West Flemish Pass Exploration Drilling Project EIS Summary

Prepared for:
Chevron Canada Limited

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

File No: 121415690

Final Report

January 2020

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
bbl	barrel
BOP	Blow-out Preventer
CAPP	Canadian Association of Petroleum Producers
CEAA	*Canadian Environmental Assessment Act, 2012*
CEA Agency	Canadian Environmental Assessment Agency
CEPA	*Canadian Environmental Protection Act, 1999*
C-NLOPB	Canada-Newfoundland and Labrador Offshore Petroleum Board (“the Board”)
CNSOPB	Canada Nova Scotia Offshore Petroleum Board
DFO	Fisheries and Oceans Canada
DP	dynamic positioning
EA	Environmental Assessment
EBSA	Ecologically and Biologically Significant Area
ECCC	Environment and Climate Change Canada
EEZ	Exclusive Economic Zone
EIS	Environmental Impact Statement
EL	Exploration Licence
FSC	Food, social, ceremonial
g	grams
g/m²	Grams per metre squared
ha	hectares
HES	Health, Environment and Safety
IMO	International Maritime Organization
IOGP	International Association of Oil & Gas Producers
km	kilometres
km²	square kilometres
L	Litres
LAA	Local Assessment Area
m	metres
m³	Metres cubed
MARPOL	International Convention for the Prevention of Pollution from Ships
MBCA	*Migratory Birds Convention Act, 1994*
metocean	meteorological and oceanographic
mm	milimetres

MMBtu	one million British Thermal Units
MODU	Mobile Offshore Drilling Unit
NAFO	Northwest Atlantic Fisheries Organization
NAVWARN	Navigational Warning
NB	New Brunswick
NEB	National Energy Board
NGO	Non-governmental organization
NL	Newfoundland and Labrador
NL ESA	*Newfoundland and Labrador (NL) Endangered Species Act*
nm	Nautical Mile
NOTMAR	Notice to Mariners
NS	Nova Scotia
OA	Operations Authorization
OCI	Ocean Choice International
OCNS	Offshore Chemical Notification Scheme
OCSG	Offshore Chemical Selection Guidelines
OSPAR	Oil Spill Prevention, Administration and Response
OWTG	Offshore Waste Treatment Guidelines
PE	Prince Edward Island
PLONOR	Pose Little or No Risk
PTS	Permanent Threshold Shift
QC	Quebec
RAA	Regional Assessment Area
ROV	remotely operated vehicle
SARA	*Species at Risk Act*
SBM	Synthetic-based Drilling Mud
SOCP	Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment
SPL	sound pressure level
UXO	Unexploded Ordnance
VC	Valued component
VME	Vulnerable Marine Ecosystem
VSP	Vertical Seismic Profile
WBM	Water-based Drilling Mud

1.0 INTRODUCTION

Chevron Canada Limited (Chevron) is proposing to undertake exploration drilling activities within its existing offshore exploration licence 1138 (the EL or EL 1138) in the Flemish Pass, approximately 375 kilometres (km) northeast of St. John's, Newfoundland and Labrador (NL) (Figure 1-1). The West Flemish Pass Exploration Drilling Project (herein referred to as "the Project") may involve drilling up to eight exploration and delineation / appraisal wells over the term of the EL (2016 to 2025), with an initial well proposed to be drilled in 2021 pending regulatory approval.

The exploration rights to EL 1138 were awarded in 2016 (Table 1.1) by the Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB) (C-NLOPB 2019). The term of this EL extends from January 15, 2016 to January 15, 2025. Chevron will serve as the operator for the Project.

Table 1.1 Licence Size and Interests

EL	Size	Interest
1138	274,732 ha	Chevron Canada Limited (50%) Anadarko Canada E&P Ltd (50%)

The Canadian Environmental Assessment Agency (now the Impact Assessment Agency of Canada; Agency) determined that the drilling of a well on EL 1138 constitutes a "designated project" under Section 10 of the *Regulations Designating Physical Activities* and thus requires review and approval according to the requirements of the *Canadian Environmental Assessment Act, 2012* (CEAA 2012). Following submission of the Project Description document, the Agency determined that an environmental assessment was required and Environmental Impact Statement (EIS) guidelines were issued on December 20, 2018. The environmental assessment will be undertaken pursuant to CEAA 2012. New federal environmental assessment legislation (Bill C-69) received Royal Assent on June 21, 2019; however, this will not apply to the currently proposed Project; which will continue under CEAA 2012.The C-NLOPB also requires a project-specific environmental assessment (EA) be completed for offshore oil and gas activities, pursuant to the *Canada-Newfoundland and Labrador Atlantic Accord Implementation Newfoundland and Labrador Act* and the *Canada-Newfoundland Atlantic Accord Implementation Act* (the Accord Acts).

An EIS document has been prepared and is intended to satisfy both the EIS guidelines (Agency 2018) and the C-NLOPB Accord Acts EA requirements. This document is a summary of the EIS, and has been prepared to facilitate public, stakeholder, and Indigenous review and engagement on the Project.

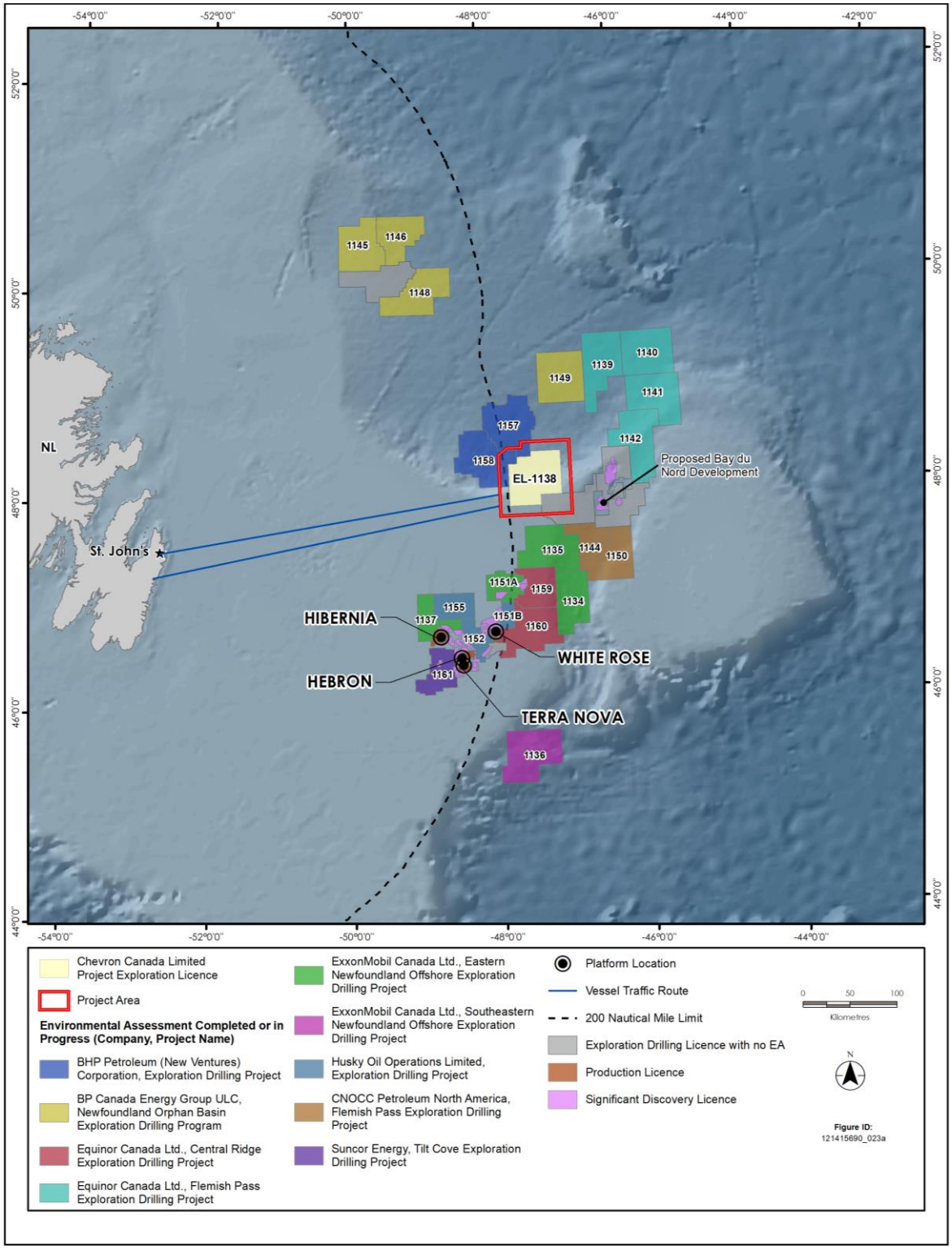


Figure 1-1 Project Location and Potential Vessel Traffic Routes

2.0 PROJECT OVERVIEW

Chevron proposes to drill up to eight exploration wells on EL 1138 during the term of the EL. The EL is in West Flemish Pass area of the Grand Banks region, just outside and bordering Canada's 200 nautical mile (nm) Exclusive Economic Zone (EEZ). Water depths in the EL range from approximately 400 to 2,200 m. Drilling operations will be conducted within the EL boundaries, but exact well site locations are not yet known.

Exploration drilling is required to assess the potential for important geological formations and hydrocarbon reserves within the EL. To compliment previous geophysical data collected in the region, this exploration drilling will help determine the presence, nature and quantities of potential hydrocarbon resources within the EL.

Wells will be drilled using either a semi-submersible rig or a drillship, referred to as a mobile offshore drilling unit (MODU). The choice of MODU may change over the course of the drilling program, depending on the results of initial wells. This anticipated multiple-phase approach for exploration drilling incorporates the analysis of initial well results to inform the execution strategy for subsequent wells.

A fleet of supply vessels and helicopters will provide logistics support and supplies and will be based out of existing, onshore facilities in Eastern NL. The scope of this EIS does not include onshore activities at these shore-based facilities which are existing facilities operated by third-party suppliers.

2.1 Project Location

EL 1138 is in the Flemish Pass area, approximately 375 km northeast of St. John's, NL, Canada. The nearest community is Flatrock (approximately 370 km), on the Avalon Peninsula. The nearest "residences" to the Project would be the *SeaRose* floating, production, storage and offloading vessel at Husky's White Rose oil development field, approximately 130 km south of EL 1138. Water depths in the EL range from approximately 400 to 2,200 m.

2.2 Project Components and Activities

The MODU and the offshore exploration wells are the two main physical components of the Project. Components related to servicing and supplying offshore activity (logistics-related components) include supply vessels and helicopters for the transportation of personnel and equipment.

2.2.1 Mobile Offshore Drilling Unit

The Project will use either a semi-submersible rig or a drillship as the MODU. A drillship is typically used in relatively deep waters or in areas where increased mobility is required due to ice or other factors and operational risks. A drillship would either be anchored in position over the drilling site or, as is more likely for this drilling program, maintained on station by dynamic positioning (DP). A semi-submersible rig is

typically used at moderate depths, such as on the Grand Banks, and anchored in place. Chevron has not yet selected the MODU that will be used to drill the wells for the Project.

Before an Operations Authorization (OA) is issued by the C-NLOPB for the drilling program, a Certificate of Fitness must be obtained for the MODU, which includes a rigorous inspection and certification process. Once the MODU is cleared for use and all authorizations to proceed are received, the MODU will be mobilized to the drilling location.

Depending on the MODU and its capabilities, it will either be towed to the drilling site or be self-propelled. Once in place, positioning and stability operations will occur, including ballasting to increase the stability of the MODU, and implementation of the DP or multi-point mooring system to maintain position.

Once the MODU is in place at the well site, a remotely operated vehicle (ROV) will be used to conduct a visual survey of the seabed prior to drilling. If environmental or anthropogenic sensitivities are discovered during the ROV survey, Chevron will contact the C-NLOPB immediately to discuss an appropriate course of action. This may involve further investigation and/or moving the well site if feasible to do so.

Pursuant to the *Newfoundland Offshore Petroleum Drilling and Production Regulations*, a safety zone (500 m radius from the well location or when moored, 50 m from the outer extent of the anchors) will be established around the MODU. The safety zone is intended to prevent collisions between the MODU and other vessels operating in the area. This safety zone will remain in place from the initial mobilization time until well suspension or abandonment, while the MODU is on location. The standby vessel will monitor the safety zone and Chevron will provide details of the safety zone to the Marine Communication and Traffic Services for broadcasting and publishing in the Navigational Warning (NAVWARN) and Notices to Mariners (NOTMAR) systems. Safety zone details will also be communicated during ongoing consultations with Indigenous and non-Indigenous fishers.

2.2.2 Offshore Exploration Wells

Chevron may drill up to eight wells over a ten-year period from 2016-2025, depending on the results of the initial well, and proposes to commence drilling in second quarter (i.e., April to June) of 2021, pending regulatory approval. The well design and location for the proposed wells have not yet been finalized and will depend on many factors, such as the geology of the formations. Once locations and well design are finalized, the details will be submitted for review and approval by the C-NLOPB as part of the OA and Approval to Drill a Well (ADW) for each well submitted in association with the Project.

Oil and gas wells consist of multiple sections, each of which is typically drilled with increasingly smaller drill bit diameters. There are many available drill bit sizes for drilling. The top interval or section, with the largest diameter hole, begins at the sea floor. The drill bit is rotated by the drill string, which is a series of joints of pipe, controlled from the MODU. Drilling fluids (also known as “muds”) are required to lubricate the drill bit. Drilling fluids from the MODU are pumped through the drill string to the drill bit. Rock layers are broken up by the drill bit which grinds the rock as it rotates downward. This creates fragments of rock known as drill cuttings, which are flushed out of the wellbore through the annulus by the drilling fluid.

It will take approximately 180 days to drill each well. The drilling process consists of two main phases: riserless drilling; and riser drilling. In the first sections of the well (conductor and/or surface) there is no closed- loop riser to serve as a conduit back to the MODU; therefore, water-based muds (WBMs) and/or seawater will be used to flush cuttings and excess cement to the seafloor and release them directly into the marine environment. Once the initial sections are drilled, the wellhead can be installed and the blowout preventer (BOP) and a closed-loop system (riser) can be connected to the well. The riser is a conduit which allows the fluids used in the drilling of the well, to be recirculated back to the MODU, and either be recycled and reused, treated and discharged or stored onboard for disposal at shore. Since the riser returns the drilling fluid to the MODU for treatment, either a WBM or synthetic-based mud (SBM) can be used.

In some circumstances, a sidetrack well may be required; this involves drilling a secondary wellbore from the original wellbore with no new surface hole on the seafloor. Before commencement of sidetrack drilling, the original wellbore is plugged with cement. If sidetrack wells are required during this exploration drilling program, well-specific design details will be submitted to the C-NLOPB to obtain approval prior to commencing sidetrack drilling.

2.2.3 Well Control and Blowout Prevention

A blowout is an uncontrolled flow of formation fluids. To prevent a blowout, the pressure in the drilled formation is managed using several well control barriers. Primary well control measures and procedures include monitoring the formation pressure and adjusting the density of the drilling fluid. To stabilize the wellbore and maintain an overbalance of pressure against the formation, drilling fluid density or weight is adjusted accordingly. In the event of failure of primary barriers, BOP system is the next line of defense.

The BOP is a mechanical device, made up of a series of different closing mechanisms, designed to seal off the wellbore when required. The BOP uses hydraulically-operated valves and sealing mechanisms that are open to allow the mud to circulate during drilling but can be quickly closed in the case of a “kick” (when reservoir fluids enter the well). Some of the closing mechanisms include rams that move horizontally across the top of the wellbore, sealing the drill string; blind shear rams are used to cut the pipe in the drill string, creating a seal or sealing the wellbore when no pipe is present; and annular preventers physically close off the wellbore.

The BOPs used as part of this Project will comply with Standard 53 (Blowout Prevention Equipment Systems for Drilling Wells) of the American Petroleum Institute. All BOPs will be rated to 15,000 psi working pressure and be installed and pressure tested in each well drilled as part of this Project as described in the Drilling and Production Guidelines (C-NLOPB and Canada Nova Scotia Offshore Petroleum Board [CNSOPB] 2017a). If primary procedures are ineffective in activating the BOP, an ROV may be used to provide hydraulic power to the BOP to manually close the rams. Therefore, once the BOP is installed, testing of the ROV intervention capability is also undertaken prior to drilling. Once installed, the BOP will not be removed until abandonment plugs are installed in the wellbore and tested for integrity.

2.2.4 Vertical Seismic Profiling

Vertical seismic profiling (VSP) may be conducted following the drilling of each well to its target depth (where hydrocarbon reservoirs are predicted to be located). VSP operations involve deploying an acoustic sound source from the MODU or support vessel, while receivers are positioned at different levels within the drilled hole to measure the travel time of the sound. This form of VSP operation is referred to as zero-offset VSP. An offset VSP (also referred to as a walkaway VSP), where the acoustic source is deployed from a marine vessel up to 8 km from the well, could also be used in the exploration wells.

Typically, between three and six sound sources are used, with a volume of 150 to 250 cubic inches each, although there could be up to 12 sound sources in a larger array. These sound sources are generally positioned at 5 to 10 m water depth. VSP operations typically take approximately one to three days to complete for each well.

VSP activity will be planned and conducted in consideration of the Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment (SOCP; DFO 2007). Specific details of the VSP program will depend on the geological target and the objectives of the VSP operation.

2.2.5 Well Evaluation and Testing

Well evaluation and testing may be required if the exploration drilling results indicate the presence of hydrocarbons in the target formations. The evaluation and testing will help characterize the reservoir and provide further information about the stratigraphic column, viability of a prospect, and the commercial potential of reservoirs. Well flow testing involves flowing the well fluids through temporary test equipment located on the MODU and may require flaring of gases or other hydrocarbons that come to surface for safe disposal.

A well test may not occur right after the drilling phase but may be scheduled later depending on rig schedule, anticipated sea states, and weather conditions. In the event of a delayed well test, the well will be secured and suspended prior to moving the MODU off location.

Well testing will be subject to Chevron's well test assurance process, which is designed to promote safe and efficient well test operations. Chevron will inform the C-NLOPB of any plans for well test flaring as part of the ADW process for each well as applicable and will report on any flaring activity.

2.2.6 Well Abandonment and Decommissioning

Once wells have been drilled to total depth and evaluated for hydrocarbons as applicable, Chevron will seek C-NLOPB approval for well abandonment. A well abandonment plan will be prepared in accordance with applicable C-NLOPB and Chevron requirements and will include a configuration of cement and mechanical bridge plugs to isolate hydrocarbon bearing intervals within the wellbore.

Once the well is plugged and tested to confirm plug integrity, the last stage in the well abandonment process will be to remove the wellhead and associated infrastructure (e.g., BOP). A mechanical cutter will be used to cut the wellhead below the seabed so it can be recovered to the surface.

In some circumstances, Chevron may seek approval from the C-NLOPB to abandon the well leaving the wellhead left in place. This will result in a permanent structure on the seafloor approximately 5 m in height with a benthic footprint less than approximately 2 m^2. All other subsea infrastructure (including the BOP) would be removed. The decision to remove or leave in place would be made in consideration of potential interference with fisheries and other ocean uses.

Final details about the well abandonment program will be provided to the C-NLOPB as part of the ADW process.

2.2.7 Supply and Servicing Components

Logistical support for offshore drilling operations is required to transport personnel and equipment between the offshore drilling site and onshore facilities. Supply vessels and helicopters will be contracted to third-party service providers on a temporary basis.

2.2.7.1 Platform Supply Vessel Operations

The well site will be located offshore in a remote location more than 300 km from the port of St. John's, NL. The primary land base for offshore operations will be St. John's for supply vessels and helicopter support. As with all offshore projects in this region, logistics and service requirements for a drilling program can be challenging especially during seasons of heavy weather and sea states. In the event of arctic ice impeding entrance to the harbor, a secondary base at Bay Bulls harbor (approximately a 15-minute drive from St. John's) will be used.

While the MODU is on location, a dedicated stand-by vessel will be stationed near the MODU to maintain the safety zone, provide support for emergencies, and provide secondary storage of well tubulars and drilling mud if required. A second vessel will be servicing the MODU by transporting equipment and people (in the event helicopters cannot fly) to and from the MODU. It is anticipated that two to three sailings per week will be required but more are possible if a rig crew change is required.

The typical speed for supply vessels is approximately 12 knots, making travel time to the Project Area approximately 16 to 28 hours (depending on the supply base discussed above). Common shipping routes will be used, as practicable, to reduce incremental marine disturbance.

