety/exclusion zone) and ongoing communications with commercial fishers to reduce the Project's contribution to adverse cumulative effects. Therefore, no additional mitigation measures beyond those in place to mitigate the Project's direct effects are considered necessary to address potential cumulative effects.

6.0 MITIGATION MEASURES AND COMMITMENTS

Husky has committed to undertake various mitigation activities to reduce potential adverse environmental effects. Most potential and cumulative environmental effects will be addressed by mitigation measures for each VC. Design features and mitigation measures have been incorporated into the Project to prevent or reduce potential environmental effects. A summary of these mitigation measures is provided in Table 6.1.

Table 6.1 Summary of Commitments

No.	Proponent Commitments	EIS Section Reference
General		
1	Husky will continue to engage Indigenous and commercial fishers on an ongoing basis to share Project details as applicable and facilitate coordination of information sharing.	6.2.10.2 6.6.10.2
2	Any Project-related damage to fishing gear will be compensated in accordance with the Compensation Guidelines Respecting Damages Relating to Offshore Petroleum Activity (C-NLOPB and CNSOPB 2017). Husky has a gear/vessel damage compensation program, to promptly settle claims for loss and/or damage that may be caused by Project-related activities such as drilling-associated surveys or OSV operations. The scope of the compensation program includes replacement costs for lost or damaged gear and any additional financial loss that is demonstrated to be associated with the incident. Procedures are in place so that any incidents of contact with fishing gear are clearly detected and documented (e.g., time, location of contact, loss of contact, and description of any identifying markings observed on affected gear).	6.2.10.2 6.6.10.2
3	The primary means of mitigating effects of the environment on the Project is through detailed engineering design and sound planning, including testing (and treatment, if necessary). All engineering design will adhere to national/ international standards.	8.3.1
4	As part of the C-NLOPB authorizations required to conduct the drilling program, and in accordance with the *Newfoundland Offshore Certificate of Fitness Regulations*, Husky will obtain a Certificate of Fitness from an independent third party Certifying Authority for the MODU prior to commencement of drilling operations.	8.3.1
5	Husky will conduct analyses, model tests and/or simulations to determine the behaviour of the soils that support the installation or anchoring systems, under all foreseeable installation and operating conditions, in order to receive a Certificate of Fitness in accordance with the *Newfoundland Offshore Certificate of Fitness Regulations* should a jack-up or anchored MODU be selected.	8.3.1 8.3.2
6	Follow ice management plan as outlined in Section 8.3.3 of the EIS, including, detection, monitoring and assessment, and physical management.	8.3.3

No.	Proponent Commitments	EIS Section Reference
Presence and Operation of the MODU		
7	A safety zone will be established typically extending to 500 m beyond the outermost physical footprint of a DP MODU or jack-up rig, or 50 m around the anchors for a semi-submersible.	2.5.2
8	Lighting on the MODU is designed to comply with requirements stipulated in the *Petroleum Occupational Safety and Health Regulations* to provide safe operations. There is no extraneous lighting. All lighting except navigational lighting is pointed downward.	6.1.10.2 6.4.10.2
9	Once the type of MODU is selected, Husky will provide details of the safety (exclusion) zone to the Marine Communication and Traffic Services for broadcasting and publishing in the Notices to Shipping and Notices to Mariners. The operator will publish a Canadian Coast Guard "Notice to Mariners" and a "Notice to Fishers" via the CBC (Canadian Broadcasting Corporation) Radio Program Fisheries Broadcast.	6.2.10.2 6.6.10.2
10	The frequency and duration of flaring events will continue to be restricted to the amount necessary to characterize the well potential (DST) and as required to maintain safe operations. Flaring will occur in accordance with the Drilling and Production Guidelines (C-NLOPB and CNSOPB 2017), which requires a DST not begin at night. A high-pressure spray of seawater between the MODU and the flare is routinely used as a heat dissipating curtain, which will also act as a deterrent to seabirds in the area.	6.4.10.2
11	Routine checks for stranded birds will continue to be conducted on the MODU and OSVs and appropriate procedures for release will be implemented. If stranded birds are found during inspections, they will be handled using the protocol outlined in Best Practices for Stranded Birds Encountered Offshore Atlantic Canada (Environment Canada 2015) and the Leach's Storm Petrel: General Information and Handling Instructions (Williams and Chardine 1999), including obtaining the associated permit from CWS. Activities will comply with the requirements for documenting and reporting any stranded birds (or bird mortalities) to CWS during the drilling program.	6.4.10.2
Drilling-associated Surveys		
12	VSP activity will be conducted in consideration of the SOCP, according to Husky Procedure EC-M-99-X-PR-00121-001 Vertical Seismic Profiles and Wellsite Surveys - Environmental Requirements.	2.5.3
13	The requirement for a Fisheries Liaison Officer during certain offshore Project activities, such as wellsite surveys, will be determined in accordance with the Risk Management Matrix Guidelines developed by One Ocean. The Risk Management Matrix Guidelines provides guidance on the requirements for Fisheries Liaison Officers and/or Fisheries Guide Vessels based on the level of fishing activity in an area and the activity being undertaken by the oil and gas operator.	6.2.10.2 6.6.10.2
14	As required in the Geophysical, Geological, Environmental and Geotechnical Program Guidelines (C-NLOPB 2016b), mitigation measures for geophysical surveys will be consistent with the SOCP. • Marine mammal observers will be used to monitor and report on marine mammal and sea turtle sightings during VSP surveys to enable shutdown or	6.1.10.2 6.3.10.2 6.5.10.2

