EXXONMOBIL CANADA LTD.
EASTERN NEWFOUNDLAND OFFSHORE EXPLORATION DRILLING PROJECT (CEAR 80132)

Environmental Impact Statement - Summary

December 2017

Table of Contents

1.0 INTRODUCTION AND ENVIRONMENTAL ASSESSMENT CONTEXT 1

2.0 PROJECT OVERVIEW 2

2.1 Project Location 3
2.2 Planned Project Components and Activities 3
2.2.1 Drilling Installations and Activities 3
2.2.2 Geophysical, Environmental and Geotechnical Surveys 8
2.2.3 Formation Flow Testing with Flaring 9
2.2.4 Well Decommissioning or Suspension 9
2.2.5 Supply and Servicing 10
2.3 Project Schedule 13
2.4 Accidental Events 13
2.4.1 Spill Prevention and Response 13
2.4.2 Potential Accidental Event Scenarios 14
2.4.3 Spill Risk and Probabilities 15
2.4.4 Spill Fate and Behaviour 16

3.0 ALTERNATIVE MEANS OF CARRYING OUT THE PROJECT 18

4.0 PUBLIC PARTICIPATION AND ENGAGEMENT WITH INDIGENOUS GROUPS 22

4.1 Governmental, Agencies and Stakeholder Consultation Activities 22
4.2 Engagement with Indigenous Groups 23
4.3 Identified Questions / Concerns / Key Comments 25

5.0 ENVIRONMENTAL ASSESSMENT SCOPE, APPROACH AND METHODS 29

5.1 Scope of the Project and its Assessment 29
5.2 Identification and Selection of Valued Components 29
5.3 Overview of EA Approach and Methods 32
5.4 Spatial and Temporal Boundaries 33

6.0 ENVIRONMENTAL EFFECTS ASSESSMENT 36

6.1 Marine Fish and Fish Habitat (including Species of Conservation Concern) 36
6.1.1 Description of the Baseline 36
6.1.2 Anticipated Changes to the Environment 41
6.1.3 Anticipated Effects (Planned Project Components and Activities) 41
6.1.4 Anticipated Effects (Accidental Events) 44
6.2 Marine and Migratory Birds (including Species of Conservation Concern) 45
6.2.1 Description of the Baseline 46
6.2.2 Anticipated Changes to the Environment 48
6.2.3 Anticipated Effects (Planned Project Components and Activities) 48
6.2.4 Anticipated Effects (Accidental Events) 50
6.3 Marine Mammals and Sea Turtles (including Species of Conservation Concern) 51
6.3.1 Description of the Baseline 52
6.3.2 Anticipated Changes to the Environment 54
6.3.3 Anticipated Effects (Planned Project Components and Activities) 54

6.3.4 Anticipated Effects (Accidental Events) 56
6.4 Special Areas 58
6.4.1 Description of the Baseline 58
6.4.2 Anticipated Changes to the Environment 62
6.4.3 Anticipated Effects (Planned Project Components and Activities) 62
6.4.4 Anticipated Effects (Accidental Events) 64
6.5 Indigenous Communities and Activities 65
6.5.1 Description of the Baseline 65
6.5.2 Anticipated Changes to the Environment 67
6.5.3 Anticipated Effects (Planned Project Components and Activities) 68
6.5.4 Anticipated Changes (Accidental Events) 69
6.6 Commercial Fisheries and Other Ocean Users 70
6.6.1 Description of the Baseline 70
6.6.2 Anticipated Changes to the Environment 71
6.6.3 Anticipated Effects (Planned Project Components and Activities) 72
6.6.4 Anticipated Effects (Accidental Events) 73
6.7 Effects of the Environment on the Project 74
6.7.1 Key Environmental Considerations 74
6.7.2 Mitigation 76
6.7.3 Residual Effects Summary 76
6.8 Cumulative Effects 76
6.8.1 Approach and Methods 77
6.8.2 Marine Fish and Fish Habitat (including Species at Risk) 77
6.8.3 Marine and Migratory Birds (including Species at Risk) 78
6.8.4 Marine Mammals and Sea Turtles (including Species at Risk) 78
6.8.5 Special Areas 79
6.8.6 Indigenous Communities and Activities 80
6.8.7 Commercial Fisheries and Other Ocean Users 80
6.8.8 Cumulative Effects Summary 80

7.0 MITIGATION MEASURES AND COMMITMENTS 81

8.0 SIGNIFICANCE OF RESIDUAL EFFECTS 85

9.0 FOLLOW-UP AND MONITORING 95

9.1 Follow-Up Program 95
9.2 Environmental Monitoring and Observation Programs 96

10.0 REFERENCES 100

LIST OF TABLES

Table 3.1 Drilling Fluids Selection - Comparison of Water-based and Synthetic-based Drilling Muds 19
Table 3.2 Drilling Installation Selection 19
Table 3.3 Drilling Waste Management - Comparison of Drilling Waste Disposal Options 20
Table 3.4 Offshore Drilling Installation Lighting 21
Table 3.5 Formation Flow Testing with Flaring at Night Options 21
Table 4.1 Summary of Governmental and Stakeholder Organizations Consulted 22
Table 4.2 Indigenous Groups by Province 24
Table 4.3 Summary of Engagement Feedback 26
Table 5.1 Identified VCs and the Rationale for their Selection 30
Table 6.1 Listed Marine Fish Species that are Known to or May Occur within the Project Area 38
Table 6.2 Listed Bird Species and Their Likelihood of Occurrence in the Vicinity of the Project Area 47
Table 6.3 Listed Marine Mammal and Sea Turtle Species Found in the Vicinity of the Project Area 53
Table 6.4 Summary of Special Areas that Overlap with the Project Area and Vessel Aircraft Traffic Routes 58
Table 6.5 Special Areas Overlapping with Project Exploration Licences 59
Table 6.6 Indigenous Groups in the Maritime Provinces and Quebec 66
Table 7.1 Summary of Mitigation and Commitments 81
Table 8.1 Summary of Residual Effects for Planned Project Components and Activities 86
Table 8.2 Summary of Residual Effects for Accidental Events 93
Table 9.1 Summary of Monitoring Programs for Routine Project Activities 97

LIST OF FIGURES

Figure 2-1 Project Area and Associated Exploration Licences 4
Figure 2-2 Typical Offshore Drilling Installations: Semisubmersible and Drill Ship 5
Figure 2-3 Schematic of a Typical Offshore Well and Associated Drilling Sequence 7
Figure 2-4 Existing Vessel Traffic Routes 11
Figure 2-5 Potential Project Vessel Traffic Routes 12
Figure 5-1 Environmental Assessment Study Area 35
Figure 6-1 Overview of Special Areas that Overlap with the Project Area and Potential Vessel and Aircraft Traffic Routes 61

Acronyms and Abbreviations

Accord Acts	*Canada-Newfoundland and Labrador Atlantic Accord Implementation Newfoundland and Labrador Act* and the *Canada-Newfoundland Atlantic Accord Implementation Act*
BOP	Blowout preventer
CEAA 2012	*Canadian Environmental Assessment Act, 2012*
CEA Agency	Canadian Environmental Assessment Agency
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
DFO	Fisheries and Oceans Canada
EA	Environmental assessment
EBSA	Ecologically and Biologically Significant Area
EEZ	Economic Exclusion Zone
EIS	Environmental Impact Statement
EL	Exploration Licence
ExxonMobil	ExxonMobil Canada Ltd.
FCA	Fisheries Closure Areas
FSC	Food, social and ceremonial
IBA	Important Bird Area
IUCN	International Union for Conservation of Nature
LSA	Local Study Area
MBCA	*Migratory Birds Convention Act*
NAFO	Northwest Atlantic Fisheries Organization
Newfoundland	Refers to the island portion of the Province of Newfoundland and Labrador
NL EPA	Newfoundland and Labrador *Endangered Species Act*
OSRP	Oil Spill Response Plan
OWTG	Offshore Waste Treatment Guidelines
Project	ExxonMobil Canada Ltd. Eastern Newfoundland Offshore Exploration Drilling Project
ROV	Remotely operated vehicle
RSA	Regional Study Area
SAR	Species at Risk
SARA	*Species at Risk Act*
SBM	Synthetic-based drilling mud
SOCC	Species of Conservation Concern
Statoil	Statoil Canada Limited
VME	Vulnerable Marine Ecosystem
VC	Valued Component
VSP	Vertical seismic profiling
WBM	Water-based drilling mud

1.0 INTRODUCTION AND ENVIRONMENTAL ASSESSMENT CONTEXT

ExxonMobil Canada Ltd. (ExxonMobil; the Operator) and its co-venturers are planning to conduct a program of petroleum exploration/delineation/appraisal drilling and associated activities (herein referred to as exploration drilling) in the eastern portion of the Canada-Newfoundland and Labrador (NL) Offshore Area over the period 2018 to 2029 (hereinafter also referred to as the Project).

The Project requires review and approval pursuant to the requirements of the *Canadian Environmental Assessment Act* (CEAA 2012) as it has been determined that the drilling of a well on ELs 1135 and 1137 constitutes a "designated project" under Section 10 of the *Regulations Designating Physical Activities.* In addition, the Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB) requires a project-specific environmental assessment (EA) be completed for such exploration activities, pursuant to the *Canada-Newfoundland and Labrador Atlantic Accord Implementation Newfoundland and Labrador Act* and the *Canada-Newfoundland Atlantic Accord Implementation Act* (the Accord Acts). 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 on December 23, 2016 (and as amended), under CEAA 2012 and to fulfil the requirements of the Accord Acts. ExxonMobil and Statoil Canada Ltd. have collaborated to assess common activities of their respective and similar exploration drilling Projects in the shared geographic area, with the intent to facilitate the environmental assessment review for government agencies, public stakeholders and Indigenous groups. This document is a summary of the EIS, and has been prepared to facilitate review and participation by members of the public, stakeholders, and Indigenous groups.

ExxonMobil holds other licences in the Project Area on which drilling activities may occur (i.e., existing ELs, Co-Venturer Operated ELs, and/or significant discovery licences). For transparency to stakeholders and clarity in terms of the total exploration activity that may be undertaken by the Operator in the Project Area, these licenses are also included. Although the effects assessment and conclusions are relevant to these licenses, it is the Operator's understanding that the Ministerial EA decision will be limited to the "designated Project" defined as exploration drilling and associated activity in ELs 1135 and 1137 (denoted as ExxonMobil EL – CEAA 2012 in Figure 2-1). Environmental assessment for licences that are not 'designated Projects' are considered under a separate regulatory process through the Accords Acts, administered by the C-NLOPB.

2.0 PROJECT OVERVIEW

The purpose of this Project is to determine the potential for oil and gas resources through an exploratory drilling program on various Operator-held land holdings within the Project Area.

The Project includes the drilling, testing, and eventual decommissioning of exploratory wells (includes delineation and appraisal wells) within the various ELs identified above, using one or more drilling installations, which may include semi-submersibles, and/or drill ships. Over the course of the anticipated duration of the Project, it is estimated that up to 35 wells could be drilled, with specific wellsite locations being selected as planning and design activities progress. The Project also includes various supporting activities or techniques that are often associated with offshore exploration drilling, including: possible delineation drilling in the case of a hydrocarbon discovery, geophysical surveys (geohazard / wellsite surveys, vertical seismic profiling (VSP)), batch drilling, formation flow testing, geotechnical surveys, environmental surveys, remotely operated vehicle (ROV) / video surveys, and eventual wellhead decommissioning / removal, as well as associated supply and service activities.

Offshore marine vessels to support the various exploration activities described above will be required throughout the duration of the Project, and will include drilling installations (semi-submersibles and/or drill ships), supply / stand-by and support vessels, helicopters, well intervention vessels, vessels for the conduct of geotechnical, geological, environmental and geophysical surveys, construction vessels for wellhead removal, and those involved in ice management operations. Project-related supply and support activities will take place at existing, established onshore facilities operated by a third-party contractor, which have been previously approved under applicable regulatory processes and currently provide services to multiple offshore and other industrial operators. No Project-specific construction or expansion of such facilities or other onshore infrastructure is required or planned. Support vessel and aircraft services and their transits to and from the Project Area from these supply bases will likewise be contracted from third party suppliers and will use a number of existing and established routes off Eastern Newfoundland that have been used for decades.

The planned temporal scope of the Project covers a period of 12 years (from 2018 to 2029), which has been selected to generally align with the terms of the various existing and potential ELs, as well as to provide an adequate and conservative timeframe within which planned Project activities (including well drilling, testing, abandonment and associated activities) may occur. Within this 12-year period, the planned exploration activities that comprise this Project may occur at any time throughout the year.

ExxonMobil and its co-venturers have varying participating interests in a number of ELs off Eastern Newfoundland, for which ExxonMobil is currently the Operator of some licences (ELs 1135 and 1137), as well as others for which it is a co-venturer with other operators. These include the Statoil Canada Ltd (Statoil) operated ELs 1139, 1140, 1141, and 1142, for which exploration drilling and other associated activities are being proposed as part of Statoil's Flemish Pass Exploration Drilling Project 2018-2027 which is undergoing concurrent EA review under CEAA 2012 (CEAR # 80129).

As a result of these integrated and overlapping interests, and given the inherent commonalities between the planned exploration activities by each of these operators, the existing environmental settings involved, and the potential environmental effects and required mitigation measures

associated with exploration activities related to these licences, Statoil and ExxonMobil have collaborated in the planning and completion of the required EISs for their planned exploration drilling programs. This EIS summary and the larger EIS document reflects a consolidated effort by both operators to provide an EIS report that has the same information, structure and content (with some Project-specific variances) for both Statoil's and ExxonMobil's drilling projects. The goal is to reduce burden on all reviewers and to provide a comprehensive cumulative effects discussion.

2.1 Project Location

The Project Area includes the licences where exploration drilling may occur and also includes a surrounding area to account for planned and potential ancillary activities, such as wellsite surveys.

Figure 2-1 shows the Project Area and the various ELs, as well as providing the corner point (UTM) coordinates for the Project Area. The designated project ELs are denoted as "ExxonMobil EL – CEAA 2012". As illustrated, the Project Area is located off Eastern Newfoundland, primarily outside Canada's 200 nm Exclusive Economic Zone (EEZ) on the outer continental shelf. The Project Area is approximately 300 km from the coast of Newfoundland.

With respect to Project Area related terminology, the EIS summary uses the term "Project Area – Northern Section" to refer to that component of the overall Project Area shown in Figure 2-1 that covers Statoil's planned Project-related activities and a portion of ExxonMobil's, while the "Project Area – Southern Section" covers ExxonMobil activities only. The assessment also considers related supply and support vessel and aircraft traffic to and from the Project Area.

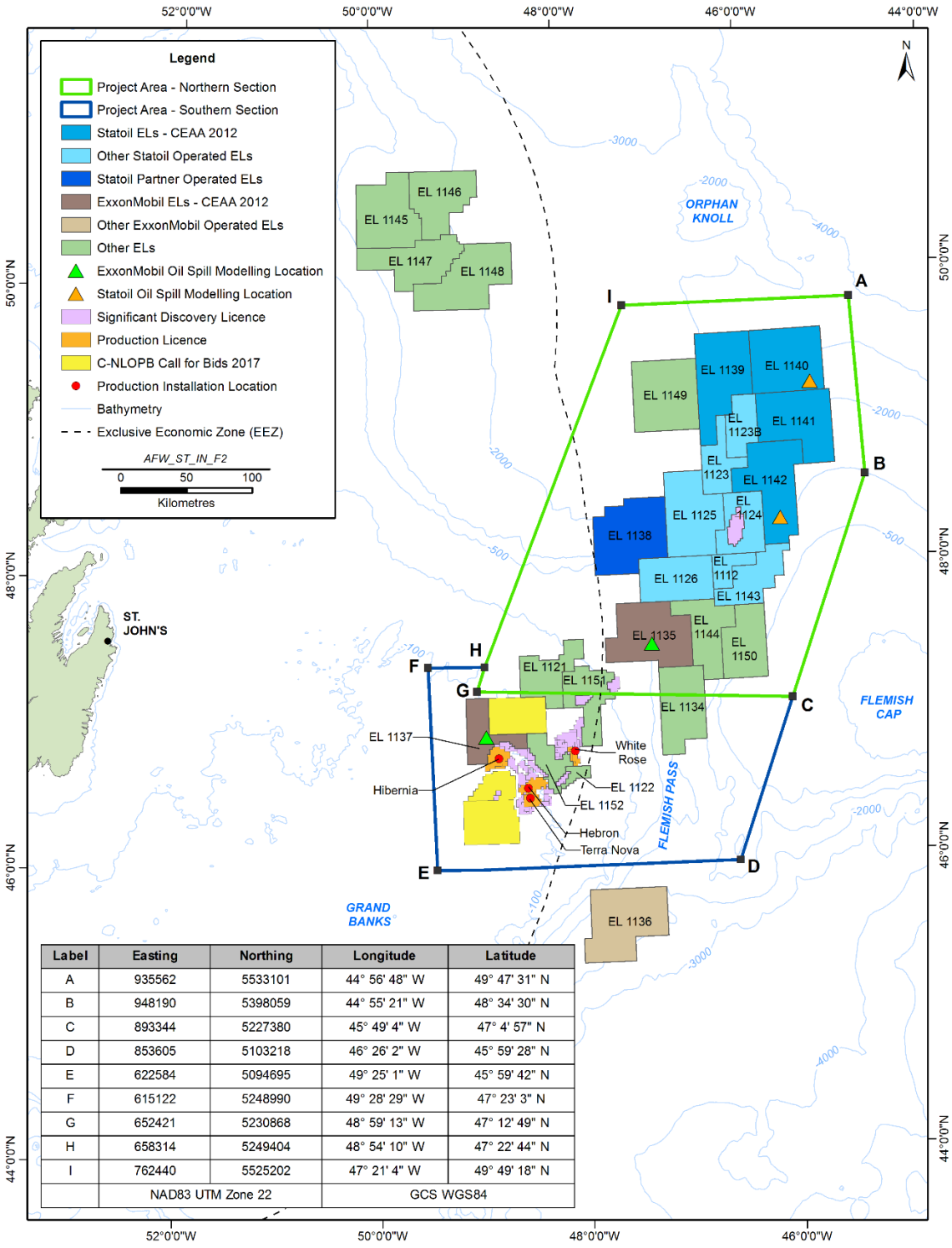
2.2 Planned Project Components and Activities

The following sections provide a general overview of the various planned components and activities that will be associated with the Project. Further details are provided in the EIS itself (Chapter 2).

2.2.1 Drilling Installations and Activities

Exploration and delineation/appraisal wells are drilled to confirm the presence, or delineate the extent, of oil and gas resources at specific locations. Exploration wells are drilled to determine whether areas of interest identified from previous geophysical surveys and other information contain oil and gas resources. Depending on the results of these wells, an operator may then drill delineation/appraisal wells into different parts of the identified hydrocarbon accumulation to confirm its size and the characteristics of the hydrocarbons found.

This Project will involve the drilling of up to 35 wells within the various ELs that comprise the Project Area over its 12-year duration. Specific wellsite locations are not currently defined, and will be selected as Project planning and design activities move forward. Detailed well design has likewise not yet been completed, and will depend on various factors including water depth, reservoir potential and its geological properties. Individual well designs will be developed and submitted for approval to the C-NLOPB as required per the applicable authorization and approvals processes.



Label	Easting	Northing	Longitude	Latitude
A	935562	5533101	44° 56' 48" W	49° 47' 31" N
B	948190	5398059	44° 55' 21" W	48° 34' 30" N
C	893344	5227380	45° 49' 4" W	47° 4' 57" N
D	853605	5103218	46° 26' 2" W	45° 59' 28" N
E	622584	5094695	49° 25' 1" W	45° 59' 42" N
F	615122	5248990	49° 28' 29" W	47° 23' 3" N
G	652421	5230868	48° 59' 13" W	47° 12' 49" N
H	658314	5249404	48° 54' 10" W	47° 22' 44" N
I	762440	5525202	47° 21' 4" W	49° 49' 18" N
	NAD83 UTM Zone 22		GCS WGS84	

Figure 2-1 Project Area and Associated Exploration Licences

Wells may be drilled using a semi-submersible drilling installation or drillship. The type of installation chosen will be based primarily on the characteristics of the physical environment at the proposed drill site, particularly water depth, expected drilling depth and expected weather and ice conditions and associated mobility requirements. Drilling installations and vessels that are used for this Project will meet the operational and environmental capabilities needed for the associated exploration activities, and will meet all regulatory requirements. Operations Authorizations granted by the C-NLOPB are required prior to undertaking any drilling activities offshore NL. For the purposes of environmental effects analysis, it is assumed that there may be up to two drilling installations actively engaged in drilling activities in the Project Area at any one time as part of this Project. A drilling installation can either be moored in position over the drilling site using mooring lines and anchors (generally in shallower water depths up to 500m), or maintained on station by a dynamic positioning system (generally in deeper water greater than 500m).

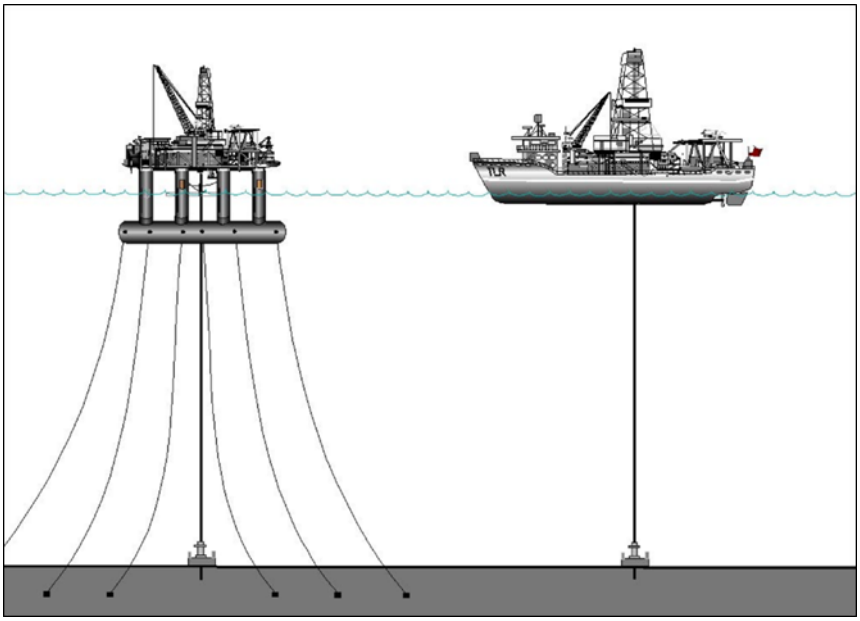


Figure 2-2 Typical Offshore Drilling Installations: Semisubmersible and Drill Ship

Once an appropriate wellsite has been identified and the permits and regulatory approvals have been granted for a drilling campaign, the drilling installation will be mobilized to the wellsite location, after which the drilling of a well will be implemented in a number of stages. A safety zone is established around the drilling installation for the protection of the drilling installation and other equipment and for the safety of other ocean users.

Once the drill site clearance has been completed and the drilling installation has been positioned or moored with anchors the drilling process commences, with a well being drilled in sections by gradually reducing the size of the wellbore (or hole). Drilling muds are fluids which lubricate and cool the drill bit and hole, circulate cuttings and carry them back to the surface, and help maintain appropriate pressure in the well. Drilling of the first section of the well, the top hole, usually involves

a large diameter hole to install the surface casing and conductor. These initial sections of the well are drilled using seawater or a water-based mud (WBM) without a riser in place. A riser enables the return of the drilling fluids and cuttings back to the drilling installation. As the initial (conductor) portion of a well is drilled without a riser in place, the drilling muds and cuttings are discharged directly to the seabed as allowed by the Offshore Waste Treatment Guidelines (OWTG).

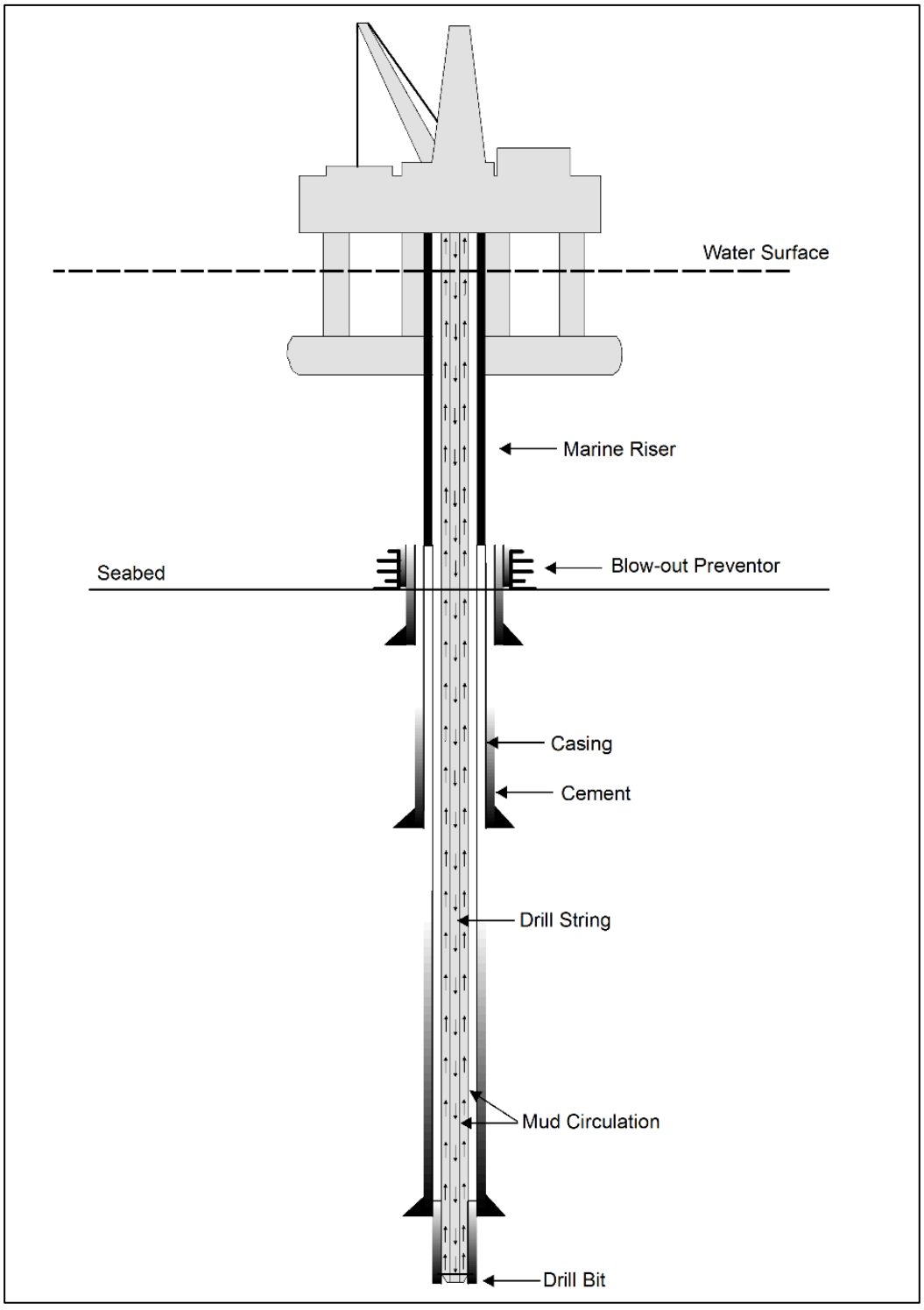
When top section drilling has been completed to the desired depth a steel casing is run and cemented in place to prevent the wall of the wellbore from caving in and to prevent muds and other fluids seeping out of the hole. At this stage, the wellhead is also installed on top of the casing and the riser and blow-out preventer (BOP) are then installed onto the wellhead. The riser is a large diameter pipe that acts as a channel connecting the drilling installation to the wellhead through the water column, and the wellhead provides structural integrity to house the BOP and pressure integrity for drilling operations. A BOP is a system of high pressure valves that prevent water or hydrocarbons from escaping into the environment in the event of an emergency or equipment failure. At intervals along the well, casing is cemented in place at set depths to reinforce the wellbore.

Once the riser has been installed, the remaining sections of the well are drilled to predefined depths using either WBM or synthetic-based mud (SBM) if the use of the former is technically impractical. Once the conductor hole is completed and when the riser and BOP are installed and in place, drilling muds and cuttings can be returned to the drilling installation for cuttings treatment and discharge and recovery and reuse of drilling muds.

With the casing and associated equipment in place, the drill bit and riser are lowered into the conductor hole. Drilling begins at the bottom of the initial (conductor) hole and then continues on to the desired depth under the seabed. Drill pipe sections are added as drilling continues and progresses. As sections of well are completed, the drill string is pulled out of the well and the sections of the casing are joined together, lowered into the well, and cemented into place. The circulation equipment includes high pressure pumps, equipment to separate rock cuttings from the fluids, and storage facilities for the used fluids once retrieved.

Figure 2-3 provides a generalized schematic of a typical well and summarizes the typical drilling sequence for the upper section of a well and associated well head, BOP, casing and riser installation for wells such as those being proposed as part of this Project.

In addition to conventional drilling approaches, where a well is drilled from surface hole to final depth without moving the drilling installation, the Project may also include batch drilling, in which only the top hole sections for multiple wells are completed. Once the all the top hole sections are finished, the drilling installation returns to a well to drill it to final depth before moving to the next wellsite.



NOTE: For general illustration only. Drilling installation and well components not to scale

Figure 2-3 Schematic of a Typical Offshore Well and Associated Drilling Sequence

2.2.2 Geophysical, Environmental and Geotechnical Surveys

Geophysical / Geohazard / Wellsite and Seabed Surveys: These surveys may be conducted prior to drilling to assess the potential for hazards (such as possible obstructions or seabed instability), which may include seismic sound sources, multibeam echo sounders, side scan sonar, subbottom profilers, and video equipment. A pre-drill coral survey will also be undertaken, using similar equipment listed above, to confirm the presence or absence of sensitive marine habitat (e.g., corals, sponges).

Vertical Seismic Profiling (VSP) survey is often undertaken following completion of drilling a well to correlate seismic data to well depth. A VSP survey is undertaken by placing a receiver (geophones) down the well at pre-determined depths, with a sound source (usually mid-sized air source arrays) suspended from the drilling installation. Walk-away VSP surveys may also be undertaken, which involve placing a sound source on a vessel which then moves away while operating the sound source at pre-determined distances from the borehole receiver. Data is recorded at multiple intervals down the well, and the information assists in determining and confirming the depth of the drilled well and for reconciling drilling information with that obtained through geophysical survey work. VSP surveys are typically short term activities (usually several days duration), with the sound source firing often limited to just a few hours. They also use sound sources that are considerably smaller than those used in regional geophysical surveys for oil and gas in the offshore.

Geotechnical surveys: These surveys measure the physical properties of the seabed and subsoil through the collection of sediment samples and in-situ testing. Methods to collect the samples typically include drilled boreholes or gravity coring. In-situ testing is done through cone penetration testing and pore pressure measurements. Installation of piezometers in boreholes to measure soil properties may also be carried out. Piezometers could be left in place to collect data for up to 12 months or longer. Geotechnical surveys may occur throughout the Project life at any time of the year, using dedicated vessels provided by marine geotechnical specialist suppliers.