2.2.7.2 Helicopter Traffic and Operations

Helicopters will be the primary method to transport personnel to and from the MODU with operations based at the St. John's International Airport. One helicopter trip per day is currently planned to support this Project. If helicopters cannot fly because of poor visibility from fog or from high winds, consideration will be given to transport by vessel depending on the long-term weather forecast and the urgency to get people to the MODU. Emergency response, safety procedures and protocol will be in place for transport of personnel offshore. Helicopters will also be used to support medical evacuation from the MODU and search and rescue activities in the area, if required. Exact routes to the well locations from the shore cannot be finalized until well locations are confirmed.

2.2.8 Emissions, Discharges and Waste Management

Key emissions, discharges and waste streams likely to be generated by the Project include the following:

- Air emissions (e.g., criteria air contaminants and greenhouse gases)
- Drilling waste (e.g., drill cuttings, drill fluids and cement)
- Liquid discharges (e.g., bilge and ballast water, grey and black water, BOP fluids, etc.)
- Hazardous waste and non-hazardous waste (e.g., domestic waste; solid and liquid hazardous waste)
- Sound emissions (e.g., from the MODU, supply vessels, and VSP sound source array)
- Light and thermal emissions (e.g., from the MODU and supply vessels)

Efforts will be made to reduce waste emissions and discharges generated during the Project. Chemicals intended for discharge to the marine environment will be selected in accordance with the Offshore Chemical Selection Guidelines (OCSG) (NEB et al. 2009). Waste generated will be managed and disposed according to regulatory requirements and applicable guidelines. Offshore waste discharges will be managed in compliance with the International Convention for the Prevention of Pollution from Ships (MARPOL) and/or the Offshore Waste Treatment Guidelines (NEB et al. 2010) as applicable. Waste not meeting conditions for discharge will be brought to shore for disposal and managed in accordance with the Newfoundland and Labrador Waste Management Strategy and other applicable regulatory requirements (including municipal by-laws).

A Waste Management Plan will be prepared as part of the Environmental Protection Plan (EPP) during the OA process with the C-NLOPB prior to drilling operations. Information on the releases, wastes, and discharges will be reported as part of a regular environmental reporting program in accordance with regulatory requirements as described in the Offshore Waste Treatment Guidelines (OWTG).

Section 2.8 in the EIS provides a general description of typical emissions and discharges to be generated over the course of Project activities and how they will be managed. A summary of potential Project-related emissions and discharges is provided in Table 2.1.

Table 2.1 Potential Project-Related Emissions and Discharges

Emission / Discharge	Source and Characterization	Waste Management
Air emission	Project activities that will result in air emissions include: • Fuel combustion from engines associated with the MODU, supply vessels, fixed and mobile deck equipment, and helicopters • Flaring during well test activity, if well testing is required	Chevron 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). Chevron will adhere to federal and provincial compliance and reporting requirements for emissions which are currently being reviewed and updated by the federal and provincial governments.

Table 2.1 Potential Project-Related Emissions and Discharges

Emission / Discharge	Source and Characterization	Waste Management
WBM	WBM or seawater will be used to drill the shallow sections of the wells. WBM consists of approximately 75% of water, which can be freshwater, seawater or brine. Several substances are added to the WBM, including barium sulphate (barite) and bentonite clay.	The majority of WBMs discharged are classified under the Offshore Chemical Notification Scheme (OCNS) as substances that pose little or no risk to the environment (PLONOR). WBM or seawater fluids will be disposed directly to the seabed.
SBM	Deeper sections of the well will be drilled with either WBM or SBM. SBM is manufactured through a chemical process and contains non-aqueous (water insoluble) fluids, as a water-in-oil emulsion.	When using SBM, cuttings will require additional treatment to enable disposal in accordance with the OWTG.
Produced water	Produced water, which includes formation water encountered in a hydrocarbon bearing reservoir, would only be produced during well evaluation and testing processes	If volumes of produced water are large, some produced water may be brought onto the MODU for treatment so that it can be discharged according to the OWTG. Small amounts of produced water may be flared
Bilge and deck drainage water	As water from various sources (such as sea spray, precipitation, washdown during systems testing, seawater seepage) may contact equipment and machinery, deck drainage and bilge water may be contaminated with oil and other chemicals	Deck drainage and bilge water will be discharged according to the OWTG (≤15 mg/L residual oil in water)
Ballast water	Ballast water is seawater stored in dedicated tanks used for MODU and supply vessel stability and balance; it typically does not contain hydrocarbons or chemicals	Ballast water will be discharged according to Transport Canada's *Ballast Water Control and Management Regulations* and IMO *Ballast Water Management Regulations*. The ballast tank on the MODU will be flushed prior to arriving in Canadian waters
BOP fluids	The BOP is regularly pressure and function tested over the duration of the well. BOP fluids are released directly to the ocean during testing in the following scenarios: 1. BOP installation and removal (approximately 665 bbl [105 m^3] per well, assuming two BOP pulls) 2. During unlatching and pulling of the Lower Marine Riser Package (approximately 324 bbl or 360 m^3, assuming once per well to trouble shoot or for weather) 3. During BOP operations and testing activity including flushing choke and kill lines (approximately 48 bbl [7.5 m^3] per well) BOP control fluid would also be discharged to the marine environment if the BOP is activated in response to an emergency event. BOP fluids are typically freshwater-based, seawater-soluble chemicals	BOP fluids and any other discharges from the subsea control equipment will be discharged according to OWTG and OCSG

Table 2.1 Potential Project-Related Emissions and Discharges

Emission / Discharge	Source and Characterization	Waste Management
Grey and black water	Black water (includes sewage water) and grey water (includes ablution, laundry and galley water) will be generated on the MODU and supply vessels	Sewage will be macerated prior to discharge in accordance with OWTG (6 mm) and MARPOL
Well treatment and testing fluids	Well testing can result in formation fluids (i.e., hydrocarbons and associated water) brought to surface. Well testing is typically required to gather information about the subsurface characteristics and to convert an EL to a Significant Discovery Licence	If well testing results in gas, oil or formation water brought to surface, these will be flared for safe disposal. All flaring, if required, will be optimized to the amount necessary to characterize the well potential and as necessary for the safety of the operation
Putrescible solid waste	Includes food waste generated offshore.	Will be disposed according to OWTG and MARPOL requirements. Macerated food waste will not be discharged within 3 nm from land.
Non-hazardous waste	Packaging material, scrap metal, and other domestic wastes and recyclables	Will be stored in designated areas on board the MODU. At scheduled intervals, the non-hazardous wastes be shipped to shore by supply vessels and collected onshore by a third-party contractor for disposal at an approved Chevron facility and in compliance with federal and provincial regulations.
Solid and liquid hazardous wastes	Hazardous waste generated by the Project includes oily wastes (e.g., filters, rags, and waste oil), waste chemicals and containers, batteries, biomedical waste, and spent drilling fluids.	The medical personnel onboard the MODU will be responsible for collection of biomedical waste, which will be stored in special containers before being sent onshore for incineration. There will be designated areas on the MODU for storage of hazardous wastes until a scheduled transferred to shore on a supply vessel for disposal by a third-party contractor at an approved facility. Transfer of hazardous wastes will be conducted according to the *Transportation of Dangerous Goods Act* and any applicable approvals for their transportation, handling, and temporary storage will be obtained as required.
Light and thermal emissions	The MODU and supply vessel navigation and deck lighting will be operating 24 hours a day and thus generate artificial lighting throughout drilling and supply vessel operations as a requirement for maritime safety and crew safety. Flaring activity that is carried out during well flow testing will generate light and thermal emissions on the MODU on a temporary basis, at the end of drilling operations.	Lighting will be reduced to the extent that worker safety and safe operations is not compromised. Reduction of light may include avoiding use of unnecessary lighting, shading, and directing lights towards the deck. If flaring is required, Chevron will discuss flaring plans with the C-NLOPB including steps to reduce adverse effects on migratory birds. This may involve restricting flaring to the minimum required to characterize the wells' hydrocarbon potential and as necessary for the safety of the operation, reducing flaring during periods of migratory bird vulnerability, and the use of a water curtain to deter birds from the general vicinity of the flare.

Table 2.1 Potential Project-Related Emissions and Discharges

Emission / Discharge	Source and Characterization	Waste Management
Sound emissions	The MODU, supply vessels, and air gun source array during VSP operations will generate underwater sound.	VSP activity will be planned and conducted in consideration of the Statement of *Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment* (SOCP; DFO 2007).

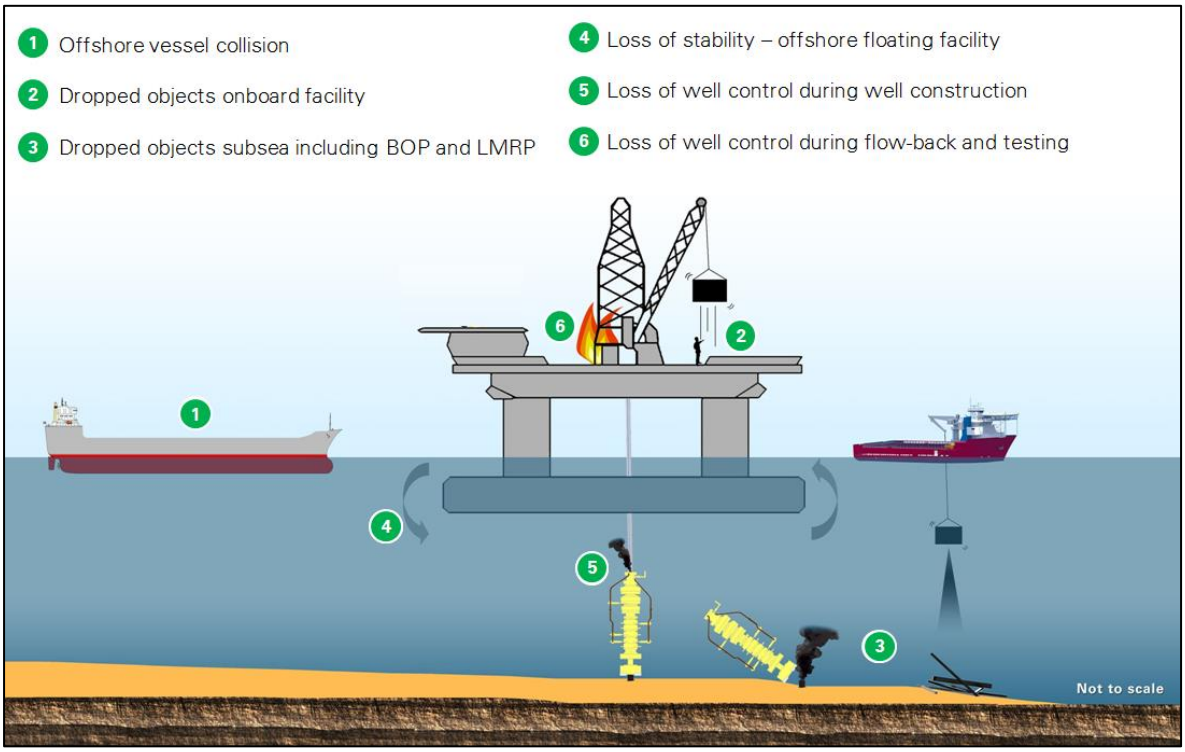
2.3 Accidental Events

Chevron evaluates the risk of potential accidents that may occur during offshore drilling activities and identifies mitigating measures to reduce the safety and environmental risks of operations. One of Chevron's key guiding principles is to undertake a project safely or not at all. Chevron will not take any unnecessary risks or short cuts to save time if it compromises safety.

In general, accidental events may include malfunctions, upset conditions or other unplanned events. Accidental events may occur in any operation as risks often cannot be reduced to a zero probability of occurrence. The Project will be designed to prevent accidents from occurring and to avoid or reduce any environmental effects. Chapter 15 of the EIS discusses potential Project-related accidental event scenarios, prevention and response measures, and potential environmental effects resulting from such events.

2.3.1 Potential Accidental Scenarios

Accidental risk events with potential environmental consequences that could occur during Project operations include vessel collision, dropped objects, loss of MODU stability or structural integrity, and loss of well control (Figure 2-1).



Source: BP 2018
Note: BOP = blowout preventer; LMRP = lower marine riser package

Figure 2-1 Exploration Drilling Potential Accident Scenarios

The environmental assessment for accidental events focuses on scenarios that could result in a release of hydrocarbons or SBM and specifically considers the following accidental spill scenarios:

- Subsea blowout
  - Continuous subsea well blowout at two hypothetical drilling sites of varying water depth (500 m and 1,500 m water depth) and each with two different response scenarios (e.g., capping stack, relief well) which affect the overall length of the hydrocarbon release
- Batch spill
  - Instantaneous spill of 1,000 L of marine diesel from the MODU in the Project Area
  - Instantaneous spill from a supply vessel along the transit route
- SBM spill
  - SBM spills from the MODU and the marine riser

2.3.2 Contingency Planning and Emergency Response

Under the *Canada-Newfoundland and Labrador Atlantic Accord Implementation Newfoundland and Labrador Act*, oil spill response at an offshore facility falls under the jurisdiction of the C-NLOPB. The C-NLOPB has a specific regulatory mandate to ensure the operator is taking all reasonable measures to prevent further spillage and to mitigate the effect and impacts of the spill. Where reasonable measures are

not being taken, the Chief Conservation Officer can direct the operator to take those measures or can take over management of the response effort directly.

C-NLOPB is the designated lead agency in offshore spill incidents at the drilling site under memoranda of understanding with a variety of federal and provincial ministries which may act in supporting roles. The C-NLOPB is also named as the lead agency in offshore spill incidents under the Canadian Coast Guard National Emergency Response Plan. Chevron will have a credible response capability including:

- Designated response personnel
- A training program for Chevron personnel and Chevron contractors
- Spill tracking and clean-up equipment at the offshore site

The project-specific Oil Spill Response Plan (OSRP) will cover the management, countermeasures, strategies and training that will be used as necessary in the response to spills originating inside the safety zone at Chevron's exploratory West Flemish Pass drill site.

The OSRP will provide a comprehensive account of:

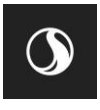
- Chevron's philosophy and policies concerning oil spill response
- The organization of Chevron's response efforts and the evolution of those efforts with the increasing scale of the spill response
- Arrangements for assistance from contractors, other operators and corporate resources
- Environmental issues resulting from an offshore oil spill
- Chevron's policies concerning safety, oil spill waste management, and training

Chevron vessels will be equipped with sorbent materials for the response to small fuel, hydraulic, or testing spills. Eastern Canada Response Corporation (ECRC) has been contracted as Chevron's prime spill response contractor thereby providing a pool of equipment and response consistency with all Grand Banks Operators. Chevron is a signatory to the current Grand Banks Operators Mutual Emergency Assistance Agreement.

Chevron's East Coast Oil Spill Response Program has been structured to support all of Chevron's operations offshore NL. The Program is comprehensive and consists of two components – Operational Response and Response Management. The operational component meets or exceeds standards established by the *Canada Shipping Act.* The response management component is linked to Chevron's East Coast Emergency Response Program and the ECRC Spill Management System, which is certified under the *Canada Shipping Act, 2001*.

Chevron has established an operational capability to respond to offshore oil spills. Equipment has been staged to allow prompt response to small spills with resources at site and an efficient response to larger spills using equipment stored at ECRC's facility in Mount Pearl. Oil spill response resources include:

- Surveillance and monitoring
- Oil and oiled wildlife sampling
- Wildlife monitoring and handling



- Physical dispersion
- Containment and recovery (sorbent boom or other systems stored onshore)

Chevron's response management process will be described in Chevron's West Flemish Pass Emergency Response Plan.

In any spill response, Chevron's priority will be to safely mitigate the effects of the spill in a way that results in the highest net environmental benefit. The measures implemented will be reasonable and will be taken after consultation with applicable regulatory authorities. Reasonableness will be based on safety, impact to the environment, practicality, and cost-effectiveness. Response strategies, including cost, are determined by ECRC through the Incident Command System planning process. Chevron may consult with and seek input from the C-NLOPB with support from federal and provincial government agencies as applicable.

2.3.3 Fate and Behaviour of Potential Spills

RPS conducted trajectory and fate modelling for unmitigated subsurface blowouts of crude oil and batch spills of marine diesel to support an evaluation of environmental effects of accidental events (see Section 15.2 of the EIS and Appendix F of the EIS).

Two release locations were used for spill modelling at representative sites with EL 1138, representing a deep-water (1,500 m) (West Flemish 1) and shallow water (500 m) (West Flemish 2) well site. A batch spill at the deep-water well site was also modelled. The modelling study employed a combined stochastic and deterministic approach to determine the potential trajectory and fate of hypothetical hydrocarbon releases from the two sites east of NL.

Stochastic modelling provides a probabilistic view of the likelihood that a given region might be exposed to released hydrocarbons over specified thresholds as well as time it takes to reach these thresholds. Because stochastic analyses include more than 100 simulated releases with different start dates throughout a year and over multiple years, they provide a range of possible trajectories based upon variable environmental conditions.

Deterministic modelling provides views of the time-history of individual releases including the spatially- and temporally varying movement and behavior of released oil from specified individual releases (i.e., representative credible "worst cases"). Deterministic scenarios provide an understanding of the predicted spatial and temporal variability in thicknesses, concentrations, and mass within each environmental compartment.

Predicted surface oil thickness, dispersed oil in the water column, and shoreline oil mass exceeding specified thresholds for the full year (i.e., annual) are provided in Section 15.2 and Appendix F of the EIS along with seasonal breakdowns associated with variable ice-cover conditions (i.e., summer/ice-free and winter/ice-covered). Individual deterministic trajectories that characterize single release scenarios are also presented associated with representative credible "worst-case" scenarios (i.e., 95th percentile "worst-case" for surface oil, subsurface contamination, and shoreline oiling). Stochastic analyses of hypothetical blowouts were modelled using the physical-chemical properties of West Flemish Pass Light Oil (WFPLO)

and seven years of variable environmental data. A total of 171 individual oil spill trajectories were modelled as unmitigated subsurface releases with randomized start dates/times within each two-week time period making up the seven-years modelled. The releases included 82 winter and 89 summer scenarios. Although the duration of hydrocarbon release varied depending on response scenario (capping stack versus relief well drilling), each simulation within the stochastic scenarios was run for 160 days.

In addition, a single representative deterministic release (1,000 L) was analyzed to evaluate a potential discharge of marine diesel on the surface associated with a batch spill that could occur from vessels, unloading hoses, or a tank.

2.3.3.1 Subsurface Model Blowout

In total, 171 unmitigated subsurface blowout release events were evaluated as part of this study. The model assumed that oil and gas were introduced to the water column near the seafloor at a rate of 22,640 m^3/d and 20,190 m^3/d for West Flemish 1 and West Flemish 2 respectively, to simulate an uncontrolled release from the wellhead (i.e., a blowout). The modelled release depth ranged from 500 m (Site 2) to 1,500 m (Site 1) at the two identified release locations without the application of mitigation or response measures.

For both release sites, summaries of the stochastic analyses of potential surface oil and water column exposure by dissolved hydrocarbons depict areas to the east of the release sites as having the highest potential probability (>90%) to exceed conservative socio-economic thresholds (i.e., 0.04 g/m^2 oil floating on surface; 1 ppb of dissolved polycyclic aromatic hydrocarbons). The >90% probability area typically extended over 1,500 km to the east to the edge of the model domain for the surface oil, but typically fell short of the boundary for the water column contamination with the 50% probability contour making contact with the easternmost extent of the modelled area. This is the result of the WFPLO being persistent, resulting in emulsified oil on the surface. The soluble and volatile fraction making up the water column contamination was more likely to evaporate and degrade over the amount of time required for oil to be transported to the easternmost boundary. In nearly all stochastic scenarios, lower probabilities of threshold exceedance are predicted for surface and/or water column oil contamination to the north and south, while generally less than 25% of releases have the potential to exceed socio-economic thresholds more than100 km to the west of the Project Area.

Due to the primarily eastward transport of oil from wind and currents, and the distance of the Project Area to the shoreline of NL, the maximum average probability of Canadian shoreline exposure above the threshold (1.0 g of oil per square metre) for the four stochastic scenarios was approximately 8.7%. As the Labrador current flowed southward along the continental shelf, it was predicted to transport subsurface oil to the south, parallel to the coast. However, this trend is generally absent in the surface oil projections as wind forcing was more likely to transport oil to the east. Oil that was predicted to make its way to the shoreline of Canada would be patchy and discontinuous due to the considerable amount of weathering and natural dispersion that would take place over the weeks or months that were required for oil to reach shore. The minimum time predicted for oil to reach shorelines at a concentration to exceed the threshold (1.0 g/m^2) was 10.9 to 32 days along the Avalon peninsula and southeastern NL, and 50 to100 days along the shores of the northern shores of NL eastern Gulf of St. Lawrence, and southwestern Labrador.