No.	Proponent Commitments	EIS Section Reference
	delay actions to be implemented in the presence of a marine mammal or sea turtle species listed on Schedule 1 of SARA, as well as all other baleen whales and sea turtles. • A ramp-up procedure (i.e., gradually increasing seismic source elements over a period of approximately 30 minutes until the operating level is achieved) will be implemented before any VSP activity begins. This measure is aimed at reducing the potential for auditory injury to marine animals near the source at the onset of the activity. It assumes that the gradual increase in emitted sound levels will provide an opportunity for marine animals to move away from the sound source before potentially injurious sound levels are achieved close to the source. • Shutdown procedures (i.e., shutdown of source array) will be implemented if a marine mammal or sea turtle species listed on Schedule 1 of SARA, as well as all other baleen whales (i.e., mysticetes) and sea turtles are observed within 500 m of the wellsite. • Shutdown of the air gun array when a member of the eastern Newfoundland (Sackville Spur) population of northern bottlenose whale is sighted within the safety zone. • Delay of ramp-up if any marine mammal or sea turtle is sighted within the safety zone.	
Waste Management		
15	All chemicals used will be screened as per the Offshore Chemical Selection Guidelines (NEB et al. 2009) and Husky's chemical management system and chemical screening program.	2.6 6.1.10.2 6.3.10.2 6.4.10.2 6.5.10.2
16	Any substances, wastes, residues or discharges not identified in the EPCMP are not permitted for discharge.	2.6
17	Exhaust emissions will comply with the Newfoundland and Labrador *Air Pollution Control Regulations, 2004*, Ambient Air Quality Objectives under the *Canadian Environmental Protection Act*, and any relevant regulations under MARPOL. Potential flaring will occur in accordance with the Drilling and Production Guidelines (C-NLOPB and CNSOPB 2011).	2.6.4.1
18	All routine discharge limits (i.e., deck drainage, bilge water, cooling water) will be in accordance with the OWTG (NEB et al. 2010), *Regulations for the Prevention of Pollution from Ships and for Dangerous Chemicals* under the *Canada Shipping Act*, 2001 and MARPOL.	6.1.10.2 6.3.10.2 6.4.10.2 6.5.10.2
19	Sewage will be macerated to a particle size of <6 mm and discharged as per the OWTG.	6.1.10.2 6.3.10.2 6.4.10.2 6.5.10.2

No.	Proponent Commitments	EIS Section Reference
20	Waste discharges not meeting Husky's EPCMP requirements and domestic garbage will be transported to shore for disposal or recycled. Garbage is segregated as required and is disposed of separately and in compliance with waste disposal requirement and Husky's Waste Management Plan.	6.1.10.2 6.3.10.2 6.4.10.2 6.5.10.2
21	Concentration of SBM on cuttings will be monitored on the MODU for compliance with the Husky EPCMP.	6.1.10.2 6.3.10.2 6.4.10.2 6.5.10.2
22	All foreign vessels operating in Canadian jurisdiction must comply with the *Ballast Water Control and Management Regulations* of the *Canada Shipping Act, 2001* during ballasting and de-ballasting activities	6.1.10.2 6.3.10.2 6.4.10.2 6.5.10.2
Supply and Servicing		
23	All vessels will adhere to *Canada Shipping Act* and industry best practices and follow marine traffic rules and regulations.	2.4.3.2 6.1.10.2
24	Husky will implement its Vessel Traffic Management Standard (AR-M-99-R-PR-00003-001), which includes procedures for management and communication relevant to the movement of OSVs, survey vessels, and MODU during Project-related activities. All communications between Husky, operators, and fishers will adhere to this standard.	6.2.10.2 6.3.10.2 6.6.10.2
25	OSVs travelling between the Project Area and supply base will follow established shipping routes from St. John's.	6.2.10.2 6.3.10.2 6.6.10.2
26	Project-related vessel traffic will avoid concentrations of marine mammals and sea turtles whenever possible. OSVs will maintain a steady course and safe vessel speed whenever possible, as sudden changes in these factors are known to increase behavioural effects in marine mammals. Helicopters will typically only reduce altitude on approach for landing.	6.3.10.2
27	If a vessel strikes a marine mammal or sea turtle, the following notifications will occur: • The master of the vessel will contact the Canadian Coast Guard (CCG) through the nearest Marine Communications and Traffic Services. The CCG will communicate this information to the appropriate regulatory departments. • The applicable Operator will also inform DFO within 24 hours, as outlined in Section 6.3 of the EIS. As outlined on the DFO website (DFO 2018), to report a marine mammal or sea turtle emergency there is a 24-hour number to contact – Whale Release and Strandings Newfoundland and Labrador at 1-888-895-3003.	6.3.10.2

