Equinor Canada Ltd.

Central Ridge Exploration Drilling Program

Project Description Summary

May 2019

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List of Abbreviations

2D	Two-dimensional
3D	Three-dimensional
Accord Acts	*Canada-Newfoundland and Labrador Atlantic Accord Implementation Act* and the *Canada-Newfoundland and Labrador Atlantic Accord Implementation Newfoundland and Labrador Act*
AGC	Atlantic Groundfish Council
ASP	Atlantic Seafood Producers
BOP	Blowout Preventer
CEAA 2012	*Canadian Environmental Assessment Act, 2012*
CEA Agency	Canadian Environmental Assessment Agency
CL	Required Clarification
C-NLOPB	Canada-Newfoundland and Labrador Offshore Petroleum Board
CNSOPB	Canada Nova Scotia Offshore Petroleum Board
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CO_2 eq	Carbon Dioxide Equivalent
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CPAWS	Canadian Parks and Wilderness Society
DFO	Fisheries and Oceans Canada
DP	Dynamic Positioning
EA	Environmental Assessment
Eastern Newfoundland EIS	Eastern Newfoundland Offshore Exploration Drilling Project Environmental Impact Statement (including the EL 1134 Addendum)
EBSA	Ecologically and Biologically Significant Area
ECCC	Environment and Climate Change Canada
EEZ	Exclusive Economic Zone
EIS	Environmental Impact Statement
EL	Exploration Licence
ENGO	Non-governmental Organizations
EPP	Environmental Protection Plan
Equinor Canada	Equinor Canada Ltd.
ExxonMobil	ExxonMobil Canada Ltd.
FCA	Fisheries Closure Area
Flemish Pass EIS	Flemish Pass Exploration Drilling Program Environmental Impact Statement
FFAW-Unifor	Fish, Food and Allied Workers-Unifor

GHG	Greenhouse Gas
Husky Energy	Husky Oil Operations Limited
IBA	Important Bird Area
IUCN	International Union for Conservation of Nature
KMKNO	Kwilmu'kw Maw-Klusuaqn Negotiation Office
LSA	Local Study Area
MCPEI	Mi'kmaq Confederacy of Prince Edward Island
MFN	Miawpukek First Nation
MSS	Mi'gmawei Mawiomi Secretariat
Mt	Megatonne
MTI	Mi'gmawe'l Tplu'taqnn Inc.
NAFO	Northwest Atlantic Fisheries Organization
NCC	NunatuKavut Community Council
NEB	National Energy Board
NL	Newfoundland and Labrador
NL ESA	Newfoundland and Labrador *Endangered Species Act*
NO_X	Nitrogen Oxide
OA	Operations Authorization
OCI	Ocean Choice International
OCSG	Offshore Chemical Selection Guidelines
OWTG	Offshore Waste Treatment Guidelines
QMFNB	Qalipu Mi-kmaq First Nation Band
PAAN	Protected Areas Association of Newfoundland
PL	Production Licence
ROV	Remotely operated vehicle
RSA	Regional Study Area
SARA	*Species at Risk Act*
SBM	Synthetic-Based Mud
SEA	Strategic Environmental Assessment
SDL	Significant Discovery Licence
SIMA	Spill Impact Mitigation Assessment
Statoil	Statoil Canada Ltd.
Suncor Energy	Suncor Energy Offshore Exploration Partnership
UNCBD	United Nations Convention on Biological Diversity
UNFAO	United Nations Food and Agriculture Organization

VC	Valued Component
VME	Vulnerable Marine Ecosystem
VSP	Vertical Seismic Profile
WBM	Water-based Mud
WG-EAFM	Working Group on Ecosystem Approach Framework to Fisheries Management
WNNB	Wolastoqey Nation in New Brunswick
WWF	World Wildlife Fund
ZOI	Zone of Influence

1.0 INTRODUCTION

Equinor Canada Ltd. (Equinor Canada), on behalf of its partners, Husky Oil Operations Limited (Husky Energy) and Suncor Energy Offshore Exploration Partnership (Suncor Energy), is proposing to undertake an exploration drilling program on Exploration Licenses (ELs) 1159 and 1160 in the Central Ridge Area located offshore Newfoundland and Labrador (NL), and approximately 375 km east of St. John's, NL.

The drilling, testing and abandonment of offshore exploratory wells in the first drilling program in an area set out in one or more ELs issued in accordance with the *Canada-Newfoundland and Labrador Atlantic Accord Implementation Act* is a designated project under the *Canadian Environmental Assessment Act, 2012* (CEAA 2012). This Project Description has been prepared to address the information requirements pursuant to the CEAA 2012 and its regulations, as well as the requirements under the *Canada-Newfoundland and Labrador Atlantic Accord Implementation Act* and the *Canada-Newfoundland and Labrador Atlantic Accord Implementation Newfoundland and Labrador Act* (the Accord Acts). This document is provided to the Canadian Environmental Assessment Agency (CEA Agency) so that it may determine whether an environmental assessment (EA) is required. It is also intended to assist other regulatory agencies, Indigenous groups and the public to determine their interest and participation in the potential EA process.

1.1 Overview of the Flemish Pass Exploration Drilling Program

In October 2016, Equinor Canada's CEAA 2012 EA associated with the Flemish Pass Exploration Drilling Program commenced (Reference number: 80129; CEA Agency 2018).

Equinor Canada submitted the Environmental Impact Statement (EIS) in December 2017 (Statoil 2017; CEA Agency 2018). As detailed in section 1.4.1 of the Flemish Pass Exploration Drilling Program EIS (herein referred to as the Flemish Pass EIS), Equinor Canada and ExxonMobil Canada Ltd. (ExxonMobil) are co-ventures in several ELs (i.e., ELs 1135, 1139, 1140, 1141, and 1142), and therefore Equinor Canada and ExxonMobil collaborated in the planning and completion of the EIS for their planned exploration drilling programs. Both operators submitted separate, but similar EISs. ExxonMobil had two submissions – the Eastern Newfoundland Offshore Exploration Drilling Project EIS (ExxonMobil 2017) and Eastern Newfoundland Offshore Exploration Drilling Project EIS: Addition of EL 1134 (ExxonMobil 2018) (collectively referred to as the Eastern Newfoundland EIS).

This joint EIS lead to improved efficiency in the EA process by reducing duplication and regulatory, Indigenous and stakeholder burden. The joint EIS also resulted in a more comprehensive and integrated environmental analysis, including cumulative effects analysis, and their identification and application of mitigation measures.

The Flemish Pass and Eastern Newfoundland EISs were deemed conformant by the CEA Agency in December 2017, and the EL 1134 Addendum was deemed conformant in September 2018. The CEA Agency commenced the public and Indigenous comment period in January 2018 (CEA Agency 2018).

The CEA Agency issued Equinor Canada a total of 109 Information Requirements (IRs) and 24 Required Clarifications (CLs). Equinor Canada responded to most of these IRs/CLs in conjunction with ExxonMobil (Equinor Canada and ExxonMobil 2018a, 2018b, 2018c), unless they were operator-specific (i.e., Statoil 2018). Responses to the IRs/CLs were addressed to the satisfaction of the CEA Agency.

The CEA Agency posted the Draft Environmental Assessment Report and potential conditions associated with the Flemish Pass EIS on February 13, 2019 (CEA Agency 2019a, 2019b). The CEA Agency also issued a public notice on February 14, 2019, which invited the public and Indigenous groups to comment on the Draft Environmental Assessment Report and potential conditions by March 16, 2019 (CEA Agency 2019c). The CEA Agency posted the final Environmental Assessment Report and Decision Statement associated with the Flemish Pass EIS on April 15, 2019 (CEA Agency 2019d) and April 17, 2019 (CEA Agency 2019e), respectively. As indicated in the CEA Agency's news release, the Flemish Pass EIS is subject to approximately 90 legally-binding conditions that will reduce or eliminate potential environmental effects, and Equinor Canada must fulfill all conditions (CEA Agency 2019f).

ELs 1159 and 1160 are located within the defined Project Area and scope assessed in the Flemish Pass and Eastern Newfoundland EISs, and therefore information in the EISs, responses to IRs/CLs and conditions in the Decision Statement (CEA Agency 2019e) are equally applicable to ELs 1159 and 1160.

It is noted that the Flemish Pass and Eastern Newfoundland EISs, and responses to IRs/CLs are referred to throughout this document, however, the references are not repeated in subsequent sections. Refer to Section 11 for applicable references.

No regional studies, as defined in CEAA 2012, have been undertaken in the NL Offshore Area, including the Project Area. However, the Canada-Newfoundland Offshore Petroleum Board (C-NLOPB) completed a strategic environmental assessment (SEA) (i.e., Eastern Newfoundland Strategic Environmental Assessment [AMEC 2014]).

1.2 Project Description Approach

The Flemish Pass and Eastern Newfoundland EISs are specific to ELs 1134, 1135, 1137, 1139, 1140, 1141, and 1142. However, when identifying the Project Area an expanded area was selected (refer to figure 1-1 in the Flemish Pass EIS) to include other licenses that are not "designated projects" and are considered under a separate regulatory process through the Accord Acts, administrated by the C-NLOPB. Key factors in selecting a broader Project Area for the Flemish Pass and Eastern Newfoundland EISs included the following: the possibility of obtaining new ELs over the temporal scope of the EISs (e.g., ELs 1159 and 1160 were acquired by Equinor Canada in November 2018) and potential working interest changes on existing ELs within the Project Area, which is a frequent occurrence in the oil and gas industry.

ELs 1159 and 1160 are located within the Project Area identified for the Flemish Pass and Eastern Newfoundland EISs and are illustrated in Figure 2-1. The overall environmental setting, biophysical

characteristics, and effects assessments completed for the Flemish Pass and Eastern Newfoundland EISs are well understood and are applicable to ELs 1159 and 1160.

Exploration drilling activities, and supporting activities, as described in the Flemish Pass and Eastern Newfoundland EISs would be the same activities to be carried out for ELs 1159 and 1160. The environmental effects associated with these activities would be the same as those assessed in the Flemish Pass and Eastern Newfoundland EISs and are therefore well understood.

Equinor Canada will apply the commitments and mitigations outlined in the Flemish Pass EIS and applicable IR/CL responses to ELs 1159 and 1160. In addition, Equinor Canada will apply the conditions outlined in the Decision Statement associated with the Flemish Pass EIS (CEA Agency 2019e) to exploration drilling activities on ELs 1159 and 1160. Based on the above, an additional environmental assessment of exploration drilling activities on ELs 1159 and 1160 is not anticipated.

1.3 Operator Information

An overview of Equinor Canada is outlined in section 1.1 of the Flemish Pass EIS. All information in that section is applicable to ELs 1159 and 1160, except for licensing. The Flemish Pass EIS provided licensing information up to September 2017, however, as of February 2019, Equinor Canada is the operator of nine ELs and five significant discovery licences (SDLs), and is an interest holder in three ELs, 30 SDLs, and seven production licences (PLs) including Terra Nova, Hibernia, Hibernia South Extension, and Hebron production operations (C-NLOPB 2018, 2019a, 2019b).

An overview of Equinor Canada's offshore experience is outlined in section 1.1.1 of the Flemish Pass EIS. All information in that section is applicable to ELs 1159 and 1160. Since the Flemish Pass EIS was submitted, Equinor Canada undertook a seabed survey in the Flemish Pass area.

The principal Equinor Canada contacts concerning exploration drilling on ELs 1159 and 1160 are as follows:

Primary Contact for Environmental Assessment:

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Equinor Canada Ltd.
3600, 308 4th Avenue SW, Calgary, Alberta, T2P 0H7
Tel (587) 233-0560

Primary Contacts for Offshore NL Operations:

Unni Fjær
Vice-President, Offshore NL
Equinor Canada Ltd.
2 Steers Cove, Level 2, St. John's, NL, A1C 6J5
Tel (709) 726-9091

1.4 Regulatory Context

An overview of the Accords Acts is outlined in section 1.3.1 of the Flemish Pass EIS. All information in that section is applicable to exploration drilling on ELs 1159 and 1160, however, an overview is provided in the following paragraphs.

