Tilt Cove Exploration Drilling Project: Project Description Summary

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Report

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Table of Contents

LIST OF TABLES

LIST OF FIGURES

Abbreviations

Accord Acts	*Canada-Newfoundland and Labrador Atlantic Accord Implementation Act* and the *Canada-Newfoundland and Labrador Atlantic Accord Implementation Newfoundland and Labrador Act*
ADW	Approval to Drill a Well
AGC	Atlantic Groundfish Council
ASP	Association of Seafood Producers
BOP	Blow-out Preventer
CAPP	Canadian Association of Petroleum Producers
CEAA 2012	*Canadian Environmental Assessment Act, 2012*
CEA Agency	Canadian Environmental Assessment Agency
C-NLOPB	Canada-Newfoundland and Labrador Offshore Petroleum Board
CNSOPB	Canada-Nova Scotia Offshore Petroleum Board
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
DFO	Fisheries and Oceans Canada
DND	Department of National Defence
DP	Dynamic Positioning
EA	Environmental Assessment
EBSA	Ecologically and Biologically Significant Area
ECCC	Environment and Climate Change Canada
EEM	Environmental Effects Monitoring
EEZ	Exclusive Economic Zone
EHS	Environment, Health & Safety
EIS	Environmental Impact Statement
EL	Exploration Licence
ERAF	Ecological Risk Assessment Framework
FFAW-Unifor	Fish, Food and Allied Workers
FPSO	Floating production, storage and offloading
FSC	Food, Social and Ceremonial
GBS	Gravity-based Structure
GHGs	Greenhouse Gases
ISO	International Organization for Standardization
IUCN	International Union for Conservation of Nature
km	kilometre
KMKNO	Kwilmu'kw Maw-klusuaqn Negotiation Office
m	metre
MARPOL	International Convention for the Prevention of Pollution from Ships

MCPEI	Mi'kmaq Confederacy of Prince Edward Island
MFN	Miawpukek First Nation
MMS	Mi'gmawei Mawiomi Secretariat
MODU	Mobile Offshore Drilling Unit
MTI	Mi'gmawe'l Tplu'tagnn Inc.
NAFO	Northwest Atlantic Fisheries Organization
NB	New Brunswick
NCC	NunatuKavut Community Council
NEB	National Energy Board
NL	Newfoundland and Labrador
nm	Nautical Mile
NO_X	Nitrogen Oxides
NGO	Non-governmental Organization
NRCAN	Natural Resources Canada
NS	Nova Scotia
OA	Operations Authorization
OCI	Ocean Choice International
OEMS	Operational Excellence Management System
OWTG	Offshore Waste Treatment Guidelines
PEI	Prince Edward Island
PL	Production Licence
PM	Particulate Matter
The Project	Tilt Cove Exploration Drilling Project
QC	Quebec
QMFNB	Qalipu Mi'kmaq First Nation Band
ROV	Remotely Operated Vehicle
SARA	*Canadian Species at Risk Act*
SBA	Significant Benthic Area
SBM	Synthetic-based Mud
SDL	Significant Discovery Licence
SEA	Strategic Environmental Assessment
SO_2	Sulfur Dioxide
UTM	Universal Transverse Mercator
VC	Valued Component
WBM	Water-based Mud
WNNB	Wolastoqey Nation of New Brunswick

1.0 INTRODUCTION

Suncor Energy Offshore Exploration Partnership (Suncor), on behalf of its partners Equinor Canada Ltd. and Husky Oil Operations Limited, is proposing an exploration drilling program, referred to as the Tilt Cove Exploration Drilling Project (the Project), on Exploration Licence (EL) 1161, located in the Jeanne d'Arc Basin. The Project may include drilling up to 12 wells over the term of the EL (2019 to 2028).

Offshore exploration drilling, under specific circumstances, is considered a designated physical activity under the *Canadian Environmental Assessment Act, 2012* (CEAA 2012). A Project Description was submitted to the Canadian Environmental Assessment Agency (CEA Agency) to determine whether further assessment, in the form on an Environmental Impact Statement (EIS), is required. This Project Description Summary provides an overview of the information required in the Project Description as required in the *Prescribed Information for the Description of a Designated Project Regulations* under CEAA 2012. The Project Description and this Summary, in both English and French, will be made available on the Canadian Environmental Assessment Registry website to allow for public review and comment.

1.1 Project Context and Objectives

Suncor is proposing an exploration drilling program on EL 1161, which will involve drilling up to 12 wells over the term of the EL (2019 to 2028). EL 1161, approximately 300 kilometres (km) from St. John's, NL, is 142,448 net acres (576.5 km^2) and covers water depths ranging from 61 to 87 metres (m) (Figure 1). Suncor has a 40% share in EL 1161, along with Husky Oil Operations Limited (30%), and Equinor Canada Ltd. (30%). EL 1161 is located to the west of the Terra Nova and Hebron developments and south of Hibernia. Assuming regulatory approval, the start of drilling would occur in July 2021. Subsequent wells will be considered based on the results of the first well. The objective of the drilling program is to determine the presence, nature, and volume of potential oil and gas resources within EL 1161. It is also consistent with the work expenditure commitments made by Suncor when the licence was issued.

1.2 Proponent Information

Suncor is already an active participant in the offshore oil and gas industry for Newfoundland and Labrador (NL) as the operator of the Terra Nova oil field located on the Grand Banks. Suncor also holds a 20% working interest in the Hibernia development, a 19.13% working interest in the Hibernia Southern Extension development, a 27.5% working interest in the White Rose development, an approximately 26% in the West White Rose Project, and a 21% working interest in the Hebron project. As a joint venture partner, this places Suncor in the unique position as the only company on the East Coast with interests in all current producing assets.

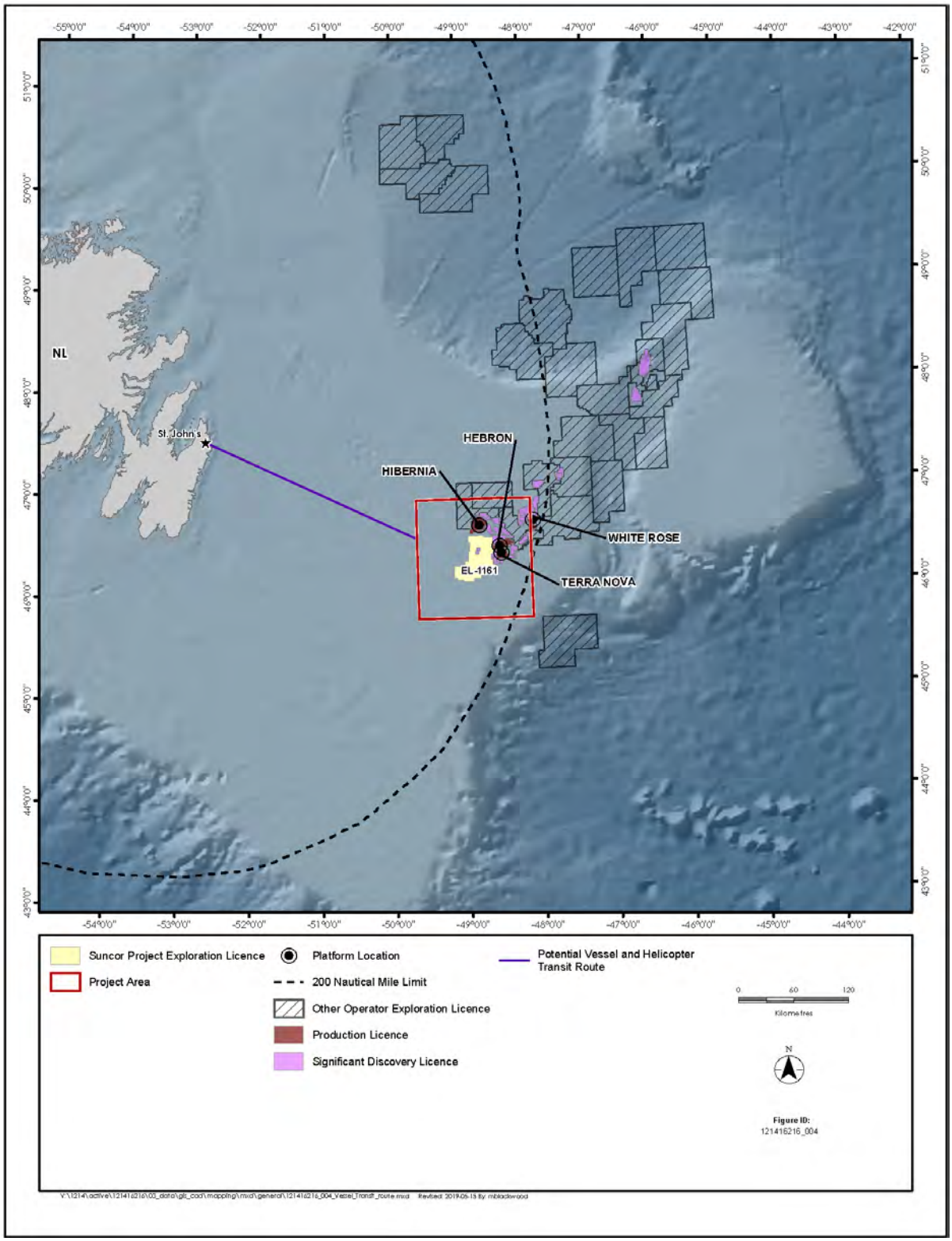

Figure 1 Project Area and Potential Transit Route

As operator of the Terra Nova development, Suncor has focused on running safe, reliable, and environmentally responsible operations. Suncor's management approach to the environment includes:

- Suncor's Strategy: The corporate mission is to be trusted stewards of valuable natural resources. A pillar of this corporate strategy is to be an industry leader in sustainable development by continued performance improvements in air emissions, water withdrawals, land reclamation and energy efficiency.
- Suncor's Policy: The Environment, Health & Safety (EHS) policy supports Suncor's mission and strategy. The EHS policy statement is: *We are committed to a culture of operational discipline which is foundational in achieving safety, environmental and health & wellness excellence*.
- Suncor uses the Operational Excellence Management System (OEMS) to identify, avoid, and mitigate operational risks and environmental impacts. This is further described in Section 2.6.

Suncor is a Canadian energy company, with its head office is located in Calgary, Alberta.

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1.2.1 Suncor's Operational Excellence Management System

The Project will be conducted in a manner consistent with Suncor's Operational Excellence Management System (OEMS), Suncor's enterprise-wide management system that organizes and links standards, systems and processes required to manage operational risks, prevent and mitigate environmental impacts and deliver safe, reliable operations. OEMS is based on the Plan-Do-Check-Act continual improvement cycle and follows the internationally recognized management system standards and specifications ISO 14001 and 9001.

The OEMS sets high-level, company-wide mandatory management system requirements with respect to the foundational non-financial risk management processes necessary for a business to achieve operational excellence. Each element the OEMS describes the company-wide requirements and expectations for managing operational and asset integrity risks inherent in the business.