No.	Proponent Commitments	EIS Section Reference
28	In addition to standard design mitigation, standard operation procedures are implemented as appropriate to assist in OSV and helicopter navigation during times of poor visibility. This includes reducing vessel or helicopter speed, adjusting flight altitude, and using appropriate sound and light signals. Navigational safety equipment will be kept in working condition at all times. Radio communication systems will be in working order for contacting other marine vessels, if necessary, as well as communication between the MODU, OSV and shore.	8.3.1
29	Mitigation measures to reduce superstructure icing hazards on the OSV may include: • reducing vessel speed in heavy seas; • placing gear below deck and covering deck machinery, if possible; • moving objects that may prevent water drainage from the deck; • making the ship as watertight as possible; and • manual removal of ice if required under severe icing conditions.	8.3.1
30	Extreme weather conditions that are outside the operating limits of OSVs or helicopters will be avoided if possible. Pilots will have the authority and obligation to suspend or modify operations in case of adverse weather or poor visibility that compromises the safety of OSV, helicopter, or MODU operations.	8.3.1
Well Abandonment		
31	Well abandonment will follow industry standard abandonment procedures and practices in accordance with C-NLOPB regulations.	2.5.5
32	Proper notification via Notice to Shipping and Notice to Mariners will be made to identify the subsea obstruction until it is removed.	2.5.5
33	Mechanical means of wellhead severance will be preferential; should blasting be required to sever the wellhead, shape charges will be set below the sediment surface, reducing the amount of explosive used. In the unlikely event that shape charges are required to remove the wellhead during well abandonment, a marine mammal observer will visually monitor marine mammals and sea turtles in the area of the wellhead, and detonation will be delayed until there are no sightings for at least 45 minutes.	6.1.10.2 6.3.10.2
Accidental Events		
34	As per the Husky Operational Integrity Management System, Husky will implement several measures and preventative actions into the design and daily operation and maintenance of a MODU. For example, there will be frequent maintenance, testing and inspection of all equipment, best practices put in place, good communication, audits of facilities and equipment and regular employee training to minimize the likelihood of an accident or malfunction. Details on spill prevention and response to spills of all types are provided in Section 7.1 of the EIS.	7.3.1.2 7.3.2.2 7.3.3.2 7.3.4.2 7.3.5.2 7.3.6.2
35	In the unlikely event of an accidental event such as a large spill or a blowout, specific monitoring programs (e.g., EEM and follow up) may be required for the Project. In such case, these programs will be developed and implemented in consultation with the appropriate regulatory agencies.	7.3.1.2 7.3.2.2 7.3.3.2 7.3.4.2 7.3.5.2 7.3.6.2

7.0 SIGNIFICANCE OF RESIDUAL EFFECTS

The significance of residual environmental effects from the Project is determined using a series of thresholds or criteria. These thresholds may be based on regulations, standards, scientific literature, or ecological processes (e.g., desired states for fish or wildlife habitats or populations). A general list of significance criteria is provided in Section 3 of this summary with the detailed approach described in Section 5 of the EIS.

Project-related activities and components assessed in the EIS include potential effects from the presence and operation of the MODU (including light and underwater noise), discharges of drill muds and cuttings, other discharges and emissions, VSP, OSV and helicopter operations, and well abandonment. These Project activities represent the scope of work for the Project as outlined in the EIS Guidelines and represent physical activities and components that would occur throughout the life of the Project. With the implementation of proposed mitigation measures surrounding each selected VC, adverse residual environmental effects of routine Project activities, including cumulative environmental effects, are predicted to not be significant for all VCs.

Adverse residual environmental effects associated with accidental events from the Project are predicted to be significant for migratory birds, commercial fisheries, and Indigenous people and community values (due to impacts on commercial communal fisheries and associate social, cultural and economic effects) in the event of a large spill such as a surface or subsea blowout. These significance determinations are made as a precautionary measure, acknowledging that the timing, volume, nature, and location of the spill, along with seasonal sensitivities to various marine species influence the actual magnitude, duration, and reversibility/ recovery of effects for certain VCs. While the effects associated with a large spill are considered to be significant, they are not likely to occur given the low probability of an accidental event occurring in Offshore Newfoundland and Labrador, and the mitigation measures that would be put in place to prevent and respond to an accidental event.

Table 7.1 summarizes the effects determination for routine activities, accidental events, and cumulative interactions. Where applicable, the likelihood of significant residual adverse environmental effects is also highlighted.

Table 7.1 Summary of Residual Environmental Effects

VC	Routine Operations	Accidental Events		Cumulative Effects
	Significance of Residual Environmental Effect	Significance of Residual Environmental Effect	Likelihood of Significant Effect	Significance of Residual Environmental Effect
Fish and Fish Habitat	N	N	N/A	N
Commercial Fisheries	N	S	L	N
Marine Mammals and Sea Turtles	N	N	N/A	N
Migratory Birds	N	S	L	N
Special Areas	N	N	N/A	N
Indigenous People and Community Values	N	S	L	N

Key:
N/A = not applicable
N = Not Significant residual environmental effect (adverse)
S = Significant residual environmental effect (adverse)
L = Low likelihood