Oil and gas activities offshore NL are regulated by the C-NLOPB under the Accord Acts. The role of the C-NLOPB, under the Accord Acts, is to regulate oil and gas exploration and development in the Canada-NL Offshore Area, oversee compliance with regulatory requirements for worker safety, environmental protection and safety, conservation of the resource, land tenure, and Canada / Newfoundland and Labrador benefits. These processes are administered under various legislation, regulations, guidelines, and memoranda of understanding.

ELs are issued in accordance with the C-NLOPB land tenure process, pursuant to the Accord Acts and are valid for up to nine years consisting of Period I and Period II. Note that the land tenure process is under review and changes are anticipated. The issuance of ELs is based on work commitments, whereby a well must be drilled or diligently pursued by the end of Period I.

All petroleum-related work or activity in the Canada-NL Offshore Area requires an Operating Licence and an Operations Authorization (OA) issued by the C-NLOPB. In accordance with the Accord Acts and Section 6 of the *Newfoundland Offshore Petroleum Drilling and Production Regulations* prior to the issuance of an OA, information such as an EA Report, Environmental Protection Plan (EPP), Canada-Newfoundland and Labrador Benefits Plan, Safety Plan, Emergency Response and Spill Contingency Plans, evidence of financial responsibility, and certificate of fitness for proposed equipment / facilities used to carry out drilling activities must be submitted by the operator and approved by the C-NLOPB.

Additional oversight for environmental protection and safety of operations is provided by regulations and guidelines issued by the C-NLOPB, and jointly with the Canada Nova Scotia Offshore Petroleum Board (CNSOPB) and/or National Energy Board (NEB). For exploration drilling programs, the *Newfoundland Offshore Drilling and Production Regulations* govern drilling activities and establish the framework for safety and environmental protection. Environmental guidelines to support drilling programs include *Offshore Chemical Selection Guidelines for Drilling & Production Activities on Frontier Lands* (OCSG) (NEB et al. 2009), *Offshore Waste Treatment Guidelines* (OWTG) (NEB et al. 2010) and *Environmental Protection Plan Guidelines* (NEB et al. 2011).

The Canada-NL Offshore Area, as defined in the Accord Act, includes those lands within Canada's 200 nautical mile (NM) Exclusive Economic Zone (EEZ) or to the edge of the continental margin, whichever is greater. EL 1159 is located beyond Canada's EEZ on the outer continental shelf, while EL 1160 has portions within and beyond Canada's EEZ. In addition, exploration drilling on ELs 1159 and 1160 will be carried out on federal lands as defined under CEAA 2012.

Schedule I of the *Regulations Designating Physical Activities* designates *"The drilling, testing and abandonment of offshore exploratory wells in the first drilling program in an area set out in one or more exploration licences issued in accordance with the Canada-Newfoundland and Labrador Atlantic Accord Implementation Act or the Canada-Nova Scotia Offshore Petroleum Resources Accord Implementation Act"* as a designated project under the CEAA 2012.

Depending on the nature of activities offshore, federal departments may require permits, authorizations or approvals for exploration drilling activities. Federal and provincial government departments and agencies, which may have regulatory responsibilities, information, and advice regarding exploration drilling activities on ELs 1159 and 1160 pursuant to their associated legislation and mandates include the following:

- Fisheries and Oceans Canada (DFO)
- Environment and Climate Change Canada (ECCC)
- Transport Canada
- Department of National Defence
- NL Department of Municipal Affairs and Environment
- NL Department of Fisheries and Land Resources
- NL Department of Natural Resources

Legislation, and regulations thereunder, that may be relevant and subsequently required regulatory approvals include the following:

- Accord Acts and its associated Regulations and Guidelines (as discussed above)
- *Fisheries Act*
- *Canadian Environmental Protection Act*
- *Oceans Act*
- *Navigation Protection Act*
- *Canada Shipping Act, 2001*
- *Migratory Birds Convention Act*
- *Species at Risk Act* (SARA)
- NL *Endangered Species Act* (NL ESA)
- NL *Seabird Ecological Reserve Regulations*

No federal funding has been requested nor provided to Equinor Canada from any federal authority to support exploration drilling on ELs 1159 and 1160.

2.0 PROJECT DESCRIPTION

2.1 Scope

The scope is the same as outlined in section 2.1 of the Flemish Pass EIS and includes the drilling, testing and decommissioning/abandonment of exploratory wells (including delineation wells) using one or more drilling installation, as well as associated exploration and supporting activities.

The Flemish Pass EIS environmental effects analysis considered the drilling of up to 30 wells. Wells to be drilled on ELs 1159 and 1160 would be captured within this 30-well count. No additional wells would be drilled with the inclusion of ELs 1159 and 1160. Therefore, the total number of wells to be drilled on ELs associated with the Flemish Pass EIS (i.e., ELs 1139, 1140, 1141, and 1142) and ELs 1159 and 1160 would not exceed 30.

2.2 Project Area

A project area is defined as the overall geographic area within which all components and activities will take place. As illustrated in Figure 2-1 below, the Project Area includes Equinor Canada ELs 1159 and 1160, where exploration drilling activities may be conducted between 2020 and 2029.

The Project Area also encompasses other existing Equinor Canada operated licences and partner operated licences. The Project Area includes a surrounding area to account for planned and potential ancillary and support activities at and around the well sites themselves.

The corner point coordinates for the Project Area are the same as those outlined in the Flemish Pass and Eastern Newfoundland EISs and are included in Tables 2.1 and 2.2 below.

The corner point coordinates and water depth ranges for ELs 1159 and 1160 are presented in Tables 2.3 and 2.4 below, respectively. Water depths in EL 1159 range from approximately 90 m to 930 m, and EL 1160 ranges from approximately 40 m to 1,020 m.

Table 2.1 Project Area – Northern Section Coordinates

Project Area Vertices	Coordinates – NAD83 UTM ZONE 22N			
	Longitude (DMS)	Latitude (DMS)	Easting (m)	Northing (m)
A	44° 56' 48" W	49° 47' 31" N	935562	5533101
B	44° 55' 21" W	48° 34' 30" N	948190	5398059
C	45° 49' 04" W	47° 04' 57" N	893344	5227380
G	48° 59' 13" W	47° 12' 49" N	652421	5230868
I	47° 21' 04" W	49° 49' 18" N	762440	5525202

Table 2.2 Project Area – Southern Section Coordinates

Project Area Vertices	Coordinates – NAD83 UTM ZONE 22N			
	Longitude (DMS)	Latitude (DMS)	Easting (m)	Northing (m)
C	45° 49' 04" W	47° 04' 57" N	893344	5227380
D	46° 26' 02" W	45° 59' 28" N	853605	5103218
E	49° 25' 01" W	45° 59' 42" N	622584	5094695
F	49° 28' 29" W	47° 23' 03" N	615122	5248990
G	48° 59' 13" W	47° 12' 49" N	652421	5230868
H	48° 54' 10" W	47° 22' 44" N	658314	5249404

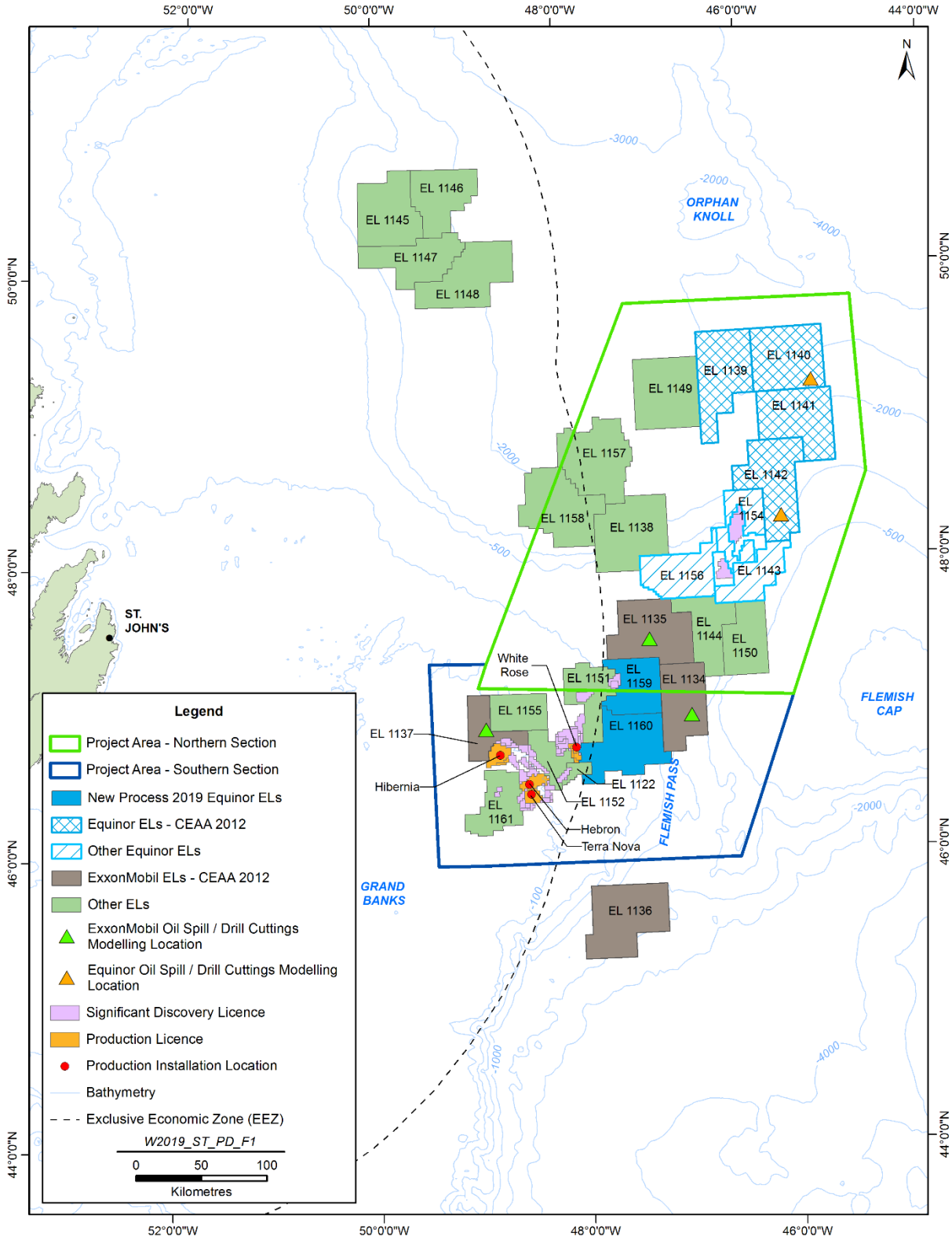

Figure 2-1 Project Area

Table 2.3 Exploration Licence 1159 – Corner Point Coordinates

Coordinates – NAD83 UTM ZONE 22N	
Longitude (DMS)	**Latitude (DMS)**
47°00'W	47°10'N
47°15'W	47°10'N
47°30'W	47°10'N
47°00'W	47°20'N
47°15'W	47°20'N
47°30'W	47°20'N
47°00'W	47°30'N
47°15'W	47°30'N
47°30'W	47°30'N
Notes: Coordinates provided by C-NLOPB Land Registry (C-NLOPB 2019c) Water depths range from 90 m to 930 m	

Table 2.4 Exploration Licence 1160 – Corner Point Coordinates

Coordinates – NAD83 UTM ZONE 22N	
Longitude (DMS)	**Latitude (DMS)**
47°00'W	46°40'N
47°15'W	46°40'N
47°30'W	46°40'N
47°45'W	46°40'N
47°00'W	46°50'N
47°15'W	46°50'N
47°30'W	46°50'N
47°45'W	46°50'N
47°00'W	47°00'N
47°15'W	47°00'N
47°30'W	47°00'N
47°30'W	47°10'N
Notes: Coordinates provided by C-NLOPB Land Registry (C-NLOPB 2019d) Water depths range from 40 m to 1,020 m	

The Flemish Pass and Eastern Newfoundland EISs assessed the impacts of drilling activities within the Project Area, and within a water depth range of 70 m to 3,500 m, and therefore, the potential effects of exploration drilling activities associated with ELs 1159 and 1160 have already been assessed. Specific drilling locations cannot be identified at this time as they will be based on the interpretation of seismic data, which is an ongoing activity, and the results for each drilled well within the Project Area.