Although minimal, there was some level of seasonal variability in spill behavior. Regardless of release site and duration, the average stochastic probability of shoreline oiling was consistently about two times higher for winter releases (3.4-8.7%) than for summer releases (1.8-3.7%). Similarly, the minimum time to shoreline threshold exceedance was about two to three times longer in the summer (26-32 days) than in the winter (10.9-11.4 days).

The deterministic trajectory and fate simulations provided an estimate of the transport of oil through the environment as well as its physical and chemical behavior for the specific set of modelled environmental conditions. For the representative credible "worst-case" deterministic scenarios at both modelling sites, subsurface oil was predicted to rise through the water column where it surfaced and predominantly was transported to the east and south. Nearly half of the oil was predicted to evaporate, while a third was predicted to degrade by natural processes. Of the remaining roughly 15-20% of the released oil, 1-15% was predicted to remain on the surface, <2% remained in the water column, <0.1% to 0.4% stranded on shorelines, and <0.1% settled onto sediments over 160 days. Because the simulations were so long, between 3.6% to 21.2% of the oil (predominantly surface oil as heavily weathered emulsifications and tar balls) was predicted to leave the model domain to the east. All scenarios assumed a completely unmitigated release, which is an unlikely situation because various emergency response tactics would typically be employed immediately in the event of a spill.

For the shoreline oil exposure cases, shoreline oil contamination was predicted to exceed the 1 g/m2 threshold for approximately 100-1,060 km and exceed the ecological threshold (100 g/m²) for 98-946 km. In general, most oiling in these scenarios was predicted to occur along the eastern and southern shores of NL, although stochastic results did result in the potential for shoreline oiling from southern Newfoundland up to Labrador. The oil that was predicted to strand along shorelines was generally in the 100 to >500 g/m² range, but would be patchy, discontinuous, and generally highly weathered by the time it reached shore. Offshore sediment contamination was predicted to be much less prevalent, occurring at very low levels (<0.01 g/m²) at locations near the release sites and to the south along the continental shelf break. The extents of shoreline exposures were predicted to be less for West Flemish 2, especially for the short-duration (27 day) release.

2.3.3.2 Batch Spill

A smaller scale near-instantaneous batch spill of marine diesel was modelled as an accidental release. One 1,000 L release was modelled at West Flemish 1 and was simulated for 30 days. The marine diesel had a low viscosity and a high aromatic content that was expected to evaporate quickly during the summertime releases. The marine diesel release was predicted to result in a patchy distribution of colorless or silver sheen of oil <0.0001 mm (0.1 µm), where the total area exposed to oil >0.04 µm over 30 days was 8 km². Due to the small release volume, low entrainment, and small size, predicted concentrations of dissolved or total hydrocarbons in the water column did not register above the threshold. Oil was not predicted to reach any shorelines from the modelled batch spill.

2.3.4 Spill Risk and Probabilities

There are three types of oil releases that could potentially occur directly from wells and their associated infrastructure: subsurface blowouts, well releases (other well-related spills), and corrosion-caused leaks after abandonment. Batch spills of fuel oils and other oils used in operations, as well as SBM may also occur from supply vessels and the MODU. The likelihood of incidents occurring depends on the number of wells and the duration of the exploration period. With more wells there are greater chances of having a spill. Water depth can also affect probability of a blowout, therefore differences in spill probabilities are predicted between the West Flemish 1 and West Flemish 2 sites.

For West Flemish 1, there is a 1 in 12,000 chance that there will be a blowout during exploration if there is one well. With eight wells, the chance increases to 1 in 1,500. For West Flemish 2, there is a 1 in 3,100 chance of a well blowout for each well during the exploration period. With eight wells, the chances are 1 in 400.

When a blowout occurs, it is more likely to involve a relatively small volume than a very large volume. The vast majority (84%) of blowouts bridge over naturally within a few hours to days even in the absence of any intervention or before an intervention can be implemented. The chances of a blowout involving 1,000 bbl or more are 1 in 5,900 for West Flemish 1, and 1 in 2,600 for West Flemish 2 per well. Larger blowout volumes are even less likely. The chances of a blowout of 100,000 bbl are 1 in 7,700 for West Flemish 1 and 1 in 4,000 for West Flemish 2.

There is a 1-in-5 chance of a batch spill for each well. This means that with five or more wells, it can be expected that there is at least one batch spill, although this is not “guaranteed.” There is no difference in spill probability between the sites. Batch spills also are generally relatively small as there is a limited amount of oil that is contained in the fuel tanks or other storage.

The analyses on probabilities of blowouts, well releases, and batch spills are based on historical data. There are continuing developments in blowout prevention and mitigation, as well as improved safety practices in offshore operations, that will continue to reduce the likelihood and severity of these incidents in the future.

2.4 Project Schedule

Chevron proposes to commence exploration drilling with an initial well in 2021 pending regulatory approval to proceed. Up to eight exploration wells could be drilled over the term of the EL (2016 to 2025) contingent on the drilling results of the initial well. Drilling activities will not be continuous and will be in part determined by MODU availability and previous wells’ results. It is anticipated that each well will take approximately 180 days to drill.

Chevron’s preference is to conduct drilling between May and September, although the EIS assumes year-round drilling. VSP operations will take approximately one to three days per well and well testing, where required, would occur over a one to three-month period with flaring likely occurring over two to three days during this period. 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.

3.0 ALTERNATIVE MEANS OF CARRYING OUT THE PROJECT

All project environmental assessments must consider and discuss technically and economically feasible, alternative means of carrying out the project and provide potential environmental effects of such alternative means, pursuant to section 19(1)(g) of CEAA 2012. There are several components of the Project, such as well site location, that are yet to be finalized. Some of these components will be confirmed to the C-NLOPB as part of the OA and ADW processes.

For the analysis of alternative means, the EIS Guidelines suggest consideration of the following:

- Drilling fluid selection (e.g., WBM or SBM)
- Drilling unit selection
- Drilling waste management
- Water management and effluent discharge
- Alternative platform lighting options (including flaring) to reduce attraction and associated mortality of birds

A summary of alternative means of carrying out the Project is provided in Table 3.1 and for each these aspects of the Project, the technical feasibility and economic feasibility, as well as the environmental effects (where applicable) of the alternative means are described. The Project is assessed based on the preferred alternative means (i.e., assumed to be the base case that is assessed for environmental effects in Chapters 8 to 13 of this EIS).

Table 3.1 Summary of Alternatives Analysis

Option	Legally acceptable?	Technically feasible?	Economically feasible?	Environmental Issues	Preferred Option
Drilling Fluid					
SBM only	No	Yes	Yes	SBM is not permitted for ocean discharge without treatment, therefore SBM cannot be used for riserless drilling where the cuttings are disposed directly on the seafloor	Not preferred
WBM only	Yes	Yes, although potential challenges with borehole stability	Yes – although potential increased cost from non-productive time and losses	No substantial difference between options. Both are considered acceptable provided that appropriate controls are in place and chemicals are selected in accordance with Offshore Chemical Selection Guidelines (OCSG) (EIS considers both WBM and SBM in effects assessment)	Exclusive use of WBM feasible but not preferred
WBM / SBM hybrid for different sections	Yes	Yes	Yes		Preferred alternative

Table 3.1 Summary of Alternatives Analysis

Option	Legally acceptable?	Technically feasible?	Economically feasible?	Environmental Issues	Preferred Option
Drilling Unit					
Jack-up Rig	Yes	No, given water depths of ELs	Not considered as option because not technically feasible.		Not feasible
Semi-submersible	Yes	Yes	Yes	Both options are environmentally acceptable and would have comparable environmental effects in terms of lighting, emissions and discharges, and underwater sound (EIS considers both options in effects assessment)	Potentially preferred alternative
Drillship	Yes	Yes	Yes		Potentially preferred alternative
Drilling Waste Management					
Discharge to water column (following treatment of SBM on cuttings)	Yes	Yes	Yes	Some localized effects are expected on the seafloor from discharge of cuttings	Preferred alternative
Offshore Reinjection	Yes	No	Not considered as option because not technically feasible		Not feasible
Ship-to-shore (SBM-associated cuttings)	Yes	Yes	Yes – but increased costs from increased transportation and operational delays	Some limited offshore effects are expected from increased transportation, and some onshore effects from transportation and onshore disposal of waste including increased health, safety and environment risks associated with truck and vessel traffic and exposure and handling of waste material	Not preferred alternative

Table 3.1 Summary of Alternatives Analysis

Option	Legally acceptable?	Technically feasible?	Economically feasible?	Environmental Issues	Preferred Option
Lighting					
Standard MODU lighting	Yes	Yes	Yes	Some localized visual effect is expected which could affect migratory birds	Preferred alternative
Spectral modified lighting	Yes	No – limited capabilities in extreme weather; safety concerns with helicopter approach and landing	No – not considered as commercially viable yet	Not considered as option because not feasible	Not feasible
Flaring					
No flaring	No	Not considered as option due to regulatory and safety requirements. Current regulatory practice requires formation flow test with flaring to secure Significant Discovery Licence. Industry continues to advocate for alternative methods.			Not feasible
Formation testing while tripping	Yes	Yes – although may not fulfill CNLOPB data requirements in all cases	Yes	No flaring therefore reduced light and atmospheric emissions and reduced risk of bird attraction and mortality	Potentially preferred alternative
Reduced flaring (i.e., no flaring during nighttime or inclement weather)	Yes	Yes – although activity could result in compromised data	Yes – but increased MODU costs and risk of delays	Reduced flaring would still result in some measure of light and atmospheric emissions	Not preferred alternative
Flaring as required with flare shield (water curtain)	Yes	Yes	Yes	Some limited offshore effects are expected from the light and atmospheric emissions generated during flaring. These are expected to be intermittent and brief in duration over a temporary period at the end of drilling	Preferred alternative

4.0 CONSULTATION AND ENGAGEMENT

Chevron recognizes the importance of early and ongoing Indigenous and stakeholder engagement that continues over the life of the Project. Chevron is committed to collaborating with Indigenous peoples of Canada and other stakeholders to build long term trusting and mutually beneficial relationships based on the principles of inclusion, transparency, respect and accountability.

4.1 Government Departments and Agencies

Regulatory stakeholders are typically engaged to confirm specific regulatory requirements / processes and/or data requests. Key regulatory stakeholders for the Project are:

- C-NLOPB
- Government of Canada
  - Agency
  - DFO
  - ECCC
  - Canadian Coast Guard
  - Natural Resources Canada (NRCan)
  - Department of National Defence (DND)
  - Transport Canada
- Government of NL
  - Municipal Affairs and Environment
  - Fisheries and Land Resources
  - Natural Resources

To date, Chevron has met with the Agency, the C-NLOPB, DFO, ECCC (including the Canadian Wildlife Service [CWS]), NRCan, Transport Canada, DND, Health Canada, and the NL Department of Natural Resources in planning and developing the EIS to obtain relevant baseline information and/or guidance in assessment methods and approach. These same government departments and agencies also participated in the review of the Project Description and EIS guidelines. The EIS incorporated comments provided during the review processes and meetings where applicable.

4.2 Indigenous Engagement Activities

There are several Indigenous organizations in Eastern Canada that hold commercial communal fishing licences for Northwest Atlantic Fisheries Organization (NAFO) Divisions that overlap the Project Area, although it is currently not known if actual fishing under these licences takes place in the Project Area. There are no documented food, social and ceremonial (FSC) licences within or near the Project Area. Species harvested for commercial or FSC purposes outside the Project Area may potentially interact with Project activities (planned or unplanned) during migration to traditional fishing grounds. There is also the potential for species at risk and/or of cultural importance to be present in the Project Area (e.g., Atlantic salmon). The list of Indigenous organizations that may have a potential interest in the Project includes

groups and communities in NL, Nova Scotia (NS), Prince Edward Island (PE), New Brunswick (NB), and Quebec (QC).

The EIS Guidelines (Section 5.1) specify that Chevron engage the following Indigenous groups:

Newfoundland and Labrador

- Labrador Inuit (Nunatsiavut Government)
- Labrador Innu (Innu Nation)
- NunatuKavut Community Council
- Qalipu Mi'kmaq First Nation Band
- Miawpukek Mi'kmamawey Mawi'omi (Miawpukek First Nation)

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

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

New Brunswick

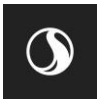
- Mi'gmawe'l Tplu'taqnn Inc. (MTI), which represents the following Mi'kmaq First Nation groups:
  - Fort Folly First Nation
  - Eel Ground First Nation
  - Pabineau First Nation
  - Esgenoôpetitj First Nation
  - Buctouche First Nation
  - Indian Island First Nation
  - Eel River Bar First Nation
  - 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)

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

Chevron initiated engagement with Indigenous groups in October 2018 to introduce the Project and inquire about potential interests and concerns as well as preferred methods of engagement going forward.

Chevron recognizes that some of these groups may prefer to participate through the Crown consultation process or may not have an interest in the Project. 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, and listening and responding to questions and concerns raised by Indigenous groups in a timely manner. Feedback obtained during engagement will be incorporated into Project planning as applicable and appropriate. This EIS documents concerns and priorities raised and demonstrates how these have influenced Project planning and/or been addressed.



Chevron understands the importance of ongoing engagement with Indigenous groups; however, Chevron is aware that the West Flemish Pass Exploration Drilling Project is one of several offshore exploration drilling programs proposed for offshore NL. Chevron has joined with other operators to collaborate on future engagement to help reduce multiple engagement requests on Indigenous groups. Chevron will coordinate opportunities for engagement with Husky Oil Operations Ltd., CNOOC International, Suncor Energy, BP Canada Energy Group ULC, and BHP (Petroleum) Canada, all of whom are proposing exploratory drilling programs in the Flemish Pass and Orphan and Jeanne d'Arc Basins. Although their exploration drilling projects have been released from the CEAA 2012 process, Equinor Canada Ltd. and ExxonMobil Canada are also part of the engagement collaboration.

Chevron has notified, and will continue to notify, each of the identified Indigenous groups about key steps in the EIS development process and of opportunities to provide comments on key documents.

4.2.1 Issues and Concerns

A summary of key issues and concerns raised by Indigenous groups during the EA process to date, and how these are being addressed, is provided in Table 4.1.

Table 4.1 Concerns Expressed by Indigenous Groups during September 2019 Workshops

Atlantic Salmon (and other culturally important species): • Potential impacts of exploration drilling (both operations and potential accidents) on Atlantic Salmon populations that may migrate and over-winter in the Project Area. These populations return to their natal rivers and streams where they could be harvested for traditional purposes (FSC). Some of these populations are listed under the Species at Risk Act (SARA), and in many cases, Indigenous communities do not harvest for FSC purposes, due to ecological concerns. • There is a lack of data, and not enough is known about the presence and behavior of Atlantic salmon in offshore areas where exploration drilling may occur. • Concerns regarding loss or harm to species of importance has two elements: one relates to the ability to access the species for traditional and current practices, which would include human health, cultural and spiritual practice – including teaching traditions to younger generations, and the practice of kinship; and the other element of concern relates to the general loss or absence of species of importance that are a part of the natural ecosystem. • Other culturally important species of concern to Indigenous groups include American eel, swordfish, tuna, ground fish, lobster, crab, sea turtles, sharks and marine mammals. *Action / Mitigation*: • Chevron recognizes the importance of salmon to Indigenous groups in the Atlantic region, as well as the uncertainty associated with the known presence and activities of Atlantic salmon in the Project Area. Chevron, along with other oil and gas companies provides funding to the Environmental Studies Research Fund (ESRF) for studies related to environmental and social issues to support sound decision-making for oil and gas projects. The ESRF is funding research in this area that involves Indigenous peoples. • Chevron has robust Oil Spill Response and Emergency Response Plans that put safeguards in place to prevent spills and other emergencies. These plans will be shared with Indigenous groups. • Chevron will develop an Indigenous Fisheries Communications Plan to establish protocols for ongoing communication and information-sharing with interested Indigenous groups
Potential Impacts to Indigenous Fisheries: • There are concerns about potential impacts from operations, or in the case of an emergency that may result in adverse environmental effects on traditional, commercial and commercial communal fisheries. For example – many concerns and questions were raised regarding the unknown behavioral impacts on Atlantic salmon and other species of operations -- such as underwater noise, light, vibration and changes to water quality.

Table 4.1 Concerns Expressed by Indigenous Groups during September 2019 Workshops

• Although there are currently no active fisheries being conducted by Indigenous groups in the immediate vicinity of the Project, concerns were expressed for the potential future ability to fish in areas currently designated as safety zones. *Action / Mitigation*: • Chevron will continue to engage with Indigenous groups throughout the exploration drilling program and provide information related to operational activity, as well as the results of environmental monitoring. • Chevron will develop a communication protocol with Indigenous groups to provide regular Project updates during operations, and to inform Indigenous groups in the event of an emergency. • While there are no current active fisheries in the immediate Project Area, Chevron will continue to work with Indigenous fishers to minimize any potential impact on their ability to exercise their rights to fish.
Cumulative Effects: • There is a perceived lack of a comprehensive approach to analyzing, understanding and addressing the potential for cumulative impacts of so many proposed projects in the region on the environment, and on Indigenous rights. It is anticipated that the current Regional Assessment underway in Atlantic Canada will attempt to address cumulative effects on a broader level. *Action/Mitigation*: • Chevron is participating in the Regional Assessment where a more regional and multi-faceted approach is being taken to examining cumulative effects of multiple projects and interactions with other ocean users. Chevron will apply any applicable new learnings from the regional assessment to their exploration drilling Project.
Indigenous Knowledge: • The EIS and Project implementation should consider and integrate Indigenous traditional and ecological knowledge regarding aquatic, nearshore and offshore environments. • Indigenous groups recognize the complexity and sensitivity of gathering and applying or integrating Indigenous Knowledge in EIS and further, to operations – particularly in an area as geographically and culturally diverse as the Atlantic region. Many issues must be considered, for example, who undertakes a study, what is the area of interest, who has access to the results of the study, confidentiality and protection of information, where that information is managed and maintained, and by whom. *Action / Mitigation:* • Chevron has endeavoured to gather Indigenous knowledge, where available or provided, and recognizes the importance of considering Indigenous knowledge in its operations. • Chevron has engaged with Indigenous groups to discuss Indigenous knowledge as applicable to their proposed exploration drilling program. The proponent has also reviewed the more than fifty submissions provided by Indigenous groups on prior and similar proposed exploration drilling programs in the same geographic region.
Environmental Impacts: • In addition to concerns regarding potential impacts to fishing and fishing rights, Indigenous Groups have general concerns regarding the potential impacts of exploration drilling operations on the marine environment, including changes to water quality, fish and fish habitat, marine plants, migratory birds and marine mammals and increased contributions to atmospheric emissions and climate change. *Actions / Mitigations*: • Potential impacts to the environment are addressed through the EIS's analysis of VCs (see Chapters 8 to 12).
Lack of Original and Recent Baseline Studies: • Indigenous groups have observed that the EIS's submitted to date have relied on existing data and studies, and some of them are considered to be outdated. Indigenous groups would like to see original/new baseline studies done for all of the exploration projects. *Actions / Mitigation*: • Chevron will make full use of existing studies, published literature, information available from federal and provincial agencies, and the regional assessment in the preparation of its EIS.

Table 4.1 Concerns Expressed by Indigenous Groups during September 2019 Workshops

Compensation:

- Indigenous groups are aware of the CNLOPB guidelines in place for loss or damage to fishing gear and vessels due to unforeseen interaction with the Project, or in the case of an emergency. However, specific compensation concerns of Indigenous groups relate to the following:
  - Potential impacts on commercial communal fisheries. The impacts on commercial communal fisheries would be different than a "regular" commercial licence because the licences are "owned" by the Band (community) itself, they are not transferrable, cannot be sold, and the profits are often used to sustain employment, programs and services, and community infrastructure
  - Because of the importance of the connection between Indigenous populations and the natural environment, potential impacts on FSC fisheries may include impacts on cultural and spiritual practices, community cohesion, intergenerational teaching and a sense of well-being.

Actions / Mitigations:

- Chevron would consider any damages to Indigenous fishing activity resulting from Chevron's proposed offshore activities on a case-by-case basis and in consultation with Indigenous groups. Chevron will also adopt the CNLOPB Compensation Guidelines Respecting Damages Relating to Offshore Petroleum Activity.