8.0 MONITORING AND FOLLOW-UP

Follow-up and monitoring programs are used to verify the accuracy of the environmental assessment of the Project and determine the effectiveness of any measures taken to mitigate the adverse environmental effects of the Project, where uncertainty around these aspects may exist in the EIS. Given the nature of the Project (i.e., exploration drilling) and the existing knowledge of potential environmental effects related to this type of activity gained through extensive and ongoing EEM programs to monitor the effects of drilling and existing scientific literature, the monitoring and follow-up requirements for the proposed Project are limited. As detailed in Section 2.7.5 of the EIS, Husky has conducted seven EEM programs since 2004 (2004, 2005, 2006, 2008, 2010, 2012, and 2014), with results compared to baseline data collected in 2000 and 2001. The EEM programs examine potential project effects on sediment chemistry, sediment toxicity and benthic community structure. As discussed in Section 6.1.10.3 of the EIS, results from the ongoing White Rose EEM program have confirmed original assessment predictions (Husky Oil Operations Limited 2000; LGL 2007) of no significant environmental effects due to operational discharges.

Monitoring programs for various VCs recommended during certain activities associated with the Project are discussed in the relevant VC sections (see Section 6 of the EIS). In summary, these include the following:

- Marine mammal observers will be employed to monitor and report on sightings of marine mammals and sea turtles as required in the Geophysical, Geological, Environmental and Geotechnical Program Guidelines (C-NLOPB 2016b) (see Section 6.3.10.2 of the EIS).
- Routine checks for stranded birds on the MODU and OSVs (with handling as per the Environment Canada (2015) and Williams and Chardine (1999) protocol) and compliance with the requirements for documenting and reporting any stranded birds (or bird mortalities) to the CWS during the drilling program.
- Annual Environmental Assessment Updates submitted to the C-NLOPB to review the most variable components of the environment, namely:
  - Commercial Fisheries. Husky would consult with the commercial fishing industry annually to outline planned exploration drilling activities and to discuss concerns and mitigations.
  - Species at Risk and Critical Habitat Designations list will be reviewed and updated with any new mitigation requirements applied.
  - Special Areas designations and associated mitigation requirements would be reviewed.

Husky will communicate with fishers and other ocean users before, during, and between drilling programs, and details of safety (exclusion) zones will be published in Notices to Shipping and/or Notices to Mariners, as appropriate. This will allow fishers and other ocean users to plan accordingly and mitigate potential space-use conflicts or environmental effects.

9.0 REFERENCES

9.1 Personal Communication

Ball, D., Resource Manager, Fisheries and Aquaculture Management Branch, Fisheries and Oceans Canada, St. John's, NL. email communication, 2016Wells, R., Wildlife Technician, CWS, St. John's, NL, email communication, 2016

Wilhelm, S., Marine Issues Biologist, CWS, St. John's, NL, email communication, 2016

9.2 Literature Cited

Amec Environment and Infrastructure. 2014. Eastern Newfoundland Strategic Environmental Assessment. Final Report, 2014. Available at: http://www.cnlopb.ca/sea/eastern.php. Accessed March 16, 2016.

Anderson, J.T., E.L. Dalley and E. Colbourne. 1999. Recent trends in the dominant pelagic fish species and environment in the Northwest Atlantic, NAFO 2J3KLNO. DFO Can. Stock Assess. Sec. Res. Doc., 99/114: i + 15 pp.

Bourne, W.R.P. 1979. Birds and gas flares. Mar. Poll. Bull., 10: 124-125.

BP Canada Energy Group ULC. 2016. Scotian Basin Exploration Drilling Project Environmental Impact Statement. Volume 1: Environmental Impact Statement. Prepared by Stantec Consulting Ltd. Dartmouth, NS.

Bradbury, I.R., L.C. Hamilton, T.F. Sheehan, G. Chaput, M.J. Robertson, J.B. Dempson, D. Reddin, V. Morris, T. King and L. Bernatchez. 2016. Genetic mixed-stock analysis disentangles spatial and temporal variation in composition of the West Greenland Atlantic Salmon fishery. ICES J. Mar. Sci,: 11 pp. doi: 10.1093/icesjms/fsw072.

Bruinzeel, L.W. and J. van Belle. 2010. Additional Research on the Impact of Conventional Illumination of Offshore Platforms in the North Sea on Migratory Bird Populations. A&W-rapport 1439. Altenburg & Wymenga Ecologisch Onderzoek, Feanwalden.

CEA (Canadian Environmental Assessment) Agency. 2015. Operational Policy Statement: Assessing Cumulative Environmental Effects under the Canadian Environmental Assessment Act, 2012. Available at: https://www.ceaa-acee.gc.ca/default.asp?lang=En&n=1DA9E048-1.

CEA (Canadian Environmental Assessment) Agency. 2016a. Operational Policy Statement: Addressing "Purpose of" and "Alternative Means" under the *Canadian Environmental Assessment Act, 2012*. Available at: http://www.ceaa.gc.ca/default.asp?lang=En&n=1B095C22-1

CEA (Canadian Environmental Assessment) Agency. 2016b. Letter to Nunatsiavut Government on Consultation Work Plan and Funding for the Federal Environmental Assessment of Husky Energy Exploration Drilling Project.

CEA (Canadian Environmental Assessment) Agency. 2016c. Letter to Innu Nation on Consultation Work Plan and Funding for the Federal Environmental Assessment of Husky Energy Exploration Drilling Project.