2.3 Components and Activities

The scope, as identified in this document, includes the mobilization and operation of drilling installations, drilling activities, supporting ancillary activities to drilling programs, and well decommissioning or suspension. The components and activities are the same as those outlined in the Flemish Pass and Eastern Newfoundland EISs (i.e., section 2.5.2), and are summarized in the subsections below.

2.3.1 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.

Specific wellsite locations are not currently defined, and will be selected as 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.

Wells may be drilled using a semi-submersible drilling installation, or drillship (Figure 2-2). 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 will meet the operational and environmental capabilities needed for the associated exploration activities, and will meet all regulatory requirements. 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. 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 500 m), or maintained on station by a dynamic positioning (DP) system (generally in deeper water greater than 500 m).

Equinor Canada will complete coral and sponge surveys at each well location, as well as 50 m around each anchor pattern, where applicable, at least three months prior to drilling activities. Site-specific survey details will be outlined in the *Coral and Sponge Survey Plans*, which will be provided to the C-NLOPB and DFO for their review and acceptance prior to commencing the survey. If corals and sponges and are identified, then a risk assessment will be completed. After the survey is complete, Equinor Canada will prepare *Coral and Sponge Survey Results and Risk Assessment Reports*, which will be provided to the C-NLOPB and DFO for their review and acceptance at least 60 days prior to commencing drilling.

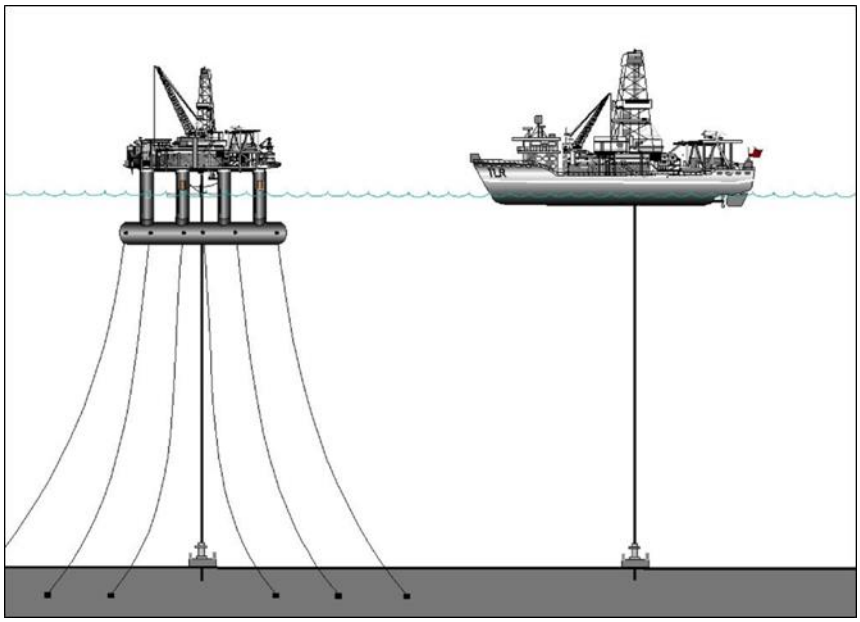

Figure 2-2 Typical Offshore Drilling Installations: Semisubmersible and Drill Ship

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. The 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 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 treatment and discharge, in the case of cuttings, 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.

In addition to conventional drilling approaches, where a well is drilled from surface hole to final depth without moving the drilling installation, batch drilling may also occur 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.

2.3.2 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, sub-bottom 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). Multiple streamer geophysical surveys including, but not limited to, conventional two-dimensional (2D) and three-dimensional (3D) seismic surveys, would not be included in the designated Project.

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 temporal scope and at any time of the year, using dedicated vessels provided by marine geotechnical specialist suppliers.

Remotely Operated Vehicle (ROV) / Autonomous Underwater Vehicle Surveys: They may be used to conduct visual inspections (camera equipped) of activities and 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 temporal scope and at any time of the year using vessels of opportunity.

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 the temporal scope and at any time of the year using vessels of opportunity, typically taking 5 to 20 days to complete.

2.3.3 Formation Flow Test 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 two to five 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.

Equinor Canada will use third-party well testing contractors. Most suppliers for well testing equipment/services have their own burner technology that has been tested and quantified for liquid fallout (i.e., oil phase) and emissions (e.g., carbon monoxide [CO], carbon dioxide [CO_2], nitrogen oxides [NO_X], hydrocarbons). Documented fallout and combustion efficiencies for burners on the market from major suppliers are typically 99.9%.

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, 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.

2.3.4 Well Decommissioning or Suspension

Once drilling and formation flow testing (if required) is completed, the offshore wells drilled will be decommissioned or suspended. These activities typically involve the isolation of the wellbore 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.

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 wellhead 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. A supply vessel or well intervention vessel using a ROV and an exterior diamond wire cutting saw will be used to cut and remove the wellheads above the sea floor. Cutting of the wellheads 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 approximately 0.85 m will remain above the seabed. While current technology has a limit of 0.85 m of casing remaining above the seafloor, cutting as close to the seafloor will be attempted.
- 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 (typically using an ROV to ensure the areas are free of equipment and obstructions) and inspected in accordance with applicable regulatory requirements at the time of their decommissioning.

2.3.5 Supply and Servicing

Supply vessels and helicopters will be used to transport personnel, equipment and materials to and from a drilling installation. 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 (helicopter) services will be based in St. John's, NL. Existing facilities in eastern Newfoundland will be used, 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 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. Exploration drilling associated with ELs 1159 and 1160 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. Supporting vessels that are involved in exploration drilling 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. It should be recognized 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. For example, should the facilities in the port of St. John's be inaccessible or if the port facility cannot service the drilling program, other existing supply facilities in the province may be used.

2.4 Schedule

The schedule will be the same as outlined in section 2.7 of the Flemish Pass EIS, except for the years associated with the temporal duration.

The planned duration is for a period of 10 years (2020 to 2029), providing an adequate and conservative timeframe within which activities may occur on ELs 1159 and 1160. 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 Equinor Canada's exploration requirements, with activities potentially being carried out at any time of the year.

2.5 Waste Discharges and Emissions

The primary waste discharges and emissions associated with exploration drilling on ELs 1159 and 1160 are the same as those outlined in section 2.9 of the Flemish Pass and Eastern Newfoundland EISs, and include the following:

- Air emissions
- Hazardous and non-hazardous waste
- Drilling waste
- Liquid discharges
- Heat, light, and sound emissions

As mentioned in Section 1.4, Equinor Canada will prepare an EPP and submit to the C-NLOPB for review as part of the OA application process. The EPP will provide details regarding the management of wastes, discharges and emissions for the drilling campaign and is specific to the drilling installation. The EPP will be prepared in accordance with the Environmental Protection Plan Guidelines (NEB et. al 2011).

2.5.1 Air Emissions

Air emissions from the drilling installation and other drilling activities will regularly occur during program execution. The main source of atmospheric emissions will be the exhausts of the drilling installation, flaring (should it occur during a formation flow test), the supply vessels and helicopters.

The primary source of atmospheric emissions include exhaust gases from the combustion of fuel in engines powering the drilling installation, offshore supply vessels, and helicopters. Depending on the type of formation flow test carried out, atmospheric emissions could result if a formation flow test with flaring is undertaken. For the purposes of environmental assessment regarding estimation of air emissions, the Flemish Pass EIS assumed that flaring would be required.

The total annual reported greenhouse gas (GHG) emissions for the province of NL and for Canada, as presented in section 2.9.1.2 of the Flemish Pass EIS, were acquired from ECCC Greenhouse Gas Emissions Reporting Program, 2015 Facility GHG Emissions by province and territory (ECCC 2018). The total annual provincial and national GHG emissions for 2016, as presented in the National Inventory Report, 1990-2016: Greenhouse Gas Sources and Sinks in Canada (ECCC 2018), are 10.8 megatonnes of carbon dioxide equivalents (Mt CO_2 eq) and 704 Mt CO_2 eq, respectively. The total predicted annual equivalent CO_2 emissions for exploration drilling activities (including the drilling installation, helicopters, and supply vessels) range from 126,214 to 180,869 tonnes of carbon dioxide equivalents (t CO_2 eq) and therefore represent 1.17 to 1.67 percent of NL's average annual GHG emissions and 0.018 to 0.026 percent of Canada's average annual reported GHG emissions. During formation flow testing with flaring, a total of 131,437 to 186,091 t CO_2 eq per year could be emitted, which would therefore represent 1.22 to 1.72 percent of NL's average annual GHG emissions and 0.019 to 0.026 percent of Canada's average annual reported GHG emissions. These represent the total potential emissions from all components and activities associated with exploration drilling, including flaring.

2.5.2 Hazardous and Non-Hazardous Waste

Equinor Canada's EPP will include plans for the management of waste material during a drilling campaign. Hazardous wastes generated, including dangerous goods, will be stored in designated areas in appropriate containers / containment for transport to shore in compliance with the *Transportation of Dangerous Goods Act* and its regulations. Hazardous wastes that may be produced and require management include oily wastes (e.g., filters, rags and waste oil), waste chemicals and containers, batteries, biomedical waste and spent drilling fluids. Biomedical waste will be collected onboard by health professionals and stored in special containers before being sent to land for incineration.

Non-hazardous wastes generated that are not allowed to be disposed overboard, will be stored in appropriate containers onboard, and transported back to shore. Non-hazardous wastes include domestic wastes, packaging material, scrap metal and other recyclables such as waste plastic.

Hazardous and non-hazardous wastes shipped to shore for disposal will be collected onshore by a third-party contractor for disposal of the waste at an approved facility and in compliance with federal and provincial regulations and requirements.

2.5.3 Drilling Waste

The primary wastes associated with drilling a well are drill mud and cuttings (either WBM or SBM), and cement. A combination of WBM and SBM will be used to drill the wells. Wastes generated from drilling include drilling muds and cuttings that retain a portion of the drilling mud. Drilling wastes will be disposed of in accordance with the OWTG (NEB et al. 2010).

The initial surface sections are normally drilled riserless with WBM, with cuttings and water-based fluids discharged at depth. Water-based cuttings are discharged for the first sections of the well and in accordance with the OWTG. Once the riser is connected, SBM is generally used. Synthetic-based cuttings are treated prior to discharge to the sea as per the OWTG. For SBM cuttings, the drilling installation will be equipped with solids control equipment for cuttings management for the treatment of the SBM cuttings prior to discharge.

Cement constitutes a part of the well barrier envelope and is used during casing installation and plug and abandonment. For the initial riserless sections of the well, a spacer fluid is typically pumped ahead of the cement which is pumped down the drillstring and up the outside of the casing, with cement (and spacer fluid) returns to the seabed in riserless sections. For casing operations with the riser installed, cementing / drilling fluid interface is returned up the riser to the rig. After every cementing operation, the cement unit must be cleaned / rinsed to prevent cement from hardening in the mixing tanks and liners.