1.3 Regulatory Context

1.3.1 Accord Acts

Petroleum activities in the NL offshore area are regulated by the Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB), a joint federal-provincial agency reporting to the federal and provincial Ministers of Natural Resources. In 1986, the Government of Canada and the Province of Newfoundland and Labrador signed the Canada-Newfoundland and Labrador Offshore Petroleum Resource Accord to promote social and economic benefits associated with petroleum exploitation. The federal and provincial governments established mirror legislation to implement the Accord. The federal *Canada-Newfoundland and Labrador Atlantic Accord Implementation Act* and the provincial *Canada-Newfoundland and Labrador Atlantic Accord Implementation Newfoundland and Labrador Act* are collectively referred to as the Accord Acts.

Offshore petroleum activities and the C-NLOPB's decision-making processes are governed by a variety of legislation, regulations, guidelines, and memoranda of understanding. Exploration drilling programs require an Operations Authorization (OA) under the Accord Acts. In addition, for each well in the drilling program a separate Approval to Drill a Well (ADW) is required. This authorization process involves specific details about the drilling program and well design.

There are several regulations under the Accord Acts that govern specific exploration or development activities. There are also various guidelines, some of which have been jointly developed with the Canada-Nova Scotia Offshore Petroleum Board (CNSOPB) and National Energy Board (NEB), which are intended to address environmental, health, safety, and economic aspects of offshore petroleum exploration and development activities. Of particular relevance this Project are:

- the Drilling and Production Guidelines (C-NLOPB and CNSOPB 2017)
- the Offshore Waste Treatment Guidelines (OWTG) (NEB et al. 2010)
- the Offshore Chemical Selection Guidelines for Drilling and Production Activities on Frontier Lands (NEB et al. 2009)

1.3.2 Environmental Assessment

As discussed in Section 1.1, offshore exploration drilling can be considered a designated physical activity subject to the requirements of the CEAA 2012 if it falls under the definition provided in Section 10 of the *Regulations Designating Physical Activities*:

> *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 Atlantic Accord Implementation Act or the Canada-Nova Scotia Petroleum Resources Accord Implementation Act.*

While seven wells have previously been drilled within the geographic boundaries of EL 1161 from 1973 to 2000, the current Project would represent the first drilling program in this area since being licensed to Suncor as EL 1161. As this Project would constitute a designated physical activity, this Project Description has been prepared to initiate the EA process under CEAA 2012. Once the Project Description is deemed complete, the CEA Agency will conduct a screening process and determine the requirement for an EA. Based on experience with previous exploration drilling projects, it is anticipated that an EIS will be required. The EIS is also expected to satisfy the C-NLOPB requirement for an EA as part of the OA review process under the Accord Acts. Should a federal EA process not be required under CEAA 2012, Suncor will still prepare an EA Report to satisfy C-NLOPB requirements as part of the OA review process.

1.3.3 Other Regulatory Requirements and Interests

There is no federal funding involved in this Project, but the Project would be carried out on federal lands under the jurisdiction of the C-NLOPB. CEAA 2012 defines federal lands as those lands that include the Exclusive Economic Zone (EEZ) and continental shelf of Canada. As well, as defined by the Accord Acts, the NL offshore area regulated by the C-NLOPB includes the greater of lands within Canada's 200 nautical mile (nm) EEZ or to the edge of the continental margin.

In addition to regulatory requirements pursuant to the Accords Acts and CEAA 2012, the Project is subject to various federal legislative and regulatory requirements, including:

- *Canada Shipping Act*
- *Canadian Environmental Protection Act, 1999*
- *Fisheries Act*
- *Migratory Birds Convention Act, 1994*
- *Species at Risk Act* (SARA)
- *Navigation Protection Act*

A Migratory Bird Handling Permit will likely be required from Environment and Climate Change Canada (ECCC) to permit the salvage of stranded birds on offshore vessels during the Project.

An EA under the provincial *Environmental Protection Act* is not anticipated as Suncor will not be constructing onshore facilities as part of the Project. Suncor would contract onshore supply base services from an existing base in St. John's, NL. This facility would be operated by a third-party that has the necessary permits and approvals to undertake activities related to offshore oil and gas projects. It is not anticipated that modifications or changes to the existing third-party supply base will be required for the purpose of supporting this Project. In addition, no provincial or municipal permits are currently anticipated to be required for the Project, including for the onshore supply base services.

2.0 PROJECT DESCRIPTION

As described above, Suncor is proposing to drill up to 12 wells on EL 1161 during the term of the EL (to 2028). The following sections present an overview of the proposed Project, including: the location; components and activities; emissions, discharges and wastes; schedule; potential accidental events; and associated environmental planning and management considerations. Activities associated with the Project

are offshore drilling, well testing, well abandonment (or suspension) procedures, and associated supply and service activities. Each of these activities are described in more detail in the following sections and would be similar to the activities conducted for previous exploration drilling projects in the NL offshore area. Seismic surveys (including vertical seismic profiles) have not been included in the scope of the Project as Suncor has an EA approval for geophysical and seismic programs through 2024 (30006-020-001; C-NLOPB 2015)

2.1 Project Location

EL 1161 is located in the Jeanne d'Arc Basin, west of the Terra Nova and Hebron developments and south of Hibernia (Figure 1). Figure 1 shows the Project Area, which represents an approximate 40 km buffer around the EL. This area has been defined for EA purposes, recognizing that the effects of Project activities have the potential to extend beyond the EL. It is recognized that should an EA be required, the EIS Guidelines would provide guidance on setting spatial boundaries for the EA. The EIS (if required) would also define study area boundaries that will extend beyond the Project Area based on potential environmental interactions with routine and unplanned Project activities and in recognition of potential cumulative environmental effects.

The distance from St. John's to the closest point of the Project Area is 261 km and the distance to the closest point of the EL is 301 km. The nearest community is Blackhead (258 km from the Project Area and 299 km from the EL) on the Avalon Peninsula. The nearest "residences" to the Project would be the Hebron gravity-based structure (GBS) platform 6.6 km away from the eastern boundary of the EL, the Terra Nova floating production, storage and offloading (FPSO) vessel, 7.2 km from the eastern boundary of the EL, and the Hibernia GBS, 11.2 km from the northern boundary of the EL.

Specific well sites are not yet known but drilling operations will be conducted within the defined boundaries of EL 1161.

EL 1161 coordinates from the licence agreement are provided in Table 1. Project Area coordinates are provided in Table 2.

Table 1 EL 1161 Coordinates and Area

Latitude*	Longitude*	Sections	Hectares
46°20'N	48°30'W	37-40,47-50,57-60,67-70, 77-80, 87-90, 97-100	9,991
46°20'N	48°45'W	7-10, 15-20,25-30,35-40,45-50,53-60,63-70, 73-80,83-90,93-100	24,276
46°20'N	49°00'W	3-10, 14-20, 24-30, 34-40, 45-50, 55-60	14,637
46°30'N	48°30'W	31-32,40-45,49-100	21,366
46°30'N	48°45'W	1-28,31-38,41-84,91-94	29,916
46°30'N	49°00'W	1, 11,21,31,41,51	2,139
46°40'N	48°30'W	31,41-48,51-58,61-68, 71-78, 81-88, 91-99	17,756
46°40'N	48°45'W	1-9, 13-19,23-29,31-39,41-49,51-59,61-69, 76-79	22,367
		Total	**14,2448**
*North American Datum 1927			

Table 2 Project Area Coordinates

X_UTM NAD 83, Zone 22	Y_UTM NAD 83, Zone 22	x_deg	y_deg
620946.5971	5187236.225	49° 24' 51.161" W	46° 49' 39.658" N
705019.3721	5189686.068	48° 18' 42.408" W	46° 49' 44.896" N
623478.9907	5097410.568	49° 24' 17.183" W	46° 1' 8.885" N
708196.7254	5099733.539	48° 18' 36.946" W	46° 1' 10.255" N

2.2 Project Components and Activities

The following components and activities are included within the scope of the Project being proposed:

- Drilling
- Well evaluation and testing
- Well abandonment
- Supply and servicing

Suncor's existing approval under the C-NLOPB following the EA of their Eastern Newfoundland Offshore Area 2D / 3D / 4D Seismic Program 2014-2024 (LGL Limited December 2013), and the Environmental Assessment of Suncor Energy's Eastern Newfoundland Offshore Area 2D / 3D / 4D Seismic Program 2014-2024 Addendum (LGL Limited August 2015) will be used for authorization applications for 2D / 3D / 4D Marine Seismic, Wellsite / Geohazard Surveys, and vertical seismic profiling activities, as the approved area encompasses EL 1161.

In addition, once a specific wellsite has been determined, a survey of the wellsite location will be conducted prior to drilling to inspect the seabed for sensitive habitat (e.g., habitat-forming corals). This is generally conducted by a remotely operated vehicle (ROV). This survey is distinct from the geohazard survey noted above and is included in the EA as part of the Project scope.

2.2.1 Drilling

The wells associated with this Project may be drilled using either a semi-submersible rig or a jackup rig, referred to generically as a mobile offshore drilling unit (MODU). It is considered highly unlikely that a drillship would be used, as this MODU is typically used in deep waters (either on anchor or using dynamic positioning (DP) systems at greater depths) or in areas where increased mobility is required due to ice or other factors and operational risks. Therefore, use of drillships is not considered part of the scope of the Project.

A semi-submersible rig (Figure 2) is typically used at moderate depths, such as on the Grand Banks. It is comprised of two longitudinal lower hulls that support several vertical cylinders or columns, which in turn support the main deck of the rig. The hulls and columns are filled with water so that the rig floats, with the main deck sitting above water and the hulls below the surface. Because much of the mass is well below the waterline, semi-submersibles are quite stable in rough seas, thereby providing a relatively stable drilling platform. The rig is generally anchored in place, although some can also stay in position through a DP system.

Source: Amec 2014

Figure 2 Typical Semi-submersible Drilling Unit

A jackup rig (Figure 3) is designed so that the legs can be stationed on the ocean floor and the drilling equipment is jacked up above the water's surface. It therefore provides a stable drilling platform and can be used in waters up to approximately 100 m deep. When their legs are not deployed, jackup rigs float and are generally transported into position through the use of tug boats or submersible barges.