CEA (Canadian Environmental Assessment) Agency. 2016d. Letter to NunatuKavut Community Council on Consultation Work Plan and Funding for the Federal Environmental Assessment of Husky Energy Exploration Drilling Project.

Chardine, J.W. 1995. The distribution and abundance of aquatic birds in Canada in relation to the threat of oil pollution. Pp. 23-36. In: L. Frink, K. Ball-Weir and C. Smith (eds.). Wildlife and Oil Spills: Response, Research, and Contingency Plan, Tri-State Bird Rescue and Research, DE.

C-NLOPB (Canada-Newfoundland and Labrador Offshore Petroleum Board). 2016a. Environment (spill) Statistics. Available at: http://www.cnlopb.ca/information/statistics.php#environment

C-NLOPB (Canada-Newfoundland and Labrador Offshore Petroleum Board). 2016b. Geophysical, Geological, Environmental and Geotechnical Program Guidelines. Available at: http://www.cnlopb.ca/pdfs/guidelines/ggegpg.pdf?lbisphpreq=1

C-NLOPB (Canadian-Newfoundland and Labrador Offshore Petroleum Board) and CNSOPB (Canada-Nova Scotia Offshore Petroleum Board). 2011. Drilling and Production Guidelines. Available at: http://www.cnlopb.ca/pdfs/guidelines/drill_prod_guide.pdf.

C-NLOPB (Canadian-Newfoundland and Labrador Offshore Petroleum Board) and CNSOPB (Canada-Nova Scotia Offshore Petroleum Board). 2017. Compensation Guidelines Respecting Damages Relating to Offshore Petroleum Activity. Available at: http://www.cnlopb.ca/pdfs/guidelines/compgle.pdf?lbisphpreq=1

COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2010. COSEWIC assessment and status report on the Barndoor Skate (*Dipturus laevis*) in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa, ON. xiii + 71 pp.

COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2011. COSEWIC assessment and status report on the Atlantic Halibut *Hippoglossus hippoglossus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa, ON. ix + 48 pp.

COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2012. COSEWIC Assessment and Status Report on the American Eel, Anguilla rostrata, in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xii + 109 pp.

Cripps, G.C. and J. Shears. 1997. The fate in the marine environment of a minor diesel fuel spill from an Antarctic research station. Environ. Monit. Assess., 46(3): 221-232.

Dalen, J. and G.M. Knutsen. 1986. Scaring effects on fish from three dimensional seismic surveys. Institute of Marine Research Rep, No. FO 8504, Bergen, Norway.

DFO (Fisheries and Oceans Canada). 2004. Identification of Ecologically and Biologically Significant Areas. Can. Sci. Advis. Sec. Ecosys. Status Rpt., 2004/006: 15 pp.

DFO (Fisheries and Oceans Canada). 2007a. Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment.

DFO (Fisheries and Oceans Canada). 2007b. Placentia Bay-Grand Banks Large Ocean Management Area Ecological and Biologically Significant Areas. DFO Can. Sci. Advis. Sec. Res. Doc., 2007/052: 21 pp.

DFO (Fisheries and Oceans Canada). 2010. Aquatic Species -Details for Monkfish. Available from: http://www.dfo-mpo.gc.ca/species-especes/aquatic-aquatique/monkfish-baudroie-amerique-eng.htm.

DFO (Fisheries and Oceans Canada). 2013a. Facts on Canadian Fisheries: Haddock. Available from: http://www.dfo-mpo.gc.ca/fm-gp/sustainable-durable/fisheries-peches/haddock-aiglefin-eng.htm.

DFO (Fisheries and Oceans Canada). 2013b. The Grand Banks of Newfoundland: Atlas of Human Activities. Available from: http://www.nfl.dfo-mpo.gc.ca/e0007405

DFO [Fisheries and Oceans Canada]. 2013c. Fisheries Protection Policy Statement. Available at: http://www.dfo-mpo.gc.ca/pnw-ppe/pol/index-eng.html.

DFO (Fisheries and Oceans Canada). 2013d. Report on the Progress of Recovery Strategy Implementation for the Leatherback Sea Turtle (*Dermochelys coriacea*) in Canada for the Period 2007-2012. *Species at Risk Act* Recovery Strategy Report Series. Fisheries and Oceans Canada, Ottawa, ON.

DFO (Fisheries and Oceans Canada). 2015o. Recovery Strategy for the Leatherback Sea Turtle (*Dermochelys coriacea*) in Atlantic Canada [Draft]. Species at Risk Act Recovery Strategy Series. Fisheries and Oceans Canada, Ottawa, ON. vii + 48 pp.

DFO (Fisheries and Oceans Canada). 2015b. Coral and Sponge Conservation Strategy for Eastern Canada 2015. Available at: http://waves-vagues.dfo-mpo.gc.ca/Library/363832.pdf.

DFO (Fisheries and Oceans Canada). 2015c. Atlantic salmon *(Salmo salar*) stock status update in Newfoundland and Labrador for 2014. DFO Can. Sci. Advis. Sec. Sci. Resp., 2015/23 (Erratum: December 2015): 13 pp.