2.5.4 Liquid Waste

Products that have the potential to be discharged to the marine environment will be selected in accordance with the OCSG (NEB et al. 2009), the purpose of which is to reduce the potential environmental effects from the discharge of chemicals used in offshore drilling and production operations. The following liquid wastes, if generated, will be treated and managed in accordance with the OWTG:

- Produced water
- Bilge and deck drainage water
- Ballast water
- Grey / black water (sewage)
- Cooling water
- Fire control water
- BOP testing fluids
- Food waste
- Well treatment fluids
- Other liquid wastes such as waste chemical, cooking oils or lubricating oils

2.5.5 Heat, Light and Sound Emissions

Heat will be generated primarily through exhaust. Light emissions will be generated at night on the drilling installation, through flaring when required during a formation flow test. Sound emissions will typically be generated during regular drilling operations and geophysical surveys.

Heat emissions generated by engines and flaring will be dissipated to the atmosphere without likely interactions to receptors.

Exploration drilling activities will present several sources of artificial lighting during drilling activities, with some lighting operating 24 hours a day. This includes navigation and deck lighting for the drilling installation and supply vessels necessary for maritime safety and crew safety requirements. Flaring activity during a formation flow test will generate light and thermal emissions.

Sound will be generated underwater during the operation of the drilling installation and supply vessels. The level of sound will be dependent on the type of drilling installation being used and method of positioning. Underwater sound generated from a drilling installation is continuous during a drilling program, while underwater sound from VSP operations is a temporary sound source (e.g., typically completed within 48 hours. The extent to which sound travels is determined by water depth, salinity, and temperature. An overview of underwater ambient sound and sound from drilling operations is provided section 2.7.5.2.6 of the Central Ridge Project Description and is based on two Project-specific reports (Maxner et al. 2017; Quijano et al. 2017).

Quijano et al. (2017) qualitatively assessed the estimated sound levels attributable to the operation of the drilling installation by comparison to the previously modelled Scotian Basin Exploration Drilling project, as the water depths and geoacoustic profiles in the deep-water sites for the proposed activity are similar to those from the Scotian Basin project. Maxner et al. (2017) analyzed data to characterize the baseline soundscape, identify the presence of marine mammals, and characterize the soundscape during Statoil's (Equinor Canada's) 2014-2016 drilling program. Drilling operations by the semi-submersible West Hercules generated sound levels similar to those previously reported for the Stena IceMAX off Nova Scotia.

There is low potential for two drilling installations to be active at the same time, due primarily to commercial and logistical factors. There is therefore very little possibility that two drilling installations would operate at the same time in proximity to one another as part of exploration drilling activities associated with ELs 1159 and 1160. However, the environmental effects assessment considered this potential occurrence, in order to be conservative and fully inclusive of all such possible scenarios, including the potential for "overlapping" or combined environmental effects to a valued component (VC) resulting from multiple, concurrent drilling campaigns.

Atmospheric sound is not of concern given the anticipated low levels of atmospheric sound emissions, the limited transmission of underwater sound above the surface and location of receptors. Helicopter traffic will generate atmospheric sound at the airport, in transit and at the drilling installation. However, with the use of the existing St. John's International Airport potential effects on human receptors is reduced.

3.0 REGULATORY, INDIGENOUS AND STAKEHOLDER ENGAGEMENT

Engagement is a key component of Equinor Canada's approach to the planning and implementation of its offshore programs. Engagement with government departments and agencies, 41 Indigenous groups, and stakeholders (including fishers organizations) associated with exploration drilling activities commenced in 2016 and is described in chapter 3 of the Flemish Pass and Eastern Newfoundland EISs. The scope and Project Area are the same as those identified in the Flemish Pass and Eastern

Newfoundland EISs, and therefore engagement activities that have occurred since 2016 are also applicable to ELs 1159 and 1160. Sections 3.2, 3.3, and 3.4 of the Flemish Pass and Eastern Newfoundland EISs contain a summary of engagement activities involving government departments and agencies, 41 Indigenous groups, and stakeholder organizations, respectively, up to approximately mid-October 2017.

3.1 Indigenous Groups

Pursuant to EIS Guidelines and amendments, Equinor Canada engaged with the following 41 Indigenous groups regarding proposed exploration drilling activities during the Flemish Pass EIS:

Newfoundland and Labrador

- Nunatsiavut Government
- Innu Nation
- NunatuKavut Community Council (NCC)
- Qalipu Mi'kmaq First Nation Band (QMFNB)
- Miawpukek First Nation (MFN)

Nova Scotia

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

New Brunswick

- Eight Mi'gmaq First Nations represented by Mi'gmawe'l Tplu'taqnn Inc. (MTI):
    - Fort Folly First Nation
    - Eel Ground First Nation
    - Pabineau First Nation
    - Esgenoôpetitj First Nation
    - Buctouche First Nation

  - Indian Island First Nation
  - Eel River Bar First Nation
  - Metepnagiag Mi'kmaq First Nation

- Elsipogtog First Nation
- Five Maliseet First Nation groups represented by Wolastoqey Nation in New Brunswick (WNNB):
  - Kingsclear First Nation
  - Madawaska Maliseet First Nation
  - Oromocto First Nation
  - Saint Mary's First Nation
  - Tobique First Nation
- Woodstock First Nation
- Peskotomuhkati Nation at Skutik (Passamaquoddy)

Prince Edward Island

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

Québec

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

The groups listed for the Flemish Pass EIS remain valid for ELs 1159 and 1160 as no additional groups have been identified in recent EIS Guidelines for other exploration drilling programs.

Appendix C of the Project Description provides a summary of engagement activities with government departments and agencies, 41 Indigenous groups and stakeholder organizations that have occurred from mid-October 2017 to May 3, 2019.

Equinor Canada provided advanced notice to Indigenous groups and stakeholder organizations regarding submitting this Project Description to the CEA Agency. As of May 3, 2019, two Indigenous Groups (i.e., Elsipogtog First Nation and Première Nation des Innus de Nutashkuan) contacted Equinor Canada regarding the advanced notice letters. Equinor Canada provided clarification to both Indigenous groups regarding the purpose of the advanced letters. To date, no other Indigenous groups have contacted Equinor Canada regarding the advanced letters associated with this Project Description.

Equinor Canada also contacted the CEA Agency to determine if they have received any correspondence from Indigenous groups regarding the advanced letters associated with this Project Description. As of May 3, 2019, the CEA Agency has not provided any correspondence from Indigenous groups to Equinor Canada.

3.2 Stakeholder Groups

Equinor Canada also provided advanced notice of this Project Description to key stakeholders and non-governmental organizations (ENGOs) including:

- Nature NL
- World Wildlife Fund (WWF)
- Canadian Parks and Wilderness Society (CPAWS)
- Sierra Club (NL Chapter)
- Protected Areas Association of Newfoundland (PAAN) (does not appear to be active)
- Fish, Food and Allied Workers-Union (FFAW-Unifor)
- Ocean Choice International (OCI)
- Association of Seafood Producers (ASP)
- Atlantic Groundfish Council (AGC)

As of May 3, 2019, one stakeholder (i.e., FFAW-Unifor), contacted Equinor Canada and inquired whether the Project Description would include fisheries catch data. To date, no other stakeholder groups have contacted Equinor Canada regarding the advanced notice associated with this Project Description.

4.0 ENVIRONMENTAL ASSESSMENT SCOPE, APPROACH AND METHODS

The EA scope is outlined in section 4.1 of the Flemish Pass EIS. The Flemish Pass EIS environmental effects analysis considered the drilling of up to 30 wells. Wells to be drilled on ELs 1159 and 1160 would be captured within this 30-well count. No additional wells would be drilled with the inclusion of ELs 1159 and 1160. Therefore, the total number of wells to be drilled on ELs associated with the Flemish Pass EIS (i.e., ELs 1139, 1140, 1141, and 1142) and ELs 1159 and 1160 would not exceed 30.

The valued components (VCs) selected for the Flemish Pass and Eastern Newfoundland EISs remain valid for ELs 1159 and 1160, and include:

- 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

The EA approach and methodology are outlined in section 4.3 of the Flemish Pass and Eastern Newfoundland EISs. All information in that section is applicable to ELs 1159 and 1160 including, but not limited to, the study areas and effects evaluation criteria.

5.0 EXISTING ENVIRONMENTS

5.1 Existing Physical Environment

The Flemish Pass and Eastern Newfoundland EISs discuss the existing physical, biological and human environments in chapters 5, 6 and 7, respectively. This information is fully applicable to ELs 1159 and 1160 as they are within the Project Area and summaries provided below. The Flemish Pass and Eastern Newfoundland EISs contained the most current data at the time of writing, however, updated information regarding aspects such as fish distributions, special areas, commercial fishing and research vessels is available (refer to Appendices D and E of the Project Description) and was taken into consideration.

The geology of the eastern Newfoundland 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. Located on the eastern continental shelf, the seabed in the vicinity of the Project Area contains the deposits that have been classified as the Grand Banks Sand and Gravel and Adolphus Sand and Gravel (Piper et al. 1988). Seabed features in the area include iceberg scouring, sand ridges and waves, shell beds, pockmarks, and seabed depressions of unknown origin (Cameron and Best 1985).

The Project Area is situated in the deeper waters of the Flemish Pass area, with water depths up to 3,000 m.

Existing and available climatological information for sites within the Project Area indicate that air temperatures are coolest in January or February and warmest from July through September. Prevailing winds in the area are from the west to northwest in winter and from the southwest in summer. Rain or drizzle can occur at any time of year and is most likely to occur with southerly or southwesterly winds. Snow and freezing rain are possible any time from October through May, and snow can accompany winds of any direction. Freezing rain is most common with easterly or northeasterly winds, and frequently persists for days in the spring along the East Coast. In general, visibility is most favourable in fall and winter and most frequently restricted in summer and spring with some of the highest occurrences of marine fog in North America (AMEC 2014).

Within the Project Area and surrounding area, the largest seas are typically found farthest offshore, usually during the winter season. Circulation, which includes the continental shelf waters, is dominated by a generally southward flow of the cold Labrador Current. Over parts of the Grand Banks, the mean currents are generally weak and flow southward, dominated by wind-induced and tidal current variability. Average sea surface temperatures generally range from 0°C to 7°C in February to 10°C to 16°C in summer, whereas near-bottom sea temperatures generally range from 3°C to 4°C on average year-round.

The Project Area is, like the rest of the eastern Newfoundland offshore area, subject to seasonal intrusions of sea ice (winter and spring), as well as vessel icing during particular meteorological conditions. Sea ice and iceberg conditions may 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. By early May, the southern Grand Banks and Flemish Cap regions are generally free of sea ice. The iceberg season typically lasts from March to July. Icebergs can range in size from growlers (less than 1 m height) to very large (100 to 200 m in length). The International Ice Patrol annual count

of icebergs south of 48°N is highly variable but has an annual average of approximately 550 icebergs, and range from 0 to 2,202 icebergs (based on data through 2006) (AMEC 2014).

5.2 Existing Biological Environment

The Project Area includes the shelf and slope regions of the Grand Banks and areas of the Flemish Cap. 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 (including ELs 1159 and 1160 and surrounding areas) is an area of relatively high fish species abundance and richness, especially on the slope. 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 deep-water 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.

Patchy 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, 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 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). 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.

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.

Thirty-six listed fish species are either known to occur, or likely to occur in the Project Area. Listed species include those listed under Schedule 1 of SARA, have been identified by the Committee on the

Status of Endangered Wildlife in Canada (COSEWIC) as species of conservation concern, or are listed by the International Union for Conservation of Nature (IUCN).

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 Regional Study Area (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 species of conservation concern. 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 15 species at risk or species of conservation concern bird species that may occur in the RSA.

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, Local Study 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.

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 species of conservation concern.

Currently, there are no known Marine Protected Areas (MPAs) within the vicinity of the Project Area. However, nationally DFO is increasing the number of Marine Protected Areas. This initiative includes the marine waters off NL. Multiple areas within offshore Newfoundland have been designated as environmentally sensitive.