ROV / autonomous underwater vehicle surveys: They may be used to conduct visual inspections (camera equipped) of Project components. ROV surveys may also be used during pre-drill surveys and before marine installations to determine presence / absence of physical objects on the seafloor, as described earlier. They may also be used during the surveys described above to support drilling operations. They will be conducted throughout the Project-life at any time of the year using vessels of opportunity associated with the Project.

Environmental Surveys: may also be conducted to collect samples to analyze the physical, chemical, and biological aspects of the selected drilling area. Sampling is typically carried out from a support / supply vessel or a dedicated vessel suitable to the survey. Environmental surveys may include oceanography, meteorology, and ice / iceberg surveys. It can also include biota, water, and sediment sample collection, and ROV-video or drop camera surveys. Environmental surveys may occur throughout Project life at any time of the year using vessels of opportunity associated with the Project, typically taking 5 to 20 days to complete.

2.2.3 Formation Flow Testing with Flaring

A formation flow test may be carried out on wells where hydrocarbons are discovered and additional reservoir data is needed. During such testing, fluids from the reservoir are flowed back to the drilling installation, measured and, if required, stored for future analysis. Produced hydrocarbons and some produced water from the reservoir are flared using high-efficiency burners. Flaring would be continuous and last between 2-5 days. If there is a larger amount of produced water than can be flared, it will be treated in accordance with the relevant regulatory requirements prior to ocean discharge or shipped onshore for disposal.

An alternative to formation flow testing with flaring exists and may be used on exploration wells to gather similar data. These types of tests, called Formation Testing While Tripping (FTWT), may be conducted without the need to flare. Formation flow testing would only be carried out on exploration wells where hydrocarbons are discovered and additional information on the specific characteristics of the find is therefore required. The specific nature and duration of any such formation flow testing is dependent upon various factors but is typically in the order of two to three days, although this may be of longer duration (up to five days) depending on the characteristics of the hydrocarbons found and the analysis being undertaken.

2.2.4 Well Decommissioning or Suspension

Once drilling and formation flow testing (if required) is completed, the offshore wells drilled as part of the Project will be decommissioned or suspended. These activities typically involve the isolation of the well bore by placing cement plugs and/or mechanical devices, at various depths, and in some cases the casing is cut and removed just below the surface of the seafloor and equipment removed. In certain circumstances, the well may be suspended, in accordance with C-NLOPB requirements, for future re-entry. This is similar to the decommissioning process, but the wellhead is not removed and a suspension cap is installed to protect the wellhead connector.

For the Project, the approach undertaken will be based largely upon the water depths at the well site and associated technical considerations, as follows:

- In water depths less than 500 m, the wellhead will be removed by using the drilling installation to cut the casing below the seafloor and return it to the installation
- In water depths between 500 m and 1,500 m, wellheads will be removed by cutting the wellhead externally, leaving a portion of the casing above the seafloor. Cutting of the casing above the seafloor will be completed as close to the natural seabed as practicably and technically feasible. A pipe stub with a maximum height of less than 1 m will remain above the seabed.
- In water depths greater than 1,500 m, the wellhead will remain in place and will not be removed.

Well decommissioning for this Project will be carried out as per the Operator's standard internal procedures, as well as applicable industry practice and in compliance with relevant regulatory requirements. These activities will adhere to the requirements set out under the *Newfoundland Offshore Petroleum Drilling and Production Regulations* wells will be monitored and inspected in accordance with applicable regulatory requirements at the time of their decommissioning.

2.2.5 Supply and Servicing

Supply vessels and helicopters will be used to transport personnel, equipment and materials to and from a drilling installation during the Project. Supply vessels will make regular trips to the drilling installation throughout the drilling program, and a dedicated stand-by vessel may also attend to the installation throughout the campaign. Personnel will be transported to and from the drilling installation by supply vessel or helicopter, according to work schedules and rotations, workforce numbers, distances and other factors.

It is expected that offshore supply vessel and aircraft services for the Project will be based in St. John's NL. Existing facilities in eastern Newfoundland will be used for these purposes for this Project, as well as for the supply and disposal of materials such as drilling fluids, for fueling and other supply, support and logistical functions. Aircraft support for the Project will be based at the St. John's International Airport. These shore-based facilities are owned and operated by independent third-party service providers, service multiple operators and their activities, and were developed and operate in accordance with relevant regulatory requirements and approvals. They are also certified as compliant port facilities under the *Marine Transportation Security Act*. Third party services and support will be procured through a competitive bid process in accordance with the requirements of the Accord Acts. The Project will not require or result in upgrades or the development and use of new infrastructure at these established shore base facilities.

It is anticipated that with a single operating drilling installation there will be 8 to 10 return transits per month by the supply vessels during the course of the Project. Supporting vessels that are involved in Project activities will travel in an essentially straight line between the drilling installation in the Project Area and an established port facility in Eastern Newfoundland, a practice which is common in the oil and gas industry that has been active in this region for several decades. Figure 2-4 illustrates a number of key supply and support vessel traffic routes related to the existing oil production facilities off Eastern Newfoundland. Figure 2-5 shows potential traffic routes that may be used for this Project. This is provided for general information and illustrative purposes, recognizing that specific routes may vary at times based on the location of the active drilling installation(s), the shore-based support facility being used, environmental conditions (including weather and ice), and other logistical factors.

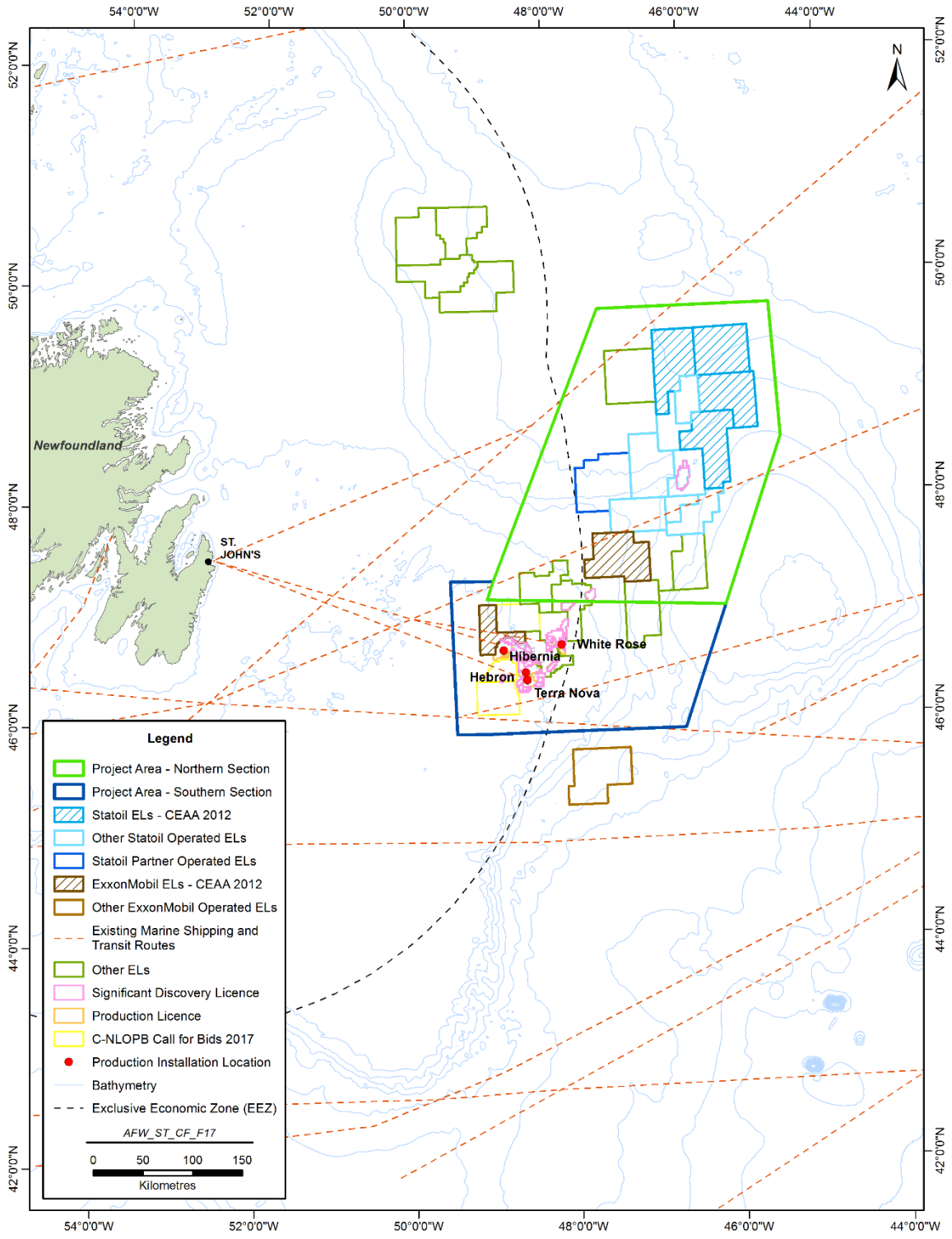


Figure 2-4 Existing Vessel Traffic Routes

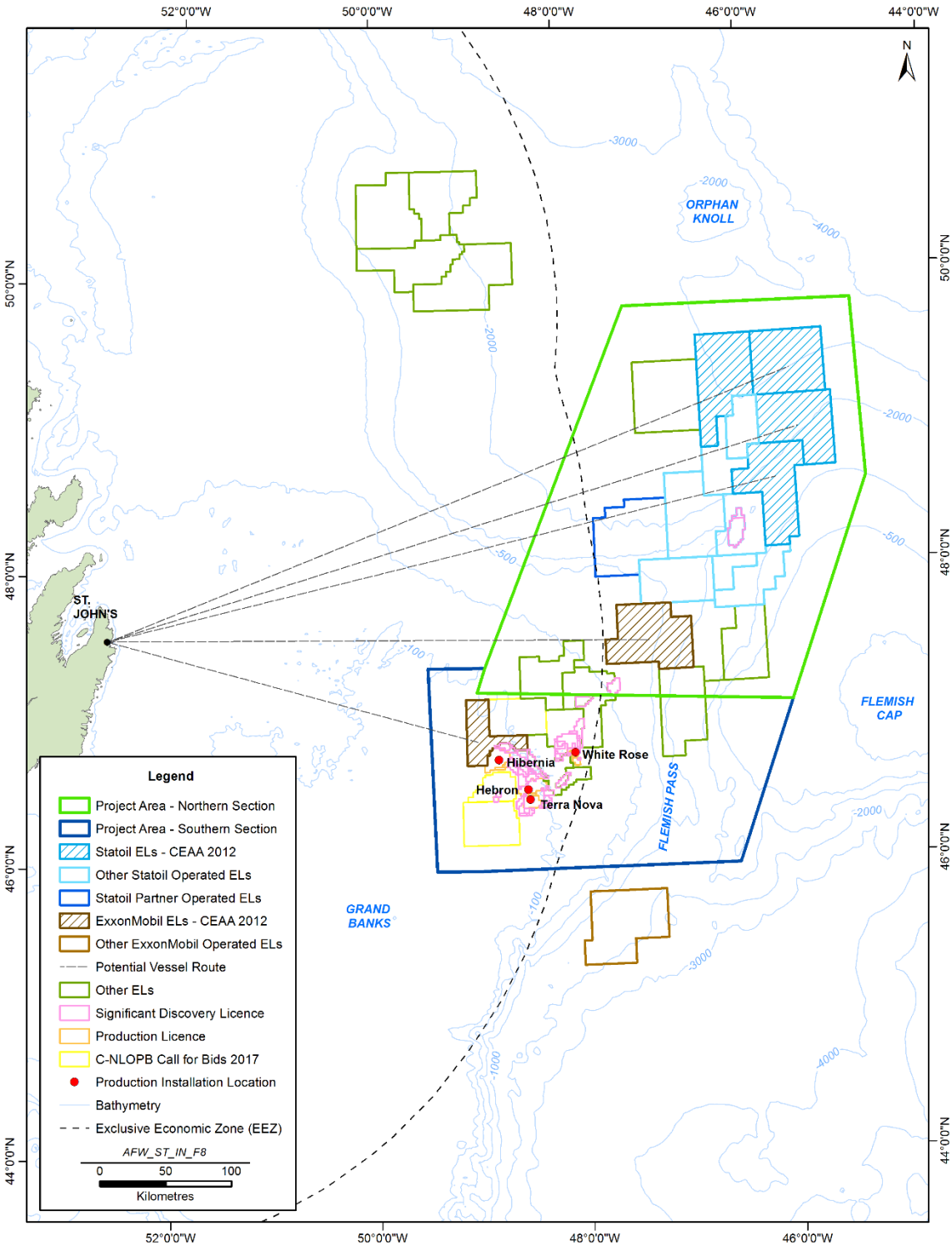


Figure 2-5 Potential Project Vessel Traffic Routes

2.3 Project Schedule

The planned Project duration is for a period of 12 years (2018 to 2029), providing an adequate and conservative timeframe within which Project activities may occur. Exploration drilling campaigns may progress year-to-year and from well-to-well based on the results and evaluation of previously drilled wells, interpretation of geophysical data, and the Operator's exploration requirements, with Project activities potentially being carried out at any time of the year.

2.4 Accidental Events

The probability, fate and trajectory of oil spills has been modelled to inform accidental event prevention and emergency response planning, as well as to assess potential environmental effects.

2.4.1 Spill Prevention and Response

The Operator maintains a strong commitment to health, safety and environmental stewardship. Central to this commitment is a corporate Safety, Security, Health and Environment management system.

Prevention is the most effective way to avoid environmental effects from accidental spills. Standard operating procedures to reduce or eliminate the chance of a spill, even in the case of equipment failure, will be instituted for hydrocarbon handling operations. Routine maintenance and testing schedules will be established for the drilling program, with particular attention paid to well control, product storage and handling, and fuel transfer systems. Prior to exploration drilling, practices for operating in poor weather, high sea state, or sea ice or iceberg conditions will be established. Good communications and sound marine practices for offshore supply vessels will also improve the ability to prevent spills.

Prior to initiation of the exploration drilling program, an operator must submit an application to the C-NLOPB for authorizations such as an Approval to Drill a Well and an Operations Authorization. Among other things, the applications include details on hazard identification and commitments for environmental protection, including spill prevention and response.

There are several control measures that are designed and implemented during drilling to maintain well control and reduce risk of a well blowout. These control measures include mechanical controls and barriers that are implemented as part of well design (e.g., steel casing, blowout preventer), and drilling and monitoring procedures. In the event that this primary barrier fails, secondary barriers such as the BOP system can be used to regain well control. A BOP is a critical piece of safety equipment which houses a system of high pressure valves that prevent water or hydrocarbons from escaping into the environment in the event of an emergency or equipment failure. The BOP and other pressure control equipment are tested regularly in accordance with the Drilling and Production Guidelines (C-NLOPB and Canada-Nova Scotia Offshore Petroleum Board 2017).

Proper environmental operating practices will be assured through regular inspections and audits of the drilling installation. The general awareness of offshore workers will be increased through training, seminars and safety meetings. Personnel will be expected to report potential problems and 'near

miss' incidents in an attempt to avoid a re-occurrence that could result in a loss of containment or other release of petroleum or other hydrocarbons.

In the unlikely event of an accidental event, the Operator's emergency response philosophy is to minimize the impact of an emergency on people, environment, and the corporation. Prior to commencement of drilling operations, contingency plans will be developed that will serve as the guidelines for the company's response to an emergency. Contingency plans will be developed to address emergencies that will be identified in operations-specific hazard and risk analyses. The plans will outline the necessary procedures, personnel, equipment and logistics support required to respond to an emergency incident in a safe, prompt, coordinated manner. The plans will be distributed to designated personnel who will be responsible for emergency response actions. The content of the plans will contain sufficient detail to enable personnel to respond in a coordinated and effective manner.

The following contingency plans will therefore be developed and implemented for the Project:

- *Offshore Emergency Response Plan:* Provides very specific role descriptions for personal for a number of potential emergencies; detailed response measures for a number of identified potential emergencies; response equipment/gear list, including location, evacuation criteria and process; provides a link between offshore operations and onshore responders; includes procedures and operations associated with subsea source control and containment (see Section 15.1 of the EIS for additional details).
- *Collision Avoidance Plan:* Identifies potential collision situations involving the drilling installation, describes communications with other vessels and lists actions to be taken on the drilling installation in the event the vessel does not respond
- *Ice Management Plan:* Defines how personnel will monitor the movement of icebergs and pack ice approaching the Project Area and describes procedures for responding to threats including countermeasures such as iceberg deflection. (Refer to Section 16.2 of the EIS for additional details)
- *Oil Spill Response Plan (OSRP): D*efines procedures for first response to spills originating at the Drilling Installation and includes consideration of various spill response tactics within the context of a Spill Impact Mitigation Assessment

Emergency preparedness also requires directed training and response exercises. Designated Operator personnel, including contractors, will receive directed emergency training. A regular program of response exercises will also be conducted to encourage readiness of personnel. These exercises will contribute to continuing familiarization of personnel with emergency procedures, test preparedness of personnel, and provide a means of developing continued improvement to emergency procedures.

2.4.2 Potential Accidental Event Scenarios

A number of potential accidental event scenarios that could occur during drilling activity have been identified based on historic industry trends/incidents and the proposed Project. These include accidental events due to natural hazards (e.g. icebergs, hurricanes, submarine landslides), vessel collision, dropped objects, loss of drilling installation stability or structural integrity and loss of well

control leading to a blowout. The consequences of accidental events may be health and safety related (i.e., injury or death of personnel) and/or loss of containment of hydrocarbons or other chemicals and release to the environment. There are a number of preventative measure, barriers and controls in place to prevent accidental events including the robust design of drilling installation/vessels, training of personnel, operational procedures and processes as detailed in the management system and oversight.

There is potential for a spill to occur as a result of most accidental event scenarios. Two accidental spill scenarios were selected for spill fate and behaviour modelling based on consideration of Project activities and potential environmental risk: These spill scenarios are considered representative of credible worst case spill scenarios that could result from an accidental event and include:

- Batch diesel spill
- Subsurface blowout

A loss of well control resulting in a subsurface blowout with a continuous release of oil represents the worst-case scenario for an accidental spill event. The Operator has various mechanisms, such as a BOP, in place to prevent a loss of well control. The risk of a subsea blowout occurring is, therefore extremely low (refer to Section 15.3 of the EIS). However, in the extremely unlikely event of a subsea blowout, hydrocarbons such as crude oil and gas condensate could be released into marine waters. The duration of a blowout, and therefore the resulting volume spilled and geographic extent affected, will be limited due to the implementation of emergency response measures.

Spills attributed to causes other than blowouts account for the vast majority of spills related to offshore exploration and production and these spills are also more likely to be smaller, with an average volume of less than 200 bbl. Batch spills, which can occur from a drilling installation or offshore supply vessel, are generally instantaneous or short-duration discharges that can involve the release of different types of hydrocarbons including diesel, hydraulic fluid, aviation fuel, or drilling fluids (refer to Section 15.2 of the EIS for drilling fluid spills). These spills can occur accidentally during handling or transfer of cargo, or equipment malfunction. They can also occur as a result of a hose or tank failure during refueling activities.

2.4.3 Spill Risk and Probabilities

A detailed analysis of the likelihood or probability that a well blowout or batch spill would occur over the life of the Project was conducted to support the EIS analysis of potential accidental events.

The results of the oil spill probability analyses show that the probability of a well blowout is extremely low (1.5×10^{-7}, or one in 666,667 chance of occurring) or other large release (more than 100 L) is very low (8.5×10^{-3}, or 1 in 118 chance of occurring); that is, blowouts and other large spills from offshore exploration wells are quite rare. The probability of an oil spill is greater for small spills (up to 100 L) as compared to larger spills, including batch and sub-surface releases. Based on world-wide statistics and C-NLOPB data for spill frequency type and volume, the annual frequency of a batch spill of any volume - from very small to the largest probable batch diesel spill volume of 126 bbl is 0.045 per well for a 35-day drilling period, and 0.084 per well for a 65-day drilling period. The probability of a subsurface release for a single well is less than 0.00000015. Overall, analysis

indicated the probabilities of spillage are very low and if accidental release does occur, the spill volumes are likely to be relatively small.

2.4.4 Spill Fate and Behaviour

The severity of an operational spill depends on the volume and type of spilled material. For the purpose of this assessment, spill scenarios of a batch diesel spill (100 litres and 1,000 litres) and subsurface blowouts have been considered to represent a credible worst case scenario. The following spill scenarios have been modelled in terms of fate and trajectory:

- Subsurface Blowout (Jeanne d'Arc Basin release site EL 1137 (EL 1137)): a hypothetical release of 4,165 m³/day (26,200 bbl/day) of crude oil for 30 and 113 days for a total of 124,964 m³ (786,000 bbl) and 470,603 m³ (2,960,000 bbl), respectively (46.9°N, 48.9°W)
- Subsurface Blowout (Southern Flemish Pass EL 1135 (EL 1135)): a hypothetical release of 24,802 m³/day (156,000 bbl/day) for 30 and 113 days for a total of 744,062 m³ (4,680,000 bbl) and 2,802,633 m³ (17,628,000 bbl), respectively (47.5°N, 47.2°W)
- Batch Spill BS100L-EL1137: a hypothetical release of 100 litres (0.63 bbl) of marine diesel fuel from a Drilling Installation or offshore supply vessel at the EL 1137 release site (46.9°N, 48.9°W)
- Batch Spill BS100L-EL1135: a hypothetical release of 100 litres (0.63 bbl) of marine diesel fuel from a Drilling Installation or offshore supply vessel at the EL 1135 release site (47.5°N, 47.2°W)
- Batch Spill BS1000L-EL1137: a hypothetical release of 1,000 litres (6.3 bbl) of marine diesel fuel from a Drilling Installation or offshore supply vessel at the EL 1137 release site (46.9°N, 48.9°W)
- Batch Spill BS1000L-EL1135: a hypothetical release of 1,000 litres (6.3 bbl) of marine diesel fuel from a Drilling Installation or offshore supply vessel at the EL 1135 release site (47.5°N, 47.2°W)

The specific trajectories and fates of an oil spill will vary for each release based upon the environmental conditions occurring at the time of the release, and the volume of oil that is released. The modelling was conducted for an unmitigated release (i.e., no spill response measures implemented) in accordance with the EIS Guidelines.

The results of the modelling suggest that oil from subsurface releases from both EL 1135 and 1137 have a higher potential to move south and to the west before it surfaces and is carried east by the prevailing winds. Although there was no predicted shoreline oil contact from the 30-day release at EL 1135, oil was predicted to contact the shoreline from the 113-day release at EL 1135, as well as the releases (30- and 113-day) at EL 1137. The highest predicted potential (30 percent) for oil to make contact with shorelines exceeding 1 g/m^2 occurred from the 113-day release in winter scenarios, with summer conditions typically resulting in substantially less probable contact with shorelines. The probability of oil making contact with shoreline above 1 g/m^2 from the 113-day release at EL 1137 exceeded 25 percent on the Avalon Peninsula, was approximately 10-25 percent for the coast of southern Newfoundland, and was closer to 1-10 percent for Sable Island and the eastern shores of Nova Scotia. The oil that does make it to shorelines is expected to be highly weathered, patchy, and discontinuous, as minimum time estimates for first shoreline oil exposure is

predicted to occur at approximately 30 days at EL 1135 to 29 days at EL 1137 (Table 4 2 of Appendix E). Modelled oil from these subsurface releases had a higher potential to be transport to the west and southwest prior to surfacing, where surface currents and winds typically carried releases further offshore.

It is important to note that while unmitigated subsurface blowouts and batch diesel spills were modeled, these represent worst case scenarios as required by the EIS Guidelines. As described in Section 15.1of the EIS, the Operator employs a number of preventative and proactive controls as part of the safety management system. In the unlikely event that an accidental event occurs, these mitigative controls would be employed. These mitigation measures will greatly decrease both the probability and consequence of a spill. Oil spill trajectory and fate modelling and analyses for the mitigated scenario, which is more realistic than the worst-case scenario, have also been modelled and can be found in Appendix E of the EIS.

3.0 ALTERNATIVE MEANS OF CARRYING OUT THE PROJECT

Consistent with CEAA 2012, the EIS Guidelines require consideration of alternative means for the following Project aspects:

- Drilling fluids selection
- Drilling installation selection
- Drilling waste management
- Water management
- Location of final effluent discharge points
- Offshore drilling installation lighting
- Formation flow testing with flaring at night
- Chemical selection

With respect to water management, the water management system (e.g., intake, storage, distribution, discharge) will be dependent on the configuration of the drilling installation's water system, and alternative systems of water management will not be available. A drilling installation has yet to be selected for the Project, and therefore, alternative water management systems are not available at this time. Likewise, with respect to the location of final effluent discharge points, discharge points on a drilling installation are fixed and cannot be changed or re-configured. A drilling installation has yet to be selected for the Project, and therefore, alternative locations for effluent discharge points are not available at this time. Typically, effluent discharge points are located near or under the water's surface. In both cases, a Certificate of Fitness for the drilling installation will be required, and obtained from a certifying authority, in accordance with requirements of the Accord Acts and an Operations Authorization from the C-NLOPB, to confirm that the effluent discharge and water management system comply with relevant legislation.

As the EIS is prepared prior to well planning or drilling program design, information regarding chemicals required for drilling are not yet determined, nor have alternatives been identified. However, in terms of chemical selection, the Operator has established chemical selection and management processes, which will be used during well planning and design, prior to the start of drilling. The chemical selection and management process is aligned with the Offshore Chemical Selection Guidelines (OCSG), and other regulatory requirements (*Canadian Environmental Protection Act*, *Fisheries Act, Hazardous Product Act, Migratory Birds Convention Act*, *Pest Control Products Act*) to enable the selection of chemicals that, once discharged at sea, would have the least effect on the receiving environment. The objective of the OCSG is to promote the selection of lower toxicity chemicals to reduce the potential environmental impact of a discharge where technically feasible. A detailed description of the OCGS procedure and criteria is provided in Chapter 2 of the EIS.

For the remainder of the Project aspects, (drilling fluids selection, drilling installation selection, drilling waste management, offshore drilling installation lighting, formation flow testing with flaring at night), options were evaluated based on legal acceptability, technical feasibility, economic feasibility, and potential environmental issues (Tables 3.1 to 3.5).

Table 3.1 Drilling Fluids Selection - Comparison of Water-based and Synthetic-based Drilling Muds

Option	Legal Acceptability	Technical Feasibility	Economic Feasibility	Potential Environmental Issues	Preferred Option
WBM	YES Use and management in accordance with OWTG and OSCG	NO Technically inferior at deeper sections of well	Potential economic increases if used at deeper sections of well	WBM acceptable for upper hole sections; SBM acceptable for lower well sections. For both options, it is assumed appropriate controls are implemented and OSCG is followed. Both options considered in assessment of potential environmental effects	Use of WBM for initial well sections when drilling without riser installed
SBM	YES	YES Technically superior for deeper sections of well	YES		SBM to be used at lower well sections, when riser installed.

Table 3.2 Drilling Installation Selection

Option	Legal Acceptability	Technical Feasibility	Economic Feasibility	Potential Environmental Issues	Preferred Option
Semi-submersible	YES	YES	YES	Both semi-submersible and drill ship options considered acceptable assuming appropriate controls are implemented	Preferred option not yet chosen. Both semi-submersibles and drill ships are considered in assessment of potential environmental effects
Drill ship	YES	YES	YES		

Table 3.3 Drilling Waste Management - Comparison of Drilling Waste Disposal Options

Fluid Type	Option	Legal Acceptability	Technical Feasibility	Economic Feasibility	Potential Environmental Issues	Preferred Option
WBM	Disposal at Sea	YES	YES Will only be used during riserless drilling; therefore cannot be returned to drilling installation for collection	N/A	Localized effects on seafloor	Disposal at sea during riserless drilling
	Disposal on shore	YES	NO Will only be used during riserless drilling; therefore, cannot be returned to drilling installation for collection	Not considered as an option as not technically feasible		
	Offshore re-injection	YES	NO	Not considered as an option as not technically feasible		
SBM	Disposal at Sea	YES	YES	YES	Localized effects on seafloor	Disposal at sea
	Disposal on shore	YES	YES	YES But increased costs from increased transportation and operational delays	Increase in GHG emissions, larger environmental footprint	
	Offshore re-injection	YES	NO	Not considered a technically feasible option and not assessed		

Table 3.4 Offshore Drilling Installation Lighting

Option	Legal Acceptability	Technical Feasibility	Economic Feasibility	Potential Environmental Issues	Preferred Option
No or limited lighting	NO – required by Canadian and international regulations	Not considered as an option due to regulatory requirements			
Standard lighting	YES	YES	YES	Potential localized effects on migratory birds	Standard lighting
Spectral modified lighting	YES	NO Not yet considered ready for commercial use	NO Not considered commercially viable	Not considered as an option due to technical/economic limitations	

Table 3.5 Formation Flow Testing with Flaring at Night Options

Option	Legal Acceptability	Technical Feasibility	Economic Feasibility	Potential Environmental Issues	Preferred Option
No flaring	NO	Not considered as an option due to regulatory and safety requirements			
Reduced flaring (no flaring at night or during low-visibility weather)	YES	YES Note – potential to result in compromised data from formation flow test; increased safety risk	YES Note – increased cost and potential schedule extension	Reduced potential effects compared with standard flaring	
Flaring as required	YES	YES	YES	Potential localized effects on migratory birds; C-NLOPB will consult with ECCC-CWS to determine safe timeline for flaring	Flaring as required
Formation Testing while Tripping (FTWT)	YES	YES	YES	No Flaring	FTWT

4.0 PUBLIC PARTICIPATION AND ENGAGEMENT WITH INDIGENOUS GROUPS

This section describes public (governmental, agency and stakeholder) consultation and Indigenous groups engagement initiatives related to the Projects and their EAs, as well as identifying the comments raised regarding the Projects, the potential effects, and where and how these are addressed. Engagement activities for both Projects have been planned and undertaken collaboratively by Statoil and ExxonMobil, the information and findings reported in this Chapter are common to and equally applicable to both Projects.

4.1 Governmental, Agencies and Stakeholder Consultation Activities

The Operators recognize that a number of federal and provincial government departments and agencies have specific responsibilities or interests related to the Projects and their potential environmental effects, as a result of associated government policies, legislation, and regulations (including required regulatory decisions and/or compliance requirements), and other relevant issues, mandates, programs, and services. As part of EIS planning and development, the Operators designed and implemented a governmental and stakeholder engagement program to provide various mechanisms and opportunities for individuals and organizations to receive and review information and to provide input related to the Projects and potential Project-related environmental effects.

During the development of the original Project Description for each Project, and subsequently as part of EIS preparation, the Operators contacted several government departments, agencies and stakeholder groups to share information on the Project and to identify questions or concerns that require consideration in the EA process. Table 4.1 summarizes the organizations engaged by the Projects (as of October 24th, 2017). Other stakeholder organization groups not listed in the table below, such as Canadian Parks and Wilderness Society (CPAWS), Protected Areas Association of Newfoundland, and Sierra Club (NL Chapter) were contacted by the Operators and have indicated an interest in following up once the EIS is publicly available. A complete list of the stakeholder engagement initiatives is provided in Tables 3.1 to 3.12 of the EIS.