Oil Spill Response:

- A number of concerns have been expressed by Indigenous groups regarding oil spill response, including:
  - Concerns about oil reaching shoreline, impacting fisheries and traditional territories.
  - Companies need to demonstrate the accuracy of probability calculation and trajectories of oil spills.
  - Capping stacks – a capping stack should be located and maintained in Atlantic Canada.
  - Lack of communication between oil and gas companies and Indigenous groups during recent oil spills.
  - How can Indigenous groups/communities be involved in emergency response?
  - Concerns expressed regarding contamination or fish taint from an oil spill and how this impacts not only consumption, but also perception and cultural norms.

Actions / Mitigations:

- Chevron is building upon the previous efforts of other oil and gas companies to create capacity and awareness of industry and company standards to prevent and respond to an emergency. Chevron participated in three workshops with Indigenous groups where emergency preparedness and oil spill response has been discussed in detail, including – management practices, oil spill modelling, capping stacks and other technology, and the oil spill response Incident Command System (ICS).
- Chevron will develop a robust oil spill response plan in advance of any project activity.
- To ensure Indigenous groups are informed of operational activity during exploratory drilling, Chevron will develop an Indigenous Fisheries Communications Plan in consultation with Indigenous groups that includes a protocol for communicating with Indigenous groups during operations, and in the event of an emergency.

Environmental Monitoring:

- Indigenous groups want to see comprehensive monitoring and follow-up programs, including research and data collection related to impacts on Indigenous groups – e.g. fish and fish habitat, birds and marine mammals.
- Indigenous groups would like to be involved with environmental monitoring; and, to be kept informed of results of environmental monitoring programs throughout the exploration drilling program, and in the event of an incident or spill that may result in adverse environmental effects.

Action / Mitigation:

- During and post-operations, Chevron will share the results of environmental monitoring with Indigenous groups through developed communications plan. At the conclusion of exploration drilling, and once results are available, Chevron will share final environmental monitoring results with Indigenous groups.

Table 4.1 Concerns Expressed by Indigenous Groups during September 2019 Workshops

Communication and Ongoing Involvement of Indigenous Groups: • Indigenous groups want to be actively informed of activities and outcomes during operations, and in the event of an incident or spill that may result in adverse environmental effects. *Action / Mitigation*: • Chevron will develop an Indigenous Fisheries Communication Plan in consultation with Indigenous groups to outline a process and content for regular operational updates during the drilling campaign, as well as outreach to Indigenous groups in the unlikely event of an emergency.

4.3 Fisheries Stakeholders

A key form of mitigation of 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. The following is a list of initial fisheries stakeholders 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 (CAPP)

The key concern noted was regarding increased vessel traffic between the Project Area and shorebase could interfere with inshore / nearshore fisheries. Standard communication on vessel movement will be required to reduce adverse effects to commercial fisheries and other ocean users. Chevron will continue to engage commercial fishers to share Project details, as applicable and determine the need for a fisheries liaison officer during mobilization and demobilization of the MODU. This engagement will be coordinated through One Ocean, Fish, Food and Allied Workers-Unifor, Ocean Choice International, Association of Seafood Producers, and Groundfish Enterprise Allocation Council. This will be accomplished through the development and implementation of a Fisheries Communication Plan.

5.0 ENVIRONMENTAL ASSESSMENT APPROACH

5.1 Scope of the Assessment

The following routine Project activities with the potential to affect the environment have been specifically identified and considered in this assessment:

- Presence and operation of a drilling vessel (including lights and flare, underwater sound, and safety zone)
- VSP surveys
- Discharges (e.g., drill muds and cuttings, liquid discharges)

- Well testing and flaring (including air emissions)
- Well abandonment
- Supply and servicing operations (including helicopter transportation and supply vessel operations)

Non-routine events (i.e., accidental events or malfunctions) have also been identified and considered within the scope of the Project, including blowouts (uncontrolled release of hydrocarbons during drilling), and platform and vessel batch spills and releases (e.g., hydraulic fluid, drilling mud, diesel). Accidental releases, or “spills”, have the potential to occur in the offshore (e.g., during drilling) or nearshore (e.g., during supply vessel transit) environment.

5.2 Overview of Approach

The methods used to assess the effects of routine Project activities and accidental events, as well as the potential cumulative effects of the Project have been developed in consideration of the requirements of CEAA 2012 and guidance issued by the Agency. These guiding principles stress the importance of environmental assessment as a planning and decision-making tool with emphasis on potential effects likely to be present and key issues raised by Indigenous peoples, stakeholders and the public.

The environmental assessment identifies valued components (VCs) which form the basis of the assessment of potential environmental effects that may arise during routine Project activities and potential accidental events. The assessment methods also included an evaluation of potential cumulative effects to consider whether there is potential for the residual environmental effects of the Project to interact cumulatively with the residual environmental effects of other past, present, or future (i.e., certain or reasonably foreseeable) physical activities in the vicinity of the Project.

The environmental effects assessment for each VC describes the baseline conditions and then characterizes the degree and nature of changes and resulting effects that may occur as a result of planned Project activities.

Mitigation measures are proposed to reduce or eliminate potential adverse effects Mitigation may include regulatory requirements, standard operating procedures, best management practices, and specific measures developed specifically to address project-specific interactions and/or sensitivities.

5.3 Selection of Valued Components

The VCs which form the basis of this EIS are:

- 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

These VCs were identified based on a consideration of several factors, including:

- Technical knowledge of the Project (i.e., the nature and extent of Project components and activities)
- Requirements of CEAA 2012 and regulatory guidance including the Project-specific EIS Guidelines provided by the Agency (2018)
- Discussions with regulatory agencies, technical experts, key stakeholders, public and Indigenous Groups during the pre-application process
- Baseline conditions for the physical, biological, and socio-economic existing environments
- Ongoing engagement with Indigenous Groups
- Ongoing engagement with key stakeholders
- Lessons learned from previous similar environmental assessments, such as Environmental Assessment of StatoilHydro Canada Ltd. Exploration and Appraisal / Delineation Drilling Program for Offshore Newfoundland, 2008-2016 (LGL Limited 2008), Equinor's (formerly Statoil Canada Ltd.) Flemish Pass Exploration Drilling Program (Statoil 2017), ExxonMobil's Eastern Newfoundland Offshore Exploration Drilling Project (ExxonMobil 2017), (formerly Nexen Energy ULC) Flemish Pass Exploration Drilling Project (Nexen Energy ULC 2018) Husky's Exploration Drilling Project (Husky 2018), and BP's Newfoundland Orphan Basin Exploration Drilling Project (BP 2018), as well as the Eastern NL SEA (AMEC 2014)
- Professional judgement based on the experience of the assessment team

5.4 Spatial and Temporal Boundaries

The spatial and temporal boundaries for the assessment were selected based on geographic extent of the measurable potential environmental, social, heritage and human effects of the Project (including project activities and components). The spatial boundaries include the following:

- Project Area (Figure 4-2): The Project Area is the boundary that encompasses the immediate area within which Project activities and components occur (EL 1138) and incorporates an approximate 10 km buffer. The Project Area is consistent across all VCs. Well locations within the Project Area have not yet been identified within the Project Area.
- Local Assessment Area (LAA): The LAA is the maximum area within which environmental effects from routine Project activities and components can be predicted or measured with a reasonable degree of accuracy and confidence. It consists of the Project Area and adjacent areas where Project-related environmental effects are reasonably expected to occur (i.e., the transit route to St. John's or Bay Bulls) based on available information including effects thresholds, predictive modelling and professional judgement. The LAA is defined for each VC.

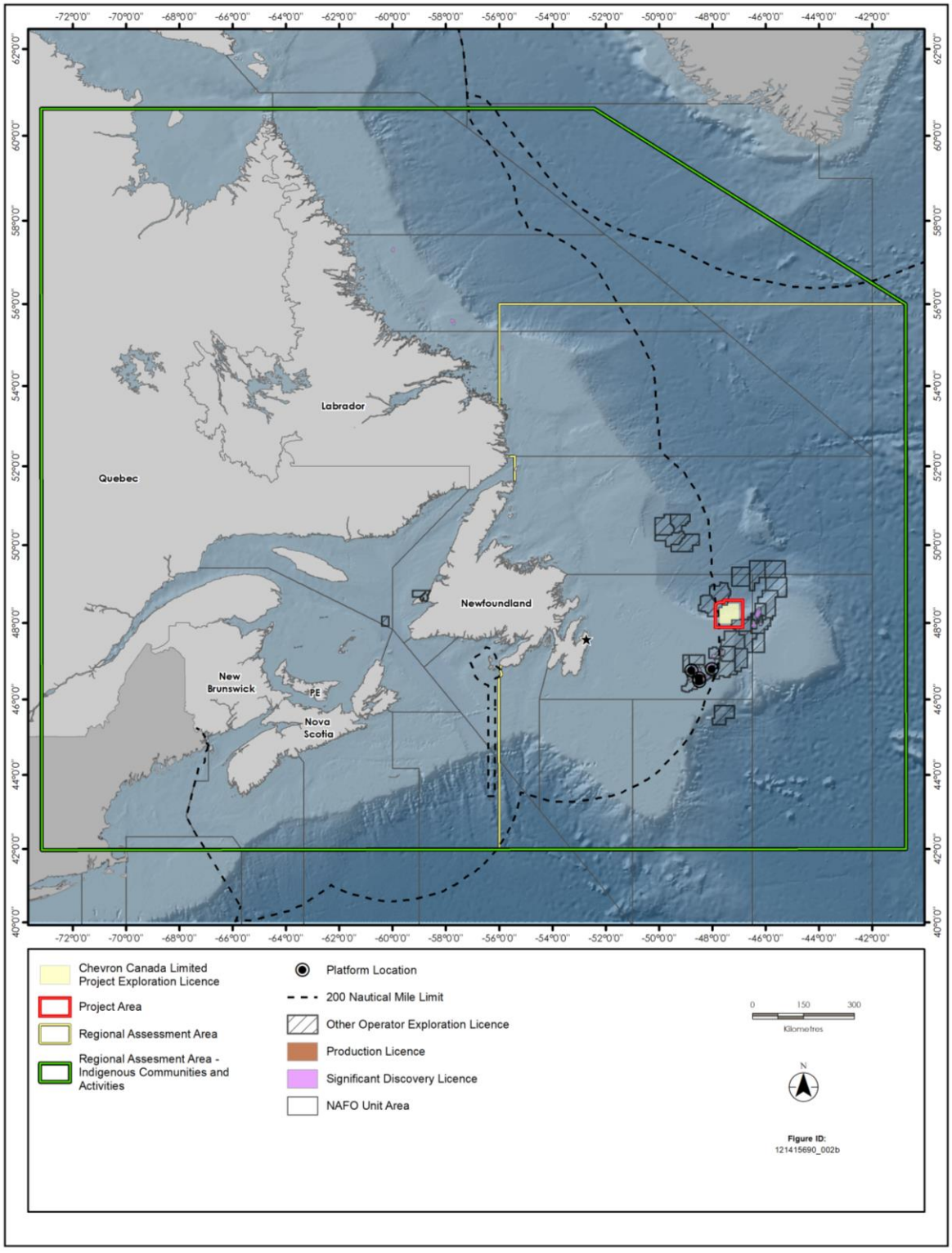


Figure 5-1 Regional Assessment Area

- Regional Assessment Area (RAA) (Figure 4-2): The RAA is the area that establishes the context for determination of significance of Project residual environmental effects from Project activities and components. It is also the area within which potential cumulative effects – the residual effects from the proposed Project in combination with those of past, present and reasonably foreseeable projects – are assessed. Although the RAA is intended to be much broader than the LAA, which focuses on the extent of potential effects associated with routine Project activities for each VC, it is possible that effects from larger scale unplanned events (e.g., blowout) could extend beyond the RAA. The RAA is consistent for all VCs, except for the Indigenous People and Community Values VC which has a larger RAA to encompass the various Indigenous communities which have the potential to be affected by Project-related activities.

Temporal boundaries identify when an environmental effect is evaluated in relation to specific project phases or activities. The temporal boundaries for this Project include all Project phases such as well drilling, testing and abandonment.

Based on the current schedule, the temporal boundaries for the assessment are as follows:

- Chevron proposed to commence exploration drilling with an initial well in 2021. Between 2016 to 2025, up to eight exploration wells could be drilled over the term of the EL contingent on the drilling results of the initial well.
- Drilling is expected to occur between May and September in any given year, although the EIS assumes year-round drilling.
- Well testing (if required, dependent on drilling results) could occur at any time during the temporal scope of this EIS.
- Well abandonment will be conducted following drilling and / or well testing.

6.0 SUMMARY OF ENVIRONMENTAL EFFECTS ASSESSMENT

This section summarizes the key findings of the environmental effects assessment. Additional detail can be found in Chapters 8 to 13 of the EIS for the assessment of effects from routine Project activities, Chapter 14 of the EIS for the cumulative effects assessment, and Chapter 16 of the EIS for an assessment of effects of the environment on the Project. Section 15.5 of the EIS presents the effects assessment for accidental events.

6.1 Marine Fish and Fish Habitat

Marine fish and fish habitat was selected as a VC in consideration of the ecological value provided to marine ecosystems, the socio-economic importance of fisheries resources (i.e., target fish species), the potential for interactions with Project activities and components, and requirements in the EIS Guidelines. The Project Area, LAA, and RAA are known to be used by many fish and invertebrate species, including species at risk and fishery species of importance to Indigenous groups or for commercial and recreational purposes.

The presence and abundance of marine fish species, and associated abiotic and biotic habitat characteristics, vary considerably across the eastern NL offshore area, which transitions from shelf areas to the continental slope and deeper waters. This VC considers relevant fish species (including Species at Risk [SAR] and Species of Conservation Concern [SOCC]), plankton, algae, benthos, and relative components of their habitat, such as water and sediment quality.

6.1.1 Existing Environment

Marine assemblages represent a community of organisms whose physiological, morphological, and life history requirements are adapted to coexist within a specific environment in an ecosystem. Near the Project Area, NAFO recognizes three general functional units:

1. The Grand Banks / Newfoundland Shelf
2. The Flemish Cap
3. The oceanic waters beyond the shelf break

The continental slopes, which act as transition zones between each of these functional units, also represent important habitat (Pepin et al. 2010). The Project Area sits at the confluence of these functional units in a place dominated by the cold Labrador Current (Nogueira et al. 2017). The Labrador Current is a strong influence in this area which limits the temperature-related heterogeneity found there and restricts many species that have more southern distributions and occur nearby on the Tail of the Grand Banks.

Plankton comprise the largest and most diverse ecosystem component on earth, representing the microscopic organisms that are passively distributed by currents. Organisms in this group include picoplankton (organisms between 0.2 and 2.0 µm in diameter including prokaryotes and eukaryotes), phytoplankton (microscopic plants), zooplankton (small animals) including invertebrate and vertebrate embryos and larvae, as well as viruses and phages (Legendre and Rassoulzadegan 1995; Suttle 2005). No information specific to the Project Area is available for bacterial communities and microbes. The biomass of the zooplankton community in the vicinity of the Newfoundland Shelf region is dominated by three large species of copepod. The largest and most abundant is a boreal species *Calanus finmarchicus*, which is ubiquitous throughout the North Atlantic from the Gulf of Maine to the Barents Sea (Melle et al. 2014; Wang and Greenan 2014). Two other prevalent species, *Calanus glacialis* and *Calanus hyperboreus*, are found in association with influxes of Arctic water such as the Labrador Current (Wang and Greenan 2014).

Macroalgae (i.e., kelps, seaweeds, coralline algae) and sea grasses enhance productivity and provide habitat for marine organisms in coastal waters. Factors influencing distribution of marine plants include substrate, nutrients, sedimentation, salinity, and temperature. Sunlight is a key factor in growth and survival of macroalgae and sea grass and therefore plant distribution is limited to photic zones (less than 50 m). The Project Area is generally too deep to support macroalgae and seagrass colonization and growth. While some seaweeds can be found on the Grand Banks up to 100 m, these areas have few plant species and low biomass (AMEC 2014).

A summary overview of the most prevalent pelagic species of macroinvertebrates sampled during Canadian and European Union surveys (1977 to 2012) was compiled by Vázquez et al. (2013). Among collected pelagic macroinvertebrates, species such as the northern shortfin squid and northern shrimp were observed in 77% to 94% of survey trawls conducted in 2003, and the percentage of trawls capturing these species subsequently declined to 17% and 59% respectively in 2012 (Vázquez et al. 2013). In addition to the high proportion of small crustaceans (copepods and shrimp) that occupy the pelagic environment, a variety of gelatinous organisms can be found. For example, pelagic tunicates including salps, pyrosomes and doliolids, are gelatinous, free-floating, filter feeding animals found as single individuals or assembled into colonies. Other groups of gelatinous organisms include pelagic cnidarians and ctenophores (jellyfish).

Marine benthic invertebrates are comprised of a diverse group of taxa that live on the sea floor and have key roles in ocean ecosystems. There are few existing studies of benthic community composition specifically for the Project Area and there is a considerable gap in knowledge of existing benthic communities that occur on deeper continental shelf environments and in abyssal habitats (LGL Limited 2003). Prior to drilling each well, Chevron will conduct an imagery-based seabed survey at the proposed well site to confirm the presence or absence of any aggregations of habitat-forming corals or sponges at each well site. The survey will provide baseline data for coral and sensitive benthic habitats that may be present.

Cold-water corals and sponges are sessile benthic invertebrates that are an important component of benthic ecosystems by providing habitat for other species of invertebrates and fishes (Buhl-Mortensen and Mortensen 2005; Buhl-Mortensen et al. 2010). Significant benthic areas (SBAs) (i.e., areas where there is a high concentration of biomass of for large gorgonian corals, small gorgonian corals, and/or sea pens) exist within the region. The Project Area contains small numbers of sea pens and sponges, but no corals were observed in the RV trawls. Although coral distributions are present within the Project Area, there are few observations in deeper waters within the northern section of the Project Area (Gates et al. 2008; Beazley et al. 2013). The lower number of observations at these water depths is likely due to lack of surveys in these areas rather than low coral distribution. Modelled distributions are also not considered reliable at these depths (Guijarro et al. 2016) due to the differences in environmental parameters between shelf and deep areas and lack of observations to verify distributional model predictions. For areas where little information exists on coral distribution, Chevron has committed to undertaking a pre-drill imagery-based seabed survey, to collect data regarding corals in the areas of a potential well site.

Pelagic species are generally either resident pelagic species (e.g., capelin and lanternfish) or migratory pelagic species (e.g., tunas, swordfish, and several shark species). The 2007 to 2018 DFO research vessel (RV) (DFO 2018a) survey data were analyzed for the Project Area and RAA. The results of the RV surveys indicate deepwater redfish, lanternfishes (not identified to species), roughhead grenadier, blue hake, common grenadier, longnose eel, Greenland halibut, and Atlantic cod make up 99.5% of the catch by count within the Project Area.

Several fish species identified as SAR or otherwise as being SOCC are known to occur, or likely to occur, in the Project Area. This includes species that are listed as endangered, threatened, or of special concern under SARA (Schedule 1) and/or as endangered, threatened, or vulnerable under the NL ESA. Their protection and conservation status are provided in Table 6.1.