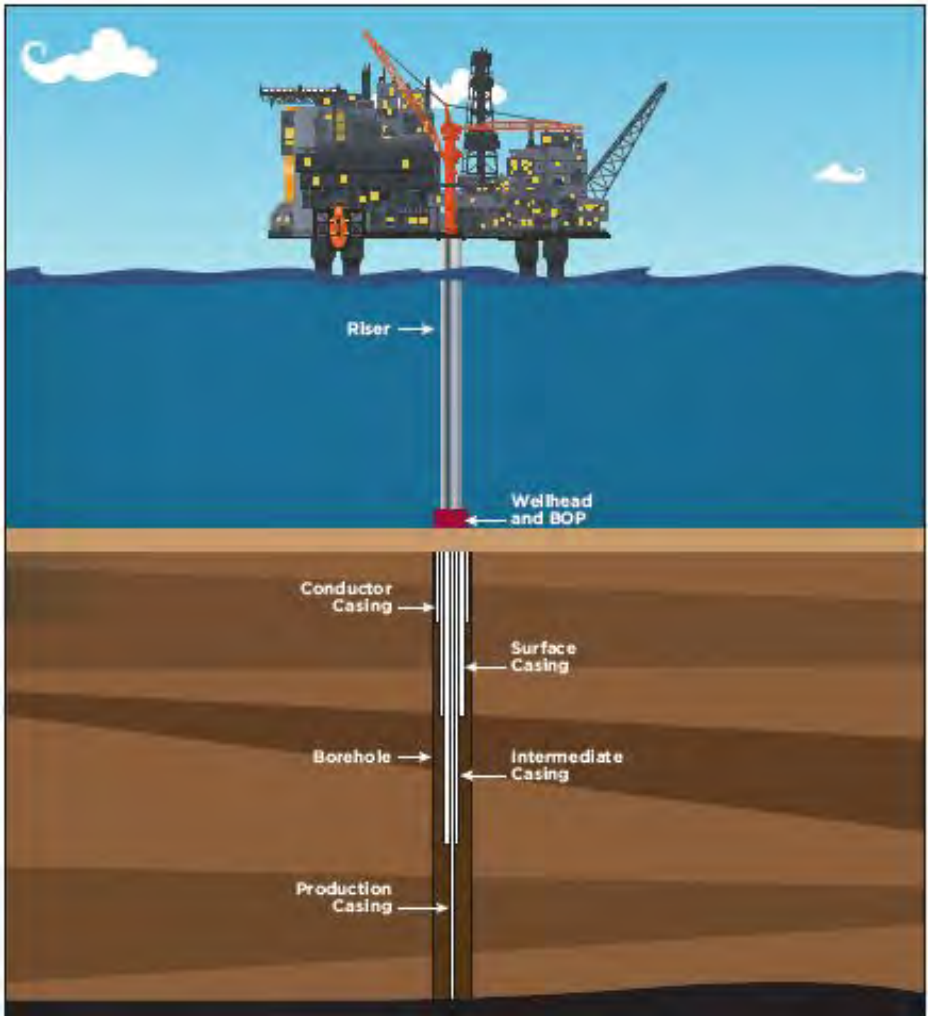
The final selection of a rig will be dependent on rig availability and other factors. Once a rig is selected, rig intake activities will include a rigorous inspection and certification before an OA will be issued by the C-NLOPB.

Source: Amec 2014

Figure 3 Typical Jackup Drilling Unit

Exploration wells would be designed for normally pressured reservoirs in the Jeanne d'Arc Formation similar to the adjacent Terra Nova field. Wellbore construction will typically begin with the spud of the well into the seabed and running and setting conductor and surface casing followed by cementing (Figure 4). The conductor hole is drilled first, usually to several hundred metres (m) below the seafloor, followed by the surface hole section. When drilling each of these sections, the hole is drilled, the drill string is pulled out and a steel casing is inserted and cemented in place to prevent the wall of the hole from caving in and to prevent the seepage of mud and other fluids while drilling subsequent sections. The conductor casing provides a foundation for subsequent casing strings while the surface casing provides formation integrity to facilitate well control while drilling the next hole.

During this initial process, drilling is typically done with a water-based mud system (WBM), where drill cuttings, drilling mud, and cement returns from casing cementing will be circulated to the seabed surrounding the wellhead. More information on the management of drilling waste is provided in Section 2.3.3. An unplanned or planned side-track (i.e., drilling perpendicular from an original wellbore) may be drilled to meet the Project objectives.



Source: CAPP 2017
NOTE: For general illustration only, Drilling unit and well components not to scale

Figure 4 Schematic of a Floating Rig While Drilling in a Closed Loop Circulating System

After cementing the surface casing, the blow-out preventer (BOP) is installed. The BOP is a piece of safety equipment which prevents hydrocarbons from escaping the wellbore into the environment. To install the BOP, it is put in place around the marine riser, which extends from the drill rig to the seabed (Figure 4) and lowered to the seabed where it is latched onto the wellhead (Figure 4). The riser is the main conduit for remaining drilling activities at depth. Drilling will then resume in a closed loop drilling mud circulation system. The mud is pumped down the drilling string where it is used to cool and lubricate the bit and to transport cuttings and formation gas back to the rig for geological evaluation. The mud is then processed on the drilling rig and then recirculated back into the well. Drilling parameters including mud volumes will be closely monitored.

As described earlier, Suncor is proposing to drill up to 12 wells over the life of their licence. It is anticipated that it will take up to 120 days to drill a well. During drilling, a safety zone would be established surrounding the rig, as per C-NLOPB regulations. Notice to Mariners would be issued in advance, and Suncor would communicate with commercial fishing representatives with respect to planned dates and locations of rig movements and drilling activities.

2.2.2 Well Evaluation and Testing

If hydrocarbons are discovered during an exploration drilling program, well evaluation and testing would be conducted to help determine the commercial potential of the reservoir. Well evaluation and testing includes wireline logging and formation (well flow) testing, which involves flowing the well fluids through the MODU's test equipment. Well flow testing requires flaring to safely dispose of gases or other hydrocarbons that come to surface. Well flow testing would be conducted over a one-month period (after drilling is complete) on every third well, depending upon the hydrocarbons discovered. Flaring associated with well testing would occur over a 36-hour period.

Well flow testing may be delayed due to rig schedule, anticipated sea states, and weather conditions and occur at a later date. In the event of a delayed well flow test, Suncor will secure and suspend the well with required barriers in place prior to moving the drilling rig off location. Well testing will be subject to Suncor's well test assurance process, which is designed to promote safe and efficient well test operations.

2.2.3 Well Abandonment

Upon acceptable evaluation of the well for hydrocarbons and upon C-NLOPB approval, the well will be suspended or permanently abandoned. An abandonment program will be executed using a configuration of cement and permanent mechanical bridge plugs, placed at strategic depths in the wellbore to separate and permanently seal off zones of varying ages and pressures. This process isolates these zones from each other and prevents subsurface fluids from escaping from the wellbore in the future.

As a minimum, the requirements of Part 6 of the *Newfoundland Offshore Petroleum Drilling and Production Regulations*, related to well termination will be met, along with relevant requirements of the *Drilling and Production Guidelines*. This includes the requirements to suspend or abandon a well in a way so that it can be easily located and left in a condition that isolates hydrocarbon bearing zones and discrete pressure zones, and prevents formation fluid from flowing through or escaping from the well-bore. If the well is suspended, Suncor will monitor and inspect the well to maintain its continued integrity and to prevent pollution until it's properly abandoned.

As part of well abandonment, there is a requirement for operators to clear the seafloor of material or equipment that might interfere with other commercial uses of the seabed. During this last stage of the abandonment process, the wellhead will be removed from the seabed depending on consultation with regulators. If determined that the wellhead needs to be removed, the preferred method is a mechanical cutter that can cut the wellhead below the seabed and then be retrieved to surface.

2.2.4 Supply and Servicing

Supply vessels and helicopters are used to transport personnel, equipment, and materials to and from the MODU during an offshore drilling initiative according to work schedules and rotations, workforce numbers, distances, and other factors. Supply vessels typically make regular trips to the drilling unit throughout a drilling program, and a dedicated stand-by vessel will attend to the rig.

As with all offshore projects in this region, logistics and service requirements for a drilling rig can be challenging especially during seasons of heavy weather, fog, Arctic ice, and sea states. Helicopter and vessel support for the Project would originate in St. John's, from third-party suppliers operating from existing licenced / permitted facilities. While the rig is on location, a dedicated stand-by vessel will be stationed near the rig for emergencies and for secondary storage of well tubulars and drilling mud if required. A second vessel will be servicing the rig by transporting equipment and people (in the event helicopters cannot fly) to and from the rig. It is anticipated that two to three sailings per week will be required, but more is possible if a rig crew change is required. Similar to the drilling rig, supply vessels will need certification and approval in order to work in Newfoundland waters. Vessel and helicopter support from St. John's would be the safest, most efficient route available at the time. The oil and gas industry has established communication and cooperation methods with other marine users, primarily commercial fisheries, to coordinate vessel traffic.

2.3 Emissions, Discharges, and Waste Management

Emissions, discharges, and wastes will be managed and disposed of according to regulatory requirements and applicable guidelines, with efforts being made to reduce emissions and discharges generated during the Project. The following subsections provide a description of atmospheric emissions, underwater sound, drilling waste, liquid discharges, and hazardous and non-hazardous solid wastes that are likely to be generated over the course of Project activities and how these wastes will be managed. In general, offshore waste discharges will be managed in compliance with the International Convention for the Prevention of Pollution from Ships (MARPOL) and/or the OWTG, as applicable. Wastes brought to shore for disposal will be managed in accordance with the provincial government's *Newfoundland and Labrador Waste Management Strategy* and other applicable regulatory requirements (including municipal by-laws). A Waste Management Plan will be prepared by Suncor as part of the OA application process with the C-NLOPB prior to drilling operations.

2.3.1 Atmospheric Emissions

During Project activities, atmospheric emissions would be created by the combustion of marine fuel by the MODU and supply vessels, and by short-term flaring during well testing, if testing is performed. Emissions would include carbon monoxide (CO), carbon dioxide (CO_2), sulphur dioxide (SO_2), nitrogen oxides (NOx), and particulate matter (PM). Suncor will comply with the provincial *Air Pollution Control Regulations*, Ambient Air Quality Objectives under the *Canadian Environmental Protection Act*, regulations under MARPOL, and the intent of the Global Gas Flaring Reduction Partnership (which seeks to increase the use of associated natural gas and thus reduce flaring and venting).

With respect to greenhouse gas (GHG) emissions, it is estimated that there could be approximately 497 tonnes of carbon dioxide equivalent (CO_2e) emissions associated with operational drilling and vessel traffic per day over the program. Project GHG emissions are estimated to be 59,593 t CO_2e per year. These estimates are based on a maximum of 12 wells being drilled with up to 1,412 days of drilling over the program. These emissions represent 0.6% of the total reported provincial GHG emissions for 2016 (10,800,000 tonnes CO_2e) and 0.01% of the national emissions (704,000,000 tones CO_2e) (ECCC 2017). If well flow testing is conducted, flaring will result in additional GHG emissions. Assuming 4 well flow testing events over the life of the Project, it is estimated that an additional 122,742 tonnes of CO_2e could be emitted.

Suncor Energy (2018a) has a corporate GHG emission goal of reducing their emission intensity of the production of oil and petroleum products by 30% (based on 2014 emissions) by 2030 from harnessing changes in technology and making improvements by innovation. To achieve this goal, Suncor is annually investing approximately $200 million to support research and technology development (Suncor Energy 2018b). While the corporate reduction goal is 30%, each of Suncor's diverse operating assets assesses and develops asset specific reduction strategies (e.g., 5%, 25%) in support of the overall company GHG emission goal.

Navigation and deck lighting from the MODU and supply vessels will create artificial light emissions. While Suncor can strive to reduce these emissions, they would only be reduced to the extent that worker and vessel safety are not compromised. In the event of flaring during well testing, there will be temporary (e.g., up to two or three days) light and thermal emissions associated with the flare. These emissions will be reduced through use of a water curtain.