DFO (Fisheries and Oceans Canada). 2016a. Atlantic salmon (*Salmo salar*) stock status update in Newfoundland and Labrador for 2015. DFO Can. Sci. Advis. Sec. Sci. Resp., 2016/20: 16 pp.

DFO (Fisheries and Oceans Canada). 2016b. Population reduction scenarios for Northwest Atlantic harp seals (*Pagophilus groenlandicus*). DFO Can. Sci. Advis. Sec. Sci0 Advis. Rpt., 2016/018: 11 pp.

DFO (Fisheries and Oceans Canada). 2018.

Dodge. R.E. and A. Szmant-Froelich. 1985. Effects of drilling fluids on reef corals: a review. Pp. 341-364. In: I.W. Duedall, D.R. Kester, P.K. Park and B.H. Ketchum (eds.). Wastes in the Ocean, Volume 4, Wiley (Interscience). New York.

Environment Canada. 2015. Best Practices for Stranded Birds Encountered Offshore Atlantic Canada. Draft 2 – April 17 2015. Available at: http://www.cnlopb.ca/pdfs/mg3/strandbird.pdf.

Environment and Climate Change Canada. 2016. National Inventory Report 1990-2014: Greenhouse Gas Sources and Sinks in Canada. Available at: https://www.ec.gc.ca/ges-ghg/default.asp?lang=En&n=662F9C56-1.

Fifield, D.A., K.P. Lewis, C. Gjerdrum, G.C. Robertson and R. Wells. 2009. Offshore seabird monitoring program. Environ. Stud. Res. Funds Rep., 183: v + 68 pp. + App.

Frederiksen, M., S. Descamps, K.E. Erikstad, A.J. Gaston, H.G. Gilchrist, D. Grémillet, K.L. Johansen, Y. Kolbeinsson, J.F. Linnebjerg, M.L. Mallory, L.A. McFarlane Tranquilla, F.R. Merkel, W.A. Montevecchi, A. Mosbech, T.K. Reiertsen, G.J. Robertson, H. Steen, H. Strøm and T.L. Thórarinsson. 2016. Migration and wintering of a declining seabird, the thick-billed murre *Uria lomvia*, on an ocean basin scale: Conservation implications. Biol. Conserv., 200: 26-35. Available at: http://dx.doi.org/10.1016/j.biocon.2016.05.011.

Geraci, J.R. and D.J. St. Aubin. 1980. Offshore petroleum resource development and marine mammals: A review and research recommendations. Mar. Fish. Rev., 42: 1-12.

Government of Canada. 2014. Newfoundland Offshore Petroleum Drilling and Production Regulations. Available online: http://laws-lois.justice.gc.ca/PDF/SOR-2009-316.pdf. Accessed March 2018.

Healey, B.P. 2010. Greenland halibut (*Reinhardtius hippoglossoides*) in NAFO Subarea 2 and Divisions 3KLMNO: stock trends based on annual Canadian research vessel survey results during 1978-2009. NAFO Sci. Coun. Res. Doc., 10/21: 67 pp.

Husky Energy. 2012. Husky Energy White Rose Extension Project Environmental Assessment. Prepared by Stantec Consulting Ltd., St. John's, NL, for Husky Energy. St. John's, NL.

Husky Oil Operations Limited. 2000. White Rose Oilfield Comprehensive Study - Part One: Environmental Impact Statement. Submitted to the Canada-Newfoundland Offshore Petroleum Board, St. John's, NL. 639 pp + Appendices.

International Association of Oil and Gas Producers. 2016. Environmental Fate and Effects of Ocean Discharge of Drill Cuttings and Associated Drilling Fluids from Offshore Oil and Gas Operations. Report 543: 143 pp. (including appendices).

Irons, D.B., S.J. Kendall, W.P. Erickson, L.L. McDonald and B.K. Lance. 2000. Nine years after the Exxon Valdez oil spill: Effects on marine bird populations in Prince William Sound, Alaska. Condor, 102: 723-737.

JWEL (Jacques Whitford Environment Limited). 2002. Environmental Assessment of Exploration Drilling in Annieopsquotch (EL 1052), Bonnawinkie (EL 1056) and Gambo (EL 1048) Leases. Prepared for EnCana Corporation, Halifax, NS. vii + 153 pp. + Appendices.

Kenchington, E.L.R., J. Prena, K. Gilkinson, D.C. Gordon, K. MacIsaac, C. Bourbonnais, P. Schwinghamer, T.W. Rowell, D.L. McKeown and W.P. Vass. 2001. Effects of experimental otter trawling on the macrofauna of a sandy bottom ecosystem on the Grand Banks of Newfoundland. Can. J. Fish. Aquat. Sci., 58: 1043-1057.

Kulka, D.W., N.C. Antle and J.M. Simms. 2003. Spatial analysis of 18 demersal species in relation to petroleum licence areas on the Grand Bank (1980-2000). Can. Tech. Rep. Fish. Aquat. Sci., 2473: xix + 182 pp.

Larsson, A.I. and A. Purser. 2011. Sedimentation on the cold-water coral Lophelia pertusa: Cleaning efficiency from natural sediments and drill cuttings. Mar Poll. Bull., 62(6): 1159-1168. doi: 10.1016/j.marpolbul.2011.03.041.