Table 6.1 Fish Species of Conservation Interest with Potential to Occur in the Project Area and/or RAA

Common Name [A]	Scientific Name	SARA Schedule 1 Status	COSEWIC Designation	NL ESA Designation	IUCN Red List Designation
American plaice (Newfoundland and Labrador population)	*Hippoglossoides platessoides*	No Status	Threatened	Not Listed	Not Assessed
Atlantic cod (Newfoundland and Labrador population); (Global - IUCN)	*Gadus morhua*	No Status	Endangered	Not Listed	Vulnerable
Northern wolffish	*Anarhichas denticulatus*	Threatened	Threatened	Not Listed	Not Assessed
Roundnose grenadier (Atlantic and Arctic populations); (Global - IUCN)	*Coryphaenoides rupestris*	No Status	Endangered	Not Listed	Endangered
Smooth skate (Funk Island Deep population); Global (IUCN)	*Malacoraja senta*	No Status	Special Concern	Not Listed	Endangered
Spinytail skate (Global - IUCN)	*Bathyraja spinicauda*	No Status	No Status	Not Listed	Near Threatened
Thorny skate (Canada); (Global - IUCN)	*Amblyraja radiata*	No Status	Special Concern	Not Listed	Vulnerable
Winter skate (Eastern Scotian Shelf – Newfoundland population); (Global - IUCN)	*Leucoraja ocellata*	No Status	Endangered	Not Listed	Endangered
Acadian redfish (Atlantic Population); Global - IUCN)	*Sebastes fasciatus*	No Status	Threatened	Not Listed	Endangered
Albacore tuna (Global - IUCN)	*Thunnus alalunga*	No Status		Not Listed	Near Threatened
American eel (Global - IUCN)	*Anguilla rostrata*	No Status	Threatened	Vulnerable	Endangered
Atlantic bluefin tuna (Global - IUCN)	*Thunnus thynnus*	No Status	Endangered	Not Listed	Endangered
Atlantic halibut (Global - IUCN)	*Hippoglossus hippoglossus*	No Status	No Status	Not Listed	Endangered

Table 6.1 Fish Species of Conservation Interest with Potential to Occur in the Project Area and/or RAA

Common Name [A]	Scientific Name	SARA Schedule 1 Status	COSEWIC Designation	NL ESA Designation	IUCN Red List Designation
Atlantic salmon (Global - IUCN)	*Salmo salar*	No Status		Not Listed	Least Concern
(South Newfoundland Population)		No Status	Threatened	Not Listed	
(Quebec Eastern Shore Population)		No Status	Special Concern	Not Listed	
(Quebec Western Shore Population)		No Status	Special Concern	Not Listed	
(Anticosti Island Population)		No Status	Endangered	Not Listed	
(Inner St. Lawrence Population)		No Status	Special Concern	Not Listed	
(Gaspé-Southern Gulf of St. Lawrence Population)		No Status	Special Concern	Not Listed	
(Eastern Cape Breton Population)		No Status	Endangered	Not Listed	
(Nova Scotia Southern Upland Population)		No Status	Endangered	Not Listed	
(Outer Bay of Fundy Population)		No Status	Endangered	Not Listed	
Atlantic wolffish	*Anarhichas lupus*	Special Concern	Special Concern	Not Listed	Not Assessed
Barndoor skate (Global - IUCN)	*Dipturus laevis*	No Status	No Status	Not Listed	Endangered
Basking shark (Atlantic Population); (Global - IUCN)	*Cetorhinus maximus*	No Status	Special Concern	Not Listed	Vulnerable
Bigeye tuna (Global - IUCN)	*Thunnus obesus*	No Status	No Status	Not Listed	Vulnerable
Blue shark (Atlantic Population); (Global - IUCN)	*Prionace glauca*	No Status	No Status	Not Listed	Near Threatened
Common Lumpfish (Atlantic Population)	*Cyclopterus lumpus*	No Status	Threatened	Not Listed	Not Assessed
Cusk	*Brosme brosme*	No Status	Endangered	Not Listed	Not Assessed
Deepwater redfish (Northern Population); (Global - IUCN)	*Sebastes mentella*	No Status	Threatened	Not Listed	Least Concern
Greenland Shark (Global - IUCN)	*Somniosus microcephalus*	No Status	No Status	Not Listed	Near Threatened

Table 6.1 Fish Species of Conservation Interest with Potential to Occur in the Project Area and/or RAA

Common Name [A]	Scientific Name	SARA Schedule 1 Status	COSEWIC Designation	NL ESA Designation	IUCN Red List Designation
Haddock (Global - IUCN)	*Melanogrammus aeglefinus*	No Status	No Status	Not Listed	Vulnerable
Little skate (Global - IUCN)	*Leucoraja erinacea*	No Status	No Status	Not Listed	Near Threatened
Porbeagle (Global - IUCN)	*Lamna nasus*	No Status	Endangered	Not Listed	Vulnerable
Shortfin mako (Atlantic Population); (Global - IUCN)	*Isurus oxyrinchus*	No Status	Endangered	Not Listed	Vulnerable
Spiny dogfish (Atlantic Population); (Global - IUCN)	*Squalus acanthias*	No Status	Special Concern	Not Listed	Vulnerable
Spotted wolffish	*Anarhichas minor*	Threatened	Threatened	Not Listed	Not Assessed
White hake (Atlantic and Northern Gulf of St. Lawrence Population)	*Urophycis tenuis*	No Status	Threatened	Not Listed	Not Assessed
White shark (Atlantic Population); (Global - IUCN)	*Carcharodon carcharias*	Endangered	Endangered	Not Listed	Vulnerable

Data Sources: SARA/COSEWIC (www.sararegistry.gc.ca), IUCN (https://www.iucnredlist.org/), NL ESA (https://www.flr.gov.nl.ca/wildlife/endangeredspecies/index.html).

A = Relevant population as determined by COSEWIC, unless identified as determined by IUCN

Within the waters offshore NL, including waters within the Project Area, commercial fishing activity for several different species occurs, including species that Indigenous groups may hold commercial communal licenses to harvest. Species harvested for commercial communal purposes within the region include capelin, groundfish, herring, mackerel, seal, shrimp, snow crab, tuna, and whelk. Commercial communal fishing activity and licenses for Indigenous groups is described in Section 6.5. Species harvested by Indigenous groups for food, social, and ceremonial (FSC) purposes include, but not limited to, gaspereau, trout, Atlantic salmon, bass, mackerel, eel, shad, groundfish (e.g., flounder, halibut, pollock), Arctic char, smelt, blue shark, herring, mussel, clams, periwinkle, soft-shell clams, squid, tomcod, quahaug, razor clams, lobster, crab, and scallops. Many FSC species are harvested in the inshore and/or freshwater systems. However, some species are anadromous and can potentially migrate through the RAA and/or Project Area. Two migratory fish species have been highlighted as being of concern due to potential interaction with oil and gas activities: American eel and Atlantic salmon. The American eel has been identified as key to Aboriginal rights-based, Treaty rights-based, and commercial fisheries, particularly to the Mi'kmaq peoples (Denny and Kavanagh 2018). Atlantic salmon have traditionally been a staple food for Indigenous peoples, although today, due to a lack of abundance and concern for local populations, it is often reserved for special occasions (Denny and Fanning 2016).

6.1.2 Anticipated Changes to the Environment

Potential interactions between planned offshore oil and gas activities and pathways of potential effects on marine fish and fish habitat include (as described in AMEC 2014):

- Destruction, contamination, or alteration of marine habitats and benthic organisms due to discharge and deposition of drill cuttings and/or fluids as well as the deployment and use of Project equipment
- Contamination of fish / invertebrates and their habitats due to other discharges in the environment during planned oil and gas exploration drilling and other associated survey and support activities
- Attraction of marine fish to MODUs and vessels potentially increasing risk of injury, mortality, contamination, and other interactions
- Temporary avoidance of areas by marine fish due to underwater sound or other disturbances, which may alter their presence and abundance as well as disturbing movements / migrations, feeding, or other activities
- Changes in the availability, distribution, or quality of food sources and/or habitats for fish and invertebrates as a result of planned activities and their associated environmental emissions
- Injury, mortality, or other disturbances to marine fish as a result of exposure to sound within the water column during VSP survey activity.

In consideration of these potential interactions, and the policies in place to protect fish and fish habitat, the assessment of Project-related environmental effects on marine fish and fish habitat is focused on the following potential environmental effects:

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

6.1.3 Potential Effects from Routine Operations

6.1.3.1 Change in Risk of Mortality or Physical Injury

A change in risk of mortality or physical injury for individual marine fish may result from the presence and operation of a MODU, VSP surveys, and Project-related discharges. The presence and operation of a MODU will generate underwater sound that may affect the quality of the underwater acoustic environment for fish species. VSP operations will also temporarily generate increased sound levels. If fish close to the VSP array do not move away from the sound source before being exposed to high sound levels, these sound levels may result in mortality or physical injury from acute changes in pressure. The responses of marine fish species to underwater sound vary by species, life stage, intensity of sound, and distance from the source; however, in general, most mobile fish species are generally expected to avoid underwater sound at levels lower than those at which injury or mortality may occur (BP 2016). Therefore, physical harm associated with peak sound pressure levels is unlikely to occur, and any potential impact on fish populations is highly unlikely.

Benthic species (e.g., fish, shellfish, sponges, and corals) may also experience mortality or physical injury from crushing or smothering from waste management activities, particularly the discharge of drill cuttings

and muds. The discharge of drill wastes is not expected to have the potential to smoother organisms since drill waste dispersion modelling predicts the sedimentation depth of discharges on the seafloor will be less than 6.5 mm (a conservative effects threshold proposed by Smit et al. [2006]) and deposition of muds and cuttings exceeding 1 mm was predicted to remain confined within 1 km from the drilling site. In the event Project activities result in mortality of benthic organisms, the results are not predicted to cause irreversible changes to local populations, although it is acknowledged that there are fewer data on effects of drilling waste on corals and sponges, and recovery rates for these communities are expected to be longer (Gates and Jones 2012; Cordes et al. 2016; Henry et al. 2017). The recovery of benthic communities from burial, changes in sediment properties, and organic enrichment occurs by recruitment of new colonies from planktonic larvae and immigration from nearby undisturbed sediments (IOGP 2016).

As noted in Section 7 (Mitigation Measures and Commitments), other routine liquid discharges, such as cooling and ballast water, will be managed in accordance with the OWTG, Transport Canada's *Ballast Water Control Management Regulations* and/or MARPOL, and are not expected to cause mortality or physical injury to marine fish.

6.1.3.2 Change in Habitat Quality and Use

A change in habitat quality and use for marine fish may result from the presence and operation of the MODU, VSP surveys, marine discharges, well abandonment, and supply and servicing operations. The quality of the underwater acoustic environment for marine fish may be affected by drilling operations and the DP activity of the MODU. Avoidance and short duration startle responses by some marine fish species may occur close to the sound source during the start-up of the initial period of drilling (Müeller-Blenkle et al. 2008; Fewtrell and McCauley 2012). However, behavioural effects on marine fish from exposure to continuous underwater sound are not predicted to extend beyond the Project Area. Given the localized and temporary nature of the drilling activity, population level disturbances are unlikely.

Habitat quality and use may also be affected from the lights of the MODU as marine fish may experience physiological stress from the artificial lighting introduced into the water column. Feeding, schooling, predator avoidance, and migratory behaviours of marine fish can be altered by sharp light contrasts created by over-water structures due to shading during the day and artificial lighting at night (Nightingale and Simenstad 2002; Hanson et al. 2003). Light from the MODU, which would be quickly attenuated through refraction and absorption, is not expected to penetrate the water column any more than 50 m radius from the source (Davies et al. 2014). As noted in Section 7 (Mitigation Measures and Commitments), lighting will be reduced to the extent that worker safety and safe operations is not compromised. Reduction of light may include avoiding use of unnecessary lighting, shading, and directing lights towards the deck.

For exploration drilling, the primary discharges resulting in changes in habitat quality relate to drilling muds and cuttings, and components of these discharges causing physical or chemical changes in the water column and/or sediment. A temporary increase in suspended particulate matter and turbidity in the water column will occur as drill muds and cuttings disperse through the water column to settle on the seafloor. Deposition of drill cuttings can change physical or chemical properties of sediments, causing a change in the abundance, composition and diversity of the benthic community (IOGP 2016) within a localized area. As noted in Section 7 (Mitigation Measures and Commitments), Chevron will conduct an imagery-based

seabed survey at the proposed well sites to confirm the absence of sensitive environmental features, such as habitat-forming corals or species at risk. The survey will be carried out prior to drilling and will encompass an area within a 500-m radius from the well site.

VSP surveys will temporarily generate high levels of underwater sound. Sound pressure levels from VSP activities are expected to result in a short-term change in habitat quality and use for marine fish. This temporary change in sound pressure levels may result in sensory disturbance and trigger behavioural responses in marine fish and invertebrates. Mobile fish species may exhibit a variety of responses when exposed to sound from seismic source arrays, including VSP, though VSP operates at levels lower than the sound sources typically used in marine seismic exploration. The responses of marine fish to underwater sound vary with species, life stage, history of exposure to similar sound sources, and the duration, intensity, frequency, and geographic extent of the underwater sound exposure, and as a result, there are currently no established sound thresholds for behavioural disturbance of fish (Popper et al. 2014; Carroll et al. 2017). Guidelines for received sound levels that cause behavioural effects in fish are very limited. The United States National Marine Fisheries Service (NMFS) uses a criterion for behavioural response of 150 dB re 1 µPa (Stadler and Woodbury 2009). Although as pointed out by Popper et al. (2014), it is unclear if this is a peak or rms level and the criterion does not specify a behaviour; it simply assumes there is potential to experience a behavioural response.

Depending on the well abandonment program, which has yet to be defined (see Section 2.2.6), potential removal of the wellhead structure could generate underwater sound and potential abandonment of the wellhead in place could cause a change in benthic habitat.

Supply and servicing operations will increase vessel traffic within the Project Area and LAA and may affect fish habitat quality and use locally around supply vessels resulting from increased underwater sound. Although underwater sound generated by supply vessel traffic will introduce additional sound to the area, this increase will be low given the relatively small increment in vessel traffic as a result of Project activities. Any change in habitat quality and use from supply vessel traffic would represent a small increment over similar effects from existing levels of marine traffic in the RAA.

6.1.4 Potential Effects from Accidental Events

Potential effects pathways for a change in risk of mortality or physical injury and/or change in habitat quality and use for marine fish due to an oil spill include: reduction of water and/or sediment quality; reduced primary productivity due to a reduction in air-water gas exchange and light penetration; and lethal and sublethal effects from acute or chronic exposure to water-soluble fractions of hydrocarbons.

The risk of exposure of fish and invertebrates to an oil spill depends on the type of oil and volume released, but also on the habitat these species occupy, their behaviour, the time of year, their life history, and the general health of the population at the time of the spill. Fish kills are typically brief and localized following a discrete spill event due to the rapid loss of the acutely lethal low-molecular weight components of oil as a result of dilution and weathering (Lee et al. 2015), the ability of motile species to detect and avoid impacted areas, and the ability of phytoplankton, zooplankton, and adult fish to metabolize hydrocarbons (Wolfe et al. 1996; Graham et al. 2010).

In general, adult pelagic and benthic fish occurring in relatively deep waters have lower exposure risk because they are highly mobile and able to avoid oiled areas (Irwin 1997; Law et al. 1997). Larval and juvenile pelagic and benthic fish species are at a greater risk of exposure as they are often less motile than adults (Yender et al. 2002) and have shown higher sensitivity to lower concentrations of hydrocarbons, since they may not have yet developed detoxification systems allowing them to metabolize hydrocarbons (Rice 1985; Carls et al. 2008; Incardona et al. 2013; Lee et al. 2015). While individuals in these life stages could be affected, effects on larval stages does not necessarily result in effects on adult populations (Gallaway et al. 2017; Carroll et al. 2018).

In general, life histories of corals, sponges, and sea pens (planktonic larvae, slow growing, long life spans, and slow recovery) and feeding mechanisms (suspension feeding) make them susceptible to accidental events (Fisher et al. 2014; Prouty et al. 2016; Cordes et al. 2016). Sessile adults and planktonic larvae of these species also have no known avoidance mechanisms to oil spill events. The effects of hydrocarbons on corals are typically assessed *in situ* using visual indicators of stress (White et al. 2012). Visual indicators of coral stress related to the Deepwater Horizon spill included partial tissue loss, excessive mucus production, retracted polyps, partial coverage by brown flocculant sourced to the spill, and death (Busky et al. 2016; Prouty et al. 2016; Ragnarsson et al. 2017). Follow-up studies on the Deepwater Horizon spill has shown a patchy distribution of effects which were highly site-specific and included incidence of hydroid colonization, a sign of deterioration on affected coral branches (Hsing et al. 2013). For example, one site 13 km to the southwest of the Macondo wellhead (lease block MC294) showed that over half of the corals were partially covered by a brown flocculant material, but follow-up surveys 16 months later indicated that recovery was occurring (Fisher et al. 2014).

A subsea blowout scenario has the greatest potential for causing environmental effects. The actual effects of a blowout incident would largely depend on the duration and volume of the spill, as well as the environmental conditions at the time of the spill. Although the areas of potential effects delineated by the modelling results are relatively large, substantial portions of these areas would have low probabilities of occurrence even if the release is allowed to continue unmitigated. The implementation of mitigation measures would further reduce the already relatively low probabilities of oil extending beyond the RAA or reaching nearshore areas. In the unlikely event of an actual subsea blowout, mitigation (including emergency response measures such as containment [e.g., capping stack] and recovery operations) would be implemented, thereby likely reducing the magnitude, duration, and geographic extent of the spill and associated residual environmental effects.

Depending on the season, stochastic modelling predicted the average probability of shoreline oiling ranging from 1.9% (summer) to 8.7% (winter). Depending on the time of year and environmental conditions, areas susceptible to shoreline oiling included the entire east coast and much of the west coast of Newfoundland, the Avalon Peninsula, the southern shores of Labrador reaching into the Gulf of St. Lawrence, and Sable Island. Oil that reached shore was expected to be patchy, discontinuous, and weathered, as it would have taken a minimum of 10 days (and frequently much longer) to reach shore.

Diesel spills are not likely to result in biological effects on fish over a large area. With respect to a change in habitat quality and use, it is expected that most diesel from a spill would evaporate and disperse quickly. Depending on the location and extent of the spill, nearshore spawning and nursery areas could potentially

be affected. Diesel is known to have immediate toxic effects on many intertidal (e.g., molluscs, amphipods) and benthic organisms (Stirling 1977; Simpson et al. 1995; Cripps and Shears 1997), with sessile and early life stages (eggs, larvae) the most at risk as they are unable to actively avoid the diesel and/or represent sensitive life-stage development periods. Benthic invertebrates, including commercial species, have experienced sublethal effects resulting from low-level exposure to hydrocarbons, with crustaceans being the most sensitive taxa (Sanders et al. 1980; Jewett et al. 1999). However, given the small-scale and short-term nature of the spill, effects on nearshore areas are expected to be limited to a scenario in which marine diesel is spilled close to the shore. Oil spill containment and recovery operations will further reduce residual effects on fish and fish habitat associated with total dissolved hydrocarbons.

With respect to a change in risk of mortality or physical injury, although there is a risk of mortality of phytoplankton and zooplankton (food sources), and sublethal and lethal effects to larval and juvenile fish species present in the mixed surface layer of the water column, these residual effects will likely be restricted to a localized area. The potential for these effects would also be temporary and reversible. Adult fish species in surface waters will largely be unaffected due to avoidance mechanisms; demersal (bottom dwelling) species are unlikely to be exposed to harmful concentrations of dissolved total hydrocarbons, unless the spilled was unmitigated and resulted in infiltration of the sea floor. Residual effects following a nearshore diesel spill could include localized mortality and sublethal effects to fish eggs, larvae, and juveniles.

In consideration of the modelling results (see Section 15.2 of the EIS), it is conservatively estimated for the Project that a change in risk of mortality or physical injury in the case of an unintended bulk release of SBM would likely be restricted to smothering effects on immotile individuals and benthic prey species within up to approximately 1 km from the spill site. With respect to a change in habitat quality and use following an SBM spill, it is conservatively predicted that there would likely be a temporary and reversible degradation in benthic habitat quality within up to approximately 1 km from the spill site.

6.2 Marine and Migratory Birds

Marine and migratory birds were chosen as a VC due to their importance in marine and coastal ecosystems, the economic and cultural importance of recreational and subsistence hunts, their risk of attraction to artificial lighting and vulnerability to oil on water and regulatory considerations. The Marine and Migratory Birds VC includes oceanic (i.e., beyond the continental shelf), neritic (continental shelf), and littoral zone (intertidal, splash, and spray zones) seabirds, waterfowl, loons, grebes, and shorebirds (plovers, sandpipers) that are protected under the *Migratory Birds Convention Act, 1994* (MBCA) and additional marine-associated birds not protected under the MBCA (i.e., cormorants).

6.2.1 Existing Environment

The marine waters off eastern NL provide a vast area of important breeding, migrating, and wintering habitat for marine-associated birds. The upwelling of the cold Labrador Current flowing upon meeting the Grand Banks, the Flemish Cap and the North Atlantic Drift brings vital mineral nutrients from the depths to the surface. The phytoplankton nourished by this upwelling form the basis for significant biomass production, culminating in globally important numbers of seabirds in parts of the region in each season (Brown 1986; Lock et al. 1994; Fifield et al. 2009).

Marine bird habitats in the RAA include continental shelf, slope, and deep waters. These birds tend to concentrate at the upwellings at the oceanographic features and fronts. Millions of marine birds breed at nesting colonies in coastal northeastern NL, and forage for their young on the Grand Banks and adjacent areas during summer. Many thousands of non-breeding seabirds also reside in the RAA during the summer months. For example, most of the world's population of great shearwater and large numbers of sooty shearwater migrate to NL waters to moult and feed upon completion of their breeding period in the Southern Hemisphere. Thousands of sub-adult seabirds of species that nest north of the RAA remain in the RAA during the summer, especially northern fulmar and black-legged kittiwake. In the fall, marine birds that have bred in the Arctic and subarctic of eastern Canada and Greenland migrate to the RAA to spend the winter. Other marine and migratory species also pass through the RAA during spring and fall migration.