The MODU, supply vessels, and helicopter traffic will generate noise; however, given the distance of the MODU offshore, the potential for interaction with human receptors would be limited. Supply vessels and helicopters will also operate out of existing port and airport facilities, generating sound comparable to existing traffic. Underwater sound is discussed in Section 2.3.2.

2.3.2 Underwater Sound

Underwater sound would be generated continuously by the MODU during a drilling program, with levels dependent on the type of drilling vessel (e.g., semi-submersible versus jackup rig) and method of positioning on station (e.g., use of thrusters for DP versus anchoring). Underwater sound would also be generated by supply vessels. In general, the propagation of underwater sound would be dependent on several factors including water column and seabed characteristics, and the EIS (should it be required) may require underwater sound modelling for Project activities.

2.3.3 Drilling Waste

Drilling muds are an essential component of drilling operations. Drilling muds are the fluids which lubricate and cool the drill bit and hole, circulate cuttings and carry them back to the surface, and help to maintain appropriate hydrostatic pressure in the well to overbalance formation pressure, providing the primary barrier for well control (BOP forms part of the secondary barrier). Different types of drilling muds will be used for different sections of the well.

WBMs will be used for the riserless sections of a well. WBMs are primarily composed of seawater, with other additives including bentonite (clay), barite, and potassium chloride. Other approved chemicals are also added as required to achieve and control the required mud properties. During this initial drilling, mud and cuttings will be returned to the seabed where they will accumulate near the wellhead. The discharge of WBM cuttings at the seabed, while drilling the first two-hole sections, is accepted as industry standard practice and is consistent with the OWTG. Spent and excess WBM may be discharged from the drilling vessel without treatment as per the OWTG.

Synthetic-based drilling muds (SBMs) are generally used to drill the deeper (lower hole) sections of the wells, once the riser has been installed. The marine riser, connecting the MODU to the well, allows for the return of drilling mud and cuttings back to the MODU, where cuttings can be treated to meet the requirements of the OWTG prior to disposal to the seabed. Specifically, the drilled cuttings and drilling mud are separated and cleaned using solids control equipment. Initially, the mud returns carrying the drilled cuttings pass through a shale shaker, where most of the mud is separated from the cuttings. Where SBM are used, cuttings from the shale shaker pass through a cuttings dryer, which removes SBM from cuttings. Residual synthetics-on-cuttings discharged to the marine environment is treated in accordance with the OWTG prior to discharge. Monitoring of the residual base mud-on-cuttings levels is carried out during well sections involving use of SBM. After recovery and treatment of drill muds, the drill cuttings are discharged from the drilling vessel at the well site. No surplus SBM is discharged to the sea; spent SBM that cannot be reused during drilling is brought to shore for disposal in an approved licensed facility.

Drilling cement is pumped into the casing / wellbore annuli after the casing is installed. Prior to installation of the marine riser and BOP, excess cement is discharged on the seabed surrounding the wellhead. Cement returned to the drilling unit will be transported back to shore and disposed of at an appropriate facility. During commissioning and testing of a cement unit, small volumes of cement may be discharged into the sea.

2.3.4 Liquid Discharges

Liquid wastes generated from the MODU and/or the supply vessels may include:

- Produced water (if well testing is conducted)
- Bilge and deck drainage water
- Ballast water
- Grey / black water (sewage)
- Cooling water
- Well treatment fluids
- Fire control testing water
- BOP fluid

The OWTG specifies allowable chemical properties for offshore disposal to the marine environment and associated reporting requirements, including in some cases, required sampling and analysis prior to ocean discharge. Where discharges occur offshore, the points of discharge will be below the water surface. Liquid discharges that do not meet OWTG performance targets for ocean disposal are transported back to shore for disposal at an approved licensed disposal facility.

2.3.5 Hazardous and Non-Hazardous Solid Wastes

Hazardous and non-hazardous solid wastes will also be generated by Project activities. Nonhazardous wastes may include domestic waste, scrap metal, recyclables, and other miscellaneous non-hazardous wastes. Hazardous wastes (including waste dangerous goods) could include oily waste (filters, rags, waste oil), waste chemicals and containers, batteries, and biomedical waste. Food wastes and domestic sewage will be macerated in accordance with the OWTG and MARPOL prior to discharge at sea (below the water surface). Other solid waste generated offshore will be transported to shore for appropriate treatment and/or disposal in accordance with applicable regulations and municipal by-laws.

Suncor will retain a third-party licensed waste management contractor to manage and dispose of wastes transported onshore. Hazardous wastes will be stored in dedicated and appropriate waste receptacles and then disposed of at approved facilities in compliance with applicable regulations and approvals.

2.4 Project Schedule

Suncor proposes to commence exploration drilling with an initial well in July 2021 with subsequent wells if the exploration well is successful. Up to 12 wells could be drilled over the term of the EL (2019 to 2028), contingent on the drilling results of the initial well. Drilling activities will not be continuous and will be in part determined by rig availability and previous wells' results. The length of drilling activities may be up to 120 days for each well, with the potential to occur year round.

Well abandonment will likely be conducted following drilling and/or well flow testing. Wells may be designed for suspension and re-entry, but this will be determined through further prospect evaluation.

2.5 Potential Accidental Events

Potential accidental events that could occur during exploration drilling and potentially result in a release to the environment, include vessel collision, dropped objects, loss of well control (e.g., blowout), and spills and releases from MODU or supply vessels. Multiple preventative and response barriers are put in place to manage risk, both in terms of the incident arising in the first place, and to mitigate and respond to incidents to manage potential consequences. Suncor has an Oil Spill Response Plan (TN-IM-EV03-X00-004, M9) filed with the C-NLOPB; this document is reviewed every three years to incorporate new response technologies that may become available (e.g., use of dispersants). The Oil Spill Response Plan outlines Suncor's objectives and approach, response strategy, the three tiers of response management, response countermeasures, waste storage and disposal, training and exercises, and regulatory considerations. This Plan would be reviewed and updated as needed to address activities associated with the proposed Project.

Suncor will use predictive spill modelling to help assess the risk of adverse environmental effects that might occur as a result of potential accidental events associated with the Project. Oil spill modelling will include water depth and metocean conditions within the proposed drilling area, which would affect the behaviour of a subsea spill scenario. Modelling is conducted as an unmitigated accident (i.e., no spill response measures are applied for the duration of the spill). Residual effects of an accidental event spill are assessed after the application of mitigation measures.

Results of recent oil spill modelling originating from within the adjacent Terra Nova field, is consistent with other spill model results originating from within the Jeanne d'Arc Basin, in that the model predicted spilled oil would be swept by currents and wind primarily from the east to the south until it gradually dispersed, diffused or evaporated. Based on recent spill modelling conducted for various exploration drilling projects in the area, similar effect assessments will be conducted. The EIS (if required under CEAA 2012) will also provide an overview of Suncor's overall oil spill preparedness and response capability which will include a range of specific response measures such as offshore containment and recovery, chemical dispersant use, in situ burning, shoreline protection and oiled wildlife response.

3.0 ENVIRONMENTAL SETTING

3.1 Physical Environment

The Project is located in the Jeanne d'Arc Basin, in the offshore region of the Newfoundland continental margin and comprises primarily Mesozoic rocks, with water depths ranging from 61 m to 87 m. This area formed during the latest Wilson cycle, which was initiated during the Late Triassic and involved tectonic activities resulting in the breakup of Pangea and opening of the Atlantic Ocean. These episodes of rifting and seafloor spreading heated the continental crust and lithosphere and then subsided to form a complex set of marginal Mesozoic basins, subbasins, troughs, and sediment ridges. The extensional system is bounded in the north by the Dover Fault and Charlie Gibbs Transform Fault and in the south by the Newfoundland-Gibraltar Transform (Enachescu 2011, in Amec 2014). The resulting combination of stratigraphy, structure, and timing has been conducive to hydrocarbon generation and entrapment (Bell and Campbell 1990, in AMEC 2014).

The Eastern Canadian continental shelf has been strongly influenced by Quaternary glaciation, which resulted in an erosional morphology. Most of the glacial deposits on the shelf are recessional, with till sheets overlain by proglacial silts (Piper 1991). The main seabed formation in the vicinity of the Project is Grand Banks Sand and Gravel. Grand Banks Sand and Gravel is the youngest of the formations in the eastern NL offshore. It is a basal transgressive deposit. It was formed by coastal and shallow water processes during the last shoreline transgression, and occurs typically at water depths shallower than 100 m. This formation is a clean, free-draining, well-sorted material ranging from uniform fine sand to gravel-sized components (Amec 2014).

Eastern Canada is located within a relatively stable area of the North American Plate, where there has been a relatively low level of recorded seismic activity. Natural Resources Canada (NRCAN) reviews earthquake probability across Canada and have classified the Jeanne d'Arc Basin as having a low to moderate seismic hazard (NRCAN 2013).

The Project Area experiences weather conditions typical of a marine climate with good or fair visibility. Annually, prevailing winds are southwesterly and westerly. Gale force winds (17.5 to 24.2 m/s) occur in all months of the year, and storm force winds (24.7 to 32.4 m/s) occur in all months except May through July (Amec 2014). The surrounding waters have a moderating effect on temperature and air temperatures are coolest in February and warmest in July. Most precipitation is in the form of rain and snow, with some mixed

rain and snow, freezing rain, hail. Most rain occurs in October and November, with peak snow fall in January and February. There is potential for thunderstorms year-round, with highest frequency of occurrence in July and August (Amec 2014).

The existing ambient air quality within the Project Area can be generally categorized as good, with occasional exposure to exhaust products from existing offshore oil production facilities (i.e., Terra Nova, Hebron, Hibernia, and White Rose), supply ships, and other vessels in the area. This region also receives long-range air contaminants from the industrial mid-west and northeastern seaboard of the United States (ExxonMobil Properties Canada 2011).

The most severe sea states on the Grand Banks occur between December and February, peaking in February when maximum significant wave heights of up to 13.3 m from the southwest are expected. Lowest significant wave heights occur in July (6.0 m). Significant wave heights of 6 m or more are expected to occur during every month (Amec 2014). Sea surface temperatures generally average about 0°C in February to 14°C in September (Amec 2014).

Circulation in the vicinity of the Project is dominated the Labrador Current and the North Atlantic Current. The main current in region is the Labrador Current, which consists of two streams; an inshore branch which transports sub-polar water to lower latitudes along the Continental Shelf of Eastern Canada and an offshore branch that flows along the outer edge of the Grand Banks (Amec 2014).

3.2 Biological Environment

The Grand Banks are home to a highly productive ecosystem which contains a variety of fish, marine mammal, sea turtle, and marine bird species which may occur in the Project Area. This includes more than 40 species of conservation interest (i.e., listed by SARA of assessed by Committee on the Status of Endangered Wildlife in Canada (COSEWIC)) with potential to occur in the Project Area (Table 3).