Table 4.1 Summary of Governmental and Stakeholder Organizations Consulted

Type	Organization
Government Departments and Agencies	CEA Agency Fisheries and Oceans Canada (DFO) C-NLOPB Environment and Climate Change Canada Transport Canada Health Canada
Fish Harvesters and Processors	One Ocean Food, Fish and Allied Workers-Unifor (FFAW-Unifor) Ocean Choice International Groundfish Enterprise Allocation Council Association of Seafood Producers
Stakeholder Organizations	Nature NL

4.2 Engagement with Indigenous Groups

When engaging with Indigenous groups potentially impacted by the Projects, the Operators respect the Aboriginal and Treaty Rights of Indigenous peoples in Canada and recognize there may be a potential impact of the Projects on these rights. The Operators also recognize that the potential environmental effects of the Projects may interact with resources used by Indigenous People in the exercise of their rights. When engaging Indigenous communities on the Projects, the Operators acknowledge the obligation of the Crown to consult with Indigenous communities where a potential Crown decision may impact potential or established Aboriginal and Treaty rights. Those obligations are reflected in the guidance provided to the Operators in the EIS Guidelines documents.

In their engagement efforts with Indigenous groups (identified in Table 4.2), the Operators have provided timely information in plain language, while consistently following up to address questions and determine the need for more information. Engagement has been guided by the needs and/or requests of communities and has included a variety of methods, including personal meetings, phone calls, emails and reports. When engaging with communities, the Operators have committed to ongoing dialogue during all phases of the Projects, with a goal of building relationships built on mutual trust and respect.

The EIS Guidelines (Section 5.1) specify that the Operators are required to notify the following Labrador-based Indigenous groups about “key steps in the EIS development process and of opportunities to provide comments on key EA documents and/or information to be provided regarding their community”:

- The Labrador Inuit (Nunatsiavut Government)
- The Labrador Innu (Innu Nation)
- The NunatuKavut Community Council

This section of the EIS Guidelines also specifies that “The proponent will ensure these groups are reflected in the baseline information and assessment of potential environmental effects as described under paragraph 5(1)(c) of CEAA 2012 and/or impacts to potential or established section 35 rights, including title and related interest in the EIS”.

The EIS Guidelines (Section 5.1) also state that “In addition, for the purposes of good governance, the proponent should also provide information to and discuss potential environmental effects from the Project…with the”:

- Qalipu Mikmaq First Nation Band (QMFNB)
- Miawpukek First Nation (MFN).

In June 2016, Statoil and ExxonMobil individually wrote to each of the above noted Indigenous groups in Newfoundland and Labrador, along with the Mi’kmaq Alsumk Mowimsikik Koqoey Association (MAMKA), which is an Aboriginal Aquatic Resources and Oceans Management (AAROM) Program organization formed by MFN and QMFNB.

Subsequently, in April 2017 the CEA Agency informed the Operator that there were potential adverse impacts of the Project on potential or established Aboriginal and/or Treaty rights and potential

environmental effects from the Project on other Indigenous groups in the Maritime Provinces and Quebec, and thus, engagement with additional groups was also required. Additionally, in July 2017, the Passamaquoddy of New Brunswick was included in this scope of engagement. The Indigenous groups by province are presented in Table 4.2.

Table 4.2 Indigenous Groups by Province

Province	Group(s)
Newfoundland and Labrador	NunatuKavut Community Council
	Innu Nation
	Nunatsiavut Government
	Miapuwkek Mi'kamawey Mawi'omi
	Qalipu Mi'kmaq First Nation
Prince Edward Island	Abegweit First Nation
	Lennox Island First Nation
New Brunswick	Elsipogtog First Nation
	Buctouche First Nation
	Eel Ground First Nation
	Eel River Bar First Nation
	Esgenoôpetitj First Nation
	Fort Folly First Nation
	Indian Island First Nation
	Metepenagiag Mi'kmaq Nation
	Pabineau First Nation
	Kingsclear First Nation
	Madawaska Maliseet First Nation
	Oromocto First Nation
	St. Mary's First Nation
	Tobique First Nation
	Woodstock First Nation
	Passamaquoddy of New Brunswick
Nova Scotia	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*

Table 4.2 Indigenous Groups by Province

Province	Group(s)
	Pictou Landing First Nation*
	Potlotek First Nation
	Wagmatcook First Nation*
	We'koqma'q First Nation
	Millbrook First Nation
	Sipekne'katik First Nation
Quebec	Conseil des Montagnais de Natashquan
	Conseil des Innus de Ekuanitshit
	La Nation Micmac de Gespeg
	Listuguj Mi'gmaq Government
	Micmacs of Gesgapegiag

4.3 Identified Questions / Concerns / Key Comments

A key purpose of the engagement program outlined above was to identify questions, concerns and issues related to the Project and its environmental effects that require consideration in the EIS and in on-going and future Project planning. Specific to Indigenous groups, in addition to potential environmental effects, an important purpose of the engagement program was to understand any potential impacts to Aboriginal and Treaty rights.

During engagement with Indigenous groups, a number of important comments, questions and issues were raised directly to the Operators, as well as indirectly to the CEA Agency, about the Project. Numerous groups expressed the need to understand the overall regulatory process and the associated roles within it more clearly. Many indicated they needed additional capacity to ensure they could respond effectively to the engagement, with expectations in this regard varying. The Operators heard numerous times that while Groups appreciated the collaboration between ExxonMobil and Statoil on the Environmental Assessment, they were still heavily burdened by the number of projects they were currently reviewing.

Indigenous groups were also concerned about the potential impact of the Project, including ongoing operations as well as possible spills and/or large scale accidental events. Concerns about impacts focused primarily on specific species of importance but also included an overall concern about the potential impact to the environment. When communicating about impact concerns related to certain species, Indigenous groups focused on both a commercial and harvesting/cultural consideration. A number of groups expressed an appreciation for the early engagement on the Project, but also indicated they would be able to provide more feedback once they had reviewed the EIS.

A summary of Project-related questions and issues raised to either the Operators or the CEA Agency (that the Operator is aware of), through the above described Indigenous, governmental and stakeholder consultation and engagement activities is provided below (Table 4.3). Further details on the questions and issues raised and where they are addressed in the EIS, can be found in Chapter 3.

Table 4.3 Summary of Engagement Feedback

Question / Issue Raised
Indigenous Engagement
To CEA Agency: Clarity on CEEA process and timelines for the Project
To CEA Agency: Accidental events and potential effects from blowout modelling should be included in the EIS – along with an impact assessment on coastal zones – including seasonal or temporary residences
To CEA Agency: Role of the proponent vs. CEA Agency in the engagement process
To CEA Agency: EIS should not reference other previous environmental assessments that are not provided
To CEA Agency: Selection of VCs should consider the communities right to harvest at all times of the year throughout the Land Claim area
To CEA Agency: Climate change should be considered in “physical oceanography’ section
To CEA Agency: NG have a specific interest in the accidental event worst case modelling
To CEA Agency: NG want assessments of malfunctions/accidents to include commercial fishing licence areas(2GHJ3KL) and potential impacts to subsistence/commercial species (cod, turbot, snow crab) and SARA listed species (Atlantic Blue Whale, North Atlantic Right Whale) that may migrate through impacted area to the Marine Zone of the Labrador Inuit Land Claim Agreement.
Innu commercial fishing activity off eastern Newfoundland
Underwater sound and its effects on marine mammals
Compensation to commercial fishery in the extremely unlikely event of a major oil spill
Capacity to engage independent experts, review EIS, conduct community engagement sessions
If future exploration could move to nearshore Labrador
Fishing industry contacts for the EA process
Potential for direct/indirect impacts to fisheries (commercial/traditional), traditional activities, culture and need for mitigation/accommodation measures
Potential impact on all species but especially Atlantic salmon, which is already threatened
To CEA Agency: Scope of the Project for EA purposes (use of supply bases and transportation corridors) and associated concerns around chemicals and hydrocarbons use and storage.
To CEA Agency: Location of current and potential future fishing activities and licences in relation to Project Area
To CEA Agency: Indigenous group encourages direct engagement between the QMFN and Operator
To CEA Agency: Consider the effects of accidents in the near shore environment as a requirement for EIS
To CEA Agency: MCPEI deferred to Indigenous groups of NL
Potential impacts of Project on Atlantic salmon migration/populations
Potential impacts of Project on commercial-communal swordfish fisheries

Table 4.3 Summary of Engagement Feedback

Question / Issue Raised
Potential impacts of Project on American eel migration
Desire for operators to collaborate on EAs in order to reduce burden on communities.
Concerns with Alton Gas project and possible use of BP and Statoil projects with further development
Concerns regarding impacts to FSC and commercial-communal fishing rights.
Concerns regarding engaging on ExxonMobil proposed Offshore Exploration Project together with Sable Decommissioning Project in Nova Scotia
Potential impact of Project on Atlantic salmon population/migration – specifically concerned about DU12, and the need for more current research.
High cultural value of fisheries including Atlantic salmon and right whales, American eel and swordfish.
Inability to fully carry out FSC rights due to limited salmon population and conservation programs, which impact food security
Type of drilling rig used, depths of wells, timing of drilling, effects of drilling mud discharge on salmon feeding areas
Impact of the Project on migratory species that travel through the Project Area – including right whales and salmon
Displacement of prey species as a result of operations
Adequacy of CEA Agency participant funding
Seeking to coordinate all four Flemish projects into one round of community engagement
Potential impact of Project on Atlantic salmon populations and migration – need for more current research to be included in salmon report – need for more research regarding Atlantic salmon generally
Have had no FSC fishing activity since 1996 due to low salmon populations and conservation efforts
More information on drilling program
Potential impact of spill on wildlife – specifically those accessed for subsistence and commercial fishing, including migratory birds and seals, eggs.
Data, studies, or reports associated with the probability of an uncontrolled well event
Policies and procedures regarding prevention of spill
Requested further clarification on salmon research, collaboration of EM and Statoil, cumulative effects of other industry
Lack of capacity to review EIS
Government Departments, Agencies and Stakeholders
Proposed collaborative approach to EIS
C-NLOPB role in EA
Food, Social and Ceremonial licensing and commercial-communal licences issued in NL
Scope of EA to satisfy both CEAA 2012 and C-NLOPB requirements
Indigenous engagement and potential interests in the Project and its effects
Fish habitat and special areas
Pre-drill coral survey and strategy

Table 4.3 Summary of Engagement Feedback

Question / Issue Raised
Fishing Industry
Re-emergence of fish species such as cod, turbot, witch flounder
Potential impacts of project on cod spawning areas
Temporal scope of EA, timeframe for review of EA and annual EA update process
Sharing of fish harvesting data
Nature-NL
Level of information available for fish species harvested in 3M
Wind effects on currents should be considered in EIS
Flaring – possible to limit to daylight hours
Met-ocean data collected by oil and gas industry is high quality, not readily available to public and researchers

5.0 ENVIRONMENTAL ASSESSMENT SCOPE, APPROACH AND METHODS

5.1 Scope of the Project and its Assessment

The EIS has been planned, prepared and submitted in accordance with requirements of CEAA 2012 as well as the Project-specific Guidelines for the Preparation of an Environmental Impact Statement pursuant to the *Canadian Environmental Assessment Act, 2012* (EIS Guidelines), issued by the CEA Agency in December 2016, and other generic EA guidance documents issued by the CEA Agency.

The scope of the Project for the purposes of the EA includes each of the components and activities defined and described in Sections 2.1 and 2.2 above, and specified in Section 3.1 of the EIS Guidelines, namely:

- The mobilization, operation, and demobilization of Mobile Offshore Drilling Units (hereinafter referred to as *drilling installations*) designed for year-round operations for the drilling, testing, and abandonment of up to 35 wells within ELs operated by ExxonMobil, including consideration of any proposed safety zones. Drilling may occur in various water depths under consideration, with various types of drilling installations, and with multiple drilling installations operating simultaneously
- VSPs and in-water works (e.g., wellsite surveys) to support the specific exploration wells under consideration, but excluding surveys potentially required to support conduct of the EA (e.g., environmental baseline surveys) and surveys related to the broader delineation of resources
- The loading, refueling, and operation of marine support vessels (i.e., for re-supply and transfer of materials, fuel, and equipment and on-site safety during drilling activities and transport between the supply base and drilling installation(s)) and helicopter support (i.e., for crew transport and delivery of light supplies and equipment) including transportation to the drilling installation

5.2 Identification and Selection of Valued Components

EAs typically identify and focus on components of the environment that are of ecological or socioeconomic importance and/or which can serve as indicators of environmental change, and that have the potential to be affected in some way by the project under assessment. These are known as Valued Components (VCs), and may include both biophysical and socioeconomic aspects of the environment. The VC approach is a useful, effective, and widely accepted way of ensuring that an EA focuses on components and issues that are most relevant to the Project and its potential effects.

For this Project, the identification and selection of the VCs was an early, ongoing, and iterative process based on a number of key considerations and inputs including regulatory guidance and the EIS Guidelines, as well as the Operator's engagement with government departments and agencies, Indigenous groups, fisheries organizations, and environmental groups. Specifically, commercial fisheries and fish and fish habitat VCs address concerns raised by fisheries organizations and Indigenous groups related to commercial fishing. Marine fish and fish habitat, marine and migratory birds, marine mammals and sea turtles with the inclusion of species at risk address the VCs of concern raised by environmental organizations and Indigenous groups from a harvesting and cultural

perspective. Special Areas was also a VC of interest identified by environmental organizations. Specific details regarding feedback from stakeholders and Indigenous groups and where in the EIS they are addressed is provided in the tables within Sections 3.3 and 3.4. The selection of VCs was ultimately informed by consideration of the nature and characteristics of the Project, its existing environmental settings, experience and knowledge from similar offshore oil and gas projects, and the professional experience of the Operator and EA Study Team.

The following VCs are considered in this assessment and are further described in Table 5.1:

- Marine Fish and Fish Habitat (including Species at Risk)
- Marine and Migratory Birds (including Species at Risk)
- Marine Mammals and Sea Turtles (including Species at Risk)
- Special Areas
- Indigenous Communities and Activities
- Commercial Fisheries and Other Ocean Users

Table 5.1 Identified VCs and the Rationale for their Selection

Valued Component	Rationale
Marine Fish and Fish Habitat	• Fish resources are an important consideration in the EA of the proposed activities that occur within, and that may affect, the marine environment. • Certain fish species are valued by Indigenous groups throughout Atlantic Canada and the east coast of Quebec for cultural (e.g., Atlantic salmon) and commercial (e.g., swordfish) reasons. • This VC includes relevant fish species, as well as plankton, algae, marine plants, benthos, and relevant components of their habitats (such as water and sediment), given the clear interrelationships between these environmental components. • The consideration of Marine Fish and Fish Habitat within a single VC is in keeping with current and standard practice, and provides for a more comprehensive, holistic approach while at the same time reducing unnecessary repetition. • The VC (description of the existing environment and effects assessment) also gives specific consideration to any particular species that have been identified by regulatory agencies, stakeholder groups or Indigenous communities (e.g., Atlantic salmon, swordfish). • Given the EIS Guidelines specify (in Section 6.3.2) “marine plants” as potential VC for the EIS, these have been considered as part of the overall Marine Fish and Fish Habitat VC, for the reasons outlined above.

Table 5.1 Identified VCs and the Rationale for their Selection

Valued Component	Rationale
Marine and Migratory Birds	• A variety of avifauna species inhabit the marine environments off Eastern Newfoundland at various times of the year. • Hunting or marine birds and collection of eggs have been identified as important to Indigenous groups in Atlantic Canada • Birds are important from an ecological, social, and economic perspective, as they often function near the top of the food chain, and may be vulnerable to certain types of environmental disturbance. They are also an important resource for various recreational and tourism related pursuits, and for traditional harvesting activities by Indigenous communities (birds and eggs, see Section 7.3).
Marine Mammals and Sea Turtles	• Marine mammals (including whales, dolphins, and seals) are an important element of the environmental and socio-cultural settings of the province and elsewhere in Atlantic Canada • Marine mammals are known to be important to Indigenous groups for cultural and traditional food harvest purposes (e.g., seal hunting) • These species are important from an ecological perspective, with a number of marine mammal species having been designated as “Species at Risk” under Canadian legislation. • Some species are also important and valued due to current traditional / commercial (seal harvests) and recreational (whale watching) uses. • The VC (description of the existing environment and effects assessment) also gives specific consideration to any particular species that have been identified by regulatory agencies, stakeholder groups or Indigenous communities (e.g., right whales, seals). • Although sea turtles are generally uncommon in the region, they are also included as part of this VC given their rare and often protected status.
Special Areas	• Several locations within the Canada-NL Offshore Area and beyond have been designated as special or sensitive areas due to their ecological characteristics and importance. • Some of these areas are protected under provincial and/or federal legislation and others are protected under international maritime agreements.
Indigenous Communities and Activities	• A number of Indigenous groups reside in Newfoundland and Labrador, the Maritime Provinces (Nova Scotia, New Brunswick, Prince Edward Island) and Quebec. Although the components and activities that comprise this Project will be located at some considerable distance from the communities, activities, and other known interests associated with each of these groups, it may affect marine-associated species and other resources that are used by these groups, and which move through, and thus may interact with, the Project's anticipated environmental zone of influence. • A number of Indigenous groups assert their right to food, social and ceremonial (FSC) harvesting of species such as Atlantic salmon. In addition, several Indigenous groups have commercial-communal fish harvesting licences that overlap with the Project’s Local Study Area.

Table 5.1 Identified VCs and the Rationale for their Selection

Valued Component	Rationale
	• This VC is included in the EIS as specified in and required by the EIS Guidelines, and to address the requirements of Section 5(1)c of CEAA 2012.
Commercial Fisheries and Other Ocean Users	• Marine commercial fisheries are key elements that have shaped the history and socioeconomic character of Newfoundland and Labrador and are important aspects of the current economic and socio-cultural fabrics of the province and other parts of Canada. • Commercial fisheries in this region are extensive and diverse, and involve a range of species and gear types at various times of the year. Fishing activities are undertaken in and around the Project Area by fishing interests from Newfoundland and Labrador (including several Indigenous organizations), as wells as other Canadian and international fishing enterprises. • Other activities take place in parts of the Project Area and adjacent areas on either a year-round or seasonal basis, including other oil and gas-related activities, general vessel traffic, research, and military exercises. • Other marine uses and users may be affected both directly (through possible interactions and disturbance) and indirectly (due to negative changes in the biophysical environment).

Species at Risk (SAR) designated under federal and/or provincial legislation are included under the respective VCs for Marine Fish and Fish Habitat, Marine and Migratory Birds, and Marine Mammals and Sea Turtles. Within Chapters 8-10 of the EIS, SAR are given special attention and emphasis in the identification, analysis, and evaluation of potential environmental effects and any required mitigation measures.

5.3 Overview of EA Approach and Methods

The EA approach and methods used to conduct the environmental effects assessments includes a number of key stages and components. The EA structure and methods used are in keeping with current EA approaches and practice in Canada, including under CEAA 2012.

As specified in Part 1, Section 4.3 of the EIS Guidelines, the EA approach and methodology used for the EIS addresses each of the following general items:

- Identifying the activities and components of the Project
- Predicting potential changes to the environment
- Predicting and evaluating the likely effects on identified VCs
- Identifying technically and economically feasible mitigation measures for significant adverse environmental effects, if any
- Determining residual environmental effects
- Considering cumulative environmental effects of the Project in combination with other physical activities that have been or will be carried out

- Determining the potential significance of a residual environmental effect following the implementation of mitigation measures

The potential environmental effects from Project activities and components are assessed using a standard framework to facilitate assessment of each VC. The environmental effects assessment for each VC predicts and evaluates the nature and degree of changes to (if any), and resulting effects on, the existing (baseline) environment that may potentially occur as a result of Project components and activities. Evaluation tables and matrices are used to document the assessment. Residual Project-related environmental effects (i.e., those environmental effects that remain after the planned mitigation measures have been applied) are characterized for each individual VC using specific analysis criteria (i.e., direction, magnitude, geographic extent, duration, frequency, reversibility, and context). The application of mitigation measures is also considered in a fully integrated manner in the environmental effects assessment for each VC. This includes technically and economically feasible mitigation measures that are or can be incorporated into Project planning and design, as well as those that are identified as part of the effects analysis to avoid or reduce potential adverse environmental effects. The significance of residual Project-related environmental effects is then determined based on pre-defined standards or thresholds (i.e., significance rating criteria). Where pre-established standards or thresholds do not exist, significance criteria have been defined qualitatively and justifications for the criteria provided.

5.4 Spatial and Temporal Boundaries

Spatial and temporal boundaries have been established to direct and focus the environmental effects assessment for each VC. These boundaries are informed by the nature, scale, timing, and other characteristics of the Project and the existing environmental setting, and potential environmental interactions. Three types of spatial assessment boundaries are used in the EIS to reflect the various means by which the Project may interact with and potentially change the environment (Figure 5-1).

Project Area: This is the overall geographic area within which all Project-related components and activities will take place, as described in the Project Description and based on those aspects that are considered to be within the defined scope of the Project for EA purposes. The Project Area is a polygon that covers the various ELs off Eastern Newfoundland where exploration drilling activities may be carried out as part of the Project, as well as a surrounding area to account for potential ancillary and support activities. For example, exploration drilling will occur within the boundaries of a specific EL, but wellsite, geotechnical and or environmental surveys may occur elsewhere within the boundaries of the Project Area. The assessment also considers related supply and support vessel and aircraft traffic to and from this offshore Project Area.

Local Study Area (LSA): These boundaries are defined on a VC-specific basis, and encompass the overall geographic area over which all planned Project-related environmental interactions (including any emissions and other disturbances) may occur. The LSA therefore represents the predicted environmental zone of influence of the Project's planned components and activities, within which any associated environmental changes resulting from the Project may occur and can be assessed and evaluated. For each VC, the LSA will depend on the geographic extent of an environmental disturbance or change and may vary based on its specific nature, timing, or location. Therefore, while the LSA for each VC has been defined to conservatively account for the overall zone of influence of

potential planned Project activities at any location within the Project Area, in some cases these environmental changes may occur only within a portion of the LSA itself.

Regional Study Area (RSA): In addition to planned Project- and disturbance-related factors, from an ecological and socioeconomic perspective the environmental effects assessments also recognize and consider the characteristics, distributions, and movements of the individual VCs under consideration, including the larger regional areas within which they occur and function. The EA assesses potential effects to marine biota (individuals and populations) and human activities that are known or likely to occur in the LSA for the VC in question, and considers the overall extent of any affected individuals and populations during the time period at which they may be affected by planned Project components and activities. In addition to the potential environmental effects of planned Project components and activities (Chapter 2) and their emissions (see LSA definition above), the RSA also considers the potential effects of any accidental events or malfunctions that may be associated with the Project, including the potential nature and geographic extent of an oil spill (see Chapter 15 of the EIS). The RSA for Indigenous Communities and Activities VC recognizes and considers the spatial distribution and overall geographic extent of the various Indigenous communities and activities under consideration, as well as the distribution and movements of the various marine-associated resources that are used for traditional purposes by these communities.

The temporal boundaries for the effects assessment encompass the frequency and duration of Project-related (in-field) activities in the Project Area, as well as the likely timing of any resulting environmental effects. In conducting the assessment, special consideration is also given to the timing of VC presence within the Project and assessment areas, including important or sensitive periods.

It is within the above described spatial and temporal boundaries that the potential environmental effects on the VC resulting from planned Project components and activities and their significance are assessed and evaluated.

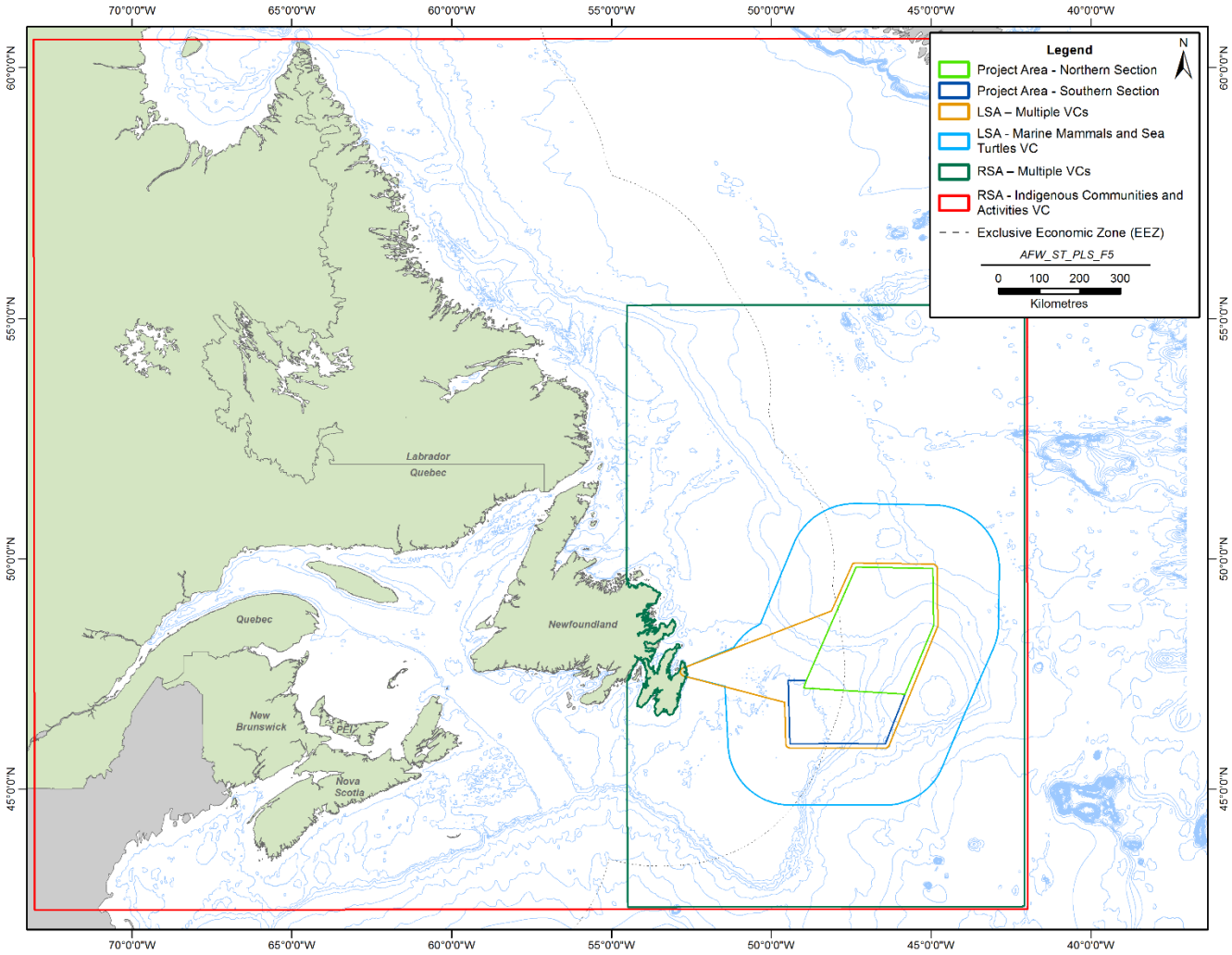


Figure 5-1 Environmental Assessment Study Area

6.0 ENVIRONMENTAL EFFECTS ASSESSMENT

The potential environmental effects of the Project on each VC are assessed, in consideration of existing baseline conditions, Project components, and application of mitigation measures. Residual adverse effects (effects remaining after the application of mitigation measures) on each VC and their significance are determined using pre-defined significance thresholds.

6.1 Marine Fish and Fish Habitat (including Species of Conservation Concern)

The Project Area and surrounding marine environments are known to be inhabited by a diversity of marine biota and are used by fish and invertebrate species of commercial, cultural, and/or ecological importance and support regionally important areas of biodiversity and marine productivity.

Marine fish and fish habitat, and the potential effects of the Project on this VC, are subject to the relevant provisions of the federal *Fisheries Act* and its associated Regulations, which provides protection to commercial, recreational, and Aboriginal fisheries by protecting the fish resources and habitats that support these activities. Certain fish species and their habitats may also be provided with legislative protection within Canadian federal (*Species at Risk Act*; SARA) and/or provincial (Newfoundland and Labrador *Endangered Species Act*; NL ESA) jurisdictions.

For the EIS, this VC includes consideration of relevant fish species (both stable and at risk), as well as plankton, algae, marine plants, benthos, and relevant components of their habitats (such as water and sediment), given the clear interrelationships between these environmental components.

6.1.1 Description of the Baseline

The Project Area include the shelf and slope regions of the Grand Banks, areas of the Flemish Cap, and parts of the Orphan Basin. Within the marine environment, habitats transition from the relatively shallow shelf zone, through the continental slope to very deep abyssal regions. These areas are used by fish and invertebrate species of commercial, cultural, and ecological value and support regionally important areas of biodiversity and marine productivity.

The Project Area – Northern Section (including ELs 1135, 1139, 1140, 1141, 1142 and surrounding areas) is an area of relatively high fish species richness, and is an aggregation area for Atlantic cod, thorny skate, and wolffish species. Greenland halibut and spotted wolffish, specifically, are known to aggregate on the Northeast Shelf and Slope EBSA in this area in the spring. Seasonal phytoplankton blooms in the spring and fall coincide with the presence in pelagic areas of early life stages of various fish and invertebrate species. The slope in this area contains relatively high densities of habitat forming sponges and corals, and the Northwest Atlantic Fisheries Organization (NAFO) has identified three Vulnerable Marine Ecosystems (VMEs) based on these features (see Section 6.4 of the EIS).

The Project Area – Southern Section (including EL 1137 and surrounding areas) is an area of relatively high fish species abundance and richness, especially on the slope. These slope areas are known to contain high densities of habitat forming sponges and corals and NAFO has identified two VMEs that overlap with the Project Area – Southern Section based on these features (see Section

6.4 of the EIS). Seasonal phytoplankton blooms in the spring and fall coincide with presence in the pelagic areas of early life history stages of various fish and invertebrate species.

Several of the resident groundfish species are commercially harvested, such as Atlantic cod, American plaice, roughhead and roundnose grenadier, and thorny skate. Many large and/or deepwater species, such as wolffish, sharks, skates, and grenadiers, have long life spans, slow reproductive periods, and/or occur at naturally low densities, making them vulnerable to additional mortality. Species such as the wolffish and grenadier are found in greatest abundance in the slope areas of the Project Area, whereas Atlantic cod and thorny skate are most abundant on the slope edges of the Flemish Pass in Canadian waters and the slope edges of the Flemish Cap in NAFO waters. In contrast, American plaice is mostly restricted to shelf areas of the Grand Banks and the Flemish Cap. Capelin, a small forage fish, has regionally high densities in the Project Area, and is a key prey source for many other marine fish, bird, and marine mammal species. Large migratory pelagics (such as sharks and tuna), are seasonal visitors to the cold waters of the Project Area.