Waterfowl (ducks, geese and swans) nest in coastal NL in relatively small numbers but winter in large numbers (Lock et al. 1994). They are rarely observed beyond coastal waters. Some species of loons and grebes also winter in coastal NL waters. Some shorebird (plovers, turnstones, and sandpipers) species nesting in the Arctic make trans-oceanic flights during fall migration from eastern North America to South America (Williams and Williams 1978; Richardson 1979). As a result, small numbers are observed in offshore areas of the RAA. These species are rarely out of sight of the coastline. A total of 32 waterfowl species have been recorded in NL (Statoil Canada Ltd. 2017), but only 24 species regularly occur in the marine waters of the RAA.

In total, 26 species of plovers, turnstones, and sandpipers use NL during breeding, passage migrants, or in winter (Mactavish et al. 2016). Of these species, piping plover, spotted sandpiper, and willet nest along marine coastlines. Piping plover is designated Endangered by COSEWIC and on Schedule 1 of SARA and under the NL ESA. Piping plover and willet nest only at sites in southwestern and western NL, well outside the RAA (Statoil Canada Ltd. 2017), although there is a historical nesting record from the Cape Freels coastline (Bird Studies Canada 2016). Several species use coastlines in the RAA during fall migration.

Landbirds such as raptors and songbirds associated with coastal habitats may be encountered in coastal areas of the RAA (Statoil Canada Ltd. 2017). Landbird species nesting in Newfoundland, Labrador, Nunavut, and Greenland and migrating over marine waters also drift with the wind out to sea and land on vessels in the RAA; several species have been recorded on offshore platforms and vessels (Thomas et al. 2014; Statoil 2015a, 2015b, unpublished migratory bird salvage reports provided by Statoil). Nocturnally migrating species are often attracted to artificial lighting on vessels, especially when fog or rain sets in after the night's nocturnal migration has begun (Gauthreaux and Belser 2006). These species are most often seen during fall migration (July to November).

Species designated at risk provincially or federally and have the potential to occur in the RAA or the Project Area are: harlequin duck, Barrow's goldeneye, piping plover, red knot, buff-breasted sandpiper, red-necked phalarope, ivory gull, Ross's gull, and peregrine falcon (Table 6.2). An additional three species are listed on the IUCN Red List of Threatened Species: Bermuda petrel, Zino's petrel and Desertas Petrel. The Project Area is at the edge of distributions or migratory routes of some of these species, but they have been recorded in the Project Area on rare occasion. Other shorebird and landbird species at risk in NL are not likely to occur in the RAA or Project Area.

Table 6.2 Marine and Migratory Bird Species of Conservation Interest Likely to Occur in the Regional Assessment Area

Species	NL ESA Status	Federal Status	
		SARA Listing	COSEWIC Assessment
Harlequin duck (eastern pop.)	Vulnerable	Special Concern (Schedule 1)	Special Concern
Barrow's goldeneye (eastern pop.)	Vulnerable	Special Concern (Schedule 1)	Special Concern
Piping plover (*melodus* ssp.)	Endangered	Endangered (Schedule 1)	Endangered
Red knot (*rufa* ssp.)	Endangered	Endangered (Schedule 1)	Endangered
Buff-breasted sandpiper	None	Special Concern (Schedule 1)	Special Concern
Red-necked phalarope	None	Special Concern (Schedule 1)	Special Concern
Ivory gull	Endangered	Endangered (Schedule 1)	Endangered
Ross's gull	None	Threatened (Schedule 1)	Threatened
Peregrine falcon *anatum / tundrius*	Vulnerable	Special Concern (Schedule 1)	Special Concern

6.2.2 Anticipated Changes to the Environment

Routine Project activities and components have potential to interact with migratory birds and their associated habitat due to attraction of birds to artificial lighting on the MODU and supply vessels, operational discharges during well drilling and testing operations, underwater sound emissions from VSP operations, and interactions with supply vessels and helicopter activities during supply and servicing.

Direct and indirect adverse effects on migratory birds could be caused by Project activities through the following effects pathways:

- Physical displacement because of vessel presence (e.g., disruption of foraging activities)
- Nocturnal disturbance (e.g., increased opportunities for predators, attraction to the MODU or supply vessels and subsequent collision or stranding resulting in mortality) due to illumination levels from artificial lighting during different weather conditions and seasons and during different project activities (e.g., drilling, formation flow testing with flaring)
- Exposure to spilled contaminants (e.g., fuel, oils) and operational discharges (e.g., drilling waste, deck drainage, gray water, black water)
- Attraction of predator species near the MODU or supply vessels
- Collision risk with the MODU, supply vessels, or helicopter
- Physical or behavioural effects due to increased underwater sound from VSP surveys

In consideration of these potential pathways, the assessment of Project-related effects on marine and migratory birds focuses on the following potential effects:

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

6.2.3 Potential Effects from Routine Operations

6.2.3.1 Change in Risk of Mortality or Physical Injury

The risk of mortality or physical injury to marine and migratory birds is primarily related to bird attraction to the MODU and/or supply vessels but can also occur due to exposure to contaminants, underwater sound emissions from VSP surveys, and helicopter strikes. Marine and migratory birds are known to be attracted to MODUs and vessels as a result of artificial lighting at night, food, and other visual cues, potentially making them vulnerable to physical strikes or stranding on the structures subsequent dehydration or starvation, predation by other marine bird species, and incineration from flares (Wiese et al. 2001; Ronconi et al. 2015). With the implementation of appropriate mitigation measures as summarized in Section 7 (Mitigation Measures and Commitments) of this document and Section 9.3 of the EIS, the overall magnitude of the effect of the presence and operation of a MODU on marine and migratory birds is anticipated to be low. There may be a slight increase in mortality / injury levels due to collisions, disorientation, and potential predation; although, based on previous monitoring, the mortality rate is anticipated to be low as most stranded birds encountered on platforms and vessels are found alive and released successfully.

As well as direct (e.g., strikes) and indirect interactions with the MODU and supply vessels, the Project has potential to result in a change in risk of mortality or physical injury for marine and migratory birds through exposure to residual hydrocarbons associated with drill muds and cuttings and other discharges. As noted in Section 7 (Mitigation Measures and Commitments), discharges from Project supply vessels and the MODU will be in accordance with the OWTG and/or MARPOL, as applicable. Discharges are expected to be temporary, localized, non-toxic, and subject to dilution in the open ocean.

Exposure to underwater sound caused by VSP operations may cause physical injury to marine and migratory birds, although the likelihood of such an exposure is limited by the short duration of VSP operations combined with the short duration of submersion by diving marine birds. No mortality or injuries of marine bird from the underwater sound energy from VSP surveys have been reported. As noted in Section 7 (Mitigation Measures and Commitments), to mitigate potential effects from VSP activities, airgun operations will incorporate a ramp-up in consideration of the Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment (SOCP, DFO 2007). The gradual increase in emitted underwater sound levels will provide an opportunity for diving marine birds to move away from the sound source before associated underwater sound reaches levels that are potentially physically damaging to marine birds diving near the source.

The Project will involve supply vessel and helicopter traffic to, from and within the Project Area potentially at all times of the year over the course of the Project (although Chevron's preference is to conduct drilling between May and September). This traffic may affect seabirds through lighting, atmospheric and underwater sound, and other associated environmental emissions and discharges. The various bird species that occupy the Project Area will not likely be affected by supply vessel activity or helicopter use, due to the transitory nature of the traffic, and because it is generally consistent with the overall marine traffic that has occurred throughout the region for years, including that associated with existing oil production and exploratory drilling platforms in the RAA. Furthermore, the implementation of mitigation measures noted in

Section 7 (Mitigation Measures and Commitments) will reduce adverse environmental effects to marine and migratory birds.

6.2.3.2 Change in Habitat Quality and Use

A change in habitat quality and use for marine and migratory birds could potentially occur as a result of Project activities, particularly due to the influence of artificial lighting and atmospheric and underwater sound.

Artificial lighting has the potential to attract nocturnally-active marine and migratory birds. Daytime marine bird densities within 500 m of offshore platforms are often many times higher than before the installation of the platforms or some distance farther away from platforms, suggesting that the birds are attracted to foraging opportunities or to the shelter found downwind of platforms (Tasker et al. 1986; Baird 1990; Wiese and Montevecchi 1999). Some marine bird species, especially alcids, may be displaced from the area around the active MODU during drilling operations and along supply vessel routes through general avoidance responses. However, the effect of habitat displacement on marine-associated birds is likely to be minor due to the relatively small footprint and temporary presence of the MODU. As noted in Section 7 (Mitigation Measures and Commitments), lighting will be reduced to the extent that worker safety and safe operations is not compromised. Reduction of light may include avoiding use of unnecessary lighting, shading, and directing lights towards the deck.

VSPs will generate underwater and atmospheric sound but these activities will have a short duration (approximately one to three days) and the sound source energy will be involve a much smaller source array with energy focused down the well, therefore the spatial and temporal footprint of effects is expected to be limited and the associated negative interactions with marine and migratory birds are predicted to be negligible. No change to avifauna presence and abundance, in the Project Area / LAA is therefore anticipated as a result of VSP operations.

Discharges associated with the MODU and supply vessels may result in changes in the marine habitat which could potentially influence bird behaviour (most likely result in attraction). The production of sheens from routine discharges would be unusual given adherence to the OWTG and MARPOL requirements for waste management (see Section 7). However, if sheens do occur, this could result in avoidance and/or attraction of marine birds. Northern fulmar, shearwaters and storm-petrels may be attracted to sheens, as the visual appearance of a hydrocarbon sheen may resemble a sheen of biological origin (Nevitt 1999). However, these species also search for food by olfaction, using the smell of chemicals found in their foods (Nevitt and Haberman 2003), and therefore likely to distinguish between sheen of oils derived from animals and sheen of petroleum oils by their odours (Hutchison and Wenzel 1980). As a result, these birds would be unlikely to contact a sheen during foraging. Other birds may not be attracted at all and may temporarily avoid the localized affected area.

The Project will involve supply vessel and helicopter transit to and from the MODU in the Project Area, potentially any time of year over the life of the Project. Helicopter routes will lie at least 14 km southeast of the Cape St. Francis IBA and at least 38 km north of the Witless Bay Ecological Reserve IBA (the nearest IBA with seabird nesting colonies). Supply vessel routes out of the Port of St. John’s will lie about 26 and

35 km, respectively, from those IBAs. This traffic may affect seabirds through lighting, atmospheric and underwater sound, and other associated environmental emissions and discharges. The various bird species that occupy the Project Area will not likely be affected by supply vessel activity or helicopter use, due to the transitory nature of this traffic and because it is generally consistent with the overall marine traffic that has occurred throughout the region for years.

6.2.4 Potential Effects from Accidental Events

Accidental spill scenarios have potential to result in a change in risk of mortality or physical injury and/or a change in habitat quality and use for marine and migratory birds. Seabirds, waterfowl, loons, grebes, and shorebirds (plovers, sandpipers) are the most vulnerable to perturbation as they spend much of their life in the marine environment. Some land bird species may also be affected, especially those associated with coastal habitats and those that undertake nocturnal migration over offshore waters.

An accidental release of hydrocarbons can result in the physical exposure of birds to oil in the affected area. Such discharges, and even routine operational discharges from vessels and platforms may lead to sheens of crude oil and other substances on the water's surface, to which avifauna (especially pelagic seabirds) may be exposed (Wiese and Robertson 2004; O'Hara and Morandin 2010; Morandin and O'Hara 2016). There would be an increased risk of mortality for individual birds that encountered the sheen (particularly for diving birds and those that spend large amounts of time on the water), as well as potential sublethal toxicity effects (metabolic rate and chick growth) to species such as Leach's storm-petrel. The possible physical effects of oil exposure on birds include changes in thermoregulatory capability (hypothermia) and buoyancy (drowning) due to feather matting (Clark 1984; Montevecchi et al. 1999), as well as physiological effects of oil ingestion from excessive preening (Hartung 1995).

Although unlikely to occur, such a blowout has potential to change both the risk of mortality or physical injury and the habitat quality and use for marine and migratory birds. Change in risk of mortality or physical injury to marine birds from exposure to hydrocarbons is manifested as hypothermia and drowning leading to death, and sub-lethal effects of lower reproductive rates or premature death. Sub-lethal effects may persist for a number of years, depending upon generation times of affected species and the persistence of any spilled hydrocarbons. Survival rate for oiled birds were traditionally considered to be very low even with rescue and cleaning attempts (French-McCay 2009).

Hydrocarbon spills are not likely to cause a permanent change in habitat quality and use for marine and migratory birds. Prey availability may be reduced, or birds may avoid affected habitat. However, spill cleanup and natural weathering processes are likely to result in the eventual recovery of such habitat. Recovery of marine bird abundance and use of oiled shorelines sites in Prince William Sound, Alaska, following the 1989 *Exxon Valdez* oil spill, back to estimated (naturally variable) baseline levels, was reported for all surveyed species within 12 years (Wiens et al. 2004).

A subsea blowout scenario has the greatest potential for causing environmental effects to marine and migratory birds. The actual effects of a blowout incident would largely depend on the duration and volume of the spill, as well as the environmental conditions at the time of the spill. In the event of a well blowout, Chevron would attempt direct intervention measures where appropriate and in consultation with regulators

(e.g., capping stack, dispersants). The magnitude and extent of potential effects would be reduced with the application of spill response measures, therefore the risk of adverse effects on secure and at-risk to marine and migratory birds would be reduced.

In the even less likely event of shoreline oiling, particularly at or near the seabird colonies of the Avalon Peninsula and for coastal SERs on the Avalon, such as Baccalieu Island and Witless Bay Islands, there is potential for marine and migratory birds present and nesting in these areas to interact with surface oil. It is probable that only a small proportion of local populations would be affected. As stated above, by the time oil contacted the shoreline, it would be patchy, discontinuous and weathered. As with surface oil, the potential effects would be reduced with mitigation measures, therefore the risk of adverse effects on shoreline and coastal marine and migratory birds would be reduced.

A batch diesel spill or vessel spill has the potential to result in a change in risk of mortality or physical injury and change in habitat quality and use for marine and migratory birds. A batch spill could result in a temporary and reversible degradation in habitat quality. Depending on the location and extent of the spill, it could directly and indirectly reduce the amount of habitat available to marine and migratory birds at sea. In the event of a vessel spill in the nearshore area, there is the potential for shoreline to be affected by a diesel spill. When diesel spills interact with the shoreline, it tends to penetrate porous sediments quickly and washes off quickly by waves and tidal flushing (NOAA 2016). These effects would be short-term in duration until the slick disperses and the diesel content in the area reaches background levels. A batch spill of diesel is therefore not expected to create permanent or irreversible changes to habitat quality and use. A batch spill of hydrocarbons has the potential to cause a change in risk of mortality or physical injury for marine and migratory birds through direct contact. However, since the sheen's predicted thickness is below the ecological threshold it is predicted that birds encountering the sheen would not suffer mortality or sublethal effects. The number of birds affected would also be limited due to the short time and small area where the diesel would be on the water's surface.

An SBM spill has the potential to result in a surface sheen which in turn could cause a change in risk of mortality or physical injury or change in habitat quality and use for seabirds present in the immediate vicinity of the MODU (Morandin and O'Hara 2016). A sheen would be limited in size, temporary, and moderate wind and wave conditions would quickly beak it up. Given the low surface oil thickness required to result in a sheen (0.04 µm), it is expected that effects would be minor and unlikely to result in seabird mortality.

6.3 Marine Mammals and Sea Turtles

The Marine Mammals and Sea Turtles VC includes baleen whales, large toothed whales, delphinids, porpoises, seals, and sea turtles, focusing on those species that are listed under Schedule 1 of SARA and considered at risk by COSEWIC. This VC was selected because of the potential for these marine mammals and sea turtles to interact with Project components and activities, as there is important habitat for these species in the offshore waters off NL, and because marine mammals are susceptible to effects from underwater sound. This VC is also of cultural and recreational value to Indigenous groups and the general public.

6.3.1 Existing Environment

Thirty-two marine mammal species could potentially occur in the Project Area and RAA, including twenty-six cetaceans (whales, dolphins, and porpoises) and six phocids (true seals). The occurrence of seven of the cetacean species is atypical; however, sightings / detections have been or could be made within the RAA. Four sea turtle species could also occur within or near the Project Area.

While many marine mammal species are sighted year-round in the RAA, they are more frequently observed between June and September within the Project Area. Summer is an important season for cetaceans and sea turtles in offshore waters of NL. At this time, many migratory species come to feed in the region before returning to southerly latitudes for the winter. Pinnipeds are more common during winter and spring. However, concentrations in certain areas at certain times may be an artifact of the survey effort that occurred in these regions. Similarly, low sightings in other areas may, at least in part, be attributable to reduced survey effort. Numerous Ecologically and Biologically Significant Areas (EBSAs) provide important ecological functions for marine mammal and sea turtle species in the RAA, including important habitat for overwintering, refuge, and foraging.

Five species / populations of marine mammals and two sea turtle species (Table 6.3) that are likely to occur in the Project Area are listed under Schedule 1 of SARA: (1) blue whale (Atlantic population); (2) fin whale; (3) North Atlantic right whale; (4) northern bottlenose whale (Scotian Shelf population); (5) Sowerby's beaked whale; (6) leatherback sea turtle; and (7) loggerhead sea turtle.

Table 6.3 Marine Mammals of Conservation Interest with Reasonable Likelihood of Occurrence in the Regional Assessment Area and Project Area

Common Name	Scientific Name	SARA Schedule 1 Status [1]	COSEWIC Designation [2,3]
Blue Whale (Atlantic population)	*Balaenoptera musculus*	Endangered	Endangered
Fin Whale (Atlantic population)	*Balaenoptera physalus*	Special Concern	Special Concern
North Atlantic Right Whale	*Eubalaena glacialis*	Endangered	Endangered
Northern Bottlenose Whale (Scotian Shelf population)	*Hyperoodon ampullatus*	Endangered	Endangered
Sowerby's Beaked Whale	*Mesoplodon bidens*	Special Concern	Special Concern
Leatherback Sea Turtle (Atlantic population)	*Dermochelys coriacea*	Endangered	Endangered
Loggerhead Sea Turtle	*Caretta*	Endangered	Endangered

Notes:
[1] SARA = Canadian *Species at Risk Act.*
[2] COSEWIC = Committee on the Status of Endangered Wildlife in Canada.
[3] None of these marine mammal or sea turtle species are currently listed under the NL ESA.

6.3.2 Anticipated Changes to the Environment

Routine Project activities and components have the potential to interact with marine mammal and sea turtle species due to underwater sound produced by operation of the MODU, VSP survey, supply vessels, and helicopter overflights. These potential sources of disturbance, as well as operational discharges, could result in direct or indirect (e.g., changes in habitat quality) effects on marine mammals and sea turtles. There is also the risk of mortality or physical injury as a result of vessel strikes. The Project could also change the availability, distribution, or quality of prey (see Section 6.1 on the assessment of effects on prey species). The assessment of Project-related effects on marine mammals and sea turtles focuses on the following potential effects:

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

6.3.3 Potential Effects from Routine Operations

6.3.3.1 Change in Risk of Mortality or Physical Injury

There are two primary pathways from Project activities that may result in change in the risk of mortality or physical injury for marine mammals and sea turtles: vessel strikes, and underwater sound generated by Project activities. The supply vessels transiting to and from the Project Area have the potential to strike marine mammals or sea turtles, resulting in injury or mortality. The pathway of effect in the case of a ship strike is the physical contact with the vessel. Although there are no known marine mammal concentration areas along the supply vessel transit route, it is possible that groups of foraging marine mammals may be encountered, especially during summer months. Sea turtles are considered rare along the transit route as well as in the Project Area.

Baleen whales are known to be more vulnerable to collisions with vessels than odontocetes and pinnipeds (Laist et al. 2001; Jensen and Silber 2003; Vanderlaan and Taggart 2007). All species of mysticetes that may occur in the Project Area have been reported as being struck by ships (Jensen and Silber 2003). Although it is unclear why whales are unable to avoid vessel collisions, even when vessels are traveling slowly, strikes may be more likely in areas where large numbers of whales congregate to feed (Panigada et al. 2006). Vessel sounds are louder at the side and stern of the vessel than at the bow (Allen et al. 2012; McKenna et al. 2012), making it more difficult for a whale to detect an approaching vessel in front of the ship. Most lethal and severe injuries to large whales from ship strikes have occurred when vessels were travelling at ≥14 knots (25.9 km/hour; Laist et al. 2001). A reduction in vessel speed is known to reduce the number of marine mammal deaths and severe injuries due to collisions (Vanderlaan and Taggart 2007; Vanderlaan et al. 2008, 2009; van der Hoop et al. 2015; Wiley et al. 2016). Lethal strikes are considered infrequent if a vessel is traveling <14 knots and rare at <10 knots (18.5 km/h; Laist et al. 2001).