Table 3 Current Listings of SARA and COSEWIC Listed Species Relevant to the Project

Common Name	Scientific Name	SARA Status	COSEWIC Status	IUCN Status
Marine Fish				
Northern wolffish[1]	*Anarhichas denticulatus*	T	T	--
Spotted wolffish[1]	*Anarhichas minor*	T	T	--
Atlantic wolffish[1]	*Anarhichas lupus*	SC	SC	--
Atlantic cod (NL population)	*Gadus morhua*	--	E	V (global pop)
Porbeagle shark (Atlantic population)	*Lamna nasus*	--	E	V (global pop)
White shark (Atlantic population)	*Carcharodon carcharias*	E	E	V (global pop)
Roundnose Grenadier	*Coryphaenoides rupestris*	--	E	CE (global pop)
Cusk	*Brosme brosme*	--	E	--

Table 3 Current Listings of SARA and COSEWIC Listed Species Relevant to the Project

Common Name	Scientific Name	SARA Status	COSEWIC Status	IUCN Status
Shortfin mako shark	*Isurus oxyrinchus*	--	SC	V (global pop)
American eel	*Anguilla rostrata*	--	T	E (global pop)
White hake (Atlantic and Northern Gulf of St. Lawrence population)	*Urophycis tenuis*	--	T	--
Thorny skate	*Amblyraja radiata*	--	T	V (global pop)
Roughhead grenadier	*Macrourus bersgla*	--	SC	--
Atlantic bluefin tuna	*Thunnus thynnus*	--	E	E (global pop)
American plaice (NL Population)	*Hippoglossoides platessoides*	--	T	--
Winter skate (Eastern Scotian Shelf - Newfoundland population)	*Leucoraja ocellata*	--	E	E (global pop)
Acadian redfish (Atlantic population)	*Sebastes fasciatus*	--	T	E (global pop)
Deepwater redfish (Northern population)	*Sebastes mentella*	--	T	LC (global pop)
Atlantic salmon (South Newfoundland; Quebec Eastern Shore; Quebec Western Shore; Anticosti Island; Inner St. Lawrence; Gaspe-Southern Gulf of St. Lawrence; Eastern Cape Breton; Nova Scotia Southern Upland; Outer Bay of Fundy; Inner Bay of Fundy populations)	*Salmo salar*	E (Inner Bay of Fundy population)	E (Inner Bay of Fundy, Anticosti Island, Eastern Cape Breton, Nova Scotia Southern Upland, Outer Bay of Fundy populations); T (South Newfoundland population); SC (Quebec Eastern Shore, Quebec Western Shore, Inner St. Lawrence, Gaspe-Southern Gulf of St. Lawrence populations)	LC (global pop)
Spiny dogfish (Atlantic population)	*Squalus acanthias*	--	SC	V (global pop)

Table 3 Current Listings of SARA and COSEWIC Listed Species Relevant to the Project

Common Name	Scientific Name	SARA Status	COSEWIC Status	IUCN Status
Basking shark (Atlantic population)	*Cetorihinus maximus*	--	SC	V (global pop)
Smooth skate (Funk Island Deep population)	*Malacoraja senta*	--	E	E (global pop)
Smooth skate (Laurentian-Scotian population)	*Malacoraja senta*	--	SC	
Marine Mammals				
Blue whale (Atlantic population)[2]	*Balaenoptera musculus*	E	E	
North Atlantic right whale[3]	*Eubalaena glacialis*	E	E	
Fin whale (Atlantic population)[4]	*Balaenoptera physalus*	SC	T	
Killer whale (NW Atlantic and Eastern \ Arctic population)	*Orcinus orca*	--	T	
Sowerby's beaked whale[5]	*Mesoplodon bidens*	SC	SC	
Northern bottlenose whale (Davis Strait / Baffin Bay / Labrador Sea and Davis and Scotian Shelf[6] populations)	*Hyperoodon ampullatus*	E (Scotian Shelf population)	E (Scotian Shelf population) SC	
Harbour porpoise (Northwest Atlantic subspecies)	*Phocoena phocoena*	--	SC	
Beluga whale (St. Lawrence Estuary population)	*Delphinapterus leucas*	T	T	
Sea Turtles				
Leatherback sea turtle[7]	*Dermochelys coriacea*	E	E	
Loggerhead sea turtle (Atlantic Population)	*Caretta caretta*	E	E	
Marine Birds				
Ivory gull[8]	*Pagophila eburnean*	E	E	
Red-necked phalarope	*Phalaropus lobatus*	--	SC	
Harlequin duck (Eastern population)[9]	*Histrionicus histrionicus*	SC	SC	
Barrow's goldeneye (Eastern population)[10]	*Bucephala islandica*	SC	SC	
Piping plover (*melodus* subspecies)[11]	*Charadrius melodus melodus*	E	E	
Red knot (*rufa* subspecies)	*Calidris canutus rufa*	E	E	
Short-eared owl	*Asio flammeus*	--	SC	
Peregrine falcon[12]	*Falco perigrinus anatum / tundrius*	SC		

Table 3 Current Listings of SARA and COSEWIC Listed Species Relevant to the Project

Common Name	Scientific Name	SARA Status	COSEWIC Status	IUCN Status
Buff-breasted sandpiper	*Tryngites subruficollis*	--	SC	
Bank swallow	*Riparia riparia*	--	T	
Olive-sided flycatcher	*Contopus cooperi*	--	T	
Bobolink	*Dolichonyx oryzivorus*	--	T	

IUCN = International Union for Conservation of Nature; E = Endangered; T = Threatened; SC = Special Concern; V = Vulnerable; CE = Critically Endangered; LC = Least Concern; -- = no status

Recovery Strategy / Management Plan / Action Plan:

[1] DFO 2018a; [2] DFO 2018b; [3] DFO 2016; [4] DFO 2017a; [5] DFO 2017b; [6] DFO 2017c; [7] DFO 2018c; [8] Environment Canada 2014; [9] Environment Canada 2007; [10] Environment Canada 2013; [11] Environment Canada 2012; [12] ECCC 2017b

A variety of fish species occur in offshore Newfoundland. Commercially important fish species that exist in the vicinity of the Project include yellowtail and witch flounder, roughhead and roundnose grenadier, Atlantic and Greenland halibut, skate, capelin, and mackerel (Amec 2014; Suncor Energy 2010). While American plaice and Atlantic cod were historically abundant, they are currently under moratoria, as are redfish (in 3LN) and witch flounder (in 3NO). Non-commercial species commonly found in the region include sand lance, Arctic cod, sculpin, and alligatorfish (Husky Energy 2012). By-catch recorded during Environmental Effects Monitoring (EEM) programs conducted from Fisheries and Oceans Canada (DFO) research vessels (2002-2008) recorded snow crab, shrimp, Atlantic cod, Arctic cod, capelin, American plaice, yellowtail flounder, witch flounder, squid, Iceland scallop, sand lance, thorny skate, sea star, sculpin, snakeblenny, toad crab, alligatorfish, seasnails, sea urchin, sand dollar, eelpouts, radiated shanny, and spiny lumpfish (Suncor Energy 2010).

The benthic species in the vicinity of the Project include various species of polychaete worms (the dominant in faunal or infauna group of organisms (DeBlois et al. 2014), amphipods, echinoderms, cumaceans, and clams (Suncor Energy 2010; DeBlois et al. 2014); the same species have been found in the Hebron field (Stantec 2016). Corals are limited in the vicinity of the Project due the predominantly sandy substrate (Deblois et al. 2014).

Suncor has conducted EEM programs since production began at the Terra Nova field in 2000. Nine collection and reporting cycles have been conducted from 2000 to 2014 (the report on the 2017 cycle is not yet public). The EEM program includes a sediment and water component. Key findings include:

- the dispersion of drill cuttings in the Project Area was consistent with model estimates (Seaconsult 1998) (i.e., fines content decreases with distance from drill centres) (DeBlois et al. 2014)
- sediment contamination decreased in direct response of reduced drilling (DeBlois et al. 2014)
- sediment quality triad results (contamination, toxicity and benthic biota effects) indicated reduced sediment quality at one station less than 150 m from a drill centre in some sampling years

- effects on some benthic invertebrate biota (abundance, biomass, richness, diversity, toxicity to laboratory amphipod cultures) were detectable 1 to 2 km from drill centres in some sampling years but such effects were weak or absent beyond less than 150 m from drill centres (Paine et al. 2014)

The Grand Banks provide important habitat for millions of marine birds, representing over 60 species (Husky Energy 2012). Species observed in the vicinity of the Project include gannets, phalaropes, gulls, petrels, alcids, and shearwaters (Amec 2014). Many of the pelagic seabirds are resident in the region year-round (such as northern fulmar and black-legged kittiwakes (ExxonMobil Canada Properties 2011)), with their numbers supplemented by the many migratory birds that use the area to forage and breed in summer. For example, most of the world's population of greater shearwater migrate to moult and feed during summer months and Leach's storm-petrel migrate from coastal colonies (ExxonMobil Canada Properties 2011). July to September represents the peak seabird density, large numbers of which occur on the shelf edges (Lock et al. 1994, in LGL Limited 2008). Migration south for the winter reduces the densities of seabirds during the fall and winter (Fifield et al. 2009, in Amec 2014), although hundreds of thousands of birds do use the Grand Banks during winter (ExxonMobil Canada Properties 2011).

Approximately 20 species of marine mammals (including whales, dolphins, porpoises, and seals) are known to occur in the vicinity of the Project. Species observed during seismic surveys conducted in the Jeanne d'Arc Basin include humpback whale, sei whale, fin whale, minke whale, long-finned pilot whale, common dolphin, Atlantic white-sided dolphin, white-beaked dolphin, harp seal (ExxonMobil Canada Properties 2011). Many marine mammal species feed in the area on a seasonal basis, with highest numbers occurring in the summer and fall (Husky Energy 2012), although some species such as minke and humpbacks whales may occur year-round. Harp and hooded seals that use ice as an overwintering and whelping area may occur within the Regional Area during years with heavy pack ice conditions (DFO 2000, in Amec 2014).

Several marine and coastal areas off Newfoundland and Labrador have been designated as protected under provincial, federal, international and/or other legislation and processes, or have been formally identified through relevant forums and processes as being otherwise special or sensitive due to their ecological, historical and/or socio-cultural characteristics and importance. These areas are shown in Figure 5.

The Project Area overlaps with two special marine areas: Snow Crab Conservation Exclusion Zone for Crab Fishing Area 8BX and a significant benthic area (SBA) for large and small gorgonian corals. Closed areas in the snow crab fishery have been established through consultation using a co-management approach with fleet committees in various crab management areas throughout the region (DFO 2019). SBAs are defined in DFO's Ecological Risk Assessment Framework (ERAF; DFO 2013) as "significant areas of cold-water corals and sponge dominated communities", where significance is determined "through guidance provided by DFO-lead processes based on current knowledge of such species, communities and ecosystems" (Kenchington et al. 2016). SBAs are not formally protected under any federal legislation but are a key variable in determining vulnerable marine ecosystems, which may be designated in the future.