Intermittent coral and sponge reef areas may occur within the Project Area. Coral biomass is mainly distributed along the slopes of the Flemish Pass, Flemish Cap, and Grand Bank with fewer observations on the Grand Bank Shelf and on top of the Flemish Cap (Murillo et al. 2011). Coral biomass is highest between 600-900 m along the northern Flemish Cap, Flemish Pass and Northeast Grand Bank shelf and was associated with warm, more saline waters with silty sand substrates (Murillo et al. 2011; Murillo et al. 2016). Sponge surveys by Murillo et al. (2012) indicate that the highest sponge biomass is located on the slopes of the Grand Banks, the slopes of the Flemish Cap, and the Flemish Pass. Sponge biomass in the Project Area – Southern Section was highest on the northeast slope of the Grand Banks between 800-1,450 m depths and on the southeastern slope of the Flemish Cap at 950-1,400 m depths (Murillo et al. 2012). In the Project Area – Northern Section, areas of high sponge presence were also observed on the north slope of the Flemish Cap and in the Sackville Spur area, in relatively deep waters (1,000-1,500 m) (Murillo et al. 2012; Beazley et al. 2015). The habitat forming sponges in the Flemish Pass at 400-1,400 m depth are also associated with the relatively high abundance and species diversity of invertebrate taxa. Within the Orphan Basin, sponges were mainly observed at 300-700 m depths and with some occurrences in deeper areas of the survey (700-3,000 m) (Carter et al. 1979; d'Entremont et al. 2008).

Invertebrates, other than habitat-forming corals and sponges, that are commonly found in the Project Area include squid, polychaetes, bivalves, sand dollars, brittle stars, basket stars, pale sea urchins, soft corals, shrimp, Icelandic scallops, and snow crab.

Twenty-nine listed fish species are either known to occur, or likely to occur in the Project Area. Listed species include those listed under the NL ESA, Schedule 1 of SARA, have been identified by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as Species of Conservation Concern (SOCC), or are listed by the International Union for Conservation of Nature (IUCN). Listed marine fish species that are known to or may occur within the Project Area are provided in Table 6.1.

Table 6.1 Listed Marine Fish Species that are Known to or May Occur within the Project Area

Species		Status/Designation				Presence
Common Name	**Scientific Name**	**NL ESA Designation**	**SARA Schedule 1 Status**	**COSEWIC Designation**	**IUCN Designation**	**Occurrence in Project Area**
Striped Wolffish	*Anarhichas lupus*	Not Listed	Special Concern	Special Concern	Not Listed	Adults resident in Project Area
Northern Wolffish	*Anarhichas denticulatus*	Not Listed	Threatened	Threatened	Not Listed	Adults resident in Project Area
Spotted Wolffish	*Anarhichas minor*	Not Listed	Threatened	Threatened	Not Listed	Adults resident in Project Area
American Eel (Global Population)	*Anguilla rostrata*	Vulnerable	Not Listed	Threatened	Endangered	May pass through the Project Area during migrations to or from spawning areas
Blue Shark (1: Atlantic Population / 2: Global Population)	*Prionace glauca*	1: Not Listed 2: Not Listed	1: Not Listed 2: Not Listed	1: Special Concern 2: Not Listed	1: Not Listed 2: Near Threatened	Likely only occurs in the Project Area during warm water season
Basking Shark (1: Atlantic Population / 2: Global Population)	*Cetorhinus maximus*	1: Not Listed 2: Not Listed	1: Not Listed 2: Not Listed	1: Special Concern 2: Not Listed	1: Not Listed 2: Vulnerable	Likely only occurs in the Project Area during warm water season
Black Dogfish (Global Population)	*Centroscyllium fabricii*	Not Listed	Not Listed	Not Listed	Least Concern	Abundant in Project Area
Atlantic Cod (1: Newfoundland and Labrador Population / 2: Global Population)	*Gadus morhua*	1: Not Listed 2: Not Listed	1: Not Listed 2: Not Listed	1: Endangered 2: Not Listed	1: Not Listed 2: Vulnerable	Occur in the Project Area (slopes of the Flemish Pass and Flemish Cap)
Cusk	*Brosme brosme*	Not Listed	Not Listed	Endangered	Not Listed	Rare in Project Area
Porbeagle (1: Atlantic Population / 2: Global Population)	*Lamna nasus*	Not Listed	Not Listed	Endangered	Vulnerable	Likely only occurs in the Project Area during warm water season
Shortfin Mako (1: Atlantic Population / 2: Global Population)	*Isurus oxyrinchus*	1: Not Listed 2: Not Listed	1: Not Listed 2: Not Listed	1: Threatened 2: Not Listed	1: Not Listed 2: Vulnerable	Likely only occurs in the Project Area during warm water season

Table 6.1 Listed Marine Fish Species that are Known to or May Occur within the Project Area

Species		Status/Designation				Presence
Common Name	**Scientific Name**	**NL ESA Designation**	**SARA Schedule 1 Status**	**COSEWIC Designation**	**IUCN Designation**	**Occurrence in Project Area**
White Shark (1: Atlantic Population / 2: Global Population)	*Carcharodon carcharias*	1: Not Listed 2: Not Listed	1: Endangered 2: Not Listed	1: Endangered 2: Not Listed	1: Not Listed 2: Vulnerable	May occasionally pass through the region
Roughhead Grenadier	*Macrourus berglax*	Not Listed	Not Listed	Special Concern	Not Listed	Abundant in Project Area along slope
Roundnose Grenadier (1: Atlantic Population / 2: Global Population)	*Coryphaenoides rupestris*	1: Not Listed 2: Not Listed	1: Not Listed 2: Not Listed	1: Endangered 2: Not Listed	1: Not Listed 2: Critically Endangered	Adults resident in Project Area, abundant in Project Area along slope
Lanternfish (Global Population)	*Myctophidae*	Not Listed	Not Listed	Not Listed	Least Concern	Uncertain
Atlantic hagfish (Global Population)	*Myxine glutinosa*	Not Listed	Not Listed	Not Listed	Least Concern	Uncertain
American Plaice (Newfoundland and Labrador Population)	*Hippoglossoides platessoides*	Not Listed	Not Listed	Threatened	Not Listed	Adults resident in Project Area
Atlantic Halibut (Global Population)	*Hippoglossus hippoglossus*	Not Listed	Not Listed	Not at Risk	Endangered	Abundant within the Canadian EEZ of the Project Area
Barndoor Skate	*Dipturus laevis*	Not Listed	Not Listed	Not at Risk	Endangered	Uncertain
Smooth Skate (1: Funk Island Deep Population / 2: Global Population)	*Malacoraja senta*	1: Not Listed 2: Not Listed	1: Not Listed 2: Not Listed	1: Endangered 2: Not Listed	1: Not Listed 2: Endangered	Resident species in Project Area, though not numerically dominant in surveys
Spinytail Skate (1: Global Population / 2: Northwest Atlantic Population)	*Bathyraja spinicauda*	1: Not Listed 2: Not Listed	1: Not Listed 2: Not Listed	1: Not Listed 2: Not Listed	1: Near Threatened 2: Vulnerable	Occurs in Canadian portions of the Project Area
Thorny Skate (1: Canadian Population / 2: Global Population)	*Amblyraja radiata*	1: Not Listed 2: Not Listed	1: Not Listed 2: Not Listed	1: Special Concern 2: Not Listed	1: Not Listed 2: Vulnerable	Adults are residents in the Project Area

Table 6.1 Listed Marine Fish Species that are Known to or May Occur within the Project Area

Species		Status/Designation				Presence
Common Name	**Scientific Name**	**NL ESA Designation**	**SARA Schedule 1 Status**	**COSEWIC Designation**	**IUCN Designation**	**Occurrence in Project Area**
Winter Skate (1: Eastern Scotian Shelf - Newfoundland Population / 2: Global Population)	*Leucoraja ocellata*	1: Not Listed 2: Not Listed	1: Not Listed 2: Not Listed	1: Endangered 2: Not Listed	1: Not Listed 2: Endangered	Rarely found in the Project Area
Atlantic Salmon (1: South Newfoundland Population / 2: Gaspe – Southern Gulf of St. Lawrence Population / 3: Inner Bay of Fundy Population / 4: Eastern Cape Breton Population / 5: Nova Scotia Southern Upland Population / 6: Global Population	*Salmo salar*	1: Not Listed 2: Not Listed 3: Not Listed 4: Not Listed 5: Not Listed 6: Not Listed	1: Not Listed 2: Not Listed 3: Endangered 4: Not Listed 5: Not Listed 6: Not Listed	1: Threatened 2: Special Concern 3: Endangered 4: Endangered 5: Endangered 6: Not Listed	1: Not Listed 2: Not Listed 3: Not Listed 4: Not Listed 5: Not Listed 6: Least Concern	Some populations may pass through the Project Area on seaward migrations, and may overwinter in the general vicinity of the Project Area
Atlantic Bluefin Tuna (1: Global Population / 2: Atlantic Population)	*Thunnus thynnus*	1: Not Listed 2: Not Listed	1: Not Listed 2: Not Listed	1: Not Listed 2: Endangered	1: Endangered 2: Not Listed	Would occur in the Project Area during warm water seasons
Bigeye Tuna (Global Population)	*Thunnus obesus*	Not Listed	Not Listed	Not Listed	Vulnerable	Would occur in the Project Area during warm water seasons
Acadian Redfish (1: Atlantic Population / 2: Global Population)	*Sebastes fasciatus*	1: Not Listed 2: Not Listed	1: Not Listed 2: Not Listed	1: Threatened 2: Not Listed	1: Not Listed 2: Endangered	Adults resident in Project Area
Deepwater Redfish (1: Northern Population / 2: Global Population)	*Sebastes mentella*	1: Not Listed 2: Not Listed	1: Not Listed 2: Not Listed	1: Threatened 2: Not Listed	1: Not Listed 2: Least Concern	Year-round residents in Project Area
Spiny Dogfish (1: Atlantic Population / 2: Global Population)	*Squalus acanthias*	1: Not Listed 2: Not Listed	1: Not Listed 2: Not Listed	1: Special Concern 2: Not Listed	1: Not Listed 2: Vulnerable	Rarely occurs in the Project Area

6.1.2 Anticipated Changes to the Environment

The key potential environmental interactions between planned offshore oil and gas activities and marine fish and their habitats include the following (adapted from Amec 2014):

- The possible destruction, contamination or alteration of marine habitats and benthic organisms due to the discharge and deposition of drill cuttings and/or fluids, the deployment and use of other Project equipment, and possibly the introduction and spread of aquatic invasive species
- Potential contamination of fish / invertebrates and their habitats due to other environmental discharges during planned oil and gas exploration drilling and other associated survey and support activities
- The attraction of marine fish to the drilling installation and vessels, with increased potential for injury, mortality, contamination, or other interactions
- Possible temporary avoidance of areas by marine fish due to underwater noise or other disturbances, which may alter their presence and abundance as well as disturbing movements / migration, feeding, or other activities
- Possible changes in the availability, distribution, or quality of feed sources and/or habitats for fish and invertebrates as a result of planned activities and their associated environmental emissions
- Possible injury, mortality, or other disturbances to marine fish as a result of exposure to noise within the water column during wellsite surveys or VSP survey activity

As a result of these identified environmental interactions, issues identified in the EIS Guidelines, and concerns raised through consultation and engagement, the assessment of Project-related environmental effects on Marine Fish and Fish Habitat is focused on the following potential environmental effects:

- Change in Habitat Availability and Quality
- Change in Fish Mortality, Injury, Health
- Change in Fish Presence and Abundance (Behavioural Effects)

6.1.3 Anticipated Effects (Planned Project Components and Activities)

The anticipated effects of planned project components and activities on Marine Fish and Fish Habitat are assessed.

6.1.3.1 Presence and Operation of Drilling Installation

The potential environmental effects of presence and operation of the drilling installation are primarily related to underwater noise and vibrations, light emissions and other environmental discharges, interactions with the benthic environment, and aquatic invasive species.

The presence of the drilling installation in combination with lighting effects will have localized positive effects on fish abundance and diversity by creating a “reef effect” that aggregates plankton and increases invertebrate colonization, resulting in increased local productivity and food sources.

Continuous operation noises or dynamic positioning may result in localized area avoidance; however, fish may remain in the area for relatively higher foraging opportunities. Safety zones around drilling operations may also afford localized, short-term protection to species that are otherwise exposed to overfishing. Direct contact with the seabed will occur if anchoring is used rather than dynamic positioning; however, underwater surveys will be conducted prior to anchoring operations to confirm that anchors are not set in sensitive coral or sponge habitats. As the Project Area is within an area of low seabed complexity, the introduction of subsea infrastructure may provide opportunities for colonization and increased distribution of benthic species that have pelagic eggs or larvae. This effect would be temporary for the length of drill operations, but the combination of increased colonization opportunities and local enrichment may support faster recovery in an otherwise slow recovering environment. Lighting and other environmental discharges (including organic waste material) associated with the drilling installation may also result in the short-term and localized attraction of some individual fish. There is the potential for temporary positive effects from the creation of increased availability of shelter and food for juveniles around the drilling installation and decreased fishing pressure on adults within the safety zone. There is also a potential for short-term exposure and subsequent potential uptake of contaminants from waste discharge.

The interactions described above may result in changes to habitat availability and quality, fish mortality / injury risk and fish health, and fish presence and abundance. These changes are predicted to be adverse, low in magnitude, localized and certainly within the Project Area, short to medium term duration, occurs regularly and reversible with a high level of confidence.

6.1.3.2 Drilling and Associated Marine Discharges

The primary interactions from discharge of drill cuttings include cuttings deposition and potential seabed disturbance (smothering habitat), chemical toxicity, and bioaccumulation (uptake of contaminants by fish and the presence or perception of taint). Drilling waste discharges will adhere to the requirements for cuttings treatment and discharge guidelines in the OWTG (National Energy Board et al. 2010). Discharge of drilling fluids and associated drilling cuttings may affect the benthic environment, with immobile or sessile bivalve and infaunal species being particularly sensitive to burial or drilling mud deposition. However, the high dispersal of the low toxicity and non-bioaccumulating drill cuttings has relatively low potential for adverse environmental effects. Drill cuttings dispersion modelling was conducted for this Project at three locations in the Project Area – Northern Section and one location in the Project Area – Southern Section. In the Project Area – Northern Section, approximately 99 percent of WBM drill cuttings settle less than 2 km from the drill centre under all season scenarios. Treated SBM drill cuttings released under the water surface become well dispersed, with greater than 97 percent of SBM drill cuttings settling outside the 32 km model area. In the modelled Eastern Project Area site (Project Area-Northern Section), relatively lower currents results in settling of discharged cuttings within 5-31 km of the wellhead for three of four seasonal scenarios with the SBM drill cuttings drifting beyond the 32 km model in the June scenario. Due to the distance settled away from the well site, overall accumulation thicknesses are relatively low. In the Project Area – Southern Section, areas of accumulation for WBMs will occur within 2 km of the wellhead indicating that any physical or chemical effects on fish habitat will be relatively localized. Where SBMs are discharged at relatively shallower depths in comparison to other modelled areas, overall average thickness is minimal (0.4 mm or less). However, there are some

areas of accumulation that reach up to 3 mm within the model boundary indicating some potential localized disturbances to fish habitat The physical and chemical effects of this volume of WBM and SBM drill cuttings over this area are anticipated to only have localized habitat disturbances, if any. Because overall sedimentation is low, there is low potential for smothering effects or the creation of oxygen depletion conditions, reducing potential recovery and recolonization times.

The use and eventual release of seawater and WBMs are not predicted to result in adverse environmental effects related to toxicity or bioaccumulation. When SBM is used (i.e., drilling the lower portions of each well), fluids and cuttings will be returned to the drilling installation for treatment before cuttings discharge below the water surface. It is not likely that the treated released SBM and SBM-associated drill cuttings will result in adverse effects associated with contamination of marine biota or habitats, as these materials have low toxicity, and localized biological effects (Deblois et al. 2014).

These interactions may result in potential changes to habitat availability and quality, fish mortality / injury risk and fish health, and fish presence, and abundance. These changes are predicted to be adverse, low in magnitude, localized and certainly within the Project Area, medium to long term in duration, occurring on a regular basis and reversible, with a high level of confidence.

6.1.3.3 Formation Flow Testing with Flaring

The predicted environmental effects of formation flow testing with flaring are primarily related to short-term light and atmospheric emissions, and produced water discharge that may result in change in fish presence and abundance. Due to the low emission quantities, the temporary and short-term nature of air and light emissions, there will be limited potential interactions with fish or their habitat. These changes are predicted to be adverse, low in magnitude, localized, short term, occurring sporadically and reversible. These predictions have been made with a high level of confidence.

6.1.3.4 Wellhead Decommissioning

Wellhead decommissioning will be conducted by cutting off the wellhead rather than blasting for environmental and safety reasons. Wellhead removal will be conducted by an ROV and result in short term, low-magnitude emissions of noise and light. Fish will likely temporarily avoid the area during activities. The remaining seabed infrastructure may add small quantities of habitat heterogeneity to the existing environment and potentially aid in recolonization of benthic species and overall recovery. These changes are predicted to be adverse, negligible to low in magnitude, localized, short-term, occurring sporadically, and reversible, with a high level of confidence.

6.1.3.5 Geophysical / Geohazard / Wellsite / Seabed Surveys and Vertical Seismic Profiling

The predicted environmental effects of geophysical, geohazard, wellsite, and VSP surveys are primarily related to seismic noise that may result in changes to fish mortality / injury risk, fish health, and fish presence and abundance. The possible effects from the use of seismic sound energy in the marine environment may be behavioural (avoidance, other changes in distribution or activities) or involve injury to or mortality of individual fish. However, operations will be short-term and localized, and have reversible, low-magnitude effects. Noise and seismic emissions from VSP activities are

mainly directed downwards into the well, with limited horizontal range. Mobile fish and invertebrate species are predicted to temporarily avoid areas of survey operations, minimizing potential interactions. The geophysical sound source will go through a “ramp up” phase to increase initial fish and invertebrate avoidance to limit potential effects. Eggs, larvae and benthic invertebrates adjacent to the sound source may be affected. However, due to the highly-localized effects and short-term nature of operations, it will not have population effects.

While there may be some short-term behavioural effects to individual fish in the immediate vicinity of the survey activity, it is unlikely that fish will be displaced from key habitats or disrupted during key activities over extended areas or periods, or be otherwise affected in a manner that causes negative and detectable effects to fish populations in the region. These changes are predicted to be adverse, low in magnitude, occurring within the Project Area, short-term, occurring sporadically and reversible, with a high level of confidence.

6.1.3.6 Geological, Geotechnical and Environmental Surveys

Most of these types of survey activities will not result in physical contact with the seabed, and will therefore not directly interact with or disturb benthic animals or their habitats. When used, sediment sampling equipment will be in direct contact with the seabed and potentially injury or cause mortality in fish, change habitat quantity or quality, and indirectly affect distribution and abundance; however, the small footprint of this temporary activity is not likely to cause any effects on population scales. Water sampling activities are not likely to have interactions with the seabed or fish. Underwater video surveys may have lighting and noise emissions; however, the temporary nature of the activity limits any potential effects on the environment. Fish may also migrate away from the area while the short-term activity is ongoing. These changes are predicted to be adverse, negligible to low in magnitude, localized, short-term, occurring sporadically and reversible, with a high level of confidence.

6.1.3.7 Supply and Servicing

Helicopter use will have no direct interactions with fish and fish habitat. With respect to offshore supply vessels, all exhaust emission levels will follow air quality regulations and guidelines. Similar to the drilling installation, all offshore supply vessel wastewaters will be treated to reduce contaminant or hydrocarbon levels prior to discharge under MARPOL. Due to the transitory nature of vessels, discharges are not likely to accumulate in any area and the low volumes would likely become highly dispersed in the marine environment. The continuous noise and lighting from vessels would also be relatively low and result in temporary avoidance by fish. As with other emissions, the temporary interaction with any one area limits potential noise and light interactions with fish. These changes are predicted to be adverse, low in magnitude, localized, short-term, occurring on a regular basis and reversible, with a high level of confidence.

6.1.4 Anticipated Effects (Accidental Events)

Potential accidental events may interact with and potentially affect fish and fish habitat in terms of habitat availability and quality, fish mortality, injury and health, and fish presence and abundance. Potential accidental effects that are considered involve varying degrees of hydrocarbon interaction

and exposure with fish and fish habitat and include SBM spills, batch diesel spills, and subsurface blowouts.

Modelling of batch diesel spills (100 L or 1,000 L at EL 1135 and EL 1137 sites) predicts that no area will exceed the ecological threshold of 100 µg/L THC; therefore, the potential for exposure and the likelihood of adverse effects on Marine Fish and Fish Habitat from a batch release are low. Only fish in the immediate vicinity near the surface at the time of the spill may be exposed, and at the concentrations predicted. A change in habitat availability and quality will likewise be of low magnitude. While batch diesel spills would affect water quality around the spill site, this would be short-term until the slick naturally disperses through surface wave action in the offshore environment.

A subsurface blowout has a larger potential to have long-term environmental effects. The results of a hypothetical, unmitigated subsurface blowout modelled at two sites in the Project Area may result in reaching or exceeding the ecological threshold for in-water concentration (1 µg/L PAH or 100 µg/L THC) for areas of the Flemish Cap, Flemish Pass, Grand Bank and mid-Atlantic. In these modelled scenarios, small amounts of oil are predicted to reach shoreline areas of the Avalon Peninsula, the southern coast of Newfoundland, the eastern shores of Nova Scotia, and Sable Island, however the small volumes would be expected to be weathered, patchy and discontinuous. For coastal Newfoundland, oil is predicted to make first contact with shoreline after 29 days; the model predicted oil would make contact with eastern Nova Scotia/Sable Island after 50 days. Model results indicate the oil would not accumulate in marine sediments, although flocculating and sinking of hydrocarbon material through plankton and microbial pathways may result in interactions with benthic environments. Adult demersal and pelagic fish could potentially avoid the spill areas, but the juvenile and the early life stages of fish and benthic invertebrates in the immediate areas of the spill would likely result in sub-lethal and lethal effects. Fish presence and abundance would also be affected by this unmitigated scenario as mobile fish species would temporarily avoid the spill footprint within the model results. Local reductions in plankton due to injury or mortality from hydrocarbon exposure may also reduce foraging opportunities for fish.

In the unlikely event of an offshore oil release, some degree of residual adverse effects to individual marine fish and to fish habitat in the area at the time of the incident are expected. The degree of exposure and type of effects would depend on the type and size of spill, time of year, and location and species of fish within the affected area. However, effects are not expected to alter the long-term viability of local or regional fish populations in the RSA. Spill prevention techniques and response strategies (e.g., cap stacks, spill clean-up processes, shoreline protection measures as detailed in Section 15.1 of the EIS) will be incorporated into the design and operations for Project activities as part of contingency planning, resulting in predicted adverse residual effects of low to medium magnitude, occurring within the RSA, of short to long term duration, not likely to occur or occurring sporadically, and reversible with a moderate level of confidence in the effects prediction.

6.2 Marine and Migratory Birds (including Species of Conservation Concern)

Marine and migratory birds are found within the RSA year-round, using the area for breeding and foraging. Most are protected under the federal *Migratory Birds Convention Act* (MBCA) and its associated Regulations. Further, wildlife in Newfoundland and Labrador (including certain species not protected under the MBCA) are managed under the provincial *Wildlife Act* and *Regulations*. Avian

species at risk and their habitats, including some species that are known or have potential to occur in the Project Area and surrounding marine environments, are protected by both federal (SARA) and provincial (NL ESA) legislation.

6.2.1 Description of the Baseline

The coastline of eastern and southern Newfoundland and Labrador, and the offshore waters, provide important breeding habitat and feeding areas for dozens of marine bird species. There are over 90 species of marine and migratory birds that may occur within the RSA including seabirds, waterfowl, and shorebirds.

The nutrient-rich waters of the Grand Banks and Flemish Pass are important to seabird species that feed on plankton, including storm-petrels, shearwaters, and dovekies. Offshore islands and mainland cliffs provide nesting grounds for tens of millions of seabirds, including some of the largest seabird colonies in eastern North America south of the Hudson Strait. While seabirds use the Project Area and RSA throughout the year, the overall abundance and distribution of species varies considerably. Some taxa (notably large gulls, kittiwakes, murres, guillemots, puffins, fulmars, and shearwaters) are abundant year-round, while others are absent or scarce in the winter months, such as the northern gannet, terns, cormorants, and phalaropes. Ivory gulls are most likely to be present during winter months, outside the breeding season.

Waterfowl occur in large numbers in marine habitats off eastern Newfoundland, especially during the winter months; however, they tend to prefer coastal habitats and are unlikely to occur frequently in the RSA. Waterfowl species (including harlequin duck and Barrow's goldeneye) are most likely to be present in the RSA during winter months, outside the breeding season. Given the Project Area is over 300 km offshore, it is unlikely that shorebirds will regularly occur in these areas, except for phalarope species.

Some landbird species, particularly those associated with coastal habitats and those that migrate nocturnally over offshore waters, may also occur in the RSA. Some species, such as the bank swallow, Savannah sparrow, and short-eared owl, nest along the coast, and some raptor species prey upon concentrations of shorebirds during migration. Other landbirds fly long distances over water during migration and may pass through the RSA.

Several Special Areas relevant to marine and migratory birds have also been identified in eastern Newfoundland, which have been designated because they provide important habitat for nationally and/or globally significant numbers of birds, and/or because they support listed bird species. Listed species are those that are listed under the NL ESA, are listed under Schedule 1 of SARA, or have been identified by COSEWIC as SOCC. Important Bird Areas (IBAs) and breeding colonies are found in coastal and inland areas. The Flemish Pass is outside the of the reported foraging range of most species breeding at the major seabird colonies in coastal Newfoundland, although northern gannets and Leach's storm-petrels travel hundreds of kilometres from their breeding colonies over multi-day foraging trips.

There are 14 SAR or SOCC bird species that may occur in the RSA. A list of these species and their likelihood to occur in the RSA is provided in Table 6.2.

Table 6.2 Listed Bird Species and Their Likelihood of Occurrence in the Vicinity of the Project Area

Common Name	NL ESA Designation	SARA Schedule 1 Status	COSEWIC Designation	Potential Presence in the vicinity of the Project Area
Barrow's Goldeneye (Eastern population)	Vulnerable	Special Concern	Special Concern	Unlikely to be present due to their preference for coastal habitats
Harlequin Duck (Eastern Population)	Vulnerable	Special Concern	Special Concern	Unlikely to be present due to their preference for coastal habitats
Ivory Gull	Endangered	Endangered	Endangered	Potentially present: Ivory Gulls spend almost all their time in the marine environment, including within the RSA
Piping Plover (*melodus* ssp.)	Endangered	Endangered	Endangered	Unlikely to be present due to their preference for coastal habitats
Red Knot (*rufa* ssp.)	Endangered	Endangered	Endangered	Unlikely to be present due to their preference for coastal habitats
Buff-breasted Sandpiper	Not Listed	Not Listed	Special Concern	Unlikely to be present due to their preference for coastal habitats
Red-necked Phalarope	Not Listed	Not Listed	Special Concern	Observed in small numbers within the RSA, though scarce in the winter and spring
Peregrine Falcon	Vulnerable	Special Concern	Special Concern	Unlikely to regularly occur in the RSA
Common Nighthawk	Threatened	Threatened	Threatened	Unlikely to regularly occur in the RSA
Bank Swallow	Not Listed	Not Listed	Threatened	Unlikely to occur offshore
Gray-cheeked Thrush (*minimus* ssp.)	Threatened	Not Listed	Candidate Species (low priority)	Potential to occur during fall migration
Olive-sided Flycatcher	Threatened	Threatened	Threatened	Potential to occur during fall migration
Bobolink	Vulnerable	Not Listed	Threatened	Potential to occur during fall migration
Short-eared Owl	Vulnerable	Special Concern	Special Concern	Unlikely to regularly occur in the RSA

6.2.2 Anticipated Changes to the Environment

The key potential environmental interactions between planned offshore oil and gas activities and Marine and Migratory Birds, include the following (adapted from Amec 2014):

- Potential attraction of birds to offshore drilling installations and vessels, including their lights, flares or other light emissions, and waste discharges, resulting in possible injury or mortality (strikes, strandings, incineration, disorientation, increased energy expenditure)
- Possible injury of avifauna (particularly diving birds) due to exposure to noise within the water column during VSP or wellsite surveys using seismic sound sources or disruptions to and changes in their distributions and behaviours
- Changes in the presence, abundance, distribution, and/or health of birds (individuals and populations) resulting from direct exposure to waste discharges from installations or vessels (physical exposure, ingestion)
- Possible indirect effects due to changes in the availability, distribution, and/or quality of food sources or habitats for marine and migratory birds due to disturbances (noise, light) and/or Project-related waste discharges (such as drilling fluids, other liquid and solid waste materials).

As a result of these identified environmental interactions, issues identified in the EIS Guidelines, and concerns raised through consultations and engagement, the assessment of Project-related environmental effects on Marine and Migratory Birds (including SAR and SOCC) is focused on the following potential environmental effects:

- Change in Mortality / Injury Levels and Bird Health (Individuals or Populations)
- Change in Avifauna Presence and Abundance (Behavioural Effects)
- Change in Habitat Availability and Quality
- Change in Food Availability or Quality

6.2.3 Anticipated Effects (Planned Project Components and Activities)

The anticipated effects of planned project components and activities on Marine and Migratory Birds are assessed.

6.2.3.1 Presence and Operation of Drilling Installation

The predicted environmental effects associated with the presence and operation of the drilling installation are primarily related to lighting and emissions that may result in changes in mortality / injury levels, presence and abundance of avifauna, and food and habitat availability and quality. This includes the possible attraction of birds due to lighting, avoidance of the drilling installation due to sensory disturbance, and the creation of new foraging opportunities for predator species (e.g., through prey attraction due to organic waste disposal, creation of new “artificial reef” habitat). There may also be a slight increase in mortality / injury levels due to collisions, disorientation, and potential predation; however, the mortality rate is anticipated to be low as most stranded birds encountered on platforms and vessels are released successfully. Some localized and short-term behavioural effects (change in presence and abundance) are also likely to occur from the operation of the drilling

installation; however, these effects will be localized, transient, and short-term in nature. Changes in habitat and food availability and quantity, if any, will also be on a localized scale and for a short-term duration. These changes are predicted to be adverse, low in magnitude, localized and certainly within the Project Area, short to medium term, regular in frequency, and reversible, with a moderate level of confidence.

6.2.3.2 Drilling and Associated Marine Discharges

The predicted environmental effects of drilling and associated marine discharges are primarily related to release of organic wastes, which may result in changes in mortality / injury levels, presence and abundance of avifauna, and food availability and quality. Organic waste will be reduced prior to discharge in accordance with the OWTG. Discharge of organic wastes (sewage and food scraps) may result in enhancement of the local food supply and attraction of birds to vessels and platforms. However, this potentially positive effect may be offset by increased exposure to risk of collision / strandings or predation as well as energetic costs due to deviation from normal movement / migration patterns. Proper waste management will reduce such effects of discharges of organic waste on birds. These potential effects are predicted to be adverse, low in magnitude, localized, short-term, sporadic in frequency, and reversible, with a moderate level of confidence.