In addition to Canadian-designated EBSAs, NAFO has identified a number of areas as VMEs for deep-water corals and sponges in the offshore region, including many canyons around the continental shelf, seamounts, and knolls. The Newfoundland Seamounts and the Beothuk Knoll have been identified as potential VMEs (NAFO 2008). The VMEs are closed to bottom trawling activities in the area, to manage habitat for corals such as gorgonians, black corals, sea pens, and sponges. These areas were created in response to the known sensitivity of corals and sponges, particularly gorgonians and black corals that cannot reattach themselves to substrate after disturbance (NAFO 2009). In the NL offshore area, there are no areas identified where drilling cannot occur. While DFO and NAFO have identified EBSAs and VMEs, there are no restrictions in these areas regarding drilling activity. The C-NLOPB requires mitigation be put in place to reduce potential effects on sensitive marine organisms (e.g., corals).

5.3 Existing Human Environment

Section 7.3.4 of the Flemish Pass 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 exploration drilling activities 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)
- NCC
- QMFNB
- MFN

Other Indigenous groups in the Maritime Provinces and Quebec and their identified potential interests in the Project are outlined in Table 5.1.

Table 5.1 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 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	
Nova Scotia	Acadia First Nation	Asserted Aboriginal right to fish for food, social, and ceremonial purposes where that right could be affected by 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	

Table 5.1 Indigenous Groups in the Maritime Provinces and Quebec

Province	Group	Identified Interest
	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 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		

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.

Within the Project Area, 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.

In terms of timing of commercial fishing activities, 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 been subject to 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.

6.0 ENVIRONMENTAL EFFECTS ASSESSMENT

The scope, Project Area and VCs for ELs 1159 and 1160 are the same as those identified in the Flemish Pass EIS, and therefore the environmental effects assessment completed in chapters 8 to 13 are valid and applicable for ELs 1159 and 1160.

6.1 Project-Specific Modelling

Drill cuttings dispersion modelling and spill trajectory modelling was undertaken in five and eighteen locations, respectively, within the Project Area. Water depths in ELs 1159 and 1160 range from approximately 40 m to 1,020 m, and therefore results from modelling undertaken are applicable and valid to ELs 1159 and 1160.

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

The environment effects assessment of exploration drilling activities on Marine Fish and Fish Habitat (including Species at Risk), as described in sections 8.1 to 8.6 of the Flemish Pass and Eastern Newfoundland EISs, would be the same for exploration drilling activities carried out in ELs 1159 and 1160, and a summary is included below.

6.2.1 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 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 Flemish Pass EIS Guidelines, and concerns raised through consultation and engagement, the assessment of

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)

6.2.2 Anticipated Effects (Planned Components and Activities)

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

6.2.2.1 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 DP 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 DP; 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.

6.2.2.2 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. 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 at three locations in the Project Area – Northern Section and two locations 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, 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. While 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 creating 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 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.

6.2.2.3 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.

6.2.2.4 Wellhead Decommissioning

Wellhead decommissioning will be conducted by cutting off the wellhead rather than blasting for environmental and safety reasons. Wellhead cutting 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.

6.2.2.5 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.

6.2.2.6 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.

6.2.2.7 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.

The conclusions in the Flemish Pass and Eastern Newfoundland EISs remain valid; with the implementation of mitigation measures, exploration drilling activities on ELs 1159 and 1160 are not likely to result in significant adverse environmental effects on Marine Fish and Fish Habitat.

6.3 Marine and Migratory Birds (including Species at Risk)

The environment effects assessment of exploration drilling activities on Marine and Migratory Birds (including Species at Risk), as described in sections 9.1 to 9.6 of the Flemish Pass and Eastern Newfoundland EISs, would be the same for exploration drilling activities carried out in ELs 1159 and 1160, and a summary is included in the subsections below.

6.3.1 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 waste discharges (such as drilling fluids, other liquid and solid waste materials).

As a result of these identified environmental interactions, issues identified in the Flemish Pass EIS Guidelines, and concerns raised through consultations and engagement, the assessment of environmental effects on Marine and Migratory Birds (including species at risk and species of conservation concern) 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

6.3.2 Anticipated Effects (Planned Components and Activities)

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

6.3.2.1 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.

6.3.2.2 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.

6.3.2.3 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 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.

6.3.2.4 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.

6.3.2.5 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 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.

6.3.2.6 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 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 vessels in the Canada-NL Offshore Area 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.

The conclusions in the Flemish Pass and Eastern Newfoundland EISs remain valid; with the implementation of mitigation measures, exploration drilling activities on ELs 1159 and 1160 are not likely to result in significant adverse environmental effects on Marine and Migratory Birds.

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

The environment effects assessment of exploration drilling activities on Marine Mammals and Sea Turtles (including Species at Risk), as described in sections 10.1 to 10.6 of the Flemish Pass and Eastern Newfoundland EISs, would be the same for exploration drilling activities carried out in ELs 1159 and 1160, and a summary is included in the subsections below.

6.4.1 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 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 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 Flemish Pass EIS Guidelines, and concerns raised through consultations and engagement, the assessment of environmental effects on Marine Mammals and Sea Turtles (including species at risk) 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)

6.4.2 Anticipated Effects (Planned Components and Activities)

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

6.4.2.1 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.

6.4.2.2 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 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.

6.4.2.3 Formation Flow Testing with Flaring

In cases where a formation flow test is carried out, interactions with marine mammals and sea turtles will be similar to those discussed in Section 8.4.1. Given compliance with OWTG requirements, the potential for 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.

6.4.2.4 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 6.4.2.1. 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.

6.4.2.5 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 surveys are predicted to be adverse, negligible to low in magnitude, localized with some extension into the LSA, short-term, sporadic in frequency, and reversible, with a high level of confidence.

6.4.2.6 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 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 only a small number of vessels relative to current vessel traffic volumes will be added 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.

The conclusions in the Flemish Pass and Eastern Newfoundland EISs remain valid; with the implementation of mitigation measures, exploration drilling activities on ELs 1159 and 1160 are not likely to result in significant adverse environmental effects on Marine Mammals and Sea Turtles.

6.5 Special Areas

The environment effects assessment of exploration drilling activities on Special Areas, as described in sections 11.1 to 11.5 of the Flemish Pass and Eastern Newfoundland EISs, would be the same for exploration drilling activities carried out in ELs 1159 and 1160, and a summary is included below.

Special Areas associated with the Flemish Pass and Eastern Newfoundland EISs, and in relation to ELs 1159 and 1160, are illustrated in Figure 6-1 below.

An additional United Nations Convention on Biological Diversity (UNCBD) EBSA has been designated since submission of the Flemish Pass and Eastern Newfoundland EISs. The Southeast Shoal and Adjacent Areas on the Tail of the Grand Bank UNCBD EBSA extends from the Canadian Exclusive Economic Zone (EEZ) in the area of the southern Grand Banks to the 100 m contour of the shelf. The shoal is a very productive ecosystem, providing a shallow, relatively warm, sandy habitat. The shoal is an ancient beach relic that provides an offshore capelin-spawning ground and spawning area for Atlantic wolffish, Atlantic cod, and American plaice, as well as a yellowtail flounder nursery. The shoal is also home to unique populations of blue mussels and wedge clams. The Tail provides an important feeding area for humpback and fin whales and large numbers of seabirds (UNCBD 2019).

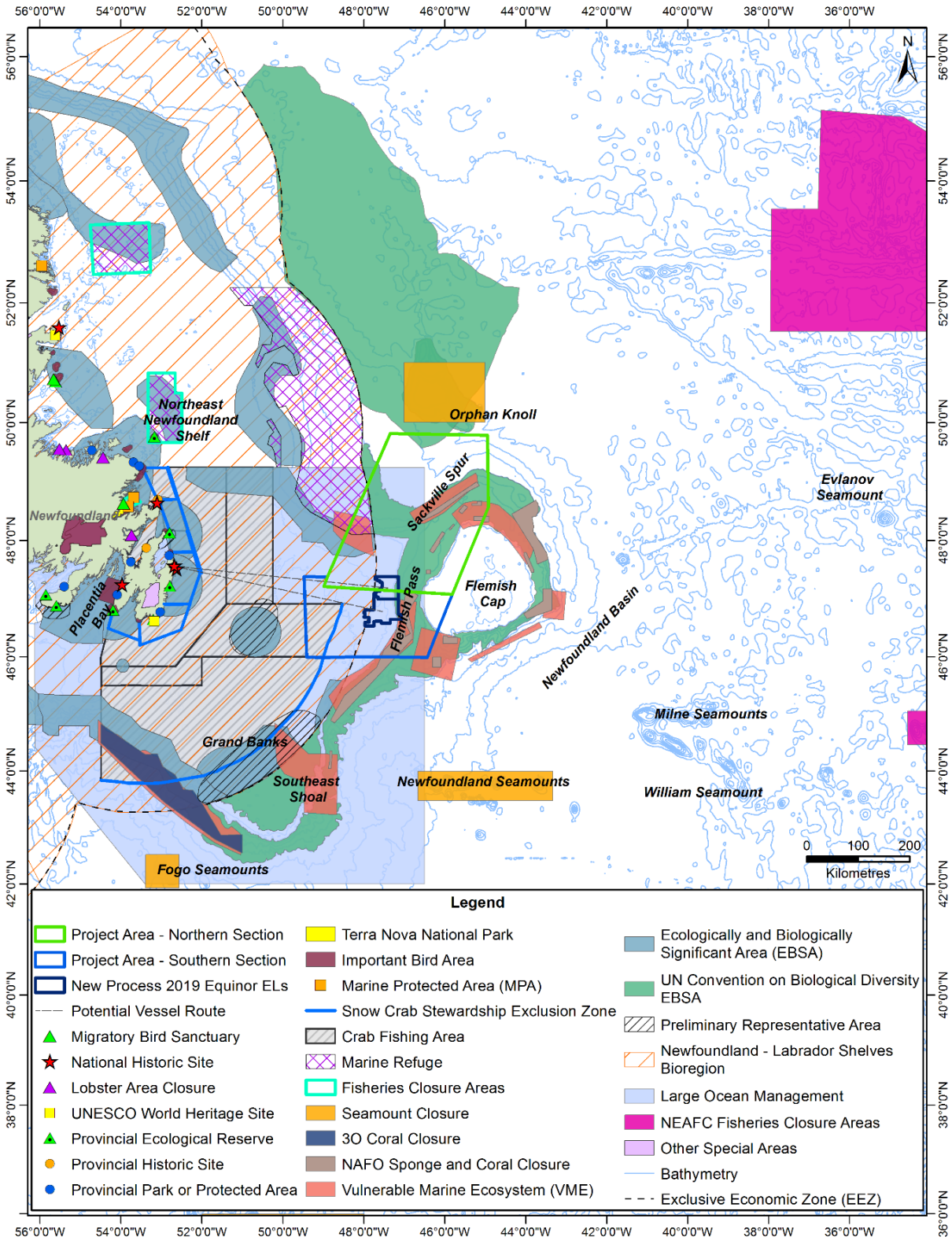

Figure 6-1 Special Areas in Eastern Newfoundland

6.5.1 Special Areas Overlapping with Project Area ELs

Table 6.1 below outlines the Special Areas that overlap with ELs 1159 and 1160, as well as their defining features.