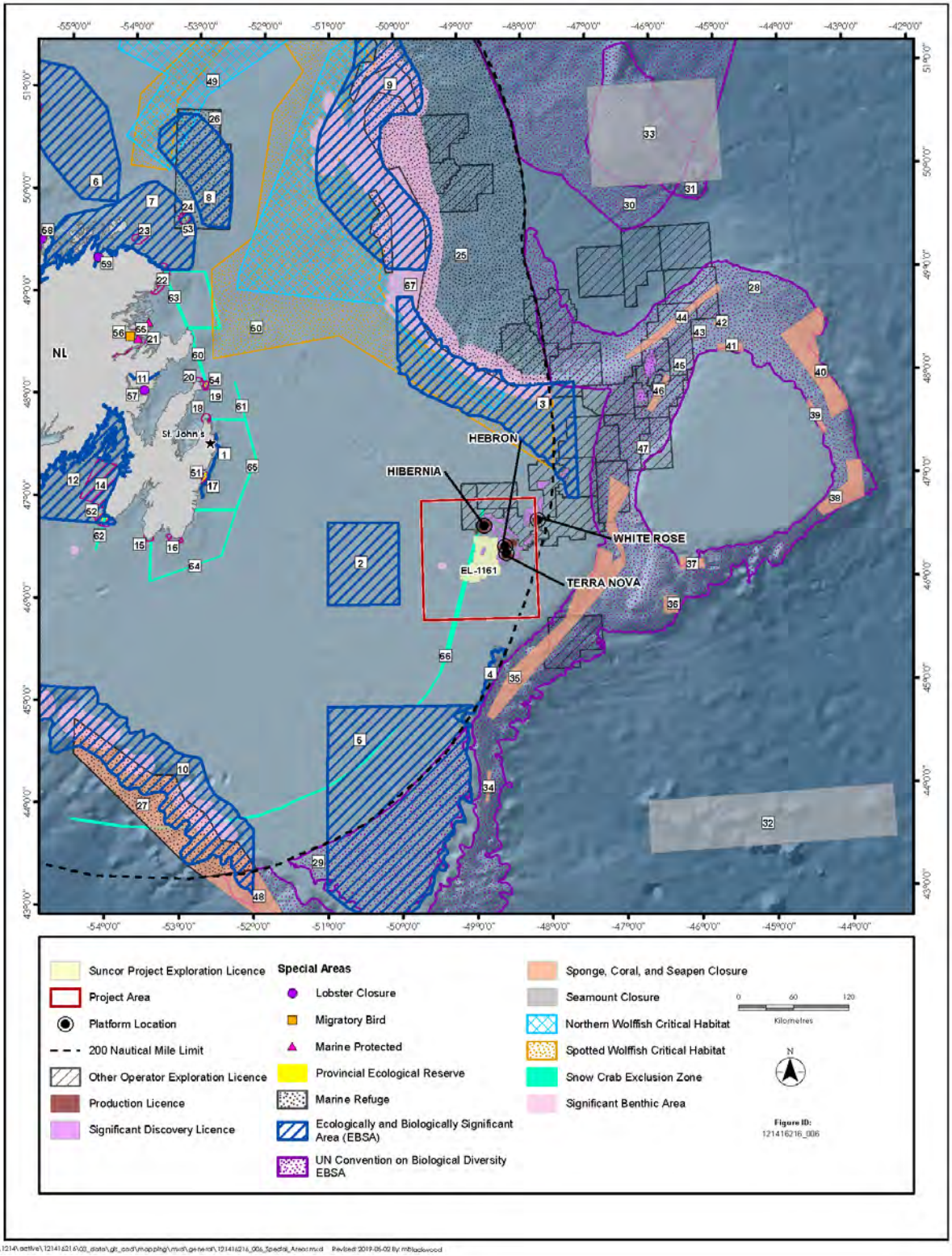


Figure 5 Special Areas in the Eastern Newfoundland Offshore Area

The potential transit route to the shorebase in St. John's (see Figure 1) has the potential to cross the Virgin Rocks and Eastern Avalon EBSAs (Ecologically and Biologically Significant Area). The current boundary of the EBSAs as presented on Figure 5 are outdated; however, DFO has not yet publicly released updated areas for 2019. Based on discussion with DFO, the geographic extent of the Virgin Rocks and Eastern Avalon EBSAs will change, but no new EBSAs are defined along the potential transit route. The potential transit route will also cross Snow Crab Conservation Exclusion Zone for Crab Fishing Area 6C.

3.3 Human Environment

Fisheries are an important component of the socio-economic environment of Newfoundland and Labrador and other parts of Canada, including the various communities and regions that extend along the coastline of eastern Newfoundland who participate in commercial fishing as a source of economic stimulus to the local economy. Commercial fisheries in this region are diverse, and involve a range of target species, use of various gear types, and occur at higher intensities at certain times of the year. The region of the Grand Banks in which the Project Area is located is not heavily fished but is located between two historically heavily fished areas including the Inner Grand Banks and the Slopes of the Grand Banks and Flemish Pass (Figure 6).

Species that have been historically harvested for commercial purposes in eastern offshore Newfoundland and Labrador include snow crab, northern shrimp, Greenland halibut, Atlantic halibut, Atlantic cod, American plaice, redfish, and flounder (yellowtail and witch). Fisheries for pelagic species such as capelin and mackerel do occur in offshore Newfoundland and Labrador but are located closer to the coast and nearshore areas. Commercial fisheries for large pelagic species, such as swordfish, shark and tuna, and for invertebrates, such as clams and scallops also occur, but on a smaller scale than those for crab, shrimp, and groundfish.

Newfoundland and Labrador has five Indigenous communities and/or governing bodies. Several Indigenous groups have commercial communal fishing licences in the Project Area or surrounding areas. There are no food, social, and ceremonial (FSC) fisheries in the Project Area, or in surrounding areas. The closest FSC fishery in Newfoundland and Labrador is a multi-species coastal fishery undertaken by Miawpukek First Nation (MFN) in Conne River, 480 km to the northwest of the Project Area (CNOOC Petroleum North America ULC; formerly Nexen Energy ULC [Nexen] 2018).

For other similar EAs of projects in the eastern Newfoundland offshore region, the CEA Agency has identified Indigenous groups in New Brunswick (NB), Nova Scotia (NS), Prince Edward Island (PEI), and Quebec (QC) (CEA Agency 2017) that have the right to harvest Atlantic salmon and American eel for FSC purposes and/or harvest swordfish (*Xiphias gladius*) under commercial communal fishing licences in Northwest Atlantic Fisheries Organization (NAFO) Areas 3, 4 and 5. While these Indigenous communities hold commercial communal licences for several species, the swordfish licence is the only licence which overlaps with the Project Area.

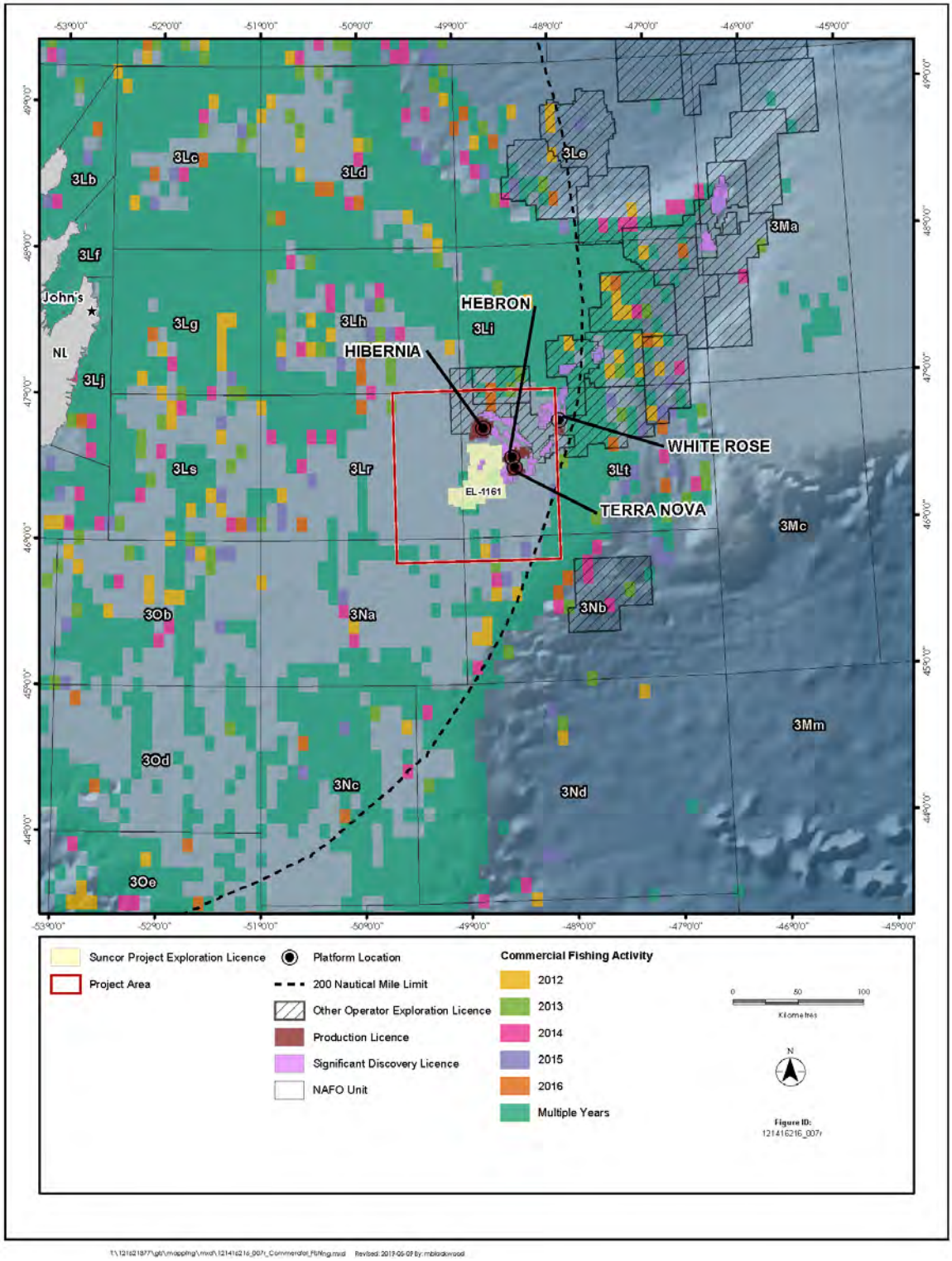


Figure 6 Commercial Fishing Activity in the Project Area and Surrounding Areas (2012 to 2016)

Other human activities also take place in parts of the Project Area and surrounding marine environment on either a year-round or seasonal basis, including oil and gas exploration and production, shipping, marine research, and defence activities. There are currently 30 ELs, 58 Significant Discovery Licences (SDLs), and 12 Production Licences (PLs) in offshore Newfoundland and Labrador (C-NLOPB 2018). Three of the currently operating production projects (Hibernia, Hebron and Terra Nova) are located within the Project Area. International shipping lanes transit through the eastern Newfoundland offshore area. Marine research and scientific studies (including DFO-led research surveys) regularly occur in the vicinity of the Project. The Department of National Defence also conducts naval training exercises involving both surface vessels and submarines in the general area. There are also legacy sites including shipwrecks and submarines and known and potential unexploded ordnance sites in the Atlantic Ocean, as well as munitions disposal sites off eastern Newfoundland (Amec 2014). Active and decommissioned marine cable networks traverse the region.