Larsson, A.I., D. van Oevelen, A. Purser and L. Thomsen. 2013. Tolerance to long-term exposure of suspended benthic sediments and drill cuttings in the cold-water coral *Lophelia pertusa*. Mar. Poll. Bull., 70: 176-188.

Leighton, F.A., R.G. Butler and D.B. Peakall. 1985. Oil and Arctic marine birds: An assessment of risk. Pp. 183-215. In: F.R. Engelhardt (ed.). Petroleum Effects in the Arctic Environment, Elsevier Applied Science Publishers, London. 281 pp.

LGL Limited. 2007. Husky Delineation/Exploration Drilling Program for Jeanne d'Arc Basin Area, 2008-2017, Environmental Assessment. LGL Rep. SA935. Prepared by LGL, St. John's, NL, in association with Canning & Pitt Associates Inc., Oceans Ltd., and PAL Environmental Services. Prepared for Husky Energy Inc., Calgary, AB. 231 pp. + Appendices.

LGL Limited. 2008. Environmental Assessment of StatoilHydro Canada Ltd. Exploration and Appraisal/Delineation Drilling Program for Offshore Newfoundland, 2008-2016. LGL Rep. SA947b. Rep. by LGL Limited, Canning & Pitt Associates Inc., and Oceans Ltd., St. John's, NL, for StatoilHydro Canada Ltd., St. John's, NL. 292 pp. + Appendices.

Maddock-Parsons, D. 2006. Witch flounder in NAFO Divisions 3NO. North Atlantic Fisheries Organization Scientific Council Meeting, June 2006. NAFO Sci. Coun. Res. Doc., 06/37: 32 pp.

McFarlane Tranquilla, L.A., W.A. Montevecchi, D.A. Fifield, A. Hedd, A.J. Gaston, G.J. Robertson and R.A. Phillips. 2014. Individual winter movement strategies in two species of murre (*Uria* spp.) in the Northwest Atlantic. PLOS ONE, 9(4): e90583. doi:10.1371/journal.pone.0090583.

McFarlane Tranquilla, L.A., W.A. Montevecchi, A. Hedd, P.M. Regular, G.J. Robertson, D.A. Fifield, and R. Devillers. 2015. Ecological segregation among Thick-billed Murres (Uria lomvia) and Common Murres (Uria aalge) in the Northwest Atlantic persists through the nonbreeding season. Can. J. Zool. 93: 447–460 (2015) dx.doi.org/10.1139/cjz-2014-0315

Mobil Oil Canada, Ltd. 1985. Hibernia Development Project - Environmental Impact Statement: Volumes IIIa and IIIb – Biophysical Assessment. Prepared by Mobil Oil Canada, Ltd. as Operator, on behalf of the joint venture participants (Gulf Canada Resources Inc., Petro-Canada Inc., Chevron Canada Resources Limited and Columbia Gas Development of Canada Ltd.).

NAFO (Northwest Atlantic Fisheries Organization). 2008. Scientific Council Meeting, Report of the NAFO Scientific Council. Working Group on Ecosystem Approach to Fisheries Management (WGEAFM). NAFO Headquarters, Dartmouth, Canada, 26-30 May 2008. NAFO Sci. Coun. Sec. Doc., 08/10: 70 pp.

NEB (National Energy Board), Canada-Newfoundland and Labrador Offshore Petroleum Board and Canada-Nova Scotia Offshore Petroleum Board). 2008. Offshore Physical Environmental Guidelines. vii + 28 pp. + Appendices.

NEB (National Energy Board), Canada-Newfoundland and Labrador Offshore Petroleum Board and Canada-Nova Scotia Offshore Petroleum Board). 2009. Offshore Chemical Selection Guidelines for Drilling and Production Activities on Frontier Lands. iii + 13 pp.

NEB (National Energy Board), Canada-Newfoundland and Labrador Offshore Petroleum Board and Canada-Nova Scotia Offshore Petroleum Board). 2010. Offshore Waste Treatment Guidelines. vi + 28 pp.

Nexen Energy ULC. 2018. Flemish Pass Exploration Drilling Project (2018-2028) – Environmental Impact Statement. Available at: http://ceaa.gc.ca/050/documents/p80117/122066E.pdf

NOAA [National Oceanic and Atmospheric Administration]. 2013a. Fish Watch: Haddock. Available at: http://www.fishwatch.gov/profiles/haddock

NOAA [National Oceanic and Atmospheric Administration]. 2013b. Fish Watch: Atlantic Pollock. Available at: http://www.fishwatch.gov/profiles/atlantic-pollock.

NOAA [National Oceanic and Atmospheric Administration]. 2013c. Fish Watch: North Atlantic Albacore tuna. Available at: http://www.fishwatch.gov/profiles/north-atlantic-albacore-tuna

NOAA [National Oceanic and Atmospheric Administration]. 2013d. Fish Watch: Atlantic Herring. Available at: http://www.fishwatch.gov/profiles/atlantic-herring

NOAA [National Oceanic and Atmospheric Administration]. 2013e. Fish Watch: North Atlantic Swordfish. Available at: http://www.fishwatch.gov/profiles/north-atlantic-swordfish

NOAA [National Oceanic and Atmospheric Administration]. 2016. Office of Response and Restoration: Small Diesel Spills (500 – 5,000 gallons). Available at: http://response.restoration.noaa.gov/oil-and-chemical-spills/oil-spills/resources/small-diesel-spills.html.