Table 6.1 Special Areas Overlapping with Project ELs

Exploration Licence	Overlapping Special Areas	Defining Features
EL 1159	• UNCBD EBSA – Slopes of the Flemish Cap and Grand Bank	• Identification of the UNCBD EBSAs are part of an initiative to conserve global diversity. The Slopes of the Flemish Cap and Grand Bank EBSA contains most of the aggregations of indicator species for VMEs in the NAFO Regulatory Area. The area includes NAFO closures to protect corals and sponges and a component of Greenland halibut fishery grounds in international waters. A high diversity of marine taxa, including threatened and listed species, are found within the EBSA (UNCBD 2017).
EL 1160	• UNCBD EBSA – Slopes of the Flemish Cap and Grand Bank • United Nations Food and Agriculture Organization (UNFAO) VME – Southern Flemish Pass to Eastern Canyons	• See above for UNCBD EBSA defining features. • The Southern Flemish Pass to Eastern Canyons VME includes large gorgonians and high density of sponges. Vulnerable fish species in the area include striped wolffish, redfish, spiny tailed skate, northern wolffish, some black dogfish and deep-sea cat shark (WG-EAFM 2008; UNFAO 2019).

UNCBD EBSA – Slopes of the Flemish Cap and Grand Bank also overlaps with the majority of ELs associated with the Flemish Pass and Eastern Newfoundland EISs (i.e., ELs 1134, 1135, 1140, 1141, and 1142), and UNFAO VME – Southern Flemish Pass to Eastern Canyons overlaps with EL 1134. The response to IR-40 completed an environmental effects assessment taking into consideration these Special Areas, which remains applicable and valid.

6.5.2 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 planned activities. Biophysical effects resulting from oil and gas or other human activities within the RSA may also extend 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 Flemish Pass EIS Guidelines and concerns raised through consultation and engagement, the assessment of 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

6.5.3 Anticipated Effects (Planned Project Components and Activities)

6.5.3.1 Potential Zones of Influence

Special Areas outside of the ELs 1159 and 1160 have the potential to be affected by extended effects associated with sound, lighting and drill cuttings. The response to IR-40-2 outlines the methodology used to determine the potential zone of influence (ZOI) boundaries, which remains applicable and valid for ELs 1159 and 1160 and summarized below.

As shown in Figure 6-2, ZOIs for sound, lighting and drill cuttings were applied to the outer boundaries of ELs 1159 and 1160. In lieu of applying ZOIs to individual ELs, which would result in separate ZOIs, one ZOI was selected for the two ELs. This approach results in a very conservative ZOI as the maximum boundary extents were selected.

Sound

Section 10.3.3 of the Flemish Pass and Eastern Newfoundland EISs discuss results from modelling completed by another operator for the Scotian Basin. These results indicated that predicted cumulative sound exposure levels (over 24 hours) associated with operating drilling installations would decrease to below threshold values for potential marine mammal auditory injury at distances between 120 m and 470 m from the source (Zykov 2016). Therefore 470 m was selected as a conservative ZOI for sound.

Effects Assessment

Taking into consideration the 470 m conservative ZOI for sound, exploration drilling activities associated with ELs 1159 and 1160 do not extend to any additional Special Areas, and therefore an expanded effects assessment is not required.

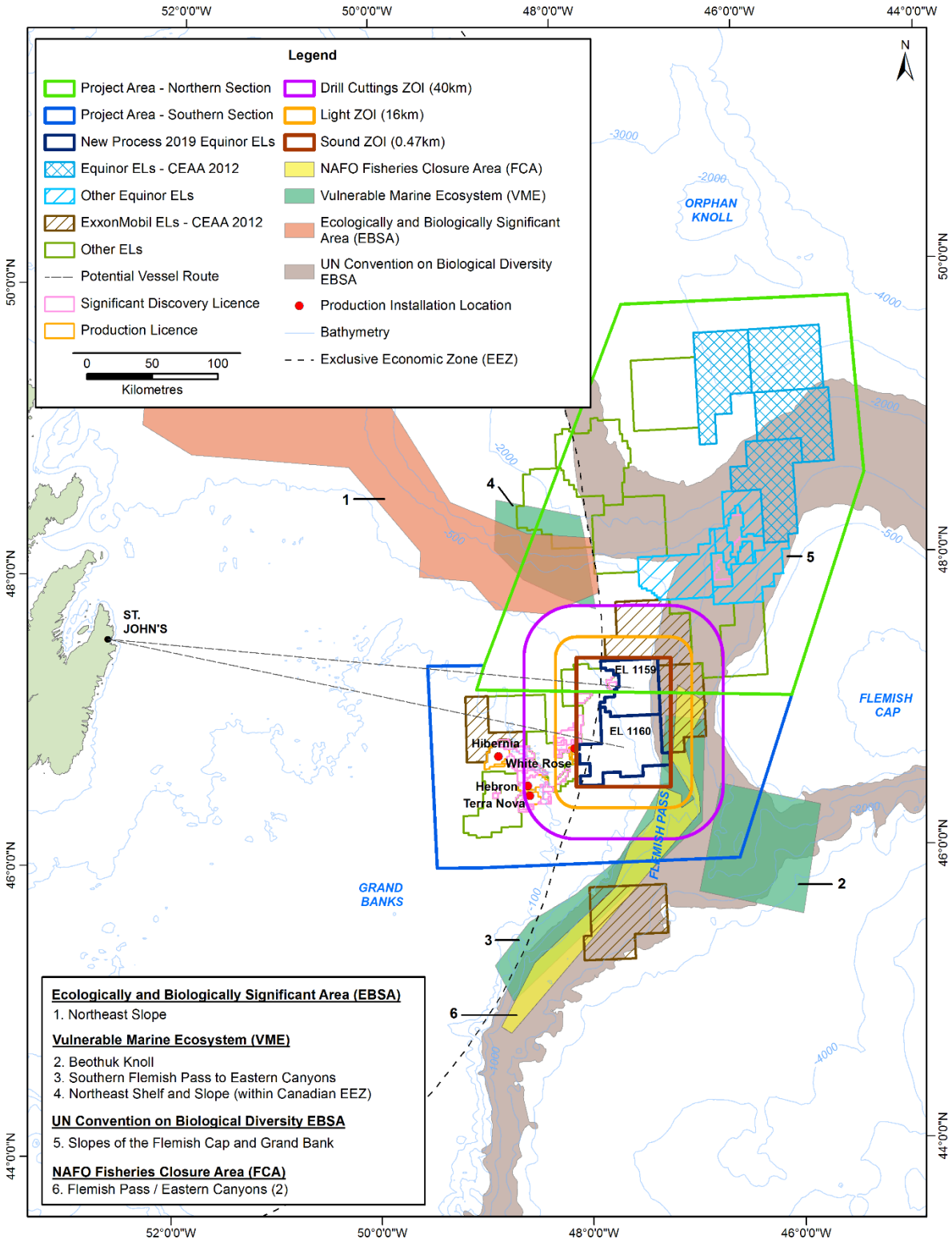

Figure 6-2 Potential Zones of Influence Around ELs 1159 and 1160 Associated with Light, Sound, and Drill Cuttings

Lighting

Section 9.3.3 of the Flemish Pass and Eastern Newfoundland EISs, and the response to IR-86, discussed bird attraction to fully lit production platforms from up to 5 km, however, attraction distances greater than 5 km could not be ruled out (Poot et al. 2008). The response to IR-86-2 further discussed this topic, including a study that found bird colonies up to 16 km were susceptible to stranding due to light attraction, which suggests that attraction distances of anthropogenic light sources may be greater than 5 km (Rodriguez et al. 2014, 2015). It is noted that exploration drilling installations emit less light than a fully lit production platform, and therefore selecting 16 km as the ZOI is very conservative.

Taking into consideration the 16 km conservative ZOI for lighting, exploration drilling activities associated with ELs 1159 and 1160 have the potential to extend to the NAFO Fisheries Closure Area (FCA) – Flemish Pass / Eastern Canyons (2).

Defining Features

NAFO FCA – Flemish Pass / Eastern Canyons (2) is closed to protect extensive sponge grounds and large gorgonian corals in the Flemish Pass.

Effects Assessment

Benthic species are not anticipated to be adversely affected by light due to distance to seafloor, which was also concluded in the response to IR-40.

Drill Cuttings

Based on drill cuttings modelling completed for the Flemish Pass and Eastern Newfoundland EISs, it was determined that 40 km at any of the modelled locations was the maximum distance that SBM drill cuttings may accumulate. Therefore 40 km was selected as a very conservative ZOI associated with drill cuttings.

Taking into consideration the 40 km conservative ZOI for drill cuttings, exploration drilling activities associated with ELs 1159 and 1160 have the potential to extend to the VME – Beothuk Knoll, VME – Northeast Shelf and Slope (within the Canadian EEZ) and NAFO FCA – Flemish Pass / Eastern Canyons (2).

Defining Features

The Beothuk Knoll VME was identified for abundant gorgonian corals and high density of sponges. Vulnerable fish species include Northern wolffish, Spiny tailed skate, Roundnose Grenadier, Deep-sea cat shark and Black dogfish.

The Northeast Shelf and Slope (within the Canadian EEZ) VME has been identified due to an abundance of gorgonian and black corals.

Flemish Pass / Eastern Canyons (2) NAFO FCA is closed to protect extensive sponge grounds and large gorgonian corals in the Flemish Pass.

Effects Assessment

The two VMEs above were already taken into consideration in the response to IR-40-2 and remain applicable and valid for ELs 1159 and 1160. The effects assessment in the response to IR-40-2 addressed the NAFO FCA as it overlaps with EL 1134 overlaps and therefore remains valid.

The predicted environmental effects of drilling discharges on special areas identified for sensitive benthic habitats are primarily related to potential sedimentation and burial of benthic species. As discussed in section 2.5.2.1 of the Flemish Pass EIS, pre-drill coral and sponge surveys and risk assessments will be completed and mitigation measures, if required from the risk assessment, will be implemented prior to drilling (e.g., relocating wellsite, using a cuttings transport system). These effects are predicted to be adverse, low in magnitude, localized and within the Project Area, short to long term in duration, occurring sporadically to regularly and reversible, with these predications being made with a moderate to high level of confidence. With the implementation of appropriate mitigation measures, the overall magnitude of the effect of marine discharges on these special areas is anticipated to be low.

6.5.4 Summary

The conclusions in the Flemish Pass and Eastern Newfoundland EISs remain valid; with the implementation of mitigation measures, the overall and defining physical, biological and socioeconomic environments within Special Areas will not be adversely affected by exploration drilling activities on ELs 1159 and 1160.

6.6 Indigenous Communities and Activities

The environment effects assessment of exploration drilling activities on Indigenous Communities and Activities, as described in sections 12.1 to 12.5 of the Flemish Pass and Eastern Newfoundland EISs, would be the same for exploration drilling activities carried out in ELs 1159 and 1160, and a summary is provided below.

6.6.1 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 kilometres from the nearest community. Indirect effects may occur if exploration drilling activities 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 Flemish Pass EIS Guidelines and concerns raised through engagement, the assessment of environmental effects on Indigenous communities and their activities is focused on the following potential environmental effects:

- 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

6.6.2 Anticipated Effects (Planned Components and Activities)

In general, 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 ZOI (LSA).

Most activities will take place in an offshore marine environment, hundreds of kilometres from land and away from any Indigenous community. Emissions and discharges and environmental interactions will be localized and short-term in nature (Chapters 8-11 and 13 of the Flemish Pass 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 will be located a considerable distance (hundreds of kilometres) from Indigenous communities, and from the traditional territories associated with each of these groups. Equinor Canada 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 NL) 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. The planned components and activities, 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. Exploration drilling activities 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 the Flemish Pass EIS will reduce direct or indirect potential effects on these resources. Exploration drilling activities 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 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.

The conclusions in the Flemish Pass and Eastern Newfoundland EISs remain valid for exploration drilling activities on ELs 1159 and 1160; given the nature, location and timing of various activities and associated environmental interactions, it is not anticipated to have adverse effects on Indigenous Communities and Activities.