3.4 Existing Environmental Studies

The Project is located within a proposed study area for a Regional Assessment of offshore oil and gas exploratory drilling in the Canada-Newfoundland and Labrador Offshore Area. An Agreement to conduct the Regional Assessment has been prepared by the CEA Agency, the C-NLOPB, NRCAN, and the Newfoundland and Labrador Department of Natural Resources.

Environmental assessments have been completed for offshore oil and gas activities in the vicinity of the Project including exploration drilling, production drilling, and seismic survey projects for nearly three decades in the Canada-Newfoundland and Labrador Offshore Area. It is anticipated that the reports listed below, and other relevant studies, will provide sufficient data to characterize the existing environment in the Project Area, and to assess the potential environmental effects associated with the Project.

Key relevant and publicly available environmental studies for consideration include:

- CNOOC International Flemish Pass Exploration Drilling Project (2018-2028) (Nexen 2018)
- Equinor Canada Ltd. (Statoil Canada Ltd.) Flemish Pass Exploration Drilling Project 2018-2028 (Equinor Canada 2017)
- ExxonMobil Canada Limited Eastern Newfoundland Offshore Exploration Drilling Project 2018-2030 (ExxonMobil Canada Limited 2017)
- Husky Energy Exploration Drilling Project 2018-2025 (Husky Energy 2018)
- BP Canada Energy Group ULC Newfoundland Orphan Basin Exploration Drilling Program, 2017-2026 (BP Canada Energy Group ULC 2018)
- Eastern Newfoundland Strategic Environmental Assessment (SEA) (AMEC 2014)
- Environmental Assessment East Canada CSEM Survey, 2014-2018 (LGL Limited 2014)
- Suncor Energy's Eastern Newfoundland Offshore Area 2D / 3D / 4D Seismic Program, 2014-2024 (LGL Limited 2013)
- White Rose Extension Project Environmental Assessment (Husky Energy 2012)
- Hebron Project Comprehensive Study Report (ExxonMobil Canada Properties 2011)
- Environmental Assessment of Chevron's North Grand Banks Regional Seismic Program, 2011-2017 (LGL Limited 2011a)
- Environmental Assessment of Statoil's Geophysical Program for Jeanne d'Arc Basin and Central Ridge / Flemish Pass Basins, 2011-2019. (LGL Limited 2011b).

- Environmental Assessment of Husky's Jeanne d'Arc Basin / Flemish Pass Regional Seismic Program, 2012-2020 (LGL Limited 2011c)
- Environmental Assessment of StatoilHydro Canada Ltd. Exploration and Appraisal/Delineation Drilling Program for Offshore Newfoundland, 2008-2016 (LGL Limited 2008)
- Husky Delineation/Exploration Program for Jeanne d'Arc Basin Area, 2008-2017, Environmental Assessment (LGL Limited 2007)
- Husky White Rose Development Project: New Drill Centre Construction and Operations Program Environmental Assessment (LGL Limited 2006)
- Orphan Basin SEA (LGL Limited 2003)
- Orphan Basin Exploration Drilling Program Environmental Assessment (LGL Limited 2005)
- White Rose Oilfield Comprehensive Study (Husky Oil Operations Limited 2000)

4.0 CONSULTATION AND ENGAGEMENT

Suncor's Stakeholder Relations Policy outlines the overall approach and commitment to consultation and engagement. Suncor aspires to be a sustainable energy company and as such, recognizes that the trust and support of stakeholders is an important component of this vision. In particular, Suncor strives to be a trusted member of the communities in which they operate. Stakeholders are identified as the individuals and/or groups who could be affected by Suncor operations or who could, through their actions, affect Suncor's business.

4.1 Indigenous Engagement

Based on the results of other EAs conducted for exploration drilling projects offshore NL, the list of Indigenous organizations that may have a potential interest in the Project includes groups and communities in Newfoundland and Labrador, Quebec, New Brunswick, Prince Edward Island, and Nova Scotia, as follows:

Newfoundland and Labrador

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

Nova Scotia

- Kwilmu'kw Maw-klusuaqn Negotation Office (KMKNO), which represents the following 11 Mi'kmaq First Nations in Nova Scotia in consultation and engagement (letters were sent to individual communities; follow-up occurred with the KMKNO):
  - Acadia First Nation
  - Annapolis Valley First Nation
  - Bear River First Nation
  - Eskasoni First Nation
  - Glooscap First Nation
  - Membertou First Nation

  - Paqtnkek Mi'kmaw Nation
  - Pictou Landing First Nation
  - Potlotek First Nation
  - Wagmatcook First Nation
  - We'koqmaq First Nation
- Sipekne'katik First Nation
- Millbrook First Nation

New Brunswick

- Mi'gmawe**'l** Tplu'taqnn Inc. (MTI), which represents the following Mi'kmaq First Nation groups:
  - 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
- Wolastoqey Nation of New Brunswick (WNNB), which coordinates consultation with the following five Maliseet First Nations (letters were sent to individual communities; follow up occurred with the WNNB):
  - Kingsclear First Nation
  - Madawaska Maliseet First Nation
  - Oromocto First Nation
  - St. Mary's First Nation
  - Tobique First Nation
- Woodstock First Nation
- Peskotomuhkati Nation at Skutik (Passamaquoddy)

Prince Edward Island

- Mi'kmaq Confederacy of PEI (MCPEI), which represents the following Mi'kmaq First Nations in consultation (letters were sent to individual communities; follow-up occurred with MCPEI):
  - Abegweit First Nation
  - Lennox Island First Nation

Quebec

- Mi'gmawei Mawiomi Secretariat (MMS), which represents the following Mi'gmaq First Nation groups:
  - Micmas of Gesgapegiag
  - La Nation Micmac de Gespeg
  - Listuguj Mi'gmaq Government
- Les Innus de Ekuanitshit
- Montagnais de Nutashkuan

In recognition of their potential interest in the Project, Suncor emailed letters on May 9, 2019, to the each of the above groups to introduce the Project and to inquire about potential interests and concerns, as well as preferred method of engagement going forward. As of the time of submission of this Project Description, no responses had been received from these initial letters. However, based on the assessments of similar projects in the region, we understand important Indigenous concerns to be addressed in the Suncor EIS include potential effects of Project operations on Atlantic salmon and other migratory species that maybe harvested for FSC or commercial communal fisheries and the potential effects of accidental events on the marine ecosystem.

Ongoing engagement will include confirmation of appropriate organization and/or community contacts and methods for future engagement, learning more about how these groups may potentially be affected by Project activities, providing Project planning updates, listening and responding to questions and concerns raised by Indigenous groups in a timely manner, and meeting with Indigenous groups if and when requested. Feedback obtained during engagement will be incorporated into Project planning as applicable and appropriate. The EIS (if required under CEAA 2012) will document concerns and priorities raised and demonstrate how these have influenced Project planning and/or been addressed in the EIS.

4.2 Stakeholder Engagement

Suncor, as operator of the Terra Nova project, maintains regular communication and engagement with stakeholders having an interest in the NL offshore. The stakeholders with potential interest in this Project would be similar and would likely include fisheries organizations, environmental non-governmental organizations (NGOs), industry associations, government, and the interested public. Each of these groups is discussed below.

4.2.1 Government and Regulatory Stakeholders

Key regulatory stakeholders for the Project are listed below:

- C-NLOPB
- Government of Canada
  - CEA Agency
  - DFO
  - ECCC
  - Canadian Coast Guard
  - NRCAN
  - Department of National Defence (DND)
  - Transport Canada
  - Health Canada
  - Parks Canada
  - Indigenous Services Canada
- Government of Newfoundland and Labrador
  - Municipal Affairs and Environment
  - Fisheries and Land Resources
  - Natural Resources

4.2.2 Fisheries Stakeholders

A key form of mitigation for potential effects of the Project on fisheries is early and ongoing consultation with the fishing industry. The location and timing of fishing activities are important to consider when identifying potential fisheries stakeholders and scheduling meetings. Suncor meets regularly with fisheries groups to keep them apprised of activities in the Terra Nova Field. The following is a list of initial fisheries stakeholders to be engaged for the Project:

- One Ocean
- Fish, Food and Allied Workers-Unifor (FFAW-Unifor)
- Association of Seafood Producers (ASP)
- Ocean Choice International (OCI)
- Atlantic Groundfish Council (AGC)
- Canadian Association of Prawn Producers

4.2.3 Other Public Stakeholder Groups

Other public stakeholders include industry associations and NGOs. Suncor will monitor activities and communications generated by these groups and participate in local industry events as appropriate, including supplier information sessions, seminars, and conferences. Project information will also be provided on Suncor's external website.

5.0 POTENTIAL PROJECT-RELATED CHANGES TO THE ENVIRONMENT AND SCOPING CONSIDERATIONS

5.1 Routine Project Activities

Routine Project activities have the potential interactions with and effects on the environment. They are well defined and understood. The main activities with the potential to result in changes to the environment include:

- Presence and operation of the MODU (lights, flaring, underwater sound, and safety zone)
- Well abandonment (noise and lights during abandonment activities)
- Presence and operation of supply vessels (lights, underwater sound) and helicopters (noise)
- Discharges and emissions (e.g., drill muds and cuttings, liquid discharges, atmospheric emissions, solid waste)

Table 4 lists the potential environmental interactions with routine Project activities that may result in changes to the environmental components identified in CEAA 2012. These potential interactions would be assessed in more detail in the EIS if a federal EA process is required under CEAA 2012.

Table 4 Potential Environmental Interactions with Routine Project Activities

Environmental Component of Concern	Relevant Section of CEAA 2012	Potential Environmental Interactions
Fish, Fish Habitat, and Aquatic Species	5(1)(a)(i) 5(1)(a)(ii)	Routine Project activities have the potential to result in changes affecting fish, fish habitat, aquatic species as defined under SARA, marine mammals, and other aquatic species (including aquatic plants), due to the following interactions: • Aquatic species response to underwater sound emissions associated with supply vessel transit and drilling • Localized degradation and disturbance to the benthic environment (including benthic species) due to seabed disposal at drill site(s) (i.e., drill mud/cuttings, cement) including potential smothering and mortality of benthic organisms • Localized effects on marine water quality due to routine ocean discharges (e.g., waste water) from MODU and supply vessels • Potential injury or mortality to marine mammal(s) from supply vessel collisions
Migratory Birds	5(1)(a)(iii)	Routine Project activities have the potential to result in changes affecting migratory birds, as defined under the *Migratory Birds Convention Act*, 1994, due to the following interactions: • Attraction of migratory birds to supply vessel and MODU lighting (including flares) and discharges (e.g., food wastes) • Mortality or stranding of migratory birds on the MODU or supply vessels
Project Activities Occurring on Federal Lands	5(1)(b)(i)	Routine Project activities may result in changes to the environment that would occur on federal waters as a result of the Project Area being located within Canada's EEZ and thus within federal waters under the jurisdiction of the Government of Canada. These potential effects occurring in federal waters are described within this table. In addition to components of the environment previously addressed above (e.g., effects on water quality, fish, fish habitat, aquatic species and migratory birds) there could also be effects on the atmospheric environment (e.g., air emissions, including GHG emissions and sound emissions).
Transboundary Issues	5(1)(b)(ii)	In addition to components of the environment previously addressed above (e.g., effects on water quality, fish, fish habitat, aquatic species and migratory birds) there could also be effects on the atmospheric environment (e.g., air, GHG, and noise emissions).