Oceans Ltd. 2017. Offshore Supply Vessels Season Oil Spill Trajectory Study for the Husky Exploration Drilling Project. Submitted to Stantec Consulting Ltd. ii + 23 pp.

Oil and Gas International. 2016. Directory of Exploration wells and Discoveries. Available at: http://www.oilandgasinternational.com/directories/exploration_discoveries.aspx.

Park, L.E., L.A. Beresford and E. Kissler. 2011. Prioritization of Key Ecosystem Components Based on Risk of Harm from Human Activities within the Placentia Bay/Grand Banks Large Ocean Management Area. Oceans, Habitat and Species at Risk Publication Series, Newfoundland and Labrador Region. 0004: vi + 9 pp. + working notes (2422 p.)

Parks Canada. 2017. Species at risk: The American Eel. Available at: https://www.pc.gc.ca/en/nature/science/especes-species/liste-list/eep-sar3aa

Petro-Canada. No Date. PureDrill IA-35LV Drilling Mud Base Fluid Fact Sheet.

Petro-Canada. 1995. Development Application – Terra Nova Development: Environmental Impact Statement. Terra Nova Proponents.

Risk Management Research Institute. 2006. Quantitative Assessment of Oil Spill Risk for the South Coast of Newfoundland and Labrador. Prepared for Transport Canada. xi + 107 pp. + Appendices.

Rogers, C.S. 1990. Responses of coral reefs and reef organisms to sedimentation. Mar. Ecol. Prog. Ser., 62: 185-202.

Saetre, R. and E. Ona, 1996. Seismic investigations and damages on fish eggs and larvae; an evaluation of possible effects on stock level. Fisken og Havet 1996:1-17, 1-8.

Scott, W.B. and M.G. Scott. 1988. Atlantic Fishes of Canada. Can. Bull. Fish. Aquat. Sci., 219: 731 pp.

Shell Canada Limited. 2014. Shelburne Basin Venture Exploration Drilling Project. Volume 1: Environmental Impact Statement. Prepared by Stantec Consulting Ltd. for Shell Canada Limited, Halifax, NS.

Simpson, R.D., S.D.A. Smith and A.R. Pople. 1995. The effects of a spillage of diesel fuel on a rocky shore in the sub-Antarctic region (Macquarie Island). Mar. Poll. Bull., 31(4-12): 367-371.

SL Ross Environmental Research Ltd. 2012. Oil Spill Fate and Behaviour Modelling in Support of Husky Energy White Rose Extension Environmental Assessment. Report by SL Ross Environmental Research for Husky Energy. 51 pp.

SL Ross Environmental Research and LGL Limited. 2013. Net Environmental Benefit Analysis of Dispersant Use for Responding to Oil Spills from Oil and Gas Facilities on the Newfoundland Grand Banks. Prepared for the Canadian Association of Petroleum Producers, St. John's, NL. xvii + 192 pp.

Statoil (Statoil Canada Ltd.). 2017. Flemish Pass Exploration Drilling Program – Environmental Impact Statement. Prepared by Amec Foster Wheeler and Stantec Consulting. St. John's, NL, Canada. November 2017.

Stirling, H.P. 1977. Effects of a spill of marine diesel oil on the rocky shore fauna of Lamma Island, Hong Kong. Environ. Poll., 12(2): 93-117.

Stokesbury, M.J.W., C. Harvey-Clark, J. Gallant, B.A. Block and R.A. Myers. 2005. Movement and environmental preferences of Greenland sharks (*Somniosus microcephalus*) electronically tagged in the St. Lawrence Estuary, Canada. Mar. Biol., 148(1): 159-165.

Veinott, G.I., M.J. Robertson, I. Bradbury, J.B. Dempson, C. Grant, N. Kelly, J. Whalen and R. Poole. 2018. Status of Atlantic salmon (*Salmo salar* L.) stocks within the Newfoundland and Labrador region (Salmon Fishing Areas 1-14B), 2016. DFO Can. Sci. Advis. Sec. Res. Doc., 2018/008: v + 38 pp.

Wiese, F.K. and P.C. Ryan. 1999. Trends of chronic oil pollution in southeast Newfoundland assessed through beached-bird surveys, 1984-1997. Bird Trends, 7: 36-40.

Williams, U. and J. Chardine. 1999. The Leach's Storm Petrel: General Information and Handling Instructions. 4 pp. Available at: http://www.cnlopb.nl.ca/pdfs/mkiseislab/mki_app_h.pdf.

Wu, Y.S. and C.L. Tang. 2011. Atlas of Ocean Currents in Eastern Canadian Waters. Ocean Sciences Division, Maritimes Region, Fisheries and Oceans Canada.

Yender, R.J., J. Michel and C. Lord. 2002. Managing Seafood Safety after an Oil Spill. Seattle Hazardous Materials Response Division, Office of Response and Restoration, National Oceanic and Atmospheric Administration. 72 pp.