With the implementation of mitigation measures (Section 7), it is highly unlikely that supply vessels transiting to and from the Project Area and within the Project Area will strike a marine mammal or a sea turtle. Supply vessels will use existing shipping lanes as practicable; where these do not exist, supply vessels will follow a straight-line approach to and from the Project Area. During transit to and from the Project Area, supply

vessels will travel at speeds not exceeding 22 km/hour or 12 knots except as needed in the case of an emergency. Vessel crew will keep a watch for marine mammals and sea turtles and reduce speed and/or alter course if practicable to avoid collision. Overall, the risk of marine mammals and sea turtles incurring Project-related injury or mortality is considered low.

Underwater sound generated by VSP operations and other Project activities has the potential to cause temporary hearing changes in marine mammals or sea turtles (temporary threshold shift) and/or permanent hearing damage (permanent threshold shift). Auditory injury from MODU operations is deemed unlikely. There have been no reported cases of marine mammal or sea turtle mortalities that have been causally linked to sounds generated during oil and gas exploration activities. With the implementation of mitigation measures (Section 7), it is unlikely that VSP surveys will result in hearing impairment for marine mammals or sea turtles. To mitigate potential effects from VSP operations, a ramp-up procedure for the air gun array will be implemented in consideration of the SOCP (DFO 2007). Ramp-up will be delayed if a marine mammal or sea turtle is detected within 500 m of the air gun array. Air gun(s) will be shut down if a marine mammal or sea turtle listed as endangered or threatened on SARA Schedule 1 as well as a beaked whale is detected within the 500-m zone around the array. Overall, the risk for marine mammals and sea turtles incurring hearing impairment (injury) is considered low.

6.3.3.2 Change in Habitat Quality and Use

A change in habitat quality and use for marine mammals and sea turtles may occur from Project activities, particularly due to the underwater sound generated by the MODU, VSP, supply vessels, and well abandonment and removal. Marine mammals detect and produce sounds both passively and actively to communicate, locate prey and predators, navigate, and obtain information about their surroundings (Richardson et al. 1995; Nowacek et al. 2007; Tyack 2008; Shannon et al. 2016). It is uncertain how important underwater sound is to sea turtles, but it is likely less important than for marine mammals. Anthropogenic sound from vessel traffic and other offshore exploration activities has the potential to cause adverse effects on marine mammals and sea turtles. The assessment focuses on potential changes in behaviour and distribution of animals that could be of sufficient magnitude to be biologically important (e.g., affecting breeding or displacement from feeding area) to the individual or the population. Communication masking of marine mammals is also considered, where a sound of interest is obscured by interfering sounds at a similar frequency.

With the implementation of mitigation measures (Section 7), the overall magnitude of the effect of the presence and operation of a MODU, VSP, and supply and servicing operations on marine mammals and sea turtles is anticipated to be low. Some localized and short-term behavioural effects (change in presence and abundance) are likely to occur, with some species potentially being displaced from the immediate area around the MODU. The localized, transient, and short-term nature of these disturbances at one location and time during Project activities considerably reduces the potential for adverse effects on individual marine mammals and sea turtles and their populations. It is therefore unlikely that individuals will be displaced over extended areas or periods of time. Given that the zone of influence of the Project at one time or location will likely be a small proportion of the feeding, breeding, or migration area of species, marine mammals and sea turtles will not be displaced from important habitats or during important activities or be affected in a manner that causes adverse effects to overall populations in the region.

6.3.4 Potential Effects from Accidental Events

Accidental spills have potential to result in a change in risk of mortality or physical injury and/or a change in habitat quality and use for marine mammals and sea turtles. The extent of potential effects will depend on how the spill trajectory and the VC overlap in both time and space (Frasier et al. 2020). The effects of oil on marine mammals depend on the extent of exposure to toxic components of oil. Exposure may occur due to external coatings of oil (e.g., interaction with surface slicks when animals surface for air, clogging of baleen plates), inhalation of aerosols of particulate oil and hydrocarbons, and ingestion of contaminated prey (Helm et al. 2015; Lee et al. 2015; NRDA 2016).

A well blowout may result in a change in risk of mortality or physical injury and a change in habitat quality and use for marine mammals and sea turtles. The likelihood, magnitude, geographic extent and duration of potential effects of a subsea blowout will depend in large part on the occurrence and distribution of marine mammals and sea turtles at the time of the blowout, as well as the duration and spatial extent of oil release (i.e., potential severity of effects will be dependent on the potential for exposure). Marine mammals and sea turtles may be exposed to oil via a combination of pathways (inhalation, ingestion, aspiration, and adsorption). Marine mammals and sea turtles that are closer to the site of the blowout are most likely to be exposed to a more constant flow and higher concentrations of recently released oil, as compared to species that are more prevalent in the nearshore. The likelihood, however, of a subsea blowout occurring is extremely low. In an actual event, emergency response measures would likely reduce the magnitude, duration and geographic extent of the spill, and therefore reduce the potential impacts on marine mammals and sea turtles.

As a result, a blowout would have a greater potential to interact with marine mammals that inhabit these deeper waters including species like sperm whales, beaked whales, and delphinids. Fin whales also occur regularly in the Flemish Pass area. Harp and hooded seals are considered common in the Project Area and adjacent deep water basins. Sea turtles are expected to be rare in Flemish Pass, Flemish Cap, and the areas to the east. It is possible that marine mammals and sea turtles that do occur in offshore areas where predicted concentrations of hydrocarbons occurs above the ecological threshold levels from an unmitigated subsurface blowout could experience adverse changes in habitat quality and use, health, and in extreme cases increases in injury and mortality levels. While some marine mammals seem to avoid oil spills, other marine mammals have been observed swimming through, and feeding in, large slicks (see Helm et al. 2015; Wilkin et al. 2017). Sea turtles may be more susceptible to the effects of exposure to hydrocarbons than marine mammals because they do not respond with avoidance behaviour, exhibit indiscriminate feeding, and take large pre-dive inhalations (see Milton et al. 2003; Vander Zanden et al. 2016). The magnitude and extent of potential effects would be reduced with the application of spill response measures; therefore, the risk of adverse effects on secure and at-risk marine mammals and sea turtles would be reduced. If in-situ burning of oil is used as a mitigation measure, there is limited potential for this measure to affect marine mammals (and sea turtles). Chevron will take steps to deter marine mammals from the area as part of its Oil Spill Response Plan before in-situ burning commences.

Depending on the location and extent of the batch diesel spill, it could directly and indirectly reduce the amount and quality of habitat available to marine mammals and sea turtles. If the vessel spill of diesel occurred in the nearshore area, there is the potential for shoreline to be affected. When diesel spills interact

with the shoreline, it tends to penetrate porous sediments quickly and washes off quickly by waves and tidal flushing (NOAA 2016). These effects would be short-term in duration until the slick disperses and the diesel content in the area reaches background levels. A batch spill of diesel is therefore not expected to create permanent or irreversible changes to habitat quality and use. Likewise, there is limited potential for a batch spill of diesel to change the risk in mortality or physical injury for marine mammals and sea turtles.

There is potential for an SBM spill to result in a surface sheen which in turn could potentially cause a change in habitat quality and use and possibly a change in the risk of mortality or physical injury for marine mammals and sea turtles present in the immediate area. If the wind and wave conditions were such that a sheen formed, it would be temporary and limited in size (Amec 2017), such that only individuals in the immediate area of the spill would likely be affected. Furthermore, given the low surface oil thickness required to result in a sheen (0.04 µm), it is expected that effects would be minor and unlikely to result in marine mammal or sea turtle mortality or injury. Likewise, any reductions in habitat quality and use would be temporary, reversible and localized and the implementation of mitigation measures will further reduce adverse effect to marine mammals and sea turtles.

6.4 Special Areas

The Special Areas VC includes areas that have been established by federal or provincial governments, municipalities, or international organizations to identify and, depending on designation type, legally protect their ecological, historical and/or socio-economic importance. Special areas were selected as a VC due to their presence within/near the Project Area and/or LAAs and their potential to be affected by Project activities. Of particular interest are potential Project-related effects which may comprise the integrity of special areas and specific characteristics for which the special area was designated.

6.4.1 Existing Environment

A variety of special areas have been designated or are currently proposed by federal, provincial or municipal governments, international organizations and special interest groups nearshore and offshore NL (Figure 6-1). These special areas are established or delineated with the intent of protecting ecologically, historically and/or socio-economically important habitat, flora and fauna.

There are two Marine Protected Areas (MPAs) within the RAA: Gilbert Bay and Eastport. No MPAs occur within the Project Area. Ecologically and biologically significant areas (EBSAs) are not legally protected but are areas that have been identified through scientific assessments to hold ecological or biological significance compared to the surrounding ecosystems. The easternmost portion of the NL Shelves Bioregion Northeast Slope EBSA overlaps the southwestern portion of the Project Area and the potential vessel route. The Eastern Avalon EBSA also overlaps the potential vessel route. An additional 19 NL Shelves Bioregion EBSAs occur partially or entirely within the RAA.

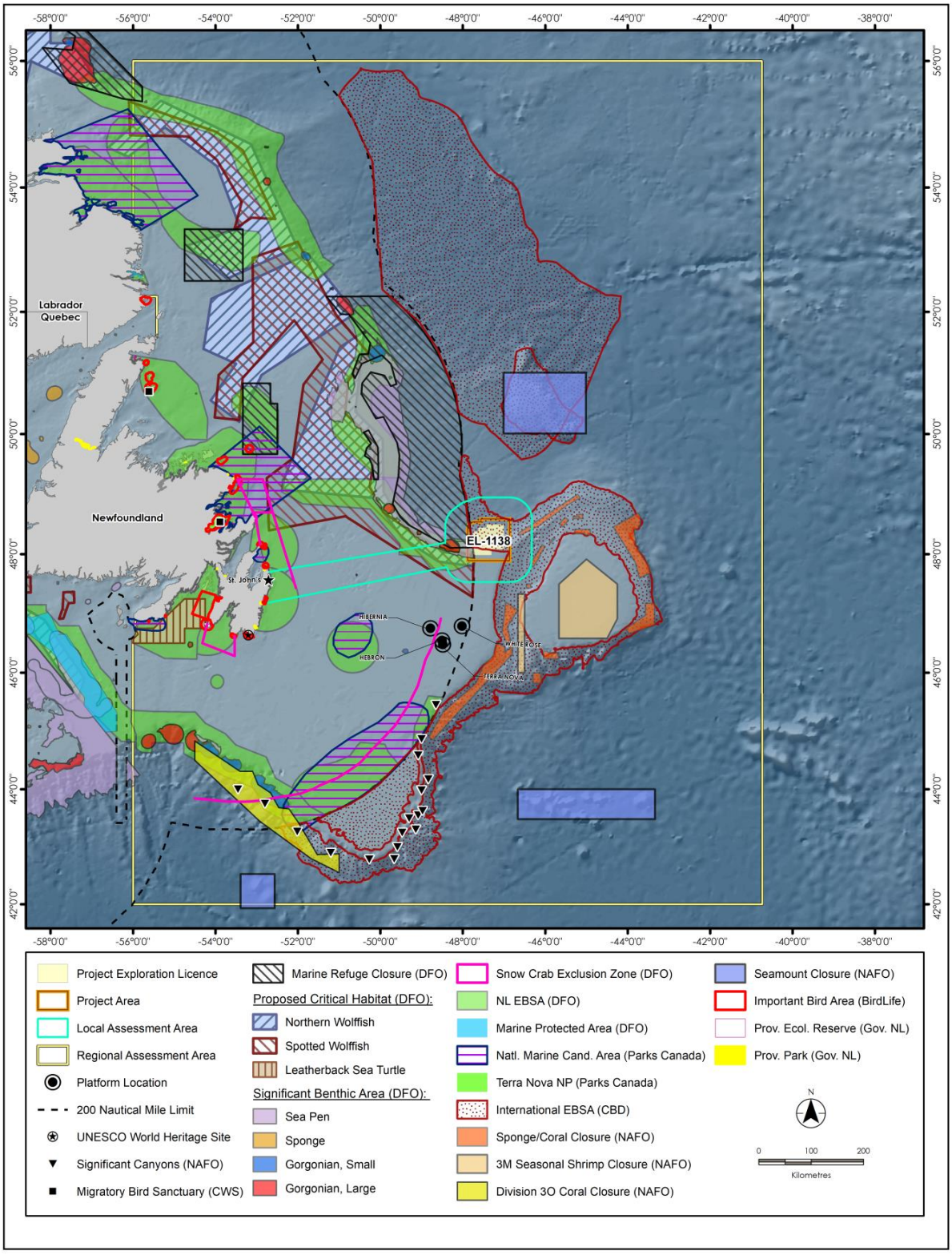


Figure 6-1 Special Areas that Overlap the Regional Assessment Area

Canadian marine refuges are effective, area-based conservation measures that serve to provide long-term protection for biodiversity, including important species and their habitats, such as unique / substantial coral and sponge aggregations (DFO 2016h, in BP 2018; DFO 2019). There are nine marine refuges within or partially within the RAA, one of which, the Northeast Newfoundland Slope Closure (closed to bottom contact fishing to protect coral and sponge habitat), partially overlaps the northwestern portion of the Project Area.

Snow Crab Conservation Exclusion Zones are Fisheries Closure Areas for snow crab within Crab Fishing Areas (CFAs) off eastern NL and on the Grand Banks (DFO 2017). Eight Snow Crab Conservation Exclusion Zones occur within the RAA, west and southwest of the Project Area.

Critical habitat is identified by DFO and provided in Recovery Strategies for at-risk species designated as *Endangered* or *Threatened* under Schedule 1 of SARA. DFO recently proposed critical habitats for northern and spotted wolffish and leatherback sea turtles within the RAA (DFO 2016, 2018b; Figure 6-1). Portions of proposed wolffish critical habitats overlap the southwestern portion of the Project Area (DFO 2018b).

Significant benthic areas (SBAs) are defined as significant areas of cold-water corals and sponge dominated communities, as determined through DFO-led processes based on current knowledge of such species, communities and ecosystems (Kenchington et al. 2018). Although SBAs are not legally protected, they identify the distribution of key marine species and may act as indicators for areas requiring future conservation designation. SBAs for sea pens are in the central-western portion of the RAA, overlapping the southwestern portion of the Project Area and parts of the Labrador Slope, Orphan Spur and Northeast Slope EBSAs (see above). A sea pen SBA was also identified in the southwestern portion of the RAA, near the central portion of the Southwest Slope EBSA. Several SBAs for large and small gorgonians are within the northwestern, central-western, and southwestern portions of the RAA, within the Labrador Slope, Orphan Spur, Northeast Slope, and Southwest Slope EBSAs. One of the large gorgonian SBAs is immediately west of the Project Area's western boundary.

Two international organizations, the United Nations (through the Convention on Biological Diversity [CBD]) and NAFO, have designated a variety of special areas, such as CBD EBSAs, vulnerable marine ecosystems (VMEs), and shrimp closure areas. NAFO-designated coral, sponge, sea pen, seamount, and shrimp closures are legally protected under NAFO's annual Conservation and Enforcement Measures (NAFO 2019). Four CBD EBSAs occur within the RAA; a portion of one CBD EBSA (Slopes of the Flemish Cap and Grand Bank) overlaps most of the Project Area.

A summary of the special areas within the Project Area and/or the LAA are provided in Table 6.4.

Table 6.4 Special Areas that Overlap the Project Area and/or Local Assessment Area

Special Area	Within Project Area		Within LAA for	
	Yes / No	% Overlap or Closest Point of Approach	Project Area	Transit Route
Federal				
EBSA				
Northeast Slope	Yes	2.04 %	Yes	Yes
Eastern Avalon	No	315 km	No	Yes
Baccalieu Island	No	306 km	No	Yes
Marine Refuge Closure				
Northeast Newfoundland Slope Closure	Yes	0.47 %	Yes	Yes
SBA				
Sea Pens	Yes	0.69 %	Yes	Yes
Large Gorgonian Corals	No	14.4 km	Yes	Yes
SARA Critical Habitat (Proposed)				
Spotted Wolffish	Yes	0.12 %	Yes	Yes
Northern Wolffish	Yes	0.08 %	Yes	Yes
Provincial				
Witless Bay Ecological Reserve	No	372.9 km	No	Yes
International				
Convention on Biological Diversity EBSA				
Slopes of the Flemish Cap and Grand Bank	Yes	4.48 %	Yes	Yes
NAFO Corals and Sponges Closures				
No. 6: Sackville Spur	No	15.6 km	Yes	No
No. 10: Northwest Flemish Cap	No	37.0 km	Yes	No
Other				
IBA				
Witless Bay Islands	No	371.9 km	No	Yes

Notes:
EBSA = Ecologically and Biologically Significant Area
SARA = *Species at Risk Act*
VME = Vulnerable Marine Ecosystem
IBA = Important Bird Area;
SBA = Significant Benthic Area
LAA = Local Assessment Area

6.4.2 Anticipated Changes to the Environment

Routine Project-related activities have the potential to affect the features of special areas which provide important ecological and biological functions for the species that use these areas. As a result, the

assessment of Project-related effects on special areas is focused on the potential effect of a change in habitat quality.

Change in risk of mortality or physical injury, and behavioural effects to marine species within special areas are addressed in Sections 6.1, 6.2. and 6.3.

6.4.3 Potential Effects from Routine Operations

6.4.3.1 Change in Habitat Quality

The primary pathway for Project-related activities to affect the physical quality of special areas is the presence and operation of a MODU (light and sound emissions), the discharge of drill muds and cuttings and other emissions (localized effects on water and sediment quality), VSP surveys (underwater sound), supply vessel operations (underwater sound associated with vessel movement), and well abandonment (underwater sound and change in benthic habitat).

The presence and operation of the MODU within Chevron's EL has the potential to affect habitat quality of special areas via underwater sound and light emissions. The continuous (i.e., non-impulsive) underwater sound emitted from the MODU has potential to affect habitat quality of special areas within the Project Area, which may in turn affect the species that use these special areas. Potential behavioural effects on fish, marine mammal, and sea turtle species, can indirectly affect the quality of special areas, if species avoid or no longer use them due to increased underwater sound levels. A change in habitat quality of special areas could therefore occur in the federally designated Northeast Newfoundland Slope Closure marine refuge and the Northeast Slope EBSA primarily related to the propagation of underwater sound from the MODU activity. These special areas also overlap in part with the internationally designated CBD Slopes of the Flemish Cap and Grand Bank EBSA. Likewise, there is some limited (<1%) overlap with proposed critical habitat for spotted and northern wolffish. Changes in underwater sound levels in any of these special areas would be temporary, with the highest sound levels localized close to the MODU. However, sound from the MODU is not predicted to result in permanent or irreversible loss of habitat for fish (see Section 6.1) or marine mammals or sea turtles (see Section 6.3). The relatively short-term nature of drilling activity (i.e., approximately 180 days per well), and the irregular occurrence of drilling activity would result in a short duration interaction with special areas. Any declines in abundance of key species (for which the special area was designated) or change in community structure would be short-term and reversible. With the implementation of mitigation measures (Section 7), there will be no permanent and irreversible loss of proposed critical habitat due to underwater sound emissions from the presence and operation of the MODU.

There is potential for VSP surveys to occur within the special areas that overlap with the Project Area and/or LAA, primarily the Northeast Newfoundland Slope Closure marine refuge and the Northeast Slope EBSA, which could temporarily affect the habitat quality of those areas and fish and marine mammal species using them. These special areas also overlap in part with the internationally designated CBD Slopes of the Flemish Cap and Grand Bank EBSA as well as proposed critical habitat for spotted and northern wolffish. The assessment of potential effects of Project-related VSP surveys on marine fish and fish habitat, and marine mammals and/or sea turtles predicted that with the implementation of mitigation measures (Section 7), there would be no significant residual adverse environmental effects from VSP surveys. VSP survey

activities will adhere to the *Statement of Canadian Practice on Mitigation of Seismic Noise in the Marine Environment*, as appended to the *Geophysical, Geological, Environmental and Geotechnical Program Guidelines* (C-NLOPB 2019).

Discharges that result from offshore exploration drilling operations, including drill muds and cuttings, have the potential to adversely alter sediment and water quality in special areas that overlap with Chevron's EL as well as affect benthic fauna and prey species for marine mammals. As noted in Section 7 (Mitigation Measures and Commitments), Chevron will conduct an imagery-based seabed survey at each proposed well site(s) to confirm the absence of sensitive environmental features, such as habitat-forming corals or species at risk. The survey will be carried out prior to drilling and will encompass an area within a 500 m radius from each well site. If environmental sensitivities are identified during the survey, Chevron will notify the C-NLOPB immediately to discuss an appropriate course of action. This may involve further investigation and/or moving the well site if it is feasible to do so.