6.2.3.3 Formation Flow Testing with Flaring

The predicted environmental effects of formation flow testing with flaring are primarily related to attraction of birds to flares, which may result in changes in mortality / injury levels, and in presence and abundance of avifauna. Any flaring events conducted during the Project will occur several hundred kilometres offshore, far away from coastal breeding sites and IBAs and well beyond the foraging range of almost all species that nest in Newfoundland. Therefore, breeding birds are unlikely to be affected by this activity, with the potential exception of the Leach's storm-petrel, which may forage thousands of kilometres from the nest site during the breeding season (Pollet et al. 2014). Although there is some potential for the attraction of migratory landbirds, it is unlikely that large numbers of landbirds will be affected. Any such effects are predicted to be adverse, low in magnitude, localized and certainly within the Project Area, short-term, sporadic in frequency, and reversible, with a moderate level of confidence.

6.2.3.4 Wellhead Decommissioning

No effects on Marine and Migratory Birds as a result of wellhead decommissioning are anticipated. Wellhead decommissioning is conducted underwater, at depth, and in adherence to the requirements set out under the *Newfoundland Offshore Petroleum Drilling and Production Regulations*. Decommissioning activities will be conducted well below diving depths for even the deepest-diving seabirds.

6.2.3.5 Project-Related Surveys

The predicted environmental effects of survey activities are primarily related to noise exposure from geophysical testing, which may result in changes in presence and abundance of avifauna, and potentially short-term injury. Deep-diving birds such as alcids (including murres, dovekies, and

puffins), as well as other bird species that forage underwater, may be at somewhat higher risk of injury or disruption due to exposure to underwater noise such as that generated by seismic sound sources. VSP and geophysical, geohazard, wellsite and/or seabed surveys using 2D seismic arrays or other equipment will be conducted as part of the Project as required. However, these surveys will be short-term and localized in nature, and Marine and Migratory Birds are unlikely to be affected by the underwater sound energy that is associated with these activities. These changes are predicted to be adverse, negligible in magnitude, localized and certainly within the Project Area, short-term, sporadic in frequency, and reversible, with a high level of confidence.

6.2.3.6 Supply and Servicing

The primary environmental effects of supply and servicing activities are related to potential disturbance due to vessel movements, release of organic wastes leading to increased food availability, and attraction / disorientation of birds due to lighting. The various bird species that occupy the Project Area and potential vessel and aircraft traffic routes will not likely be disturbed by Project-related vessel activity or associated aircraft use due to its short-term transitory nature, and because it will generally be in keeping with the overall marine traffic that has occurred throughout the region for years. The release of organic wastes by offshore vessels and activities can attract birds, which may increase the potential for interactions including risk of predation, collision and exposure to contaminants. However, this will be reduced with proper waste management practices and adherence to associated MARPOL requirements (e.g., food and sewage waste will not be discharged within 5.5 km (3 nautical miles) of the coast). Potential effects due to lighting on supply vessels, will be highly transient in nature. Overall, the presence of these Project-related vessels in the Canada-NL Offshore Area as part of this Project would result in a negligible addition of night lighting in this region. These changes are predicted to be adverse, low in magnitude, localized in extent, short-term, regular in frequency, and reversible, with a high level of confidence.

6.2.4 Anticipated Effects (Accidental Events)

Accidental events such as oil spills can have important, adverse consequences for marine-associated birds, leading to potential changes in the presence, abundance, distribution and/or health of marine birds (individuals and populations). Exposure to accidental oil spills from a drilling installation or vessels may affect individuals (e.g. through physical exposure including ingestion), important habitats and food sources. Marine birds are amongst the biota most at risk from oil spills, as they spend much of their time upon the surface of the ocean (LGL Limited 2005; Barron 2012; Boertmann and Mosbech 2012). In the event of a spill, and depending upon project and area specific factors, coastal birds may also be at risk on beaches and in intertidal zones.

Batch spills, if any, resulting from the Project would cause a temporary (likely less than 24 hours) decrease in water quality (and thus habitat quality) around the spill site. This would be short-term in nature, lasting until the slick disperses in the offshore environment. Based on modelling results, the potential for exposure and the likelihood of adverse effects on marine birds from a batch release are low. Only those birds occupying the immediate footprint of the spill for this time period would be affected.

A subsurface blowout represents the accidental event with the greatest potential to affect marine birds, given the potentially large volume of discharged oil, and the possibility for such a spill to have a large geographic extent. Based on vulnerability indices (French-McCay 2009) the mortality rate would range from 35-95 percent for birds that come in contact with the slick in the 0.01-0.1 mm thickness range. Murres and dovekies, which spend most of their time sitting on the water's surface, are most vulnerable (estimated 95 percent mortality), while species that dive or feed at the water's surface for their prey but otherwise spend little time on the water, including Leach's storm-petrels, great shearwaters, and great skuas, are predicted to have a lower mortality rate of 35 percent. Black-legged kittiwakes and northern gannets, which do often sit on the water but spend more time in the air than alcids (murres and dovekies), would be expected to have an intermediate mortality rate. Shoreline contact was considered possible from releases at both the EL 1135 and EL 1137 sites, with maximum probabilities of shoreline contact with the Avalon Peninsula exceeding 25 percent from the EL 1137 site in the case of a 113-day release. Oil that is predicted to make contact with the shoreline is expected to be highly weathered, patchy and discontinuous given the time to make contact with the shoreline. For coastal Newfoundland, oil is predicted to make first contact with shoreline after 29 days; the model predicted oil would make contact with eastern Nova Scotia/Sable Island after 50 days.

In the unlikely event of an offshore oil release, some degree of residual adverse effects to individual marine and migratory birds in the area at the time of the accident or malfunction are expected. The degree of exposure and type of effects would depend on the type and size of spill, time of year, and location and species of Marine and Migratory Birds within the affected area. Spill prevention techniques and response strategies (e.g., cap stacks, spill clean-up processes detailed in Section 15.1 of the EIS) will be incorporated into the design and operations for Project activities as part of contingency planning, resulting in predicted adverse residual effects of low to high magnitude, occurring within the RSA, of short to long term duration, not likely to occur or occurring sporadically, and reversible with a moderate level of confidence in the effects prediction.

6.3 Marine Mammals and Sea Turtles (including Species of Conservation Concern)

The Project Area and surrounding marine environments are known to be used by marine mammals and sea turtles. Marine mammals and sea turtles and their habitats are protected under the federal *Fisheries Act* and SARA. The *Fisheries Act* includes provisions that prohibit serious harm to fish (i.e., the death of fish or any permanent alteration to, or destruction of, fish habitat) that are part of a commercial, recreational, or Aboriginal fishery. Marine mammals and sea turtles as "marine animals" are considered "fish" for the purposes of the Act. SARA includes provisions to protect species listed on Schedule 1 of the Act as well as their critical habitat, which is defined as "habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species' critical habitat in a recovery strategy or action plan for the species" (Section 2(1)).

For the purposes of this assessment, marine mammals include baleen whales (mysticetes), toothed whales (odontocetes), and seals (phocids). Due to similarities in habitat use and the nature of potential interactions with Project components and activities, sea turtles are assessed together with marine mammals, with key differences noted where applicable.

6.3.1 Description of the Baseline

Marine mammals and sea turtles found in the Canada-NL Offshore Area include seven species of mysticetes (baleen whales), sixteen species of odontocetes (toothed whales, dolphins, and porpoises), four species of phocids (seals), and four species of sea turtles. While some species of marine mammals remain in the waters off eastern Newfoundland year-round, many marine mammals and sea turtles arrive in the late spring and remain until the fall, feeding and socializing in the highly productive waters of the Grand Banks, the Flemish Pass, and surrounding waters.

The species of mysticetes that are most common in the RSA include humpback whales, fin whales, and minke whales. Odontocete species are expected to occur throughout the RSA, though sperm whale sightings are more likely to be associated with continental slope waters. Harbour seals are concentrated primarily in coastal areas, while the other species of phocids are more widespread and can be found in the deeper waters of the RSA when not breeding or whelping on land or pack ice. Leatherback sea turtles are considered most likely to be observed over the continental slope areas off the Grand Banks and south of the Flemish Cap, while the likelihood of the other species of sea turtles to occur anywhere in the Project Area is considered low.

No critical habitat for marine mammals or sea turtles has been designated in or near the Project Area, LSA, and RSA. However, there are several Ecologically and Biologically Significant Areas (EBSAs) identified in the RSA which have importance to Marine Mammals and Sea Turtles (refer to Section 6.4).

There are eleven listed species including four species of mysticetes, five species of odontocetes, and two species of sea turtles. Listed species are those listed under Schedule 1 of SARA or identified by COSEWIC as SOCC. Table 6.3 shows listed species that have the potential to occur in the RSA, their respective statuses under SARA and COSEWIC, and their potential presence in the RSA.

Table 6.3 Listed Marine Mammal and Sea Turtle Species Found in the Vicinity of the Project Area

Common Name	Scientific Name	SARA Schedule 1 Status	COSEWIC Designation	Potential for Occurrence in the Vicinity of the Project Area[1]	Potential Timing of Presence
Mysticetes (Toothless or Baleen Whales)					
Blue whale (Atlantic population)	*Balaenoptera musculus*	Endangered	Endangered	Moderate	Year- round (highest concentrations from early spring through winter)
Bowhead whale (Eastern Canada-West Greenland population)	*Balaena mysticetus*	Not Listed	Special Concern	Low	Unknown
Fin whale (Atlantic population)	*Balaenoptera physalus*	Special Concern	Special Concern	High	Year- round (highest concentrations in summer and winter)
North Atlantic right whale	*Eubalaena glacialis*	Endangered	Endangered	Low	Unknown
Odontocetes (Toothed Whales, Dolphins, and Porpoises)					
Beluga whale (St. Lawrence Estuary population)	*Delphinapterus leucas*	Endangered	Endangered	Low	Unknown
Harbour porpoise (Northwest Atlantic subspecies)	*Phocoena phocoena*	Not Listed (Threatened on Schedule 2)	Special Concern	Moderate	Year- round
Killer whale (Northwest Atlantic population)	*Orcinus orca*	Not Listed	Special Concern	Moderate	Year- round
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	Moderate	Year-round
Sowerby's beaked whale	*Mesoplodon bidens*	Special Concern	Special Concern	Low	Unknown
Sea Turtles					
Leatherback sea turtle (Atlantic population)	*Dermochelys coriacea*	Endangered	Endangered	Low to Moderate	Seasonal (spring through fall)
Loggerhead sea turtle	*Caretta caretta*	Endangered	Endangered	Low	Seasonal (spring through fall)

[1]This is based on the habitat preferences during various life stages, distribution mapping, and sightings data for each species within the Project Area

6.3.2 Anticipated Changes to the Environment

The key potential environmental interactions between offshore oil and gas activities and marine mammals and sea turtles include the following (adapted from Amec 2014):

- Temporary hearing impairment or permanent injury or mortality from exposure to loud underwater noise after coming into close contact with a Project-related underwater sound source (e.g., drilling, VSP) at or above threshold levels for onset of injury derived from published scientific literature or those used in relevant legislation
- Behavioural effects due to Project-related sound sources or other disturbances at or above threshold levels for onset of behavioural disturbance derived from published scientific literature or those used in relevant legislation. These may include alterations in the presence, abundance, and overall distribution (including avoidance) of marine mammals and sea turtles as well as modifications to their movements, feeding, communication patterns and other activities
- Interference with (and the masking of) sounds within the marine environment that originate from and/or are used by marine biota, such as in communication between individuals, the identification and detection of predators and prey, echolocation, and other activities and requirements
- Potential for injury or mortality through collisions or other interactions with offshore survey and supply vessels, including possible attraction of individual animals
- Possible changes in the availability, distribution, or quality of feed sources and/or habitats for marine mammals and sea turtles

As a result of these potential effects, identified environmental interactions, issues identified in the EIS Guidelines, and concerns raised through consultations and engagement, the assessment of Project-related environmental effects on Marine Mammals and Sea Turtles (including SAR) is focused on the following potential environmental effects:

- Change in Mortality or Injury (Underwater Noise)
- Change in Habitat Quality or Use (Behavioural Effects)
- Change in Mortality or Injury (Vessel Strikes)
- Change in Food Availability or Quality
- Change in Health (Contaminants)

6.3.3 Anticipated Effects (Planned Project Components and Activities)

The anticipated effects of planned project components and activities on Marine Mammals and Sea Turtles are assessed.

6.3.3.1 Presence and Operation of Drilling Installation

The predicted environmental effects associated with presence and operation of a drilling installation are primarily related to increase in underwater noise that may result in a change in mortality or injury and change in habitat quality or use (behavioural effects). However, in this case, marine mammals or sea turtles are not expected to be injured or killed as a result of underwater noise introduced during

presence and operation of a drilling installation, nor is the quality or availability of their prey expected to be adversely affected. Some degree of change in habitat use in response to underwater noise is expected of individuals that occur within tens of kilometres of the drilling installation at the time of operation. The exact nature of behavioural response cannot be predicted but could include interference in communication, minor alterations in activity, or localized avoidance responses. The number of individuals affected is expected to be minimal relative to overall population sizes, effects will be of moderate duration (less for transient individuals), and there are no known concentration or critical habitat areas in the RSA. These changes are predicted to be adverse, low to medium in magnitude, within the Project Area and LSA, short- to medium-term, regular to continuous in frequency, and reversible, with a moderate level of confidence.

6.3.3.2 Drilling and Associated Marine Discharges

The predicted environmental effects to marine mammals and sea turtles associated with drilling and associated marine discharges is change in health (contaminants) related to routine discharges of drilling muds, drilling fluid, and cuttings associated with drilling activities. Chemicals used for drilling operations will be screened in accordance with a chemical management system that adheres to the C-NLOPB requirements. With the application of mitigation measures, the potential for Project-related changes in health and in food availability or quality as a result of drilling and marine discharges is predicted to be adverse but negligible. This conclusion has been determined with a high level of confidence, based on the implementation of industry-standard guidelines and best management practices and the limited potential for exposure of marine mammals and sea turtles to marine contaminants or contaminated prey. These changes are predicted to be adverse, low in magnitude, within the Project Area, short-term, regular in frequency, and reversible, with a high level of confidence.

6.3.3.3 Formation Flow Testing with Flaring

In cases where a formation flow test is carried out, Project interactions with marine mammals and sea turtles will be similar to those discussed in Section 6.3.3.1. Given compliance with OWTG requirements, the potential for Project-related changes in health and food availability or quality as a result of drilling and marine discharges is predicted to be adverse but negligible. These changes are predicted to be adverse, negligible to low in magnitude, localized and within the Project Area, short-term, sporadic in frequency, and reversible, with a high level of confidence.

6.3.3.4 Wellhead Decommissioning

During wellhead decommissioning, disturbance during mechanical removal of wellheads and presence of the ROV may result in temporary, localized avoidance by marine mammals and sea turtles within the immediate area surrounding the wellhead. Underwater noise will be produced by either the drilling installation or an alternative vessel capable of carrying out the decommissioning activity. Sound levels are likely to be similar to or less than those summarized in Section 6.3.3.1. Changes in marine fish health (and thus changes in marine mammal and sea turtle prey quality) are not expected. As such, potential interactions with marine mammals associated with this activity will be limited to change in habitat quality or use due to an increase in underwater noise during vessel transit and change in mortality or injury from vessel strike risk. At water depths greater than 1,500 m,

it is planned that the wellhead will remain in place and will not be removed, and therefore no interactions with marine mammals or sea turtles are anticipated during or after the activity. These changes are predicted to be adverse, negligible to low in magnitude, localized with some extension into Project Area, short-term, sporadic in frequency, and reversible, with a high level of confidence.

6.3.3.5 Project-related Surveys

Underwater noise produced during VSP and other geophysical surveys have the potential for injury or mortality or behavioural changes in marine mammals and sea turtles. However, in this case, and particularly with the implementation of mitigation measures, injury or mortality is not predicted for marine mammals or sea turtles as a result of underwater noise from VSP and other geophysical surveys, nor is the quality or availability of their prey expected to be adversely affected. Some degree of change in habitat use in response to underwater noise is expected for individuals that occur within a few kilometres of the surveys at the time of operation. The exact nature of behavioural response cannot be predicted but could include, for example, interference in communication, minor alterations in activity, or localized avoidance responses. Avoidance responses, where they occur, will further reduce the potential for injury. The number of individual marine mammal and sea turtles affected is expected to be minimal relative to overall population sizes, effects will be localized and of short-term duration, and there are no known concentration or critical habitat areas in the Project Area. Geological, geotechnical, and environmental surveys have a low potential to affect Marine Mammals and Sea Turtles, resulting from changes in habitat quality or use, change in mortality / injury (vessel strikes), and change in food availability and quality. The changes associated with Project-related surveys are predicted to be adverse, negligible to low in magnitude, localized with some extension into the LSA, short to medium-term, sporadic in frequency, and reversible, with a high level of confidence.

6.3.3.6 Supply and Servicing

Marine transportation associated with support / supply / survey vessels will result in an increase in marine vessel traffic to, from and within the LSA and within the RSA overall, and an associated increase in underwater noise and vessel strike risk. Despite the lack of Project-specific underwater sound modelling and uncertainty regarding noise thresholds for different species of marine mammals and sea turtles, potential for exposure is expected to be brief and transient in nature. While vessel strikes can and do have serious consequences for individuals involved, these events are rare on a per-vessel basis and the Project will add only a small number of vessels relative to current vessel traffic volumes in the RSA. Helicopter support will be used for crew transfers out of St. John's International Airport. Routine transportation activities associated with helicopter support have the potential to result in change in habitat quality or use for marine mammals and sea turtles as a result of sensory disturbances from the introduction of visual cues and noise. These changes are predicted to be adverse, low in magnitude, within the LSA, short-term, regular in frequency, and reversible, with a high level of confidence.

6.3.4 Anticipated Effects (Accidental Events)

Various species of marine mammals and sea turtles, including several SAR/SOCC, are known to occur in the RSA seasonally or year-round, and could therefore be present at the time of an

accidental event. The potential for interaction of different species of marine mammals or sea turtles with an accidental event such as a hydrocarbon release will vary based on the timing, location, duration, and extent of the spill. Marine mammals and sea turtles may experience a change in mortality or injury (acute or immediate effects) if directly exposed to accidentally-released hydrocarbons or associated volatiles and aerosols. They may experience a change in health (sub-lethal effects) from direct contact with hydrocarbons (including volatiles and aerosols) or consumption of contaminated prey. There may be a change in habitat (marine water or shoreline/haulout) quality due to oiling and associated response measures.

Results of the modelling of batch diesel spills (100 or 1,000 L at the EL 1135 and EL 1137 sites) suggest that both the potential for exposure and the likelihood of adverse effects on marine mammals and sea turtles from a batch release (e.g., fouling, inhalation of vapours) are low. Only animals in the immediate vicinity at the time of the spill may be exposed, and at the concentrations predicted, change in mortality or injury is considered unlikely and changes in health are predicted to be of low magnitude (e.g., temporary inflammation of mucous membranes). Changes in habitat quality or use will likewise be of low magnitude. Batch diesel spills from either the EL 1135 or EL 1137 site are not expected to affect haulout areas on distant shorelines. While there will be a decrease in water quality around the spill site, this would be short-term until the slick disperses (aided by surface wave action in the offshore environment).

Based on modelling of a sub-surface release at the EL 1137 site, oil is predicted to be transported by subsurface currents, and to contact shorelines after approximately 29 days. Highly weathered, discontinuous patches of oil may reach Sable Island, the coast of southern Newfoundland, or the Avalon Peninsula; terrestrial areas affected may or may not be used by marine mammals for haulouts. There was no predicted shoreline oil contamination from the 30-day release at EL 1135; however, for the 113-day release at EL 1135, minimum time for highly weathered discontinuous patches of oil to contact the shoreline was predicted to be 30 days.

In the unlikely event of shoreline oiling, fur-bearing marine mammals that haul out in the affected area may experience a change in mortality or injury and a change in health upon exposure to hydrocarbons, although it is probable that only a small proportion of local populations would be affected. Predatory marine mammals that prey on seals (e.g., killer whales) may also experience changes in mortality, injury, or health following consumption of oiled prey species. Change in habitat quality or use of terrestrial habitats is predicted to be low in magnitude and short-term in duration.

Potential for change in habitat quality or use of oceanic habitats (i.e., water quality and air quality at the air-sea interface) will be greater near the location of the sub-surface release (either EL 1137 or EL 1135). The degree of change in mortality or injury and change in health will depend in large part on the occurrence and distribution of marine mammals and sea turtles at the time of the blowout, as well as the duration and extent of oil release (i.e., potential severity of effects will be dependent on the potential for exposure). Depending on the exact nature, extent, and duration of a spill, marine mammals and sea turtles in the spill area are likely to experience a combination of exposures from contaminated air, water, and sediment and via a combination of pathways (inhalation, ingestion, aspiration, and adsorption). Oceanic animals that are closer to the site of the blowout are more likely to be exposed to a more constant flow and higher concentrations of fresher oil, as compared to nearshore species.

In the unlikely event of an offshore oil release, some degree of residual adverse effects to individual marine mammals or sea turtles in the area at the time of the accident or malfunction are expected. The degree of exposure and type of effects would depend on the type and size of spill, time of year, and location and species of animals within the affected area. However, effects are not expected to alter the long-term viability of local or regional marine mammal and sea turtle populations in the RSA and it is considered unlikely that the size, health, ecological function, and/or sustainability of a population of marine mammals or sea turtles would be measurably affected. Spill prevention techniques and response strategies will be incorporated into the design and operations for Project activities as part of contingency planning, resulting in predicted adverse residual effects of low to medium magnitude, within the RSA, short to long term in duration, not likely to occur or occurring sporadically, and reversible with a moderate to high degree of confidence in the effects prediction.

6.4 Special Areas

Several marine and coastal areas in Newfoundland and Labrador have been designated as protected under provincial, federal, and/or or legislation or agreements due to their ecological, historical, or socio-cultural characteristics and importance. Other areas have been formally identified as being special or sensitive through relevant processes and initiatives

Most of the Special Areas identified in Eastern Newfoundland are located on land or in coastal and nearshore areas, outside of the Project Area. Special Areas in offshore locations off Eastern Newfoundland include various Fisheries Closure Areas (FCAs) that protect sensitive benthic habitats from bottom fishing activities, but with no associated prohibitions of petroleum exploration and development activities within their boundaries. Other identified Special Areas include VME areas identified by NAFO for their high ecological or biological activity, portions of which may eventually be designated as FCAs. In addition, EBSAs are ecologically and biologically significant areas identified through the Canadian *Oceans Act.*

6.4.1 Description of the Baseline

Special Areas occur within the Project Area and within the potential vessel and aircraft traffic route (VATR). Fifteen Special Areas overlap the Project Area and/or the VATR (Table 6.4): Four overlap with both the Project Area and VATR; one overlaps the VATR only; ten overlap the Project Area only.

Table 6.4 Summary of Special Areas that Overlap with the Project Area and Vessel Aircraft Traffic Routes

Special Area	Project Area	Traffic Route
Northeast Shelf and Slope EBSA	✓	✓
Eastern Avalon Coast EBSA		✓
Northeast Shelf and Slope (within Canadian EEZ) VME	✓	✓
Sackville Spur VME	✓	✓
Northern Flemish Cap VME	✓	
Southern Flemish Pass to Eastern Canyons VME	✓	

Table 6.4 Summary of Special Areas that Overlap with the Project Area and Vessel Aircraft Traffic Routes

Special Area	Project Area	Traffic Route
Beothuk Knoll VME	✓	
NAFO Fisheries Closure Areas (FCAs) – High sponge and coral concentration areas		
Northwest Flemish Cap (10)	✓	
Northwest Flemish Cap (11)	✓	
Northwest Flemish Cap (12)	✓	
Flemish Pass / Eastern Canyon (2)	✓	
Sackville Spur (6)	✓	✓
Northern Flemish Cap (7)	✓	
Northern Flemish Cap (8)	✓	
Northern Flemish Cap (9)	✓	

Table 6.5 and Figure 6-1 provide a summary of the identified special areas that overlap with any portion of the various ELs that comprise the Project.

Table 6.5 Special Areas Overlapping with Project Exploration Licences

Exploration Licence	Overlapping Special Areas
EL 1135 (ExxonMobil)	• Northeast Shelf and Slope EBSA
EL 1137 (ExxonMobil)	• None
EL 1139 (Statoil)	• None
EL 1140 (Statoil)	• None
EL 1141 (Statoil)	• Sackville Spur (6) NAFO FCA • Northern Flemish Cap VME • Sackville Spur VME
EL 1142 (Statoil)	• Sackville Spur (6) NAFO FCA • Northern Flemish Cap (9) NAFO FCA • Northwest Flemish Cap (12) NAFO FCA • Northern Flemish Cap VME • Sackville Spur VME

There are no Marine Protected Areas or Areas of Interest near the Project Area and RSA. Federal FCAs off eastern Newfoundland are located in coastal and nearshore areas and are not located in or near the Project Area and will not be crossed by Project-related vessel traffic.

DFO has identified various EBSAs located in deep ocean areas off Newfoundland and Labrador. There are two EBSAs which either overlap with the Project Area, or may be potentially crossed by Project-related vessel traffic. The Northeast Shelf and Slope EBSA is located partially within the Project Area – Northern Section, and a small portion of this EBSA also overlaps with the Project Area – Southern Section. Project vessels may cross through this EBSA (Northeast Shelf and Slope) as

well as the Eastern Avalon Coast EBSA on the east coast of Newfoundland. The Northeast Shelf and Slope EBSA has high aggregations of Greenland halibut and spotted wolffish, which congregate in this area in the spring. The area also has concentrations of marine mammals (cetaceans and seals) and corals. The Eastern Avalon Coast EBSA has known feeding areas for seabirds. Marine mammals (cetaceans and seals) and leatherback sea turtles also feed in the area from spring to fall. The next nearest EBSA, the Lily Canyon-Carson Canyon EBSA, located 50 km south of the Project Area -Southern Section, is known aggregation and overwintering area for marine mammals and phocids.

Parks Canada has identified Representative Marine Areas in the RSA of which the Virgin Rocks and the South Grand Bank Area are located in the Canada-NL Offshore Area. Neither of these overlap with the Project Area, and are not likely to be crossed by Project-related vessel traffic.

NAFO has identified VMEs in the Canada-NL Offshore Area and five of these areas overlap with the Project Area, or may be potentially crossed by Project-related vessel traffic. The Project Area – Northern Section overlaps with the Northern Flemish Cap (EL 1141 and EL 1142), Sackville Spur (EL 1141 and EL 1142), and Northeast Shelf and Slope (within Canadian EEZ) VMEs. The Northern Flemish Cap VME (EL 1141 and EL 1142) has a high density of sea pens, soft corals, black corals, and to a lesser extent solitary stony corals and small gorgonians. Vulnerable fish species known to occur in this area are northern wolffish and spiny dogfish. The Sackville Spur VME (EL 1141 and EL 1142) has a high density of sponges. The Northeast Shelf and Slope VME (which does not intersect with Project ELs) has an abundance of gorgonian and black corals.

The Project Area – Southern Section overlaps with the Southern Flemish Pass to Eastern Canyons and Beothuk Knoll VMEs. The Southern Flemish Pass to Eastern Canyons VME has large gorgonians and a high density of sponges. Vulnerable fish species in the area include striped wolffish, redfish, spiny-tailed skate, northern wolffish, black dogfish, and deep-sea cat shark. The Beothuk Knoll VME (EL 1135) has an abundance of gorgonian corals and a high density of sponges. Vulnerable fish species in the area include northern wolffish, spiny-tailed skate, roundnose grenadier, deep-sea cat shark, and black dogfish. In addition, the Northeast Shelf and Slope EBSA overlaps the Project Area – Southern Section (EL 1135). This EBSA has been noted as having concentrations of cetaceans and pinnipeds (phocids).

Potential Project-related vessel traffic may intersect with the Northern Flemish Cap, Sackville Spur, and Northeast Shelf and Slope (within Canadian EEZ) VMEs.

NAFO has established 21 FCAs within its jurisdiction outside the Canadian EEZ in offshore Newfoundland and Labrador, and there is overlap with some of these areas and the Project Area. These FCAs were established to protect high coral and sponge concentrations and other sensitive habitats and features such as seamounts. The Project Area - Northern Section overlaps with the Flemish Pass / Eastern Canyon (2) FCA (do not intersect with Project ELs), Sackville Spur (6) FCA (EL 1141 and EL 1142), three FCAs in the Northern Flemish Cap (i.e., 7, 8, and 9); and three FCAs in the Northwest Flemish Cap (i.e., 10, 11, and 12). Of these, the Sackville Spur (6), Northern Flemish Cap (9), and Northwest Flemish Pass (12) overlap EL 1141 and EL1142. The Project Area – Southern Section overlaps with the Flemish Pass / Eastern Canyon (2) FCA, but does not intersect with the Project ELs.

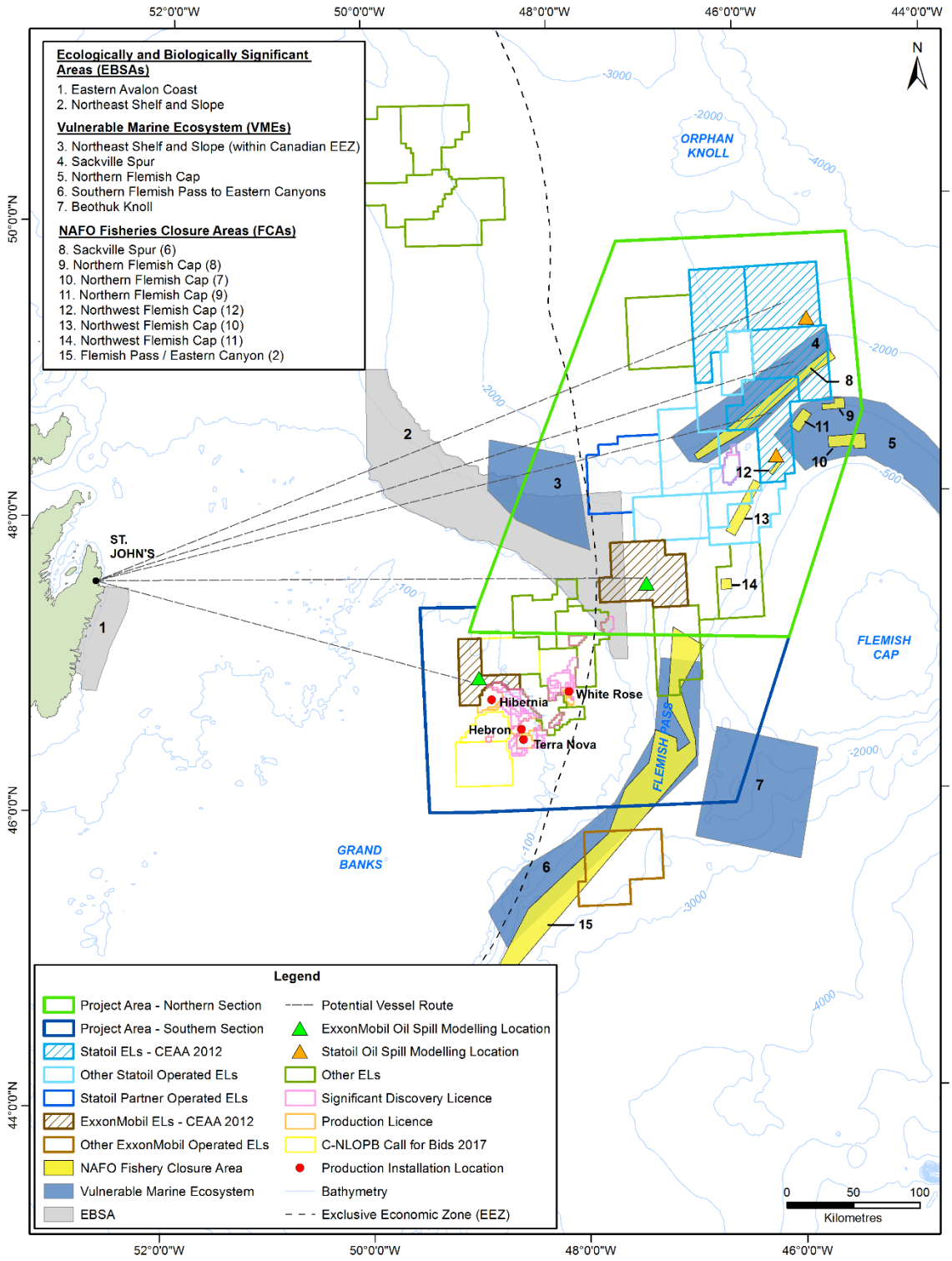


Figure 6-1 Overview of Special Areas that Overlap with the Project Area and Potential Vessel and Aircraft Traffic Routes

Several IBAs are located in coastal areas of Eastern Newfoundland; however, none of these areas are in or near the Project Area nor will be crossed by Project-related vessel traffic.