6.7 Commercial Fisheries and Other Ocean Users

The environment effects assessment of exploration drilling activities on Commercial Fisheries and Other Ocean Users, as described in sections 13.1 to 13.5 of the Flemish Pass and Eastern Newfoundland EISs, would be the same for exploration drilling activities carried out in ELs 1159 and 1160, and summarized below.

6.7.1 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 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 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 Flemish Pass EIS Guidelines and concerns raised through consultation and engagement, the assessment of environmental effects on Commercial Fisheries and Other Ocean Users is focused on the following potential environmental effects:

- 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

6.7.2 Anticipated Effects (Planned Components and Activities)

6.7.2.1 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 Flemish Pass and Eastern Newfoundland EISs. 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 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 considerably reduces the potential for detectable, adverse effects upon the commercial fishery and other ocean users.

6.7.2.2 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.

6.7.2.3 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 Equinor Canada 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.

6.7.2.4 Surveys

The effects of underwater noise associated with 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 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 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 activity.

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

6.7.2.5 Supply and Servicing

The contribution 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.

The conclusions in the Flemish Pass and Eastern Newfoundland EISs remain valid; with the implementation of mitigation measures, exploration drilling activities on ELs 1159 and 1160 are not likely to result in significant adverse effects on Commercial Fisheries and Other Ocean Users.

7.0 CUMULATIVE ENVIRONMENTAL EFFECTS

The Flemish Pass and Eastern Newfoundland EISs described and outlined the cumulative environmental effects assessment of the Project Area, and specifically the Project Area – Northern Section and Project Area – Southern Section. The Flemish Pass EIS environmental effects analysis considered the drilling of up to 30 wells. Wells to be drilled on ELs 1159 and 1160 would be captured within this 30-well count, and they are located within the Project Area. No additional wells would be drilled with the inclusion of ELs 1159 and 1160. Therefore, the total number of wells to be drilled on ELs

associated with the Flemish Pass EIS (i.e., ELs 1139, 1140, 1141 and 1142) and ELs 1159 and 1160 would not exceed 30.

Sources of potential environmental effects identified for the Flemish Pass and Eastern Newfoundland EISs remain applicable and valid for ELs 1159 and 1160 and include:

- Offshore production facilities (i.e., Hebron, Terra Nova, White Rose and Hibernia) and the proposed Bay du Nord development project
- Offshore petroleum exploration – geophysical and other exploration activities
- Offshore petroleum exploration – drilling
- Fishing activity
- Other marine vessel traffic
- Hunting activity

Production facilities offshore NL are located within the Project Area – Southern Section and the proposed Bay du Nord development project is located within the Project Area – Northern Section. Table 7.1 below provides minimum distances from ELs 1159 and 1160.

Table 7.1 Minimum Distances to Operating and Proposed Production Facilities

Project	Minimum Distance (km)	
	EL 1159	EL 1160
Hibernia	86	60
Terra Nova	86	50
White Rose	36	2
Hebron	82	40
Proposed Bay du Nord Development Project	39	80

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

The environment effects assessment of exploration drilling activities on Marine Fish and Fish Habitat (including Species at Risk), as described in chapter 8 of the Flemish Pass and Eastern Newfoundland EISs, would be the same for exploration drilling activities carried out in ELs 1159 and 1160. With the implementation of mitigation measures (refer to Project Description Appendices F and I), exploration drilling activities on ELs 1159 and 1160 are not anticipated to result in significant adverse effects on Marine Fish and Fish Habitat (including Species at Risk).

Three of the production facilities (i.e., Hibernia, Terra Nova and White Rose) have ongoing environmental effects monitoring programs, which have demonstrated a localized (i.e., less than 10 km) geographic extent for the project-induced changes on fish habitat. It is assumed that Hebron, which started production in 2017, will have a similar geographic extent. The proposed Bay du Nord development project is in the Project Area – Northern Section and also assumed to have a similar geographic extent.

It is acknowledged that White Rose is located approximately 2 km from the closest edge of EL 1160. However, as outlined in table 14.14 of the Flemish Pass and Eastern Newfoundland EISs, this production facility has a safety zone of approximately 95 km², and the South White Rose Extension has a safety zone of 9 km², which would aid in increasing the separation distance between exploration drilling activities and production, and in turn reduce the potential for cumulative effects to Marine Fish and Fish Habitat.

The conclusions in the Flemish Pass and Eastern Newfoundland EISs remain valid; exploration drilling activities on ELs 1159 and 1160 are not likely to result in significant adverse cumulative environmental effects on Marine Fish and Fish Habitat (including Species at Risk) in combination with other projects and activities that have been or will be carried out.

7.2 Marine and Migratory Birds (including Species at Risk)

The environment effects assessment of exploration drilling activities on Marine and Migratory Birds (including Species at Risk), as described in chapter 9 of the Flemish Pass and Eastern Newfoundland EISs, would be the same for exploration drilling activities carried out in ELs 1159 and 1160. With the implementation of mitigation measures (refer to Project Description Appendices F and I), exploration drilling activities on ELs 1159 and 1160 are not anticipated to result in significant adverse effects on Marine and Migratory Birds (including Species at Risk).

Potential interactions with Marine and Migratory Birds as a result of exploration drilling on ELs 1159 and 1160 are primarily related to potential attraction and/or disorientation of birds due to artificial light sources associated with the drilling installation and vessels. ELs 1159 and 1160 are located within, or partially within, the Project Area – Southern Section, and there is potential for cumulative effects to result from the combined effects of exploration drilling on ELs 1159 and 1160 and other offshore exploration and production activities, marine traffic and commercial fishing activity. The four production facilities are long-term operations with similarly long-term environmental disturbances, however, the effects are localized. Potential effects associated with exploration drilling on ELs 1159 and 1160 are short-term and localized, which may reduce the potential for cumulative effects to occur.

It is acknowledged that White Rose is located approximately 2 km from the closest edge of EL 1160. However, as outlined in table 14.14 of the Flemish Pass and Eastern Newfoundland EISs, this production facility has a safety zone of approximately 95 km², and the South White Rose Extension has a safety zone of 9 km², which would aid in increasing the separation distance between exploration drilling activities and production, and in turn reduce the potential for cumulative effects to Marine and Migratory Birds.

The conclusions in the Flemish Pass and Eastern Newfoundland EISs remain valid; exploration drilling activities on ELs 1159 and 1160 are not likely to result in significant adverse cumulative environmental effects on Marine and Migratory Birds (including Species at Risk) in combination with other projects and activities that have been or will be carried out.

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

The environment effects assessment of exploration drilling activities on Marine Mammals and Sea Turtles (including Species at Risk), as described in chapter 10 of the Flemish Pass and Eastern Newfoundland EISs, would be the same for exploration drilling activities carried out in ELs 1159 and 1160. With the implementation of mitigation measures (refer to Project Description Appendices F and I), exploration drilling activities on ELs 1159 and 1160 are not anticipated to result in significant adverse effects on Marine Mammals and Sea Turtles (including Species at Risk).

Potential interactions with Marine Mammals and Sea Turtles as a result of exploration drilling on ELs 1159 and 1160 are primarily related to possible injury or disturbance from the movement and sound associated with the drilling installation and vessels. Potential interactions are likely to be highly transient and temporary for individual marine mammals and sea turtles.

Safety zones are required between offshore oil and gas activities, which help reduce the degree to which the potential ZOI from sound may overlap and interact in space and time. There is, however, potential that underwater sound produced from these activities may extend beyond these established safety zones and interact spatially with those of other projects and activities.

The four production facilities have vessel traffic occurring year-round, however, sound levels from these activities are below those expected to cause auditory injury (Zykov 2016). Sound generated from exploration drilling and geophysical surveys is temporary and short-term in nature.

It is acknowledged that White Rose is located approximately 2 km from the closest edge of EL 1160. However, as outlined in table 14.14 of the Flemish Pass and Eastern Newfoundland EISs, this production facility has a safety zone of approximately 95 km², and the South White Rose Extension has a safety zone of 9 km², which would aid in increasing the separation distance between exploration drilling activities and production, and in turn reduce the potential for cumulative effects to Marine Mammals and Sea Turtles.

Project vessel traffic within the RSA and vessel traffic associated with other projects and activities pose a risk of mortality or physical injury to marine mammals and sea turtles due to the increased potential for vessel strikes. Vessel traffic associated with ELs 1159 and 1160 is short-term and transient in nature, which limits the potential for vessel strikes.

The conclusions in the Flemish Pass and Eastern Newfoundland EISs remain valid; exploration drilling activities on ELs 1159 and 1160 are not likely to result in significant adverse cumulative environmental effects on Marine Mammals and Sea Turtles (including Species at Risk) in combination with other projects and activities that have been or will be carried out.

7.4 Special Areas

The environment effects assessment of exploration drilling activities on Special Areas, as described in chapter 11 of the Flemish Pass and Eastern Newfoundland EISs, would be the same for exploration drilling activities carried out in ELs 1159 and 1160. With the implementation of mitigation measures (refer to Project Description Appendices F and I), the overall and defining physical, biological and

socioeconomic environmental within Special Areas will not be adversely affected by exploration drilling activities on ELs 1159 and 1160.

Many of the Special Areas in eastern Newfoundland are in the nearshore and onshore areas and will therefore not have direct contact with exploration drilling activities on ELs 1159 and 1160. Several Special Areas, or portions of them, overlap with the Project Area and potential traffic routes including but not limited to EBSAs, VMEs, NAFO FCAs (refer to Section 6 of the Project Description). Exploration drilling activities are not prohibited from occurring in these Special Areas.

The four production facilities (i.e., Hibernia, Terra Nova, White Rose and Hebron) do not overlap with any Special Areas. However, other projects and activities such as exploration drilling on other ELs may interact spatially. Several other existing and active ELs in this region overlap with portions of these or other Special Areas. The specific location and timing of other offshore exploration activities in the region over the 10-year temporal duration is not known and cannot be defined, however, these activities are short-term in nature and have a relatively limited ZOI, and mitigation measures will be implemented. In addition, while other general marine traffic occurs throughout the Newfoundland offshore and is likely to intersect with EBSAs and VMEs that overlap the Project Area, vessel traffic is intermittent and transient at any one location and time, with negligible contributions to cumulative effects on an area.

It is acknowledged that White Rose is located approximately 2 km from the closest edge of EL 1160. However, as outlined in table 14.14 of the Flemish Pass and Eastern Newfoundland EISs, this production facility has a safety zone of approximately 95 km², and the South White Rose Extension has a safety zone of 9 km², which would aid in increasing the separation distance between exploration drilling activities and production, and in turn reduce the potential for cumulative effects to Special Areas.

The conclusions in the Flemish Pass and Eastern Newfoundland EISs remain valid; exploration drilling activities on ELs 1159 and 1160 are not likely to result in significant adverse cumulative environmental effects on Special Areas in combination with other projects and activities that have been or will be carried out.

7.5 Indigenous Communities and Activities

The environment effects assessment of exploration drilling activities on Indigenous Communities and Activities, as described in chapter 12 of the Flemish Pass and Eastern Newfoundland EISs, would be the same for exploration drilling activities carried out in ELs 1159 and 1160. Given the nature, location and timing of various activities and associated environmental interactions, exploration drilling activities on ELs 1159 and 1160 are not anticipated to have adverse effects on Indigenous Communities and Activities.

There are no documented food, social or ceremonial licences within the Project Area / LSA and Indigenous groups do not otherwise undertake the current use of lands and resources for traditional purpose within or near this area. There are also no other known aspects of the physical and cultural heritage of these groups in proximity to ELs 1159 and 1160.

A number of Indigenous communities hold commercial communal swordfish licenses for NAFO areas 3O, 3M and 3N, which overlap or are near the Project Area. Equinor Canada has engaged associated

licence holders as part of the Flemish Pass EISA. To date, no Indigenous community has specifically provided information that they actively fish in the Project Area at the current time. However, this does not mean that those Indigenous communities will not exercise their right to fish in those areas in the future. However, at the current time there appears to be no potential for interaction with commercial communal fishery licence holders.