Table 4 Potential Environmental Interactions with Routine Project Activities

Environmental Component of Concern	Relevant Section of CEAA 2012	Potential Environmental Interactions
Health and Socio-Economic Conditions for Indigenous People	5(1)(c)(i)	Routine Project activities have the potential to result in the following changes to the environment that may affect Indigenous fishing activities, including those carried out under commercial communal licences in and around the Project Area, and associated potential effects to socio-economic conditions: • Establishment of a safety zone (fisheries exclusion zone) around the drilling vessel during drilling activities, as required by the C-NLOPB, and associated spatial and temporal restrictions on Indigenous fish harvesting activity • Fish species response to underwater sound emissions, including changes in behaviour and distribution of targeted species • The Project is also expected to have economic benefits, including economic and contracting opportunities. • Routine supply vessel operations outside of the safety zone will be consistent with existing offshore and nearshore shipping traffic in the region and are not anticipated to result in changes to the environment that would affect Indigenous fishing activities. • Routine Project activities are not expected to result in changes to the environment that would affect the health conditions of Indigenous peoples.
Health and Socio-Economic Conditions	5(2)(b)(i)	Routine Project activities have the potential to result in the following changes to the environment that may affect commercial fishing activities, including those carried out under commercial licences in and around the Project Area: • Establishment of a safety zone (fisheries exclusion zone) around the drilling vessel during drilling activities, as required by the C-NLOPB, and associated spatial and temporal restrictions on commercial fish harvesting activity • Fish species response to underwater sound emissions, and associated changes in behavior and distribution of commercial fish species • The Project is also expected to have economic benefits, including economic and contracting opportunities. • Routine supply vessel operations outside of the safety zone will be consistent with existing offshore and nearshore shipping traffic in the region and are not anticipated to result in changes to the environment that would affect commercial fishing activities. • Routine Project activities are not expected to result in changes to the environment that would affect health conditions.
Physical and Cultural Heritage or Resources of historical, Archaeological, Paleontological, or Architectural Significance	5(1)(c)(ii) 5(1)(c)(iv) 5(2)(b)(ii) 5(2)(b)(iii)	Routine Project activities are not anticipated to result in changes to the environment that would affect physical and cultural heritage areas or resources including shipwrecks that have been recorded in the Project Area. Information gathered during 3D seismic surveys previously conducted by others and pre-drill ROV site surveys in the Project Area will document the presence/absence of marine heritage resources on the seabed before seabed disturbance takes place. If concerns related to this matter are identified during Indigenous engagement for this Project, they will be considered in the EIS.

Table 4 Potential Environmental Interactions with Routine Project Activities

Environmental Component of Concern	Relevant Section of CEAA 2012	Potential Environmental Interactions
Current Use of Lands and Resources for Traditional Purposes by Indigenous People	5(1)(c)(iii)	Routine Project activities are not anticipated to result in changes to the environment that would have an effect on the current use of land and resources for traditional purposes by Indigenous peoples, other than commercial communal fisheries and associated socio-economic interactions (discussed above), given the Project Area's water depth and distance from shore. Routine supply vessel activities will be consistent with existing shipping traffic in the region and are not anticipated to result in changes to the environment that would have an effect on traditional Indigenous fisheries and resource use. Additional information regarding traditional Indigenous fisheries and traditional resource use will be gathered through Indigenous engagement, and concerns related to this matter identified during engagement will be considered in the EIS.
Other Changes to the Environment Directly Related or Necessarily Incidental to a Federal Authority's Exercise of a Power or Performance of Duty or Function in Support of the Project	5(2)(a) 5(1)(b)(i)	Routine Project activities authorized by the C-NLOPB have the potential to result in directly related or necessarily incidental changes to the atmospheric environment due to the release of air emissions

5.2 Non-Routine Project Activities

A non-routine Project activity, such as an accidental events or malfunctions, also has the potential to result in potential changes to the environment. For the purposes of environmental assessment, worst-case scenarios are considered, and for an offshore exploration drilling project, this would include a blowout (i.e., an uncontrolled release of hydrocarbons during drilling) or a batch spill or release from the MODU or supply vessel (e.g., hydraulic fluid, drilling mud, diesel). These events could occur in the offshore environment (e.g., during drilling) or nearshore environment (e.g., during supply vessel transit). As part of the environmental assessment process, detailed spill trajectory modelling will be conducted to predict the areas that could potentially be affected by a spill. Potential environmental interactions can occur within the spill trajectory or as a result of transitory species or their prey travelling through an affected area.

If an EIS is required under CEAA 2012, it will describe and assess non-routine Project activities, including the results of associated spill modelling which will form an integrated part of the associated environmental effects analysis and the identification of appropriate mitigation. The EIS will also describe relevant accident prevention and emergency response plans and procedures. Table 5 provides further detail on how non-routine Project activities could result in changes to the environment.

Table 5 Potential Environmental Interactions with Non-routine Project Activities

Environmental Component of Concern	Relevant Section of CEAA 2012	Potential Environmental Interactions
Fish, Fish Habitat, and Aquatic Species	5(1)(a)(i) 5(1)(a)(ii)	A spill during Project activities could potentially result in changes to fish, fish habitat, aquatic species as defined in SARA, marine mammals, and other aquatic species, including: • Reduced availability and quality of habitat • Degradation and reduction in marine water quality • Injury, mortality and/or reduced health for fish and other aquatic species
Migratory Birds	5(1)(a)(iii)	A spill during Project activities could potentially result in changes to migratory birds, as defined under the *Migratory Birds Convention Act*, 1994, including injury, mortality and/or reduced health for migratory bird species.
Project Activities Occurring on Federal Lands	5(1)(b)(i)	A spill during Project activities could potentially result in changes to the environment that would occur in federal waters as a result of the Project Area being located within Canada's EEZ and thus within federal waters under the jurisdiction of the Government of Canada. These potential effects occurring in federal waters are described within this table. Components of the environment not previously addressed above include potential effects on the atmospheric environment (e.g., air and noise emissions).
Transboundary Issues	5(1)(b)(ii)	A spill may result in transboundary effects outside of Newfoundland and Labrador or Canadian offshore areas. A spill may enter international waters, which fall outside the Canadian EEZ. Spill-related effects in international waters could include adverse effects to birds, fish, fish habitat, and commercial fisheries.
Health and Socio-Economic Conditions for Indigenous People	5(1)(c)(i)	A spill during Project activities could potentially result in the following changes to the environment that may affect Indigenous fisheries and associated socio-economic conditions: • Contamination-related closure of commercial fishing areas, and associated restrictions on commercial communal fish harvesting activity • Reduced catchability associated with damage to fishing gear (e.g., fouling) and changes in population health, behavior, and distribution of commercial fish species as a result of marine pollution • Changes in population size and health of individuals among commercial fish species, and associated loss of income through reduced catch value A vessel collision with fishing gear could potentially result in changes to the environment that may affect human health and safety for Indigenous peoples.

Table 5 Potential Environmental Interactions with Non-routine Project Activities

Environmental Component of Concern	Relevant Section of CEAA 2012	Potential Environmental Interactions
Health and Socio-Economic Conditions	5(2)(b)(i)	A spill during Project activities could potentially result in the following changes to the environment that affect fisheries: • Contamination-related closure of commercial fishing areas, and associated restrictions on commercial fish harvesting activity • Reduced catchability associated with damage to fishing gear (e.g., fouling) and changes in population health, behavior, and distribution of commercial fish species as a result of marine pollution • Changes in population size and health of individuals among commercial fish species, and associated loss of income through reduced catch value A vessel collision with fishing gear could potentially result in changes to the environment that may affect human health and safety.
Physical and Cultural Heritage or Resources of historical, Archaeological, Paleontological, or Architectural Significance	5(1)(c)(ii) 5(1)(c)(iv) 5(2)(b)(ii) 5(2)(b)(iii)	A spill during Project activities could potentially cause a change to the environment that may affect physical and cultural heritage area (including shipwrecks). However, given the location of the Project offshore, and the ROV survey prior to drilling, non-routine Project activities are not expected to result in changes to resources of historical, archeological, paleontological, or architectural significance.
Current Use of Lands and Resources for Traditional Purposes by Indigenous People	5(1)(c)(iii)	A spill during Project activities could potentially result in the following changes to the environment that may affect traditional Indigenous fisheries, including the Aboriginal and/or Treaty rights to fish, in the area: • Contamination-related closure of traditional fishing areas, and associated restrictions on traditional fish harvesting activity • Reduced catchability associated with damage to fishing gear (e.g., fouling) and changes in population size, behaviour, and distribution of targeted fish species as a result of marine pollution • Changes in population size and health of individuals among targeted fish species, and associated reduction in fishery for traditional use These changes could potentially occur within the spill trajectory or as a result of migratory fish species transiting through the affected area.
Other Changes to the Environment Directly Related or Necessarily Incidental to a Federal Authority's Exercise of a Power or Performance of Duty or Function in Support of the Project	5(2)(a) 5(1)(b)(i)	A spill occurring as a result of Project activities authorized by the C-NLOPB could potentially result in temporary and localized changes to marine and atmospheric environment. These potential changes have been discussed above.

5.3 Scoping Considerations

If required, the EIS for this Project will be planned and prepared in accordance with the requirements of CEAA 2012 and its associated Regulations, and in compliance with the EIS Guidelines that may be issued by the Agency. It is generally accepted that environmental effects are assessed by considering the individual biophysical and socio-economic components that could be affected by the Project and the resultant Project-related effects. Based on the interactions discussed in Tables 6 and 7 and recent EAs for similar exploration projects, the proposed valued components (VCs) to be assessed in an EIS (if required) will likely include:

- Marine Fish and Fish Habitat (including species at risk and species of conservation concern)
- Marine and Migratory Birds (including species at risk and species of conservation concern)
- Marine Mammals and Sea Turtles (including species at risk and species of conservation concern)
- Special Areas
- Commercial Fisheries and Other Ocean Users
- Indigenous Communities

Final direction on VCs to be assessed would be provided in the EIS Guidelines and would be made in consideration of the components and activities described in Chapter 2 as part of the Project. In particular, existing facilities in eastern Newfoundland will be used for supply, support, and logistical functions, and third-party service providers will be responsible for obtaining and/or maintaining applicable regulatory approvals to operate their facilities. The Project will not require the development of new infrastructure or upgrades to these existing facilities to support Project operations. Logistical support from supply vessels and helicopters is also well established for the offshore Newfoundland oil and gas industry but is proposed to be assessed as it travels from the onshore supply base to the MODU. It is therefore proposed that the scope of the EIS be limited to offshore components should a federal EA process be required under CEAA 2012.

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TILT COVE EXPLORATION DRILLING PROJECT: PROJECT DESCRIPTION SUMMARY