6.4.2 Anticipated Changes to the Environment

Changes to the environment because of offshore oil and gas activities and their potential effects on identified Special Areas may be both direct and indirect in nature and cause. The conduct of oil and gas exploration activities directly within or near such areas may have adverse implications for these locations and their important and defining ecological and socio-cultural characteristics. These interactions may occur through the possible presence of oil and gas exploration equipment, personnel, and activities within the Special Area in question, as well as the associated emissions and discharges from Project activities. Biophysical effects resulting from oil and gas or other human activities within the RSA may also "spread" to adjacent Special Areas by affecting the marine fish, birds, mammals, or other environmental components that move to and through these areas. Any resulting decrease in the real or perceived integrity of these areas in the short or long term may also affect their ecological and/or societal importance, use and value.

As a result of these identified environmental interactions, issues identified in the EIS Guidelines and concerns raised through consultation and engagement, the assessment of Project-related environmental effects on Special Areas is focused on the following potential environmental effects:

- Change in Environmental Features and/or Processes
- Change in Human use and/or Societal Value

6.4.3 Anticipated Effects (Planned Project Components and Activities)

Project exploration activities will occur in an offshore marine area that is more than 300 km from the shoreline of Eastern Newfoundland. These planned Project components and activities will therefore not occur within, or otherwise interact directly with, any of the existing provincially-defined Special Areas, such as provincial ecological reserves, parks and protected areas and historic sites. Likewise, the Project will not have a direct interaction with most federally designated areas (i.e., marine protected areas, fisheries closures within Canada's EEZ, migratory bird sanctuaries, national parks and historic sites). International designations such as Important Bird Areas will also not be directly affected by the Project. These areas, most regularly used by humans for recreation, subsistence or tourism activities, are located in coastal and onshore areas.

The Project Area - Northern Section overlaps with portions of one EBSA, three VMEs and eight NAFO FCAs, none of which has associated prohibitions of offshore exploration activities. In particular, the Sackville Spur (6) FCA, Northern Flemish Cap (9) FCA, Northwest Flemish Cap (12) FCA, Sackville Spur VME, and Northern Flemish Cap VME overlap EL 1141 and 1142. In addition, a number of Special Areas (EBSAs, VMEs, NAFO FCAs and PRMAs) are located in the general vicinity, some within approximately 17 km of the Project Area / LSA boundary. These areas are not regularly used by humans but are valued for their biological and ecological characteristics and their importance for human activities such as the fishing industry.

The Project Area - Southern Section overlaps with the same EBSA, two VMEs and one NAFO FCA, which have no prohibitions of oil and gas exploration activities. Similar to the Northern Section, there

are also various other VMEs and FCAs, and to a lesser extent EBSAs, located in the general vicinity of the Project Area - Southern Section and one is within 10 km.

Potential vessel and aircraft traffic routes to the Project Area - Northern Section cross an EBSA, two VMEs and an FCA, while those to the Project Area - Southern Section cross two EBSAs one of which is also crossed by routes to the Northern Section.

The overall and defining environmental features and characteristics of the Northeast Shelf and Slope EBSA and the five VMEs – Sackville Spur, Northern Flemish Cap, Northeast Shelf and Slope (within Canadian EEZ), Beothuk Knoll and Southern Flemish Pass to Eastern Canyons – that overlap with the Project Area (ELs 1135, 1141, and 1142) will not be adversely affected by the Project. The small environmental footprints and short-term nature of the planned exploration activities will mean that activity will occur at any one location for a short period of time. Moreover, the implementation of the various mitigation measures outlined throughout this EIS will serve to help address any direct or indirect potential environmental effects that may have implications for overlapping or adjacent Special Areas.

The Project Area also overlaps with portions of eight FCAs, including the Sackville Spur (6), Northern Flemish Cap (7, 8, 9), Northwest Flemish Cap (10, 11, 12) and Flemish Pass / Eastern Canyon (2), which intersect with ELs 1141, and 1142. These areas have been designated as such to protect important and sensitive benthic components and habitats from further disturbance due to certain types of bottom-dragging fishing activity, but their designations as such do not prohibit petroleum exploration activities in these areas. As discussed in Chapter 2 of the EIS, the planned drilling and associated activities will be characterized by a relatively small and temporary footprint, with mitigation measures planned to reduce potential effects the marine benthic environment. In particular, a pre-drill coral survey will be undertaken to determine if corals/sponges are present within the potential zone of influence as predicted by the drill cuttings model. Many of the other offshore survey activities that are planned to be undertaken as part of this Project will not result in any direct contact with the seabed, and will therefore not physically disturb benthic animals or their habitats. Any seabed geological, geochemical or geotechnical sampling activities will likewise have a short duration, and those which involve contact with the seabed will have a small footprint.

Notwithstanding the overall size and extent of the Project Area itself, all exploration drilling activity carried out as part of this Project will occur within the boundaries of an EL, as currently defined in Section 2.1.

The offshore vessel and aircraft activity within the Project Area and to and from Eastern Newfoundland will be generally in keeping with, and may make a relatively minor contribution to, the overall marine vessel activity occurring in the region for many years. Supporting vessels that are involved in Project activities will travel in an essentially straight line between a drilling installation operating within an EL (see Section 2.1) in the Project Area and the established supply facility in Eastern Newfoundland, recognizing that specific routes may vary at times based on the location of the active drilling installation(s) and to avoid sea-ice. The planning and conduct of Project-related vessel traffic will be undertaken in consideration of these factors, relevant regulatory requirements, and through established cooperative processes that involve discussions and communications between the oil and gas sector, fishing industry and other ocean users.

The changes associated with Project components and activities are predicted to be neutral to adverse, negligible to low in magnitude, localized and within the Project Area, short to medium term duration, occurring sporadically to regularly in frequency, and reversible, with a high level of confidence. As described for the biophysical VCs (Sections 6.1 to 6.3), the Project is not expected to result in significant adverse effects upon marine fish, birds, mammals, sea turtles, species at risk or their habitats. It will therefore not adversely affect the ecological features, processes and integrity of any marine or coastal locations that are designated as Special Areas, nor their human use and societal value.

6.4.4 Anticipated Effects (Accidental Events)

There are a number of Special Areas in offshore Eastern Newfoundland that overlap in whole or in part with the Project Area - Northern or Southern Sections) including various EBSAs, VMEs and NAFO FCAs. Key potential effects in the unlikely event of an accidental event include potential changes in environmental features and/or processes and changes in human use and/or societal value.

Modelling results for batch diesel spills (100 or 1,000 L at each hypothetical well site location) for both sites indicate that such spills would not reach the threshold for ecological effects from surface slicks or in water concentrations, but do potentially reach the socioeconomic effects threshold of 0.04 µm in some areas (ranging from 17-22 km² surface area) for a 1,000 L spill only. The special areas that would partially overlap with the affected area exceeding the socioeconomic threshold of 0.04 µm (for the 1,000 L EL 1137 site scenario) are the Flemish Pass\Eastern Canyon (2) NAFO FCA, as well as the Southern Flemish Pass to Eastern Canyons VME. No special areas overlap with the area exceeding the socioeconomic threshold of 0.04 µm for the 1,000 L EL 1135 site scenario. This concentration of spilled materials will be short in duration with less than 0.1 percent of the released volume predicted to remain floating on the water surface at the end of the 30-day simulation.

A subsurface blowout represents the accidental event with the greatest potential to affect adjacent Special Areas, given the potentially large amount of discharged oil that could conceivably be associated with a blowout event, and the possibility for such a spill to extend to adjacent areas and resources. Based on model results for the EL 1137 site, the worst-case modelling results (i.e., winter scenario) indicates that the likely areas to be affected by such a spill include the Flemish Cap East, Northern Flemish Cap, Deep Water Coral Area, Beothuk Knoll, Southern Flemish Pass to Eastern Canyons and South East Shoal and Adjacent Shelf and Edge/Canyons VMEs, and the Tail of the Bank (1), Flemish Pass/Eastern Canyon (2), Eastern Flemish Cap (4), Eastern Flemish Cap (14), Northeast Flemish Cap (5), Northwest Flemish Cap (11), Beothuk Knoll (3) and Beothuk Knoll (13) and Newfoundland Seamounts FCAs. Based on model results for the EL 1135 site, the likely areas to be affected by such a spill include the Southern Flemish Pass to Eastern Canyons, Beothuk Knoll, Deep Water Coral Area, Flemish Cap East and Northern Flemish Cap VMEs, and the Flemish Pass/Eastern Canyon (2), Beothuk Knoll (3), Beothuk Knoll (13), Eastern Flemish Cap (4), Eastern Flemish Cap (14), Northeast Flemish Cap (5), Northern Flemish Cap (7), Northwest Flemish Cap (10), Northwest Flemish Cap (11) and Northwest Flemish Cap (12) FCAs.

In the extremely unlikely event of an offshore oil release, some degree of residual adverse effects to Special Areas are expected. Given the potential interaction with identified Special Areas in the

offshore environment of Eastern Newfoundland is predicted to be limited, and with the various spill response procedures outlined previously, it is considered extremely unlikely that any of these Special Areas would be subject to oiling to the degree and duration that would result in a change in their overall, important and defining ecological and socio-cultural characteristics, resulting in a decrease in their overall integrity, value or use. Given that the points of contact are patchy and discontinuous, a worst-case approach was taken to identify Special Areas that may be affected; that is, Special Areas in the vicinity of the points of contact have been identified. Special Areas within or near the predicted shoreline contact areas include coastal portions of the Placentia Bay/Grand Banks LOMA, Placentia Bay Extension EBSA, the Southern Coast of Burin Peninsula and Southwestern Placentia Bay Preliminary Representative Marine Area, Mistaken Point Ecological Reserve/World Heritage Site/IBA, Cape St. Mary's Ecological Reserve/IBA, Lawn Bay Ecological Reserve, Fortune Head Ecological Reserve, Cape Pine and St. Shott's Barren IBA, Placentia Bay IBA, Corbin Island IBA, Middle Island IBA, Green Island IBA, and Sable Island National Park Reserve off the southeast coast of Nova Scotia. Due to the time predicted for the oil to reach shore (29 days for coastal Newfoundland and greater than 50 days for Sable Island) and the fact it is occurring in the winter season, the oil is expected to be highly weathered, patchy and discontinuous. In the event of a spill, there will be adequate time to plan and implement shoreline response measures before any weathered oil contacts the shoreline.

Spill prevention techniques and response strategies will be incorporated into the design and operations for Project activities as part of contingency planning, resulting in predicted adverse residual effects of low to medium in magnitude, within the RSA, of short to long-term duration, not likely to occur or to occur sporadically, and reversible with a moderate level of confidence in the effects prediction. In the extremely unlikely event of a subsurface blowout occurring within a Special Area, significant effects may result, depending on the nature of the Special Area, and the extent and duration of the spill event.

6.5 Indigenous Communities and Activities

A key focus of the EIS has been assessing and evaluating the potential for the Project, and the various changes to the environment that may be associated with it, to interact with and affect Indigenous communities and their activities, including each of the socio-cultural aspects identified in Section 5(1)c of CEAA 2012. This VC also relates to and overlaps with other components of the biophysical and socioeconomic environments, including several of the other VCs being considered in this assessment. Potential effects to Indigenous communities and their activities may, for example, result from Project-related changes in air quality and noise levels (Section 2.9 of the EIS), in the availability and quality of marine resources and other components of the biophysical environment (Chapters 8-11 of the EIS), and other human components and activities (Chapter 13 of the EIS).

6.5.1 Description of the Baseline

Section 7.3.4 of the EIS identifies and describes the various Indigenous groups throughout Newfoundland and Labrador, the Maritime Provinces, and Québec who have been identified by the CEA Agency as having interests related to the Project and its potential environmental effects, including potential interactions with their commercial and current traditional hunting and fishing activities.

Indigenous groups that reside in Newfoundland and Labrador include:

- Labrador Inuit (Nunatsiavut Government)
- Labrador Innu (Innu Nation)
- NunatuKavut Community Council (NCC)
- Qalipu Mi'kmaq First Nation
- Miawpukek First Nation

In April 2017, the CEA Agency informed the Proponent that the interests of other Indigenous groups in the Maritime Provinces and Quebec may potentially be affected by the Project, and that engagement with these groups was required. These groups and their identified potential interests in the Project are outlined in Table 6.6.

Table 6.6 Indigenous Groups in the Maritime Provinces and Quebec

Province	Group	Identified Interest
Prince Edward Island	Abegweit First Nation	Commercial-Communal Swordfish Licence in NAFO Division 3, 4, 5
	Lennox Island First Nation	
Nova Scotia	Paq'tnkek*	Commercial-Communal Swordfish Licence in NAFO Division 3, 4, 5
	Pictou Landing*	
	Wagmatcook*	
	Millbrook*	
New Brunswick	Elsipogtog First Nation	Asserted Aboriginal right to fish for food, social, and ceremonial purposes where that right could be affected by Project-related effects to the Atlantic salmon population(s) identified as endangered by COSEWIC
	Buctouche First Nation	
	Eel Ground First Nation	
	Eel River Bar First Nation	
	Esgenoôpetitj First Nation	
	Fort Folly First Nation	
	Indian Island First Nation	
	Metepenagiag Mi'kmaq Nation	
	Pabineau First Nation	
	Kingsclear First Nation	
	Madawaska Maliseet First Nation	
	Oromocto First Nation	
	Saint Mary's First Nation	
	Tobique First Nation	
	Woodstock First Nation	
	Passamaquoddy	

Table 6.6 Indigenous Groups in the Maritime Provinces and Quebec

Province	Group	Identified Interest
Nova Scotia	Acadia First Nation	Asserted Aboriginal right to fish for food, social, and ceremonial purposes where that right could be affected by Project-related effects to the Atlantic salmon population(s) identified as endangered by COSEWIC
	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*	
	Waycobah First Nation	
	Millbrook First Nation*	
	Sipekne'katik First Nation	
Quebec	Conseil des Montagnais de Natashquan	Asserted Aboriginal right to fish for food, social, and ceremonial purposes where that right could be affected by Project-related effects to the Atlantic salmon population(s) identified as endangered by COSEWIC
	Conseil des Innus de Ekuanitshit	
	La Nation Micmac de Gespeg	
	Listuguj Mi'gmaq Government	
	Micmacs of Gesgapegiag	
*Indigenous groups that have commercial-communal swordfish licences that overlap the Project Area and may also be exercising rights related to endangered Atlantic Salmon		

6.5.2 Anticipated Changes to the Environment

The presence of drilling installations and the conduct of these exploration activities is not anticipated to interact directly with or adversely affect Indigenous Communities and Activities, as the Project Area is located hundreds of kilometers from the nearest community. Indirect effects may occur if the Project adversely affects fish and wildlife, as these biophysical effects may in turn reduce the availability or quality of such resources and their use for traditional purposes.

As a result of these identified environmental interactions, issues identified in the EIS Guidelines and concerns raised through engagement, the assessment of Project-related environmental effects on Indigenous communities and their activities is focused on the following potential environmental:

- Change in Health and Socioeconomic Conditions
- Change in the Current Use of Lands and Resources for Traditional Purposes
- Change in Physical and Cultural Heritage and Change in any Structure, Site, or Thing that is of Historical, Archaeological, Paleontological or Architectural Significance

6.5.3 Anticipated Effects (Planned Project Components and Activities)

In general, Project components or activities that would result in possible restricted access to lands and resources, possible emissions to the environment, or other disturbances have the potential to (directly or indirectly) affect Indigenous communities and their activities where these occur within or near the Project Area and its expected environmental zone of influence (LSA).

Most Project-related activities will take place in an offshore marine environment, hundreds of kilometres from land and any Indigenous community. Project-related emissions and discharges and environmental interactions will be localized and short-term in nature (Chapters 8-11 and 13 of the EIS), and are unlikely to extend to or affect the physical or social health and well-being or other socioeconomic conditions of Indigenous communities.

The components and activities that comprise this Project (and the LSA) will be located a considerable distance (hundreds of kilometers) from Indigenous communities, and from the traditional territories associated with each of these groups. The Operator is not aware that these or other Indigenous groups assert Aboriginal or Treaty rights or otherwise undertake traditional activities within or near the Project Area and LSA, pursuant to Section 35 of the Constitution Act, 1982. Although fishing enterprises associated with several of these organizations undertake commercial fishing activity for various species within NAFO Divisions that overlap parts of the Project Area, it is understood that most of these organizations (including those in Newfoundland and Labrador) undertake fishing activities off Eastern Newfoundland through commercial licences issued by the federal government under the *Fisheries Act* and its associated *Aboriginal Communal Fisheries Licencing Regulation*, as well as other government policies and strategies that are designed to involve Indigenous groups in commercial fisheries in Canada. As “traditional use” is (as outlined above) generally understood to mean activities that have been exercised (and are being exercised) by an identifiable Indigenous community since before European contact or control of a specific area, these contemporary, commercial land and resource use activities within the LSA may not be considered traditional in that they are not a continuation of ancestral activities that took place historically within this area offshore Eastern Newfoundland and Labrador. The Project, including its planned components and activities and potential vessel and aircraft traffic routes, and the environmental emissions / disturbances and associated environmental changes resulting from these (as defined through the LSA), will therefore not directly interfere with or otherwise interact with the current use of lands and resources for traditional purposes by Indigenous communities. The Project will not have adverse effects on such activities as they do not occur within or near the LSA at any time of the year.

The environmental effects analysis also indicates there is limited potential for marine associated species that are known to be used by the identified Indigenous groups to occur within the Project Area / LSA prior to moving to any area of traditional use (e.g., Atlantic salmon (various populations)). The implementation of the mitigation measures outlined throughout this EIS will reduce direct or indirect potential effects on these resources. The Project will not have an adverse effect on the availability or quality of resources that are currently used for traditional purposes by Indigenous groups to a nature and to a degree that would alter the nature, location, timing, intensity or value of these activities or the health or heritage of any Indigenous community.

The Project Area and LSA are not known to contain resources of historical, archaeological, paleontological, or architectural significance, and given its location far offshore Eastern

Newfoundland, are not likely to contain such resources or materials that are relevant to and valued by Indigenous groups. Based on the nature, location, extent and duration of planned Project activities and the associated emission and discharges, the Project will not interact with nor adversely affect physical and cultural sites, including structures, sites, or things of historical, archaeological, paleontological, or architectural significance.

6.5.4 Anticipated Changes (Accidental Events)

Although the environmental effects assessment for the Project's planned components and activities has predicted no potential interactions with or adverse effects upon Indigenous communities and their activities, there is potential for an accidental event, such as a large oil spill to eventually reach and affect Indigenous communities and their activities elsewhere in Eastern Canada.

A potential batch spill from a Project-related drilling installation or supply vessel will be limited in terms of its overall magnitude, extent and duration, and thus, its potential environmental consequences. The geographic extent of such Project-related discharges and their effects, if they did occur, will be localized to the Project Area, far away from Indigenous communities and therefore unlikely to extend to or affect the physical or social health and well-being of Indigenous persons or communities. Moreover, given the distances involved, they will not interact with nor adversely affect the physical and cultural heritage of any Indigenous community. The Project Area is also not known to contain resources of historical, archaeological, paleontological, or architectural significance, and given its location far offshore Eastern Newfoundland, is not likely to contain such resources or materials that are relevant to and valued by any Indigenous group. The potential effects of the Project on commercial fishing activities by Indigenous groups are addressed as part of the Commercial Fisheries and Other Ocean Users VC (Section 6.6).

Although extremely unlikely to occur, a large subsurface blowout is the scenario with greatest potential to interact with Indigenous Communities and Activities in Newfoundland and Labrador, and elsewhere in eastern Canada. The two modeled scenarios include subsurface blowouts at two locations (one site in EL 1135 and one in EL 1137). This type of event could potentially discharge a large volume of oil which could extend beyond the LSA. Notwithstanding the much larger size and magnitude of such a blowout as compared to a smaller batch spill during routine operations, most of the potential issues, key considerations and general principles associated with the potential effects of a batch spill on this VC, as described above, are also generally relevant to a blowout. While it is obviously not possible to determine with absolute certainty whether any individual of a species (e.g., Atlantic salmon) (in any life history stage) used for traditional purposes by any group may be present in the affected area before moving to an area that is the subject of traditional harvesting activity, as noted in Section 6.5.3, there is limited potential for any degree of connection. As also described for the various preceding biophysical VCs (Sections 6.1 to 6.4) accidental events are not likely to occur and therefore significant adverse environmental effects upon marine fish and marine mammals are not likely.

In the extremely unlikely event that a blowout occurs, the (conservative, without mitigation) oil spill modelling predicts a low potential of oil making contact with the shoreline areas of eastern/southern Newfoundland, and Sable Island and the eastern shores of Nova Scotia (depending on the time of the spill) and thus, potentially coming into direct contact with Indigenous communities or activities.

Given the time to shore, any oil that did make contact with the shoreline is expected to be highly weathered, patchy and discontinuous. There will be little or no potential for such biophysical effects on marine-associated resources to translate into any decrease in the overall nature, intensity, distribution, quality or cultural value of these traditional activities by Indigenous communities. Spill prevention techniques and response strategies will be incorporated into the design and operations for Project activities as part of contingency planning, resulting in predicted adverse residual effects of neutral to low magnitude, within the RSA, of medium to long-term duration, not likely to occur, and reversible with a moderate to high level of confidence in the effects prediction.

6.6 Commercial Fisheries and Other Ocean Users

Commercial fishing is a key economic activity within the Province and elsewhere, and fisheries within the Canada-NL Offshore Area are extensive and diverse, involving a range of participants, species, gear types, and other characteristics at various times of the year. This includes fishing activity by Canadian enterprises and vessels (primarily within Canada's 200 nautical mile EEZ) and by both Canadian and non-Canadian fishers outside of the EEZ. There are also various regulatory jurisdictions that pertain to marine fish and fisheries in the region. The Government of Canada maintains jurisdiction over fish stocks and fishing activities within its EEZ and for benthic invertebrates (such as crab) across the entire continental shelf, while NAFO manages groundfish activities and other resources beyond the EEZ. The management and conduct of commercial fishing activities in this region is therefore the subject of various pieces of legislation, regulations and other regulatory and policy instruments involving Canadian (federal) and international jurisdictions.

A range of other anthropogenic components and human activities also occur throughout the NL Offshore Area, including marine shipping, oil and gas exploration and production, and various other commercial and recreational pursuits, military operations, and ocean infrastructure such as subsea cables with which aspects of the Project may also interact.

6.6.1 Description of the Baseline

Within the Project Area, the socioeconomic setting primarily consists of commercial fishing and industrial oil and gas activity. The waters of the Canada-NL Offshore Area, and specifically the area of the Grand Banks, are productive for marine life, and home to a number of commercially-important fish species. Domestic fisheries for groundfish, shellfish and invertebrates, and pelagic species occur in the Canada-NL Offshore Area, with northern shrimp and snow crab historically providing the majority of commercial landings after the collapse of groundfish stocks in the 1990s. The Project Area is located within NAFO Subdivisions 3KLMNO, occupying less than 30 percent of 3KLMNO, which historically have been areas of commercial fishing activity. Based on publicly available commercial fish landings data provided from DFO (2016), the Project Area – Northern Section has had a lower amount of commercial fishing activity than Project Area - Southern Section. Commercial fishing in the Project Area – Northern Section is made up primarily of landings for northern shrimp, snow crab, and Greenland halibut.

Within the Project Area – Southern Section, there is a higher rate of fishing activity, as this area is located on the edge of the Grand Banks and is a prominent area for commercial fishing activity. This area is dominated by a high amount of northern shrimp and snow crab landings; yellowtail flounder; Greenland halibut, redfish, American plaice, and other groundfish species have landings within this

area as well. Other species such as herring, capelin, sea urchins, scallops, and lobster have landings recorded in waters that encompass the larger RSA around the Project Area.

April to August are the months in which commercial fishing in the Canada-NL Offshore Area is most active, with fishing activities gradually slowing down in the fall and winter. This is driven primarily by the snow crab fishing season, which takes place from April to August. Other fisheries such as those for northern shrimp and groundfish species occur year-round, but are predominantly active during the summer months, when ocean productivity is higher.

Research activities also have the potential to occur year-round. DFO conducts annual research surveys in the spring and fall in the Canada-NL Offshore Area. This includes DFO's Atlantic Zone Monitoring Program, the RAPID Climate Change Program Study, and the post-season trap survey for snow crab in partnership with FFAW-Unifor. These research activities occur throughout various NAFO divisions in the Canada-NL Offshore Area, including the Project Area. Military activities do not have a set schedule, but can be scheduled to occur at any time of the year. The Canada-NL Offshore Area has hosted offshore oil and gas activity for over 30 years, and there has been some level of activity in the Project Area during this timeframe. Other oil and gas activities will, and have the potential to be, occurring during the temporal scope of this Project.

6.6.2 Anticipated Changes to the Environment

Potential interactions between offshore oil and gas exploration activities and Commercial Fisheries and Other Ocean Users can occur both directly and indirectly. Key potential interactions have been identified based on previous EAs conducted for similar projects and activities in the Canada-NL Offshore Area, including the Eastern Newfoundland SEA (Amec 2014), and include:

- Possible damage to fishing gear, vessels, equipment, or other components as a result of direct interactions between Project equipment or emissions and these other ocean users
- Loss of access to important and established fishing grounds, or other areas of potential marine use, as a result of Project activities, and associated decreases in value (economic or otherwise) of these activities
- Possible indirect effects on Commercial Fisheries and Other Ocean Users due to biophysical effects on the presence, abundance, distribution, or quality of marine fish species or other resources
- Possible interference with scheduled government / industry research activities, including direct disturbance and/or effects on research results and associated management decisions

As a result of these identified environmental interactions, issues identified in the EIS Guidelines and concerns raised through consultation and engagement, the assessment of Project-related environmental effects on Special Areas is focused on the following potential environmental:

- Direct interference, resulting in a change in the distribution, intensity and/or functions (effectiveness / efficiency) of Commercial Fishing and Other Ocean Users
- Damage to fishing gear, vessels, and other equipment and components

- Change in the abundance distribution and quality of marine resources, resulting in a change in distribution, intensity and/or function (effectiveness / efficiency) of Commercial Fishing and Other Ocean Uses

6.6.3 Anticipated Effects (Planned Project Components and Activities)

6.6.3.1 Presence and Operation of Drilling Installation (Including Drilling and Associated Discharges)

The predicted environmental effects associated with the presence and operation of a drilling installation are primarily associated with environmental effects on fish, as discussed in Section 6.1 and Chapter 8 of the EIS. Project-related biophysical effects to fish or other marine resources have the potential to result in a subsequent change in the nature, quality, and/or value of one or more of the marine activities that depend upon them. However, disturbance to fish or other marine biota will therefore be localized and of short-term duration at any one location. It is therefore unlikely that marine resources will be affected or disrupted due to presence of the drilling installation and associated drilling activities in a manner and to a degree that would then translate into effects on the overall availability or quality of a marine resource, and thus, on the overall nature, intensity or value of related commercial activity.

The presence and operation of the drilling installation and the safety zone may require commercial fishers and other oceans users (e.g., research surveys) to reroute, relocate or reschedule their activities. Given the short-term and localized nature of these planned Project activities, and in consideration of the implementation of communication protocols, such as Notices to Shipping, and the relatively small footprint of the safety zone, it is predicted there will be no measurable adverse effects on other ocean users resulting from the presence and operation of the drilling installation and associated drilling activities.

With implementation of mitigation measures, the overall magnitude of the effect of drilling and marine-associated discharges on Commercial Fisheries and Other Ocean Users is anticipated to be low. The slight decrease in access to fishing or other ocean use will be localized, short-term, occurring continuously when drilling activities are scheduled, and reversible, with a high level of confidence. The localized and short-term nature of these disturbances at any one location and time during the Project considerably reduces the potential for detectable, adverse effects upon the commercial fishery and other ocean users.

6.6.3.2 Formation Flow Testing with Flaring

Formation flow testing, including associated flaring activity, is not expected to have adverse interactions with or effects on Commercial Fisheries and Other Ocean Users. When well fluids are sent through the wellbore and to the drilling installation for testing, it is in a closed casing and does not interact with the surrounding marine environment. Likewise, flaring is not anticipated to have an interaction with commercial fishing activity and other ocean users, as it will take place above the drilling installation and will therefore not come into contact with commercial fishing activities or resources, nor have an interaction that would result in an effect on other ocean users.

6.6.3.3 Wellhead Decommissioning

The potential for gear damage from wellhead decommissioning is limited as the cut will be as close to the seafloor as possible (maximum height is 0.85 m) and the Operator will provide the locations for each decommissioned well to fishers and the Canadian Hydrographic Service, enabling mobile-gear and fixed-gear fishers to avoid these locations. Given the implementation of mitigation measures, the resulting residual environmental effects on Commercial Fisheries and Other Ocean Users is expected to be adverse, low in magnitude, localized, long-term in duration, continuous in occurrence, and reversible, made with a high level of confidence

6.6.3.4 Project-Related Surveys

The effects of underwater noise associated with Project-related surveys on marine fish species have been assessed in the Marine Fish and Fish Habitat VC and it was concluded that there would not be a significant residual environmental effect on marine fish species (including commercial fish species). Therefore, underwater noise is likely to have only limited indirect effects on catch rates and associated economic value for commercial fishers.

Some Project-related surveys that use geophysics, such as VSP and wellsite surveys, can result in direct interference with commercial fishing activity because the sound waves have the potential to interact with fishing gear (e.g., crab pots) that may already be set in an area where surveying is taking place. However, due to the transient and localized nature of Project-related surveys, and their short-term duration, gear damage is not likely. Similarly, although there is a potential for interaction with research gear, and other vessels, the likelihood is low due to the nature of the Project activity.