No residual effects (direct nor indirect) on the current use of lands and resources for traditional purposes by any group are therefore anticipated as a result of exploration drilling on ELs 1159 and 1160.

The environmental effects analysis also indicates that few of the marine species that are known to be used by Indigenous groups migrate through the Project Area / LSA and are thus likely to be affected by activities and disturbances, and the implementation of the various environmental mitigation measures (see Appendices F and I) will serve to further address direct or indirect potential effects on these resources.

The conclusions in the Flemish Pass and Eastern Newfoundland EISs remain valid; exploration drilling activities on ELs 1159 and 1160 are not anticipated to result in residual environmental effects on Indigenous Communities and Activities and will therefore not result in or contribute to cumulative effects to this VC.

7.6 Commercial Fisheries and Other Ocean Users

The environment effects assessment of exploration drilling activities on Commercial Fisheries and Other Ocean Users, as described in chapter 13 of the Flemish Pass and Eastern Newfoundland EISs, would be the same for exploration drilling activities carried out in ELs 1159 and 1160. With the implementation of mitigation measures (refer to Project Description Appendices F and I), exploration drilling activities on ELs 1159 and 1160 are not likely to result in significant adverse effects on Commercial Fisheries and Other Ocean Users.

The dynamic nature of fishing and other marine based activity throughout the region (in terms of locations, seasons, gear types, and key species) makes it difficult to predict specific areas and times from year-to-year for both domestic and foreign fleets, and thus, the potential for interactions between separate projects, activities and their effects.

Production facilities have established safety zones that occupy a relatively small footprint in comparison to available fishing grounds. Supply vessel activity associated with production facilities is year-round, however, operators have established communication protocols to mitigate interactions with commercial fish harvesters and other ocean users.

Exploration drilling activities and geophysical surveys also implement safety zones during program activities. It is possible for multiple exploration operations to occur within the Project Area or RSA at a given time during the 10-year temporal duration. The implementation of multiple safety zones, depending on proximity to one another, could result in a (cumulatively) larger area restricted to commercial fishers and other ocean users. However, exploration drilling and geophysical surveys are relatively short-term and localized in nature.

There is relatively more existing and planned marine-based activity occurring within the Project Area - Southern Section than the Project Area – Northern Section. The four production facilities are located in the Jeanne d'Arc Basin. White Rose is the closest producing facility; minimum distances from ELs 1159 and 1160 are approximately 36 km and 2 km, respectively. While production facilities may have their own effects on commercial fishing activity, such as the creation of safety zones, and supply vessel traffic, it is not anticipated that effects on commercial fishing activity and other marine users from those producing fields will interact cumulatively with potential environmental effects of exploration drilling on ELs 1159 and 1160.

The Project Area – Southern Section has higher levels of marine traffic than other areas of offshore Newfoundland, mostly due to the presence of established oil and gas production facilities, and higher volumes of marine research, commercial fishing, and shipping activities. This has the potential to result in cumulative effects due to the increase in supply vessel traffic related to exploration drilling on ELs 1159 and 1160. However, supply vessel traffic will only contribute a small increase to the marine traffic that already occurs within the Project Area - Southern Section and will be transient in nature.

The conclusions in the Flemish Pass and Eastern Newfoundland EISs remain valid; exploration drilling activities on ELs 1159 and 1160 are not likely to result in significant adverse cumulative environmental effects on Commercial Fisheries and Other Ocean Users in combination with other projects and activities that have been or will be carried out.

8.0 ACCIDENTAL EVENTS

8.1 Spill Prevention and Response

Section 15.1, including subsections, of the Flemish Pass EIS outline spill prevention and response measures including aspects such as, well control and blowout prevention, contingency planning, well capping and containment, spill response, response contractors and agencies, spill response tactics (e.g., natural attenuation, mechanical containment, in-situ burning and chemical dispersion), Spill Impact Mitigation Assessment (SIMA), shoreline protection and clean-up, oiled wildlife response, remediation, and financial requirements. All information in section 15.1 of the Flemish Pass EIS remains valid for ELs 1159 and 1160.

8.2 Spill Risk and Probabilities

Section 15.3, including subsections, of the Flemish Pass EIS outlines the spill risk and probabilities calculated based on number of wells (i.e., 30) and drilling duration (i.e., 35 to 65 days); this information remains valid for ELs 1159 and 1160 as the well count and drilling duration remain the same.

8.3 Fate and Behaviour of Potential Spills

The Flemish Pass and Eastern Newfoundland EISs completed spill trajectory modelling of the 18 unmitigated scenarios. These scenarios occurred throughout the Project Area and a range of water depths and spill rates. Modelling undertaken for ELs 1134, 1135, 1137, and 1142 are suitable to apply to ELs 1159 and 1160 due to water depths and estimated spill rates, and therefore re-modelling is not

anticipated. Estimated spill rates associated with EL 1159 and 1160 are adequately addressed in modelling that has been undertaken, with EL 1159 being similar to EL 1135 (which is the highest, worst-case scenario) and EL 1160 being significantly lower as it's located in a lower pressure area. All modelled unmitigated subsurface blowouts and batch spills, regardless of location, resulted in the similar predictions (i.e., surface oil would move eastward due to prevailing westerly winds).

8.4 Accidental Events – Environmental Effects Assessment

CEAA 2012 defined "federal lands" as those lands that include the EEZ and continental shelf of Canada. Therefore, exploration drilling activities on ELs 1159 and 1160 will be carried out on federal lands under the jurisdiction of the C-NLOPB. An accidental event during exploration drilling activities could potentially result in changes to the environment, including air and noise emissions, that would occur in federal lands as defined by the Accord Acts. Routine Project activities could potentially result in changes to the environment (i.e., as described above and including air and noise emissions) that would occur on federal lands as defined by the Accord Acts.

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

Taking into consideration the results of the spill modelling exercises completed in the Flemish Pass and Eastern Newfoundland EISs, and planned mitigation, the predicted residual environmental effects from an accidental event scenario on Marine Fish and Fish Habitat is considered not significant. This determination of significance remains applicable and valid for ELs 1159 and 1160.

8.4.2 Marine and Migratory Birds (including Species at Risk)

Taking into consideration the results of the spill modelling exercises completed in the Flemish Pass and Eastern Newfoundland EISs, and planned mitigation, a precautionary conclusion was drawn and residual environmental effects from a subsurface blowout on Marine and Migratory Birds was predicted to be significant, but dependent on the specific occurrence, nature and degree of the event, but extremely unlikely to occur. This determination of significance remains applicable and valid for ELs 1159 and 1160.

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

Taking into consideration the results of the spill modelling exercises completed in the Flemish Pass and Eastern Newfoundland EISs, and planned mitigation, the predicted residual environmental effects from an accidental event scenario on Marine Mammals and Sea Turtles is considered not significant. This determination of significance remains applicable and valid for ELs 1159 and 1160.

8.4.4 Special Areas

Taking into consideration the results of the spill modelling exercises completed in the Flemish Pass and Eastern Newfoundland EISs, and planned mitigation, the predicted residual environmental effects from an accidental event scenario on Special Areas is considered not significant. This determination of significance remains applicable and valid for ELs 1159 and 1160.

8.4.5 Indigenous Communities and Activities

Taking into consideration the results of the spill modelling exercises completed in the Flemish Pass and Eastern Newfoundland EISs, and planned mitigation, the predicted residual environmental effects from an accidental event scenario on Indigenous Communities and Activities is considered not significant. This determination of significance remains applicable and valid for ELs 1159 and 1160.

8.4.6 Commercial Fisheries and Other Ocean Users

Taking into consideration the results of the spill modelling exercises completed in the Flemish Pass and Eastern Newfoundland EISs, and planned mitigation, the predicted residual environmental effects from an accidental event scenario on Commercial Fisheries and Other Ocean Users is considered not significant. This determination of significance remains applicable and valid for ELs 1159 and 1160.

9.0 EFFECTS OF THE ENVIRONMENT ON THE PROJECT

Chapter 16 of the Flemish Pass and Eastern Newfoundland EISs considered environmental factors, including climatological and meteorological conditions (wind, precipitation, fog, and visibility), oceanographic conditions (waves, currents), seasonal presence of sea ice and icebergs, geology and seismicity, and other environmental features and conditions. It also described how these issues will be considered and addressed as part of ongoing and future planning, design, and eventual implementation. This includes discussing how relevant engineering and environmental design criteria, industry standards, guidelines, and regulatory conditions will be applied and will be relevant to the mitigation of such Effects of the Environment on the Project.

Information in the Flemish Pass and Eastern Newfoundland EISs related to Effects of the Environment on the Project remains valid and applicable for ELs 1159 and 1160.

10.0 SUMMARY AND CONCLUSION

The summary and conclusions outlined in chapter 17 of the Flemish Pass and Eastern Newfoundland EISs remain applicable and valid for exploration drilling activities on ELs 1159 and 1160. Appendix I of the Project Description contains an updated list of mitigations and commitments made throughout the EISs, as well as additional commitments made in responses to IRs/CLs. In addition, Equinor Canada will apply conditions outlined in the Decision Statement (CEA Agency 2019e) associated with the Flemish Pass EIS to exploration drilling activities on ELs 1159 and 1160.

The proposed exploration drilling activities associated with ELs 1159 and 1160 have been reviewed and assessed to be within the scope of the Flemish Pass EIS, specifically:

- The scope and nature of activities planned and assessed in the Flemish Pass EIS have not changed, and therefore re-assessment is not anticipated
- ELs 1159 and 1160 are within the defined Project Area assessed for the Flemish Pass and Eastern Newfoundland EISs, and therefore re-assessment is not anticipated
- The well count assessed in the Flemish Pass EIS (i.e., 30) remains the same, and therefore re-assessment is not anticipated

- Engagement with government departments and agencies, Indigenous groups and stakeholders completed for the Flemish Pass EIS is also applicable to ELs 1159 and 1160
- Updated information regarding the existing biological and human environments has been compiled and reviewed, however, it does not change the environmental effects assessments
- The Flemish Pass and Eastern Newfoundland EISs completed drill cuttings modelling in five locations with varying locations and water depths, four of which are applicable and valid for ELs 1159 and 1160 and therefore re-modelling is not anticipated
- The Flemish Pass and Eastern Newfoundland EISs completed spill trajectory modelling of eight unmitigated subsurface blowouts with varying locations, water depths, spill rates and durations, seven of which are applicable and valid for ELs 1159 and 1160 and therefore re-modelling is not anticipated
- The Flemish Pass and Eastern Newfoundland EISs completed spill trajectory modelling of 10 unmitigated batch spills with varying locations, water depths and volumes, eight of which are applicable and valid for ELs 1159 and 1160 and therefore re-modelling is not anticipated
- The environmental effects predicted for the Flemish Pass EIS remain valid for ELs 1159 and 1160, and therefore re-assessment is not anticipated
- The nature of species at risk in the Project Area have been validated and no new species have been added to Schedule 1 of the SARA, and therefore re-assessment is not anticipated
- The commitments and mitigation measures associated with the Flemish Pass EIS (i.e., in the Flemish Pass EIS, IR/CL responses) remain applicable and valid, and will be implemented for ELs 1159 and 1160
- Conditions outlined in the Decision Statement (CEA Agency 2019e) associated with the Flemish Pass EIS will be implemented for exploration drilling activities on ELs 1159 and 1160

In conclusion, the proposed exploration drilling activities on ELs 1159 and 1160 are not expected to result in significant adverse residual environmental effects on the environment and will not cumulatively interact with other industries in the Canada-NL Offshore Area, including other oil and gas operations, in a way that would cause significant environmental effects. Exploration drilling on ELs 1159 and 1160 has the potential to provide economic benefits to Newfoundland and Labrador, and Canada, while posing a low risk of environmental effects.

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