In consideration of the limited temporal scope of Project-related surveys, and the implementation of mitigation, the residual environmental effects of Project-related surveys are predicted to be adverse, low in magnitude, localized, short-term in duration, occurring sporadically, and reversible, with a high level of confidence.

6.6.3.5 Supply and Servicing

The contribution of the Project to existing offshore supply vessel and helicopter traffic serving the offshore industry will be negligible, and will continue at approximately the same level as current traffic supporting the operators' ongoing exploration activities in the region. Residual environmental effects on Commercial Fisheries and Other Ocean Users associated with supply and servicing operations are predicted to be low in magnitude, localized, short-term in duration, occurring at regular intervals, and reversible, with a high level of confidence.

6.6.4 Anticipated Effects (Accidental Events)

Accidental events that have the potential to interact with Commercial Fisheries and Other Ocean Users are primarily related to the release of hydrocarbons from a surface batch spill or subsurface blowout. These releases could interact with Commercial Fisheries and Other Ocean Users by potentially impeding the ability of fishers to harvest fish, affecting the biological health of commercial fish species, reducing the marketability of commercial fish products, and interfering with marine research activities or offshore military exercises.

In the event of a batch spill, there is potential for temporary closure of commercial fishing activity in the immediate area. Likewise, a subsurface blowout from either the EL 1135 or EL 1137 site has the potential to result in the closure of fishing areas and fouling of gear and vessels. In both cases, the potential effects on commercial fishing and other ocean users will depend on the volume of oil released, the time of year, and the timely implementation of mitigation and response measures. The geographic and temporal extent of a spill would be reduced through the implementation of mitigation and response measures.

Although a temporary closure of one or more areas to fishing activities and other ocean users, such as researchers and military training, may result, the geographic and temporal extent will be reduced through the implementation of mitigation and response measures. The issuance of a Notice to Shippers will provide timely notice of closure areas, giving fishers opportunity to make alternate plans, thereby reducing effects to commercial harvesting activity and notifying fishers to avoid the area, and reducing potential gear/vessel fouling. In the event of gear fouling, the compensation program for damages will be activated, mitigating the cost of damaged or lost fishing gear. Likewise, other commercial damages or losses associated with the spill will be addressed through the existing compensation program and best practices procedures currently under development by One Ocean (joint fishing and petroleum industry initiative). Spill prevention techniques and response strategies will be incorporated into the design and operations for Project activities as part of contingency planning, resulting in predicted adverse residual effects of low magnitude, within the RSA, short to long term, not likely to occur or occurring sporadically, and reversible with a moderate level of confidence in the effects prediction.

6.7 Effects of the Environment on the Project

The planning and conduct of offshore oil and gas exploration and other marine activities in the Canada-NL Offshore Area are often influenced by environmental factors, including climatological and meteorological conditions (wind, precipitation, fog, and visibility), oceanographic conditions (waves, currents), the seasonal presence of sea ice and icebergs, geology and seismicity, and other environmental features and conditions.

6.7.1 Key Environmental Considerations

Key components of the environment that could potentially affect the Project include:

- Weather conditions
- Oceanographic conditions
- Sea ice, icebergs, and superstructure icing
- Geological stability and seismicity

The overall Project Area exhibits spatial and temporal (seasonal) variability in its meteorological conditions, including the potential for, and nature and degree of, associated severe or extreme weather conditions. Air temperatures are coolest in January or February and warmest from July through September with the daily mean ranging from -0.4°C in winter to 13°C in summer in the Project Area – Northern Section and -0.1°C in January to 14.4°C in August in the Project Area – Southern Section. Prevailing winds in the area are from the west to northwest in winter and from the

southwest in summer. The highest wind speeds occur in winter and can reach 31-32.4 m/s in February (based on available climatology MSC50 data created by Oceanweather). Precipitation varies within localized regions of the Project Area with rain or drizzle occurring at any time of year and snow and freezing rain occurring from October through May. There is also a year-round potential for thunderstorms and hail, with hail most likely in winter, and thunderstorms most frequently reported in summer.

Within the Project Area and surrounding marine environments, the largest seas are typically found farthest offshore, usually during the winter season. Mean significant wave heights range from approximately 1.8 m in July to 4.6 m in January, with maximum significant wave heights of 13.8 m in December to January in the Project Area - Northern Section and 0.7 m in July to 3.4 m in January, with maximum significant wave heights of up to 14.2 m in December and January in the Project Area – Southern Section.

The annual 100-year extreme significant wave height ranges from 15.6 m in the Project Area – Northern Section to 17.2 m in the Project Area – Southern Section. The 100-year extreme wind speed ranges from 34.0 m/s in the Project Area – Northern Section to 34.6 m/s in the Project Area – Southern Section (see Section 5.5.3 of the EIS).

Like other parts of the Canada-NL Offshore Area, the Project Area is subject to seasonal intrusions of sea ice and icebergs, as well as vessel icing during particular meteorological conditions. Sea ice and iceberg conditions vary each year and by location, and are influenced by colder or milder winter conditions over Newfoundland and the surrounding waters, and seasonal wind patterns. The iceberg season typically lasts from January through August and comprise growlers (less than 1 m height) to very large (100-200 m in length) icebergs. A number of factors can contribute to vessel icing potential at any given time, including air and sea temperature, wind speed, wave height, and precipitation. With sub-zero temperatures and strong winds common, icing of the ships superstructure can be an important consideration and risk as a few tens of centimetres of ice over a complex deck and superstructure represents many tonnes of loading. Vessel icing in this region is likely to occur in the period between November and May, with the highest frequency typically occurring in February (Amec 2014).

The geology of the Canada-NL Offshore Area is complex and dynamic, and the current bedrock and surficial characteristics of the area have been shaped by various natural and human factors and processes over time. There have been seven seismic events recorded within the Project Area – Southern Section in the 1985 to 2017 period ranging from ranging from 3.0 to 4.5 in magnitude. Other potential offshore geohazards include slope instability, sediment loading, venting of shallow gas, gas hydrates, seabed instabilities, and ice scour. It would likely take a major earthquake in the northern Flemish Pass to trigger future landslides; Cameron et al. (2014) estimated such a quake would occur approximately every 10,000 years in a worst-case scenario. The results of a slope stability evaluation in the Project Area – Northern Section indicate that a triggering event of greater magnitude than the 3,000-year recurrence interval Abnormal Level Earthquake event is required for slope instability over large areas of the Flemish Pass flanks.

6.7.2 Mitigation

The primary measures for mitigating risks associated with effects from the environment on the Project are engineering design that incorporates environmental criteria so that the physical conditions of the Project Area can be tolerated, and sound planning that includes adherence to regulatory design and fitness standards. Engineering design of drilling installations used offshore Newfoundland adhere to national and international standards, which inform and guide Project design that is suitable for the requirements for site-specific normal and extreme physical environmental conditions.

An Operations Authorization is required from the C-NLOPB to conduct an exploration drilling program. That Authorization, and the *Newfoundland Offshore Certificate of Fitness Regulations*, require an Operator obtain a Certificate of Fitness from an independent, third-party Certifying Authority for a drilling installation prior to onset of drilling. The third-party Certifying Authority will review the installation to confirm it meets the requirements of the Regulations, is fit for purpose, can function as intended, and remains in compliance with the Regulations without compromising safety and polluting the environment. In addition, modifications/repairs to the installation that affects its strength, stability, integrity, operability, safety, or regulatory compliance need to be reviewed and accepted by the Certifying Authority for the continued validity of the certificate.

Additional mitigation measures are described in Section 17.2 of the EIS and Section 7 of this Summary.

6.7.3 Residual Effects Summary

The key environmental factors that may affect the Project include severe and/or extreme weather conditions, sea ice, icebergs and superstructure icing, oceanographic conditions, and geological stability and seismicity (unlikely due to low probability of occurrence). Engineering design, operational procedures, and the implementation of mitigation measures will reduce the potential adverse effects to the Project. The short-term duration of offshore activities between 2018 and 2029 (i.e., 35 to 65 days per well (up to 35 wells)), the absence of fixed offshore infrastructure, the harsh-weather design criteria for the drilling installation, the requirements of the C-NLOPB's Operations Authorization for drilling an exploration well, the requirements of the *Newfoundland Offshore Certificate of Fitness Regulations* and the Offshore Physical Environmental Guidelines (National Energy Board et al. 2008) also reduce the potential for, and possible magnitude of, effects of the environment on the Project.

With the application of the engineering and environmental design standards, operational procedures, regulations (e.g., *Newfoundland Offshore Certificate of Fitness Regulations*, *Newfoundland Offshore Petroleum Installations Regulations*), and adherence to the Offshore Physical Environmental Guidelines (National Energy Board et al. 2008), it is predicted that there will be no adverse residual effects of the environment on the Project.

6.8 Cumulative Effects

As required under Section 19(1) of CEAA 2012 and specified in the EIS Guidelines, the EIS assesses and evaluates any cumulative environmental effects that are likely to result from the Project in combination with other physical activities that have been or will be carried out, as well as the significance of these potential effects.

6.8.1 Approach and Methods

The cumulative effects assessment considers the overall (total) effect on the VCs as a result of any predicted effects resulting from the Project and those of other relevant projects and activities in the RSA. The cumulative effects assessment focusses upon the same set of VCs as those considered in the Project-specific analysis, as these represent the key components of the environment that may be affected by the Project, and thus, which it may contribute to cumulative effects upon. The spatial and temporal boundaries for the cumulative effects assessment are also consistent with those established for the Project-specific assessment (see earlier LSA and RSA definitions, Section 5.4), as these were defined to incorporate the likely geographic and temporal zones of influence of the Project and its effects, the overall distributions of the various biota and human activities that comprise the VCs, and the other physical activities that may affect the same individuals or populations.

Past and on-going projects and activities and their environmental effects are reflected in the existing (baseline) environmental conditions for each VC (see above Sections 6.1 to 6.7). The current condition of the VC as a result of natural and anthropogenic factors, and thus its overall sensitivity or resiliency to further change, has been considered throughout the effects assessments. The assessment considers how this existing environmental condition may be changed by the Project, and then, whether and how the effects of other on-going and future projects and activities would affect the same VCs through direct overlap in space and time and/or by affecting the same individuals or populations. The following other projects and activities are considered in the cumulative effects assessment for each VC as relevant: 1) Existing oil production projects (Hibernia, Terra Nova, White Rose and Extension, Hebron, 2) Offshore petroleum exploration programs (seismic, drilling and others), 3) Fishing activity, 4) Other marine vessel traffic, and 5) Hunting.

The assessment also includes the consideration of mitigation measures to avoid or reduce potential environmental (including cumulative) effects, and evaluates the significance of predicted cumulative effects on each VC using the same criteria used for the Project-specific effects assessment.

6.8.2 Marine Fish and Fish Habitat (including Species at Risk)

Marine fish and their habitats in the Project Area, RSA and in the larger Northwest Atlantic are being affected by a variety of natural and anthropogenic factors and processes. These include past and on-going fishing activity, offshore petroleum exploration and production, general vessel traffic and other human activities (both planned and routine, as well as illegal activities and accidental events), as well as the effects of climate change and other natural and anthropogenic processes. These have collectively, and to varying degrees, influenced the presence, distribution and abundance of fish and invertebrate species in particular areas and times, as well as the overall size and health of fish populations and the availability and quality of their habitats.

Offshore exploration drilling and associated activities such as those that will comprise this Project may affect marine fish and fish habitat in various ways, including possible injury, mortality or behavioral effects due to noise or other disturbances in the marine environment, effects to benthic communities through the alteration of marine habitats and change in habitat quality from discharges or accidental events. Although the Project will interact with fish and their habitats within parts of the Project Area, it will entail a relatively minor, localized and short-term environmental disturbance at

any one location, with various mitigation measures being implemented to avoid or reduce the magnitude, geographic extent and duration of any such effects.

While other oil and gas exploration and production activities have and will have similar effects on fish and fish habitat within their respective zones of influence, their EAs and/or associated EEM programs indicate that these have somewhat localized environmental effects. The planned and required distances between Project activities other oil and gas programs and fishing activities (due to EL boundaries and safety zones) will further decrease the potential for interactions between effects. This will reduce the potential for individuals and populations to be affected through multiple interactions with this Project and other activities in the marine environment, and for species to be affected simultaneously and repeatedly by multiple activities, and thus, for cumulative environmental effects to occur.

6.8.3 Marine and Migratory Birds (including Species at Risk)

The distribution, abundance and health of marine and migratory birds and their populations are often influenced by both natural phenomena such as weather, food availability and oceanographic variation, as well as human activities and their associated disturbances including hunting, fishing activity, vessel traffic, offshore structures and pollution. In addition to these local disturbances, migratory bird species may also be affected by a variety of activities and associated effects within their often very extensive ranges. Although the populations of most marine-associated bird species occurring off Eastern Newfoundland are considered stable overall, some species such as the Leach's Storm-petrel have seen declines in recent years.

Potential interactions with marine and migratory birds as a result of the Project relate primarily to possible attraction and/or disorientation of the birds around the drilling installation and vessels due to artificial light sources. Because any such interactions are anticipated to be minor and spatially and temporally limited, and given the typically wide variation in marine bird presence and distribution in space and time throughout this very large offshore area, the number of individuals affected by the Project is not expected to have population-level effects, nor to interact cumulatively with similar effects from other projects and activities in the region. The environmental zone of influence of each project and activity in the region is typically localized (especially with regards to the effects of lights and other such disturbances), often short-term, and very small compared with the total amount of habitat available in the region. This reduces the potential for individuals and populations to be affected repeatedly through multiple interactions with this Project, as well as the potential for, and degree and duration of, overlap between the effects of this Project and other activities in this marine environment.

6.8.4 Marine Mammals and Sea Turtles (including Species at Risk)

The potential effects of human activities on marine mammals and sea turtles include possible hearing impairment or permanent injury or mortality from exposure to loud underwater noise, as well as behavioural effects (avoidance) due to these or other disturbances, which may alter the presence, abundance and distribution of these species and their health, movements, communications, feeding and other activities. The migratory nature of most species and their overall sensitivity to certain types of disturbance somewhat increases the potential for individuals to be affected by multiple

environmental disturbances, and thus, for cumulative effects to occur. This is reflected in the fact that many species have been designated as being at risk or are otherwise of conservation concern.

Potential interactions with marine mammals and sea turtles as a result of this Project relate primarily to possible injury or disturbance (behavioural effects) from the noise, lights and possible waste materials associated with the drilling installation and other related vessel and aircraft traffic. Potential for Project-VC interactions is likely to be highly transient and temporary for individuals, especially in consideration of the large-scale daily and seasonal fluctuations in presence within the assessment areas and the alternative habitats available. Mitigation measures will be applied across a number of Project components and activities and will help prevent or reduce potential interactions with this VC.

Other on-going and future activities which may affect marine mammals and sea turtles in the RSA include the fisheries, general vessel traffic and other offshore oil and gas exploration and development activities. Based on previous studies, most potential effects as a result of these activities occur within relatively close proximity (several kilometers) of the source, although this propagation of underwater noise in the marine environment results in some potential for overlap and interactions between individual disturbances. Behavioural effects as a result of most such activities would however be temporary in nature, and this along with the known and likely spatial distribution of these activities will reduce the potential for, and degree and duration of, interaction or accumulation between the effects of the Project and other activities in the marine environment. Marine Mammals and Sea Turtles will therefore not likely be displaced from key habitats or during important activities, or be otherwise affected in a manner that causes adverse and detectable effects to populations.

6.8.5 Special Areas

Special Areas of various types are located off Eastern Newfoundland, including coastal and marine areas that have been designated as protected through legislated processes or formally identified through other initiatives. The current environmental conditions within these special areas reflect the occurrence and environmental consequences of past and ongoing anthropogenic activities and natural processes within and beyond their boundaries. In some cases, special areas are designated to help conserve the presently pristine nature of these areas, while in others their designation helps prevent further damage to already affected and thus sensitive environments.

Although the Project Area overlaps with a number of special areas off Eastern Newfoundland, there are no prohibitions of the types of activities being planned as part of this Project. Moreover, given the overall nature, scale and duration of the planned Project activities, the overall and defining biophysical and socioeconomic environments within these areas will not be adversely affected by it. While there is some potential for other types of human activities (such as oil and gas exploration or fishing activity) to have varying degrees of effect on the same special areas that may interact with this Project, most such activities result in a short-term disturbance within a relatively limited zone of influence, with applicable mitigation measures implemented avoid or reduce their environmental consequences. This reduces the potential for particular areas and their environmental characteristics to be affected simultaneously and repeatedly by multiple projects and activities, to a degree and duration that will affect their defining characteristics and overall integrity.

6.8.6 Indigenous Communities and Activities

Other past and on-going projects and activities in Eastern Canada have, to varying degrees, interacted with and affected Indigenous communities and activities, depending on their location, nature and scale in relation to the communities, activities and other components and interests of individual groups. The description of the socioeconomic characteristics of these Indigenous communities provided in the EIS inherently reflects such past and on-going activities and effects.

Given the nature, location and timing of the various activities and associated environment changes likely to occur as a result of this Project, it is not expected to have direct, adverse effects on Indigenous communities and activities. The effects analysis also indicates that few of the marine associated resources (species) that are known to be used by these Indigenous groups migrate through the Project Area / LSA and are thus likely to be affected by Project activities and disturbances. The Project will therefore not result in residual environmental effects on Indigenous Communities and Activities, and will therefore not result in or contribute to cumulative effects on this VC.

6.8.7 Commercial Fisheries and Other Ocean Users

Fisheries and other marine activities may be affected both individually and collectively by offshore oil and gas exploration and production, general marine traffic and other activities, each of which may result in direct disturbance, damage to equipment, effects on marine resources or other interactions, which may accumulate or interact on a regional scale. The extensive and dynamic nature of fishing and other marine activity throughout the region (in terms of locations, seasons, gear types and key species), and possible future changes in the fisheries off Eastern Newfoundland, makes it difficult to predict specific areas and times from year to year for both domestic and foreign activities, and thus, the potential for interactions between the effects of separate projects on these.

Although Project components and activities, including the associated safety zones, will temporarily reduce access for fishing and other activities in certain areas, such disturbances will be localized, short term, and reversible once Project activity ceases at a particular location. The potential for interference by offshore oil and gas installations and vessels as well as general marine traffic can be further mitigated through good communication and cooperation between industries, with fishing gear damage compensation initiatives being implemented as required. These mitigation measures will apply to the Project and other oil and gas activities in the region. This, along with the relatively localized and in most cases short-term duration of these disruptions, and the amount of alternative fishing areas available, mean that detectable, cumulative effects are unlikely.

6.8.8 Cumulative Effects Summary

The Project is not likely to result in significant adverse cumulative environmental effects to either VC in combination with other projects and activities that have been or will be carried out. Moreover, the relative contribution of this Project to overall effects within the RSA will be low, and will not likely be perceptible. Mitigation and monitoring or follow-up programs identified as part of the Project-specific effects assessment (Chapters 8 to 13 in the EIS) would be applicable to cumulative effects, in that they are relevant to addressing the Project's potential contribution to cumulative effects in the region. No additional or revised mitigation, monitoring or follow-up is required or proposed related specifically to cumulative environmental effects.

7.0 MITIGATION MEASURES AND COMMITMENTS

Mitigation is proposed to reduce or eliminate adverse environmental effects. Design features and mitigation measures have been incorporated into the Project to prevent or reduce potential environmental effects. These design-feature mitigation measures, in combination with VC-specific mitigation measures will reduce environmental effects to acceptable levels. A summary of mitigation and commitments set out in the EIS is provided in Table 7.1.

Table 7.1 Summary of Mitigation and Commitments

No.	Operator Commitment
General*	
1	Compliance with applicable regulations and adherence to C-NLOPB guidelines (environmental and drilling/production).
2	Operator will provide an update of planned activities to fishers and fish processors that will include timing of exploration activities and locations of planned wells. In addition, the Operator will provide an EA update to the C-NLOPB each year that offshore operations are planned. The EA update will provide an overview of planned activities as defined by the scope of the Project, update on recent and on-going engagement activities and their outcomes, and an overview of any new information regarding commercial fishing activities and updates to Species at Risk, if applicable, as well as outlining the proposed work for the coming year and evaluating the continued applicability and validity of the EIS predictions and mitigation measures.
3	A copy of the EA update will be sent to all Indigenous groups and stakeholders identified in Chapter 3 of the EIS. The Operator will follow up with Indigenous groups and stakeholders on any questions arising from the EA update.
4	Use of existing and common travel routes for vessels and helicopters will be used where possible and practicable.
5	Low-level aircraft operations will be avoided where they are not required per Transport Canada protocols.
6	Operational discharges will be treated prior to release, in accordance with the OWTG (2016) and other applicable regulations and standards.
7	The selection and screening of chemicals to be discharged, including drilling fluids, will be in accordance with the Offshore Chemical Selection Guidelines for Drilling and Production Activities on Frontier Lands (2009).
8	During formation flow testing with flaring, produced hydrocarbons and produced water will be flared. If there is a large amount of produced water encountered, it will be treated in accordance with the relevant regulatory requirements prior to ocean discharge, or shipped to shore for appropriate disposal.
9	Appropriate handling, storage, transportation and on-shore disposal of solid and hazardous waste.
10	Spill prevention plans and procedures as required by the C-NLOPB, will be developed and submitted for approval to the C-NLOPB as a requirement of the Operations Authorization and will include, at a minimum, the following: • Training of project personnel in spill prevention and response • Spill Response equipment for containment (e.g., booms) and/or removal • Implementation of measures to deter birds from contacting spilled oil (e.g., bird scaring devices) • Shoreline response measures, if oil is predicted to contact shoreline

Table 7.1 Summary of Mitigation and Commitments

No.	Operator Commitment
	• Shoreline clean-up measures, if in the event oil contacts shoreline • Measures to be implemented for the rehabilitation and recovery of oiled seabirds • Overview of monitoring that could be conducted in relation to various spill events
Air Emissions	
11	Sulphur content in diesel fuel will meet the *Sulphur in Diesel Fuel Regulations* and will comply with the sulphur limits in fuels for large marine diesel engines, per the *Vessel Pollution and Dangerous Chemicals Regulations* under the CSA.
12	Adherence with the *Canadian Environmental Protection Act*, the Newfoundland *Air Pollution Control Regulations* for specified criteria air contaminants in exhaust emissions, relevant regulations under MARPOL, and use of the National Ambient Air Quality Objectives as the benchmark for assessing air quality
Marine Fish and Fish Habitat	
13	Prior to the start of a drilling campaign, a pre-drill coral survey will be undertaken (see Section 2.5 of the EIS for details). A report summarizing the coral mapping, risk assessment and planned mitigation measures (if corals are identified) will be prepared and submitted to C-NLOPB/DFO for review and acceptance.
14	Relocation of well and/or redirection of WBM cuttings discharge location in the event that the pre-drill coral survey and risk assessment identifies mitigations required to protect sensitive benthic habitat (i.e. corals and sponges)
15	SBM-related drill cuttings will be returned to the drilling installation and treated in accordance with the OWTG before being discharged to the marine environment. WBM-related drill cuttings will be discharged without treatment.
16	Use of explosives will not be employed for removal of wellheads.
17	At the time of decommissioning a well, the well will be inspected in accordance with applicable regulatory requirements.
Marine and Migratory Birds	
18	The Operator will avoid, where possible, established bird colonies. Helicopters will avoid known coastal seabird colonies per requirements of the NL *Seabird Ecological Reserve Regulations, 2015*
19	During drilling operations, routine observations of seabirds, following the CWS protocols will be undertaken from the drilling installation.
20	Routine searches for stranded birds will be conducted on the platform and supply vessels, and appropriate programs and protocols for the collection and release of marine and migratory birds will be implemented for any birds that become stranded (i.e., “ECCC-CWS’s Oiled Birds Protocol and Protocol for Collecting Dead Birds From Platforms. Best Practices for Stranded Birds Encountered Offshore Atlantic Canada (Draft 2)”. and Williams and Chardine (n.d): The Leach’s Storm Petrel: General Information and Handling Instructions).
21	The Operator will obtain a Seabird Handling permit from ECCC-CWS.
22	Maceration of sewage and kitchen waste, in accordance with the OWTG to 6 mm particle size.
23	Operators are required to notify the C-NLOPB for plans to flare associated with formation flow testing for exploration drilling. The C-NLOPB then consults with ECCCC-CWS to determine a safe timeline to proceed to minimize effects on migrating birds

Table 7.1 Summary of Mitigation and Commitments

No.	Operator Commitment
Marine Mammals and Sea Turtles	
24	Project associated vessel traffic will be approximately eight to ten trips per month for one drilling installation. Use of existing and common travel routes will be used where possible and practical. Vessels will maintain a steady course and safe vessel speed whenever possible.
25	Use of explosives will not be employed for removal of wellheads.
26	As required in the Geophysical, Geological, Environmental and Geotechnical Program Guidelines (C-NLOPB 2017), mitigation measures applied during the Project's geophysical surveys will be consistent with those outlined in the Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment (SOCP) (DFO 2007). The following is a partial list of those mitigation measures. • Trained MMOs will be used to monitor and report on marine mammal and sea turtle sightings during VSP and geophysical surveys where seismic sources are used. • A ramp-up of the source (i.e., gradually increasing seismic source elements over a period of at least 20 minutes until the operating level is achieved) starting from a single source element. • MMOs will implement a pre-ramp-up watch of 30 minutes prior to the start of the air source. Ramp-up will be delayed if any marine mammal or sea turtle is sighted within the safety zone. • Shut down of the seismic source array if a marine mammal or sea turtle listed as endangered or threatened on SARA Schedule 1 is sighted within the safety zone.
Indigenous Communities and Activities	
27	The mitigation measures outlined elsewhere in this EIS will serve to avoid or reduce Project-related environmental emissions, disturbances and resulting environmental changes by minimizing reducing the nature, degree, extent and duration of these changes, and therefore, reducing the potential for these to interact with and adversely affect the various components and activities that comprise this VC. A copy of the EA update will be sent to all Indigenous groups and stakeholders identified in Chapter 3 of the EIS. The Operator will follow up with Indigenous groups and stakeholders on any questions arising from the EA update. The Operator will continue to communicate with relevant Indigenous communities and representative organizations, through established and/or informal engagement processes, as required and requested. The specific nature, frequency, subject matter and format of such future engagement will be determined in discussion with the Indigenous organizations and outlined in an Indigenous Communities Fisheries Communication Plan.
Commercial Fisheries and Other Ocean Users	
28	Establishment of a safety zone around drilling installations in accordance with the *Newfoundland Offshore Petroleum Drilling and Production Regulations*.
29	Issuance of Notices to Shipping, Notice to Mariners (where appropriate) regarding planned project activities.
30	Ongoing communications with commercial fishers through One Ocean, FFAW-Unifor and seafood producers regarding planned project activities, including timely communication of drilling locations, safety zone and decommissioned wellsites. This information will also be communicated to Indigenous commercial fishers in accordance with the Indigenous Communities Fisheries Communication Plan.
31	Ongoing communications with the NAFO Secretariat, through DFO as the Canadian representative, regarding planned project activities, including timely communication of drilling locations, safety zone and decommissioned wellsites.

Table 7.1 Summary of Mitigation and Commitments

No.	Operator Commitment
32	In accordance with the One Ocean "Risk Management Matrix Guidelines," the need for a Fisheries Liaison Officer (FLO) and/or fisheries guide vessels during drilling installation movement from port to its offshore location will be determined in consideration of the guidelines. Use of a FLO during geophysical programs will also be determined in consideration of these guidelines.
33	A single point of contact (SPOC) will be established during project activities to facilitate communications between fishers and the operator regarding gear loss//damage and other potential compensation matters.
34	Develop and implement a compensation program for damages resulting from Project activities. This compensation program will be developed in consideration of C-NLOPB guidelines, including the Compensation Guidelines Respecting Damages Relating to Offshore Petroleum Activities (March 2002) and as revised. This program will outline compensation procedures for actual loss or damages to commercial fishers, including Commercial-communal fishers, attributable to the operator resulting from a spill or debris, or expenses incurred in taking remedial action. Actual loss or damage includes loss of income or future income; loss of hunting, fishing, or gathering opportunities; and costs and expenses incurred for action taken to remedy a situation involving a spill, including measure to control or clean a spill.
35	The communication of suspended and/or abandoned wellsite locations to the appropriate authorities for inclusion on nautical charts for use by commercial fishers and other mariners.
36	Contact DFO regarding timing and locations of planned DFO research surveys
37	Contact DND regarding timing of planned offshore military exercises
Effects of the Environment on the Project	
38	Selection criteria for drilling installations where the installation is capable of operating at required water depths and in environmental conditions prevalent in the Northwest Atlantic Ocean.
39	Third party certification – a Certificate of Fitness – of the drilling installation and other facilities, as required to obtain an Operations Authorization issued by the C-NLOPB.
40	Physical environment data observations, weather forecasting, and reporting will be conducted in accordance with the Offshore Physical Environmental Guidelines.
41	Implementation of an Ice Management Plan. Options to be investigated for ice management include: ice detecting radar on drilling installations, use of satellite data to monitor for presence of ice
42	Ability to quick disconnect riser in event of emergency.
*General mitigation measures are applicable to the assessment of potential environmental effects on all identified VCs.	

8.0 SIGNIFICANCE OF RESIDUAL EFFECTS

Chapters 8 to 14 of the EIS present the residual environmental effects (i.e., after mitigation measures have been applied) for each VC for routine Project-related interactions as well as cumulative effects. Table 8.1 summarizes the residual effect findings for each VC and indicates the significance of these effects. Where an effect is predicted to be significant (refer to the specific VC-chapter of the EIS for predefined criteria for each VC), the likelihood of that effect occurring is also presented. With the implementation of proposed mitigation measures (refer to Table 7.1), residual adverse environmental effects of routine Project activities and components are predicted to be not significant for all VCs.

Chapter 15 of the EIS presents the residual environmental effects related to accidental events. Table 8.2 summarizes the residual effect findings for each VC and indicates the significance of these effects. In the extremely unlikely event of a Project-related accidental event resulting in the large-scale release of oil, residual effects on Marine and Migratory Birds has potential to be significant if the spill trajectory overlaps spatially and temporally with sensitive receptors. Spill prevention techniques and response strategies (e.g., cap stacks, spill response processes detailed in Section 15.1 of the EIS) will be incorporated into the design and operations for Project activities as part of contingency planning.

Table 8.1 Summary of Residual Effects for Planned Project Components and Activities

Valued Component	Area of Federal Jurisdiction (CEAA, 2012 s.5 "environmental effect")	Potential Effect	Project Activity	Mitigation	Residual Effect Characterization						Other Criteria Used to Determine Significance *(Ecological/ Socio-economic Context)*	Significance of Residual Effect	Likelihood of Significant Effect
					Nature / Direction	Magnitude	Extent	Duration	Frequency	Reversibility			
Marine Fish and Fish Habitat	s. 5(1)(a)(i)	• Change in Habitat Availability and Quality • Change in Fish Presence and Abundance • Change in Fish Mortality, Injury, Health	Presence and Operation of Drilling Installation (Including lights, noise, air emissions, anchoring)	See Table 7.1	A	L	L-PA	S-M	R	R	Ecological / Socioeconomic Context as summarized in Section 8.5 of the EIS	N	N/A
		• Change in Habitat Availability and Quality • Change in Fish Presence and Abundance • Change in Fish Mortality, Injury, Health	Drilling and Associated Marine Discharges (including fluids and cuttings)		A	L	L-PA	M-L	R	R		N	N/A
		• Change in Fish Presence and Abundance • Change in Fish Mortality, Injury, Health	Formation Flow Testing with Flaring		A	L	L	S	S	R		N	N/A
		• Change in Fish Presence and Abundance • Change in Fish Mortality, Injury, Health	Wellhead Decommissioning		A	N-L	L	S	S	R		N	N/A
		• Change in Fish Presence and Abundance • Change in Fish Mortality, Injury, Health	Geophysical, Geohazard, Wellsite, Seabed and Vertical Seismic Profiling Surveys		A	L	PA	S	S	R		N	N/A
		• Change in Habitat Availability and Quality • Change in Fish Presence and Abundance • Change in Fish Mortality, Injury, Health	Geological, Geotechnical, and Environmental Surveys		A	N-L	L	S	S	R		N	N/A
		• Change in Fish Presence and Abundance • Change in Fish Mortality, Injury, Health	Supply and Servicing		A	L	L	S	R	R		N	N/A

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Valued Component	Area of Federal Jurisdiction (CEAA, 2012 s.5 "environmental effect")	Potential Effect	Project Activity	Mitigation	Residual Effect Characterization						Other Criteria Used to Determine Significance *(Ecological/ Socio-economic Context)*	Significance of Residual Effect	Likelihood of Significant Effect
					Nature / Direction	Magnitude	Extent	Duration	Frequency	Reversibility			
Marine and Migratory Birds	s. 5(1)(a)(iii)	• Change in Mortality / Injury Levels and Bird Health • Change in Avifauna Presence and Abundance • Change in Habitat Availability and Quality • Change in Food Availability or Quality	Presence and Operation of Drilling Installation (Including lights, noise, air emissions, anchoring)	See Table 7.1	A	L	L-PA	S-M	R	R	Ecological / Socioeconomic Context as summarized in Section 9.5 of the EIS	N	N/A
		• Change in Mortality / Injury Levels and Bird Health • Change in Food Availability or Quality	Drilling and Associated Marine Discharges (including fluids and cuttings)		A	L	L	S	S	R		N	N/A
		• Change in Mortality / Injury Levels and Bird Health	Formation Flow Testing with Flaring		A	L	L-PA	S	S	R		N	N/A
		• None expected	Wellhead Decommissioning		N	-	-	-	-	-		N	N/A
		• Change in Mortality / Injury Levels and Bird Health • Change in Avifauna Presence and Abundance • Change in Habitat Availability and Quality	Geophysical, Geohazard, Wellsite, Seabed and Vertical Seismic Profiling Surveys		A	N	L-PA	S	S	R		N	N/A
		• None expected	Geological, Geotechnical, and Environmental Surveys		N	-	-	-	-	-		N	N/A
		• Change in Mortality / Injury Levels and Bird Health • Change in Avifauna Presence and Abundance	Supply and Servicing		A	L	L	S	R	R		N	N/A

Table 8.1 Summary of Residual Effects for Planned Project Components and Activities

Valued Component	Area of Federal Jurisdiction (CEAA, 2012 s.5 "environmental effect")	Potential Effect	Project Activity	Mitigation	Residual Effect Characterization						Other Criteria Used to Determine Significance *(Ecological/ Socio-economic Context)*	Significance of Residual Effect	Likelihood of Significant Effect
					Nature / Direction	Magnitude	Extent	Duration	Frequency	Reversibility			
Marine Mammals and Sea Turtles	s. 5(1)(a)(ii)	• Change in Mortality or Injury (Underwater Noise) • Change in Habitat Quality or Use • Change in Mortality or Injury (Vessel Strike) • Change in Food Availability or Quality	Presence and Operation of Drilling Installation (Including lights, noise, air emissions, anchoring)	See Table 7.1	A	L-M	PA-LSA	S-M	R	R	Ecological / Socioeconomic Context as summarized in Section 10.4 of the EIS	N	N/A
		• Change in Habitat Quality or Use • Change in Mortality or Injury (Vessel Strike) • Change in Food Availability or Quality • Change in Health (Contaminants)	Drilling and Associated Marine Discharges (including fluids and cuttings)		A	L	L-PA	S	R	R		N	N/A
		• Change in Habitat Quality or Use • Change in Mortality or Injury (Vessel Strike) • Change in Food Availability or Quality • Change in health (contaminants)	Formation Flow Testing with Flaring		A	N-L	L-PA	S	S	R		N	N/A
		• Change in Habitat Quality or Use • Change in Mortality or Injury (Underwater Noise) • Change in Mortality or Injury (Vessel Strike) • Change in Food Availability or Quality	Wellhead Decommissioning		A	N-L	L-PA	S	S	R		N	N/A

Table 8.1 Summary of Residual Effects for Planned Project Components and Activities

Valued Component	Area of Federal Jurisdiction (CEAA, 2012 s.5 "environmental effect")	Potential Effect	Project Activity	Mitigation	Residual Effect Characterization						Other Criteria Used to Determine Significance *(Ecological/ Socio-economic Context)*	Significance of Residual Effect	Likelihood of Significant Effect
					Nature / Direction	Magnitude	Extent	Duration	Frequency	Reversibility			
Marine Mammals and Sea Turtles	s. 5(1)(a)(ii)	• Change in Mortality or Injury (Underwater Noise)) • Change in Habitat Quality or Use • Change in Mortality or Injury (Vessel Strike) • Change in Food Availability or Quality	Geophysical, Geohazard, Wellsite, Seabed and Vertical Seismic Profiling Surveys	See Table 7.1	A	N-L	L-LSA	S-M	S	R	Ecological / Socioeconomic Context as summarized in Section 10.4 of the EIS	N	N/A
		• Change in Habitat Quality or Use • Change in Mortality or Injury (Vessel Strike) • Change in Food Availability or Quality	Geological, Geotechnical, and Environmental Surveys		A	N	L-PA	S	S	R		N	N/A
		• Change in Habitat Quality or Use • Change in Mortality or Injury (Vessel Strike) • Change in Food Availability or Quality	Supply and Servicing		A	L	L-LSA	S	R	R		N	N/A
Special Areas	s. 5(1)(b)(i)	• Possible direct interactions with special areas • Possible effects through associated changes to the biophysical environment • Possible interactions (interference or disturbances) with other human activities	Presence and Operation of Drilling Installation (Including lights, noise, air emissions, anchoring)	See Table 7.1	A	N-L	L-PA	S-M	R	R	Ecological / Socioeconomic Context as summarized in Section 11.4 of the EIS	N	N/A
			Drilling and Associated Marine Discharges (including fluids and cuttings)		A	N-L	L-PA	S-M	R	R		N	N/A
			Formation Flow Testing with Flaring		N	-	-	-	-	-		N	N/A
			Wellhead Decommissioning		A	N-L	L	S	S	R		N	N/A

Table 8.1 Summary of Residual Effects for Planned Project Components and Activities

Valued Component	Area of Federal Jurisdiction (CEAA, 2012 s.5 "environmental effect")	Potential Effect	Project Activity	Mitigation	Residual Effect Characterization						Other Criteria Used to Determine Significance *(Ecological/ Socio-economic Context)*	Significance of Residual Effect	Likelihood of Significant Effect
					Nature / Direction	Magnitude	Extent	Duration	Frequency	Reversibility			
Special Areas	s. 5(1)(b)(i)	• Possible direct interactions with special areas • Possible effects through associated changes to the biophysical environment Possible interactions (interference or disturbances) with other human activities	Geophysical, Geohazard, Wellsite, Seabed and Vertical Seismic Profiling Surveys	See Table 7.1	A	N-L	L-PA	S	S	R		N	N/A
			Geological, Geotechnical and Environmental Surveys		N	-	-	-	-	-		N	N/A
			Supply and Servicing		N	-	-	-	-	-		N	N/A
Indigenous Communities and Activities	s.5(1)(c)(i) s.5(1)(c)(iii)	• Possible direct interactions (interference or disturbances) with Indigenous communities and their activities Possible effects through associated changes to the biophysical environment (health, resource availability or quality, physical structure, site, or thing))	Presence and Operation of Drilling Installation	See Table 7.1	N	-	-	-	-	-	Ecological / Socioeconomic Context as summarized in Section 12.4 of the EIS	N	N/A
		• As above	Drilling and Associated Marine Discharges	See Table 7.1	N	-	-	-	-	-		N	N/A
		• As above	Formation Flow Testing with Flaring	See Table 7.1	N	-	-	-	-	-		N	N/A
		• As above	Wellhead Decommissioning	See Table 7.1	N	-	-	-	-	-		N	N/A
		• As above	Geophysical, Geohazard, Wellsite, Seabed and Vertical Seismic Profiling Surveys	See Table 7.1	N	-	-	-	-	-		N	N/A
		• As above	Geological, Geotechnical and Environmental Surveys	See Table 7.1	N	-	-	-	-	-		N	N/A
		• As above	Supply and Servicing	See Table 7.1	N	-	-	-	-	-		N	N/A

Table 8.1 Summary of Residual Effects for Planned Project Components and Activities

Valued Component	Area of Federal Jurisdiction (CEAA, 2012 s.5 "environmental effect")	Potential Effect	Project Activity	Mitigation	Residual Effect Characterization						Other Criteria Used to Determine Significance *(Ecological/ Socio-economic Context)*	Significance of Residual Effect	Likelihood of Significant Effect
					Nature / Direction	Magnitude	Extent	Duration	Frequency	Reversibility			
Commercial Fisheries and Other Ocean Users	s. 5(2)(b)(i)	• Direct Interference, Resulting in a Change in the Distribution, Intensity, and/or Function of Commercial Fishing and Other Ocean Uses • Damage to Fishing Gear, Vessels, and other Equipment and Components • Change in Abundance, Location, and Quality of Marine Resources	Presence and Operation of Drilling Installation	See Table 7.1	A	L	L	S	C	R	Ecological / Socioeconomic Context as summarized in Section 13.4 of the EIS	N	N/A
		• As above	Drilling and Associated Marine Discharges		A	L	L	S	R	R		N	N/A
		• None expected	Formation Flow Testing with Flaring		N	-	-	-	-	-		N	N/A
		• Direct Interference • Damage to Fishing Gear, Vessels, and Equipment	Wellhead Decommissioning		A	L	L	L	C	R		N	N/A
		• Direct Interference • Damage to Fishing Gear, Vessels, and Equipment • Change in Abundance, Location, and Quality of Marine Resources	Geophysical, Geohazard, Wellsite, Seabed and Vertical Seismic Profiling Surveys		A	L	L	S	S	R		N	N/A
		• Direct Interference • Damage to Fishing Gear, Vessels, and Equipment • Change in Aabundance, Location, and Quality of Marine Resources	Geological, Geotechnical and Environmental Surveys		A	L	L	S	S	R		N	N/A
		• Direct Interference • Damage to Fishing Gear, Vessels, and Equipment • Change in Abundance, Location, and Quality of Marine Resources	Supply and Servicing		A	L	L	S	R	R		N	N/A

Table 8.1 Summary of Residual Effects for Planned Project Components and Activities

Valued Component	Area of Federal Jurisdiction (CEAA, 2012 s.5 "environmental effect")	Potential Effect	Project Activity	Mitigation	Residual Effect Characterization						Other Criteria Used to Determine Significance *(Ecological/ Socio-economic Context)*	Significance of Residual Effect	Likelihood of Significant Effect
					Nature / Direction	Magnitude	Extent	Duration	Frequency	Reversibility			
Key/Note: **Environmental Effects under CEAA, 2012:** 5(1) (a) a change that may be caused to the following components of the environment that are within the legislative authority of Parliament: (i) fish as defined in Section 2 of the *Fisheries Act* and fish habitat as defined in subsection 34(1) of that Act, (ii) aquatic species as defined in subsection 2(1) of the *Species at Risk Act*, (iii) migratory birds as defined in subsection 2(1) of the *Migratory Birds Convention Act*, 1994, and (iv) any other component of the environment that is set out in Schedule 2 of [CEAA, 2012]; (b) a change that may be caused to the environment that would occur (i) on federal lands, (ii) in a province other than the one in which the act or thing is done or where the physical activity, the designated project or the project is being carried out, or (iii) outside Canada; and (c) with respect to Aboriginal peoples, an effect occurring in Canada of any change that may be caused to the environment on (i) health and socioeconomic conditions, (ii) physical and cultural heritage, (iii) the current use of lands and resources for traditional purposes, or (iv) any structure, site or thing that is of historical, archaeological, paleontological or architectural significance. Certain additional environmental effects must be considered under Section 5(2) of CEAA, 2012 where the carrying out of the physical activity, the designated project, or the project requires a federal authority to exercise a power or perform a duty or function conferred on it under any Act of Parliament other than CEAA, 2012. 5(2) (a) a change, other than those referred to in paragraphs (1)(a) and (b), that may be caused to the environment and that is directly linked or necessarily incidental to a federal authority's exercise of a power or performance of a duty or function that would permit the carrying out, in whole or in part, of the physical activity, the designated project or the project; and (b) an effect, other than those referred to in paragraph (1)(c), of any change referred to in paragraph (a) on (i) health and socioeconomic conditions, (ii) physical and cultural heritage, or (iii) any structure, site or thing that is of historical, archaeological, paleontological or architectural significance.					Nature / Direction: A – Adverse P – Positive N – Neutral (or no effect) - = Rating not required because the effect is not expected to occur	Magnitude: N - Negligible L - Low M - Medium H – High - = Rating not required because the effect is not expected to occur or because the effect is neutral	Extent: L - Localized PA - Within Project Area LSA -Within LSA RSA -Within RSA or Beyond - = Rating not required because the effect is not expected to occur or because the effect is neutral	Duration: S - Short term (for duration of the activity, or for duration of accidental event) M - Medium term (beyond duration of activity, or for duration of threshold exceedance of accidental event – weeks or months) L - Long term (beyond duration of activity, or beyond the duration of threshold exceedance for accidental event – years) P – Permanent (recovery unlikely) - = Rating not required because the effect is not expected to occur or because the effect is neutral	Frequency: N - Not likely to occur O - Occurs once S - Occurs sporadically R - Occurs on a regular basis C - Occurs continuously - = Rating not required because the effect is not expected to occur or because the effect is neutral	Reversibility: R – Reversible (will recover to baseline) I – Irreversible (permanent) - = Rating not required because the effect is not expected to occur or because the effect is neutral		N: Not significant S: Significant Likelihood: N/A: Not Applicable L: Low M – Moderate H – High	

Table 8.2 Summary of Residual Effects for Accidental Events

Valued Component	Area of Federal Jurisdiction (CEAA, 2012 s.5 "environmental effect")	Potential Effect	Project Activity	Mitigation	Residual Effect Characterization						Significance of Residual Effect	Likelihood of Significant Effect
					Nature / Direction	Magnitude	Extent	Duration	Frequency	Reversibility		
Marine Fish and Fish Habitat	s. 5(1)(a)(i)	• Change in Habitat Availability and Quality • Change in Fish Mortality, Injury, Health • Change in Fish Presence and Abundance	100 litre Diesel Spill	See Table 7.1	A	L	PA	S	S	R	N	N/A
			1,000 litre Diesel Spill	See Table 7.1	A	L-M	PA	M	N	R	N	N/A
			Subsurface Blowout – EL 1135 Site	See Table 7.1	A	M	RSA	M-L	N	R	N	N/A
			Subsurface Blowout – EL 1137 Site	See Table 7.1	A	M	RSA	M-L	N	R	N	N/A
Marine and Migratory Birds	s. 5(1)(a)(iii)	• Change in Mortality / Injury Levels and Bird Health • Change in Avifauna Presence and Abundance • Change in Habitat Availability and Quality • Change in Food Availability or Quality	100 litre Diesel Spill	See Table 7.1	A	L	PA	S	S	R	N	N/A
			1,000 litre Diesel Spill	See Table 7.1	A	M	PA	M	N	R	N	N/A
			Subsurface Blowout – EL 1135 Site	See Table 7.1	A	M-H	RSA	M-L	N	R	S	L
			Subsurface Blowout – EL 1137 Site	See Table 7.1	A	M-H	RSA	M-L	N	R	S	L
Marine Mammals and Sea Turtles	s. 5(1)(a)(ii)	• Change in Mortality or Injury • Change in Health • Change in Habitat Quality or Use	100 litre Diesel Spill	See Table 7.1	A	L	PA	S	S	R	N	N/A
			1,000 litre Diesel Spill	See Table 7.1	A	L	PA	S	N	R	N	N/A
			Subsurface Blowout – EL 1135 Site	See Table 7.1	A	L-M	RSA	M-L	N	R	N	N/A
			Subsurface Blowout – EL 1137 Site	See Table 7.1	A	L-M	RSA	M-L	N	R	N	N/A
Special Areas	s. 5(1)(b)(i)	• Change in Environmental Features and/or Processes • Change in Human Use and /or Societal Value	100 Litre Diesel Spill	See Table 7.1	A	L	PA	S	S	R	N	N/A
			1,000 Litre Diesel Spill	See Table 7.1	A	L-M	PA	M	N	R	N	N/A
			Subsurface Blowout – EL 1135 Site	See Table 7.1	A	M	RSA	M-L	N	R	N	N/A
			Subsurface Blowout – EL 1137 Site	See Table 7.1	A	M	RSA	M-L	N	R	N	N/A

Table 8.2 Summary of Residual Effects for Accidental Events

Valued Component	Area of Federal Jurisdiction (CEAA, 2012 s.5 "environmental effect")	Potential Effect	Project Activity	Mitigation	Residual Effect Characterization						Significance of Residual Effect	Likelihood of Significant Effect
					Nature / Direction	Magnitude	Extent	Duration	Frequency	Reversibility		
Indigenous Communities and Activities	s.5(1)(c)(i) s.5(1)(c)(iii)	• Change in health and socio-economic conditions • Change in the current use of lands and resources for traditional purposes • Change in physical and cultural heritage • Change in any structure, site, or thing that is of historical, archaeological, paleontological or architectural significance • Changes in Health and Socio-economic Conditions	100 litre Diesel Spill	See Table 7.1	N	-	-	-	-	-	N	N/A
			1,000 litre Diesel Spill	See Table 7.1	N	-	-	-	-	-	N	N/A
			Subsurface Blowout – EL 1135 Site	See Table 7.1	A	N-L	RSA	M-L	N	R	N	N/A
			Subsurface Blowout – EL 1137 Site	See Table 7.1	A	N-L	RSA	M-L	N	R	N	N/A
Commercial Fisheries and Other Ocean Users	s. 5(2)(b)(i)	• Direct Interference, Resulting in a Change in the Distribution, Intensity, or Function of Commercial Fishing and Other Ocean Uses • Damage to Fishing Gear, Vessels, and Other Equipment and Components • Change in the Abundance, Distribution and Quality of Marine Resources	100 L Diesel Spill	See Table 7.1	A	L	PA	S	S	R	N	N/A
			1,000 L Diesel Spill	See Table 7.1	A	L	PA	M	N	R	N	N/A
			Subsurface Blowout – EL 1135 Site	See Table 7.1	A	L	RSA	M-L	N	R	N	N/A
			Subsurface Blowout – EL 1137 Site	See Table 7.1	A	L	RSA	M-L	N	R	N	N/A

9.0 FOLLOW-UP AND MONITORING

The Operator will obtain the required permits, approvals, and authorizations for the Project, and the Operator and its contractors will comply with these and relevant regulations and guidelines in planning and implementing the Project. This includes the mitigation measures summarized in the preceding sections, the implementation of which will be directed, managed and tracked in accordance with the Operator's existing policies and procedures.

The following sections summarize the monitoring and follow-up programs to which the Operator has committed in the EIS.

9.1 Follow-Up Program

Under CEAA 2012, a follow-up program is defined as a program for "verifying the accuracy of the environmental assessment of a designated project" and "determining the effectiveness of any mitigation measures." Based on the information presented in the EIS, and the conclusion of the effects assessment, a follow-up program will be undertaken in consideration of sensitive benthic habitat. Follow-up monitoring will occur if drilling is undertaken in the following circumstances:

- within an identified VME or FCA
- adjacent/near to an identified VME or FCA, such that drill cuttings dispersion model predicts that drill cuttings deposition may occur within the VME or FCA at levels above the biological effects threshold, or
- in an area where the results of the pre-drill coral survey and risk assessment (DFO / C-NLOPB reviewed and accepted) indicate that monitoring is required

The purpose of the follow-up monitoring program would be to determine the effectiveness of mitigation measures in protecting the sensitive benthic habitat. The monitoring program may include parameters such as:

- sediment traps and/or seabed core samples to measure drill cuttings deposition
- current and turbidity measurements
- visual assessments using high-definition images / video

Detailed design of a follow-up monitoring program would be based on the pre-drill coral survey, potential zone of influence as estimated in the drill cuttings dispersions modelling, location of the well in proximity to the sensitive benthic habitat, other site-specific information collected during planning, and industry experience in conducting similar monitoring programs (e.g., Norwegian Continental Shelf experience). If exploration wells are planned to be drilled near sensitive benthic habitat as outlined above, a follow-up monitoring program plan will be developed and submitted for C-NLOPB / DFO review and acceptance.

The effects of exploration drilling activities are well understood, and mitigation measures are effective, allowing for a high level of confidence in the environmental effects predictions. Therefore, follow-up monitoring is not proposed for other VCs, including SAR.

9.2 Environmental Monitoring and Observation Programs

The Operator is proposing to implement monitoring and observation programs related to Marine Fish and Fish Habitat, Marine and Migratory Birds, and Marine Mammals and Sea Turtles as well as environmental compliance monitoring as required by the *Drilling and Production Regulations*. A summary of these monitoring programs is provided in Table 9.1, with additional detail available in the EIS. The implementation schedule and program details will be developed in consultation with the appropriate regulatory agencies, including C-NLOPB, DFO, and CWS, as applicable.

Table 9.1 Summary of Monitoring Programs for Routine Project Activities

Proposed Monitoring Program	Program Overview	Applicable VC(s)	Proposed Intervention/Adaptive Management	Schedule	Reporting
Benthic Sedimentation Monitoring in VMEs / FCAs and / or other sensitive benthic habitat	Site specific monitoring program to be developed based on results of coral mapping and risk assessment. Monitoring program to be reviewed and accepted by C-NLOPB/DFO. May include: • sediment traps and/or seabed core samples to measure drill cuttings deposition • current and turbidity measurements • visual assessments using high-definition images / video	Marine Fish and Fish Habitat	Survey is for data gathering purposes. Coral mapping, risk assessment, and mitigation processes may be improved based on the results and learnings.	Drilling and Post-Drilling	A monitoring report will be provided to the C-NLOPB/DFO within 12 months of completing the monitoring program
Migratory Bird Observations	Operational program including: • A trained Environmental Observer will be onboard to record marine bird (and marine mammals) sightings during Project operations, which will be undertaken in accordance with CWS's monitoring protocol from fixed platforms • Regular searches of vessel decks will be undertaken and accepted protocols for the collection / handling of bird mortalities and release of birds that become stranded	Migratory and Marine Birds	Survey is for data gathering purposes.	Mobilization to well decommissioning	If a Species at Risk is found alive (stranded) or dead on the drilling installation or survey vessel, a report will be sent to CWS for identification. Seabird observations report will be submitted to the C-NLOPB within 90 days of well suspension and/or decommissioning An annual report summarizing stranded

Table 9.1 Summary of Monitoring Programs for Routine Project Activities

Proposed Monitoring Program	Program Overview	Applicable VC(s)	Proposed Intervention/Adaptive Management	Schedule	Reporting
					and/or seabird handling will be submitted to the CWS in accordance with the Seabird Handling permit requirements.
Marine Mammal and Sea Turtle Observations	Operational program for marine mammals during geophysical surveys where sound source is used, including VSP • A trained MMO will be onboard to record marine mammal and sea turtle sightings during Project operations • A marine mammal and sea turtle monitoring plan will be submitted to the applicable regulators for review at least 30 days prior to the commencement of the first geophysical survey • Visual monitoring for the presence of marine mammals and sea turtles within a pre-determined exclusion zone will take place during geophysical operations where an air source array is used • Observational / shutdown procedures will follow the SOCP	Marine Mammals and Sea Turtles	Survey is for data gathering purposes and reducing potential interactions	Geophysical surveys with use of sound source, VSP Surveys; as required	A report of the observational program will be submitted annually to the C-NLOPB and DFO, including documentation of marine mammal and sea turtle sightings. Vessel strikes involving marine mammals or sea turtles will be reported to DFO within 24 hours.

Table 9.1 Summary of Monitoring Programs for Routine Project Activities

Proposed Monitoring Program	Program Overview	Applicable VC(s)	Proposed Intervention/Adaptive Management	Schedule	Reporting
Environmental Compliance Monitoring	Environmental compliance monitoring is a requirement of the *Drilling and Production Regulations*. Monitoring of volumes and hydrocarbon concentration for the following treated effluents is completed: • Bilge and ballast water • Deck drainage • Drill cuttings	All			Monthly compliance monitoring report submitted to C-NLOPB during drilling operations. Final compliance monitoring report submitted to C-NLOPB within 90 days of completion of drilling activities.

10.0 REFERENCES

Amec Environment and Infrastructure 2014. Eastern Newfoundland and Labrador Offshore Area Strategic Environmental Assessment Update. Report prepared for the Canada-Newfoundland and Labrador Offshore Petroleum Board, St. John's, NL.

Barron, M.G. 2012. Ecological impacts of the Deepwater Horizon oil spill: implications for immunotoxicity. Toxicol. Pathol., 40: 315-320.

Beazley, L., Kenchington, E., Yashayaev, I., & Murillo, F. J. (2015). Drivers of epibenthic megafaunal composition in the sponge grounds of the Sackville Spur, northwest Atlantic. Deep Sea Research Part I: Oceanographic Research Papers, 98, 102-114.

Boertmann, D. and Mosbech, A. (Eds.) 2011. The western Greenland Sea, a strategic environmental impact assessment of hydrocarbon activities. Aarhus University, DCE – Danish Centre for Environment and Energy, 268 pp. - Scientific Report from DCE – Danish Centre For Environment and Energy no. 22.

Cameron, G.D.M., Piper, D.J.W. and MacKillop, A. 2014. Sediment failures in Northern Flemish Pass. Geological Survey of Canada Open File 7566.

Carter, L., Schafer, C. T., & Rashid, M. A. (1979). Observations on depositional environments and benthos of the continental slope and rise, east of Newfoundland. Canadian Journal of Earth Sciences, 16(4), 831-846.

C-NLOPB (Canada-Newfoundland and Labrador Offshore Petroleum Board). 2002. Compensation Guidelines Respecting Damages Relating to Offshore Petroleum Activity. Available online at: http://www.cnlopb.ca/pdfs/guidelines/compgle.pdf?lbisphpreq=1

C-NLOPB (Canada-Newfoundland and Labrador Offshore Petroleum Board). 2011. Data Acquisition and Reporting Guidelines. Available online at: http://www.cnlopb.ca/pdfs/guidelines/data_aq_guide.pdf?lbisphpreq=1

C-NLOPB (Canada-Newfoundland and Labrador Offshore Petroleum Board). 2017. Geophysical, Geological, Environmental and Geotechnical Program Guidelines. Available from: http://www.cnlopb.ca/pdfs/guidelines/ggegpg.pdf?lbisphpreq=1

C-NLOPB (Canada-Newfoundland and Labrador Offshore Petroleum Board) and Canada-Nova Scotia Offshore Petroleum Board. 2017a Drilling and Production Guidelines. 124 pp.

d'Entremont, A. (2008, January). SERPENT of the Deep-Best Practices in Research, Monitoring and Partnerships for a Deepwater Well off Atlantic Canada. In SPE International Conference on Health, Safety, and Environment in Oil and Gas Exploration and Production. Society of Petroleum Engineers.

DeBlois, E.M., Paine, M.D., Kilgour, B.W., Tracy, E., Crowley, R.D., Williams, U.P., and G.G. Janes. 2014. Alterations in bottom sediment physical and chemical characteristics at the Terra Nova offshore oil development over ten years of drilling on the grand banks of Newfoundland, Canada. Deep Sea Res. Part II, 110: 13-25.

DFO (Fisheries and Oceans Canada). 2007. Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment. Available online at: http://www.dfo-mpo.gc.ca/oceans/publications/seismic-sismique/index-eng.html

DFO (Fisheries and Oceans Canada). 2016. Economic Analysis and Statistics Catch Data 2010-2014. Provided by Economic Analysis and Statistics, Strategic Policy, DFO, Ottawa, ON.

Environment Canada. 2015. Best practices for stranded birds encountered offshore Atlantic Canada. Draft 2 – April 17, 2015. Available from: http://www.cnlopb.ca/pdfs/mg3/strandbird.pdf.

French-McCay. 2009. Proceedings of the 32nd AMOP Technical Seminar on Environmental Contamination and Response, Emergencies Science Division, Environment Canada, Ottawa, ON, pp. 601-653.

Government of Newfoundland and Labrador. 2015. Newfoundland and Labrador Regulation 32/15: Seabird Ecological Reserve Regulations, 2015 under the Wilderness and Ecological Reserves Act (O.C. 2015-092).

LGL Limited. 2005. Orphan Basin Exploration Drilling Program Environmental Assessment. LGL Rep. SA825. Rep. by LGL Limited, St. John's, NL, Canning & Pitt Associates, Inc., St. John's, NL, SL Ross Environmental Research Limited, Ottawa, ON, Oceans Limited, St. John's, NL, Lorax Environmental, Vancouver, BC, and PAL Environmental Services, St. John's, NL, for Chevron Canada Limited, Calgary, AB, ExxonMobil Canada Ltd., St. John's, NL, Imperial Oil Resources Ventures Limited, Calgary, AB and Shell Canada Limited.

Murillo, F. J., Muñoz, P. D., Altuna, A., and Serrano, A. (2011). Distribution of deep-water corals of the Flemish Cap, Flemish Pass, and the Grand Banks of Newfoundland (Northwest Atlantic Ocean): interaction with fishing activities. ICES Journal of Marine Science: Journal du Conseil, 68(2): 319-332.

Murillo, F.J., Muñoz, P.D., Cristobo, J., Rios, P., Gonzalez, C., Kenchington, E. and A. Serrano (2012). Deep-sea sponge grounds of the Flemish Cap, Flemish Pass and the Grand Banks of Newfoundland (Northwest Atlantic Ocean): Distribution and species composition. Marine Biology Research, 8:842-854.

Murillo, F.J., Serrano, A., Kenchington, E., and Mora, J. (2016). Epibenthic assemblages of the Tail of the Grand Bank and Flemish Cap (northwest Atlantic) in relation to environmental parameters and trawling intensity. Deep Sea Research Part I: Oceanographic Research Papers. 109: 99-122.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. 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). 2010. Offshore Waste Treatment Guidelines. vi + 28 pp.

Pollet, I.L., Ronconi, R.A., Jonsen, I., Leonard, M.L., Taylor, P.D. and Shutler, D. 2014. Foraging movements of Leach's storm-petrels *Oceanodroma leucorhoa* during incubation. J. Avian Biol., 45(4): 305-314.

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.