Discharges into the marine environment may result in a temporary and localized reduction in water or sediment quality within special areas that overlap with the Project Area. These special areas include the Northeast Newfoundland Slope Closure marine refuge, the Northeast Slope EBSA, a Sea Pen SBA, and the CBD Slopes of the Flemish Cap and Grand Bank EBSA. With mitigation measures in place, changes in water and sediment quality are not anticipated to result in a substantial change of habitat quality for marine species that use these areas. There will be no permanent and irreversible loss of proposed critical habitat for spotted and northern wolffish particularly since these areas do not overlap with Chevron's EL 1138.

Special areas which may be affected by well abandonment activities include the Northeast Newfoundland Slope Closure marine refuge, the Northeast Slope EBSA, and SBA for sea pens as well as the internationally designated CBD Slopes of the Flemish Cap and Grand Bank EBSA. With mitigation measures in place, well abandonment activities are not predicted to result in a substantial change of habitat quality for marine species that use these areas.

The potential effects of supply and servicing operations on special areas within the Project Area primarily include those effects of underwater sound on fish, marine mammals, and sea turtles that use these special areas. The number of supply vessels and aircraft required for the Project will represent a small increase above existing vessel traffic in the area. Supply and servicing is expected to have a short-term and localized effect on special areas, and the species that use them. As noted in Section 7 (Mitigation Measures and Commitments), supply vessel routes transiting to and from the MODU will be planned to avoid passing within 300 m of migratory bird nesting colonies during the nesting period and will comply with provincial Seabird Ecological Reserve Regulations, 2015 and federal guidelines in order to reduce disturbance to colonies (ECCC 2017c). The regional CWS office will be contacted for separation distances and altitudes between helicopters transiting to and from the MODU and migratory bird nesting colonies, as per CWS guidelines (Government of Canada 2018).

6.4.4 Potential Effects from Accidental Events

Special areas may be vulnerable to an accidental event, as degradation of their conditions may affect habitat quality and associated biological life cycles or cultural aspects. In the unlikely event of an accidental release of hydrocarbons, potential effects on special areas include degradation of the integrity of a special area such that it no longer fulfills the biological, ecological, or cultural function for which it was designated. Therefore, the assessment of accidental events on special areas is directly linked to that of the marine fish and fish habitat, marine and migratory birds, and marine mammals and sea turtles VCs, particularly for accidental events where the physical effects on the biological resources found in these areas represent the potential effects of greatest concern.

If left unmitigated, a subsea blowout in the West Flemish Pass Project Area could result in the release of a high volume of oil that may extend to and affect resources within adjacent areas in the RAA, and is the accidental event of greatest environmental concern. Although highly unlikely, a subsea blowout may result in a change in habitat quality of special areas within the RAA. Although some special areas that were designated due to sensitive, ecologically important benthic features (e.g., NAFO VME Sponge, Coral, and Seapen Closures) overlap with probable worst-case scenario subsea spill surface oil, total hydrocarbon, or shoreline exposure contours, deterministic modelling for all representative scenarios predicted that <0.1% of oil would settle onto sediments. Overall, it is predicted that the residual adverse environmental effects associated with most accidental event scenarios on special areas will not be significant. However, should surface oil affect a large portion of the Seabird Foraging Zone in the Southern Labrador Sea Convention on Biological Diversity EBSA it could significantly affect the biological and ecological integrity of this special area. The implementation of mitigation measures would reduce the overall interaction with and extent/magnitude of effects from surface oiling for marine and migratory birds including those in the Seabird Foraging Zone in the Southern Labrador Sea CBD EBSA.

A SBM spill could result in smothering of benthos, sedimentation, or bioaccumulation/contamination that could affect the risk of mortality or injury for marine fish or alter marine fish habitat quality; and/or a surface sheen that could change the risk for mortality or injury for marine and migratory birds and possibly marine mammals and sea turtles. If a surface sheen formed as a result of a SBM spill, it would be limited in size and duration, possibly affecting marine fish and fish habitat, marine and migratory birds, and marine mammals and sea turtles in the immediate area. Portions of the Northeast Slope Canadian EBSA, Northeast Newfoundland Slope Closure Marine Refuge, proposed critical habitat for northern and spotted wolffishes, and Slopes of the Flemish Cap and Grand Bank UNCBD EBSA nearest to or overlapping the Project Area may be exposed to released drilling muds from a SBM spill.

6.5 Indigenous Communities and Activities

Indigenous Communities and Activities is selected as a VC in recognition of the cultural, spiritual, health, social, and economic importance of the marine environment and its resources to Indigenous communities and in recognition of potential or established Aboriginal and treaty rights.

As required by the EIS Guidelines, and section 5(1)(c) of CEAA 2012, the scope of this VC includes changes to the environment caused by the Project that could affect, with respect to Indigenous peoples: health and

socio-economic conditions; physical and cultural heritage including any structure, site or thing of historical, archaeological or paleontological importance; or current use of lands and resources for traditional purposes.

6.5.1 Existing Environment

The EIS Guidelines identify 41 Indigenous groups in Eastern Canada which may have an interest in the Project (see Section 3.2 and Section 7.3 of the EIS for information on these groups). There are several Indigenous organizations in Eastern Canada that hold commercial communal fishing licences for the NAFO Divisions that overlap the Project Area, although it is currently not known if actual fishing under these licences takes place in the Project Area.

Key species commercially fished in and near the Project Area, include shrimp, snow crab, and groundfish, while species such as capelin, herring, and mackerel are generally harvested in coastal areas. In offshore NL, the type of commercial fishing gear used typically depends on the species that is being harvested, except for groundfish which often uses a combination of stern otter trawls, mobile or fixed gillnets, or longlines (e.g., baited hooks). Crab pots and shrimp trawls are used for snow crab and northern shrimp, respectively. Harvesting usually occurs between April and August, with some activity occurring year around.

Newfoundland and Labrador Indigenous groups harvest harp, grey, hooded, and ringed seals between late March and mid-May, however this can vary by species, and environmental and biological conditions (DFO 2011). The primary seal species harvested by the Inuit is the ringed seal (DFO 2011). Grey seals are generally harvested around the Gulf of St. Lawrence and coastal areas of Nova Scotia. In addition to the commercial communal fishery, Indigenous groups can harvest seals throughout the year for FSC purposes.

There are no documented food, social and ceremonial (FSC) licences within or near the Project Area. Species harvested for FSC purposes primarily include gaspereau, trout, Atlantic salmon, bass, mackerel, eel, shad, groundfish (e.g., flounder, halibut, pollock), Arctic char, smelt, blue shark, herring, mussel, clams, periwinkle, soft-shell clams, squid, tomcod, quahaug, razor clams, lobster, crab and scallops. Typically, fishing areas for FSC fisheries are near shore and/or in freshwater systems. There is, however, the potential for species at risk and/or of cultural importance to be present in the Project Area (e.g., Atlantic salmon, American eel). Species harvested for commercial or FSC purposes outside the Project Area may potentially interact with Project activities (planned or unplanned) during migration to traditional fishing or hunting grounds.

6.5.2 Anticipated Changes to the Environment

The Project Area is located approximately 609 km from the nearest Indigenous community on the Island of Newfoundland (Miawpukek First Nation). There are no known physical and cultural sites, including structures, sites, or things of historical, archaeological, paleontological, or architectural significance within the Project Area or the LAA. Therefore, there are no pathways of effects from routine Project activities to changes in structures, sites or things of historical, archaeological, paleontological, or architectural significance due to the offshore location of the Project and localized extent of routine Project interactions.

Given the distance of the Project offshore and the limited geographic extent of predicted atmospheric and marine discharges arising from routine Project activities, effects from routine activities are unlikely to affect the physical or social health and wellbeing of Indigenous communities, except potentially indirectly as a result of effects on commercial communal or FSC fishing, hunting, or other harvesting activities. The Project could affect commercial communal fisheries resources by direct or indirect effects on fished species or through effects on fishing activity (e.g., displacement from fishing areas, gear loss or damage, availability of fisheries resources). To date, no Indigenous community has indicated that they actively fish in the Project Area or LAA, although this does not necessarily mean they will not do so in the future. Although there is no known FSC fishing or harvesting taking place in the Project Area, routine Project activities could interact with migratory fish, bird or mammal species that may be harvested by Indigenous communities from onshore / nearshore harvesting sites.

As a result of these considerations, the assessment of Project-related effects on Indigenous communities and activities is focused on the following potential effects:

- Change in health and socio-economic conditions
- Change in current use of lands and resources for traditional purposes

6.5.3 Potential Effects from Routine Operations

6.5.3.1 Change in Health and Socio-economic Conditions

Given the distance of the Project offshore and the localized extent of predicted atmospheric and marine discharges arising from routine Project activities, any change in health and socio-economic conditions would most likely occur indirectly as a result of effects on commercial communal or FSC fishing or other harvesting (e.g., hunting) activities. For many Indigenous communities, commercial communal fishing activities represents an important revenue source.

Project interactions which could potentially interrupt or prevent commercial communal fishing through restricted access to fishing areas, lost or damaged gear, and/or lost or reduced catch, could result in reduced revenue for a community and affect community spending and investment in infrastructure, services and/or programs. A change in health and socio-economic conditions could occur from:

- The presence and operation of a MODU (fisheries exclusions within the 500-m radius safety (exclusion zone) and underwater sound effects on fishery species)
- VSP operation (underwater sound effects on fishery species)
- Discharges (effects on water and sediment quality on fishery species)
- Well testing and flaring (effects on marine and migratory birds)
- Well abandonment (potential underwater sound associated with removal of wellhead infrastructure and/or a change in benthic habitat associated with leaving the wellhead in place)
- Supply and servicing operation (underwater sound effects on fishery species)

A 500-m radius safety (exclusion) zone will be maintained around the MODU when it is present and operating; therefore, commercial communal fisheries will be excluded from an area of approximately 0.8

km^2 (80 ha) for up to approximately 180 days for each well drilled. Details of the safety zone will be published in the Navigational Warning (NAVWARN) and Notices to Mariners (NOTMAR) systems and communicated through operational updates as described in the Indigenous Fisheries Communication Plan. Commercial fishing efforts within the Project Area, however, are low with activity from 2013 to 2017 only occurring within the southwestern corner. The temporary exclusion of fishing from the safety zone is not predicted to affect commercial communal fisheries to the extent that it would substantively affect revenue for Indigenous communities and affect community health and socio-economic conditions.

Marine fish may experience biophysical and/or behavioural (e.g., avoidance) effects due to underwater sound from the presence and operation of the MODU and/or VSP operations (see Chapter 8). However, these effects are predicted to be localized and temporary, particularly as the fish may become habituated to the continuous underwater sound emissions (Chapman and Hawkins 1969; McCauley et al. 2000a, 2000b; Fewtrel and McCauley 2012). Given the temporary and localized nature of this effect, it is not expected that fisheries species (or prey upon which they may depend) would experience a measurable change in availability to the extent that commercial communal or FSC fisheries resources would be adversely affected.

Drilling waste and other drilling discharges and emissions may result in temporary and localized effects on water and sediment quality and therefore could potentially affect commercial communal or FSC fishery species. Section 6.1 describes the effects of discharges on marine fish and concludes that effects will be low in magnitude and localized to the Project Area. As noted in Section 7 (Mitigation Measures and Commitments) discharges from the MODU will be in accordance with Chevron's EPP and the OWTG (NEB et al. 2010). The availability of fisheries resources is not expected to be affected by discharges; therefore, resulting affects to health and socio-economic conditions are not anticipated.

If well testing includes flaring, marine and migratory birds could potentially be attracted to the MODU, potentially resulting in stranding and/or mortality of individuals. As described in Section 6.2, effects would likely be temporary (flaring occurring one to two days per well test) and localized to within several kilometres of the MODU (up to approximately 16 km). Species most vulnerable to artificial light attraction and strandings (e.g., storm-petrels) are not species targeted for harvesting by Indigenous communities.

Chevron has not yet defined its well abandonment strategy. Upon completion of drilling (and testing if applicable), well abandonment may or may not involve removal of wellheads from the seafloor. If the wellhead is kept in place (with approval from the C-NLOPB), it could potentially interact with commercial communal fishing as the infrastructure protruding from the seafloor could present a snagging hazard in some circumstances. However, water depth and potential for interaction with fishing practices will be considered in the development and regulatory approval of its well abandonment strategy. Chevron will also communicate the locations of abandoned wellheads to fishers and the Canadian Hydrographic Services for publishing on future nautical charts.

Supply vessels will increase vessel traffic in the Project Area and the LAA and therefore could potentially interact with commercial communal fishing activity (e.g., interfere with fishing gear or fishing vessel navigation) or disrupt fishery species due to underwater sound emissions. As noted in Section 7 (Mitigation Measures and Commitments), common shipping routes will be used by supply vessels, as practicable, and

will adhere to standard navigation procedures, to reduce incremental marine disturbance and potential conflict with fishing vessels.

6.5.3.2 Change in Current Use of Lands and Resources for Traditional Purposes

Indigenous peoples have historically relied on harvesting a variety of species (e.g., fish, birds, marine mammals, wildlife, plants) for sustenance, medicine, spiritual and cultural practices, and for trade. Indigenous people continue to engage in traditional land and resource use practices though the location, species and methods of harvesting may have changed over time.

Chevron is not aware of any FSC fishing occurring in the Project Area and routine Project activities are not predicted to interact with onshore lands used for traditional purposes (e.g., hunting, gathering, inshore fishing). However, migratory fish, mammal and/or bird species that may be traditionally harvested by Indigenous communities (or species linked to these harvested species [e.g., prey or predator species]) in the nearshore or onshore lands and waters, may migrate through the Project Area and interact with the Project, thereby potentially affecting the quality or availability of these resources upon which Indigenous communities may depend. This could potentially result in a change in current use of resources for traditional purposes.

The pathway for a Project effect causing a change in the current use of lands and resources for traditional purposes is therefore tied to effects on migratory species which may occur in the Project Area or LAA.

A change in current use of lands and resources for traditional purposes could occur as a result of Project activities affecting the marine environment, including:

- Presence and operation of a MODU (underwater sound effects on FSC fisheries species)
- VSP (underwater sound effects on FSC fisheries species)
- Discharges (effects on water and sediment quality for FSC fisheries, effects on marine and migratory birds)
- Well testing and flaring (effects on marine and migratory birds)
- Supply and servicing (helicopters and supply vessels disturbing marine and migratory birds, and supply vessels disturbing marine fish)

Drilling activities will result in underwater sound emissions associated with MODU which may cause fish to temporarily avoid the area around the MODU, particularly during start up, although these effects are expected to temporary as the fish become habituated to the continuous sound levels. Given the temporary nature of this effect, it is not expected that migratory fish would be affected to the extent that FSC fisheries would experience a change in availability of fisheries resources (through species mortality or dispersion of stocks).

The presence and operation of the MODU could affect bird harvesting activities through nocturnal attraction of birds to artificial lighting. Species commonly harvested by Indigenous communities include geese, ducks, loons, gulls, murres, mergansers and scoters. The magnitude of the effect of MODU operation on marine and migratory birds is expected to be low in consideration of the implementation of mitigation (Section 7)

including following the Best Practices for Stranded Birds Encountered Offshore Atlantic Canada (ECCC 2016).

Underwater sound associated with VSP could cause physiological or behavioral effects on migratory fish. Mobile fish, however, would be expected to avoid underwater sound at thresholds which could result in injury or mortality, particularly with the implementation of ramp-up procedures (implemented primarily for the protection of marine mammals and sea turtles). Residual effects from VSP on FSC fisheries species are not anticipated since the VSP operation would be localized and short term, with negligible environmental effects on FSC fisheries species that may be migrating through the area.

Sound levels produced by VSP surveys could also potentially interact with migratory birds, particularly diving birds, who may hear a sound pulse if they are underwater when the VSP sound source is activated. Murres are diving species which could be present in the Project Area and which are traditionally harvested by Indigenous communities in the RAA. Common murres may dive to a depth of 180 m or deeper (Piatt and Nettleship 1985); however, given the ramp-up period, it is likely that the gradual increase in underwater sound levels would deter these birds from feeding underwater in the affected area when the seismic source is activated. Residual effects from VSP are not anticipated since the VSP operation would be localized and short term, with negligible environmental interactions on marine and migratory birds.

Discharges and emissions from routine Project activities could potentially result in localized adverse effects on water and sediment quality within the Project Area, and therefore could potentially affect FSC species within a localized area. As noted in Section 7 (Mitigation Measures and Commitments), discharges and emissions will be in accordance with Chevron's EPP and the OWTG (NEB et al. 2010), thereby reducing the potential for adverse environmental effects on marine fish and marine and migratory birds.

If well testing involves flaring, there is potential for marine and migratory birds to be attracted to the flare where they may become stranded on the MODU and/or experience physical injury or death. Flaring, if conducted, would be brief and bird attraction would be limited to several kilometres of the MODU. Mitigation measures (Section 7) would be implemented to reduce adverse effects on marine and migratory birds.

Supply and servicing activities are not predicted to affect access to traditional fishing areas or interfere with fishing activities. Supply vessels and helicopters would represent an incremental increase of existing high levels of traffic in the nearshore and would abide by standard navigation practices to reduce or avoid adverse interactions with fishing activities. With respect to migratory bird colonies, buffer zones would be observed to reduce potential for sensory disturbance of breeding birds.

6.5.4 Potential Effects from Accidental Events

Accidental spills can potentially affect fisheries resources (e.g., direct and indirect effects on fished species) and/or fishing activity (e.g., displacement from fishing areas, gear loss or damage) in such a way that it may affect commercial communal or FSC fishing and/or use of lands and resource for traditional purposes, either of which could potentially affect the physical or social health and well-being of affected Indigenous communities. The extent of potential effects will depend on how the spill trajectory and Indigenous activities and species of interest intersect in space and time.

Although commercial-communal and FSC fisheries have not been confirmed to occur in the vicinity of the Project Area, an oil spill could potentially extend to other parts of the RAA or even beyond RAA boundaries to reach harvesting areas, or affect species of interest that could be migrating through or using the spill-affected area. In the event of a spill, an effect on fished species or implementation of fishery closure could affect health and/or socio-economic conditions of Indigenous communities through reduced fisheries revenue, change in cultural practices and heritage, and/or direct (e.g., direct contact) or indirect exposure (e.g., ingestion of contaminated food) to contaminants.

Surface oiling could have a short-term effect on commercial-communal fisheries due to the exclusion of fishing in areas where oil exceeds a thickness of 0.04 µm (a visible sheen). Affected areas would be closed to fishing to prevent human contact with spilled oil and consumption of potentially contaminated food sources. Fishery closures are intended to reduce risk of contamination of gear and protect consumers from consumption of potentially contaminated resources. However, the restriction of access to commercial communal or FSC fisheries can also result in adverse socio-economic effects on Indigenous communities.

Effects may also occur due to reduced consumer confidence and marketability of seafood following a spill (ITOPF 2011). The uptake of oil by exposed fish may pose a potential threat to human consumers and affect the marketability of catches. Physical contamination of fishing gear can also occur and in some cases, result in transfer of oil to the catch (ITOPF 2011). Tainting of seafood (when a fish absorbs oil-derived substances into its tissues, causing petroleum tastes and odours) can occur at exposures to low hydrocarbon concentrations (ITOPF 2011). And although tainting is reversible through depuration, concerns and altered consumption patterns may linger after seafood has been determined safe for consumption, leading to potential continued economic losses (Yender et al. 2002; ITOPF 2011) that can have adverse health and socio-economic effects for affected Indigenous communities.

The Project is not located within an area of high harvesting activity by Indigenous fishers, and oil spill trajectory modelling has shown that in the unlikely event of a blowout incident, prevailing winds and currents are most likely to force released oil to the east, away from Canadian shorelines. Depending on the season, stochastic modelling predicted the average probability of shoreline oiling ranging from 1.9% (summer) to 8.7% (winter). Depending on the time of year and environmental conditions, areas susceptible to shoreline oiling under the “worst-case” scenario included the entire east coast and much of the west coast of Newfoundland, the Avalon Peninsula, the southern shores of Labrador reaching into the Gulf of St. Lawrence, and Sable Island. Oil that reached shore was expected to be patchy, discontinuous, and weathered, as it would have taken a minimum of 10 days (and frequently much longer) to reach shore.

Oil intersection with areas traditionally fished for commercial communal and/or FSC fisheries is therefore unlikely; however, there is a possible interaction with species of interest to Indigenous communities as a species may potentially move through a spill affected area prior to being harvested in a non-affected area. This may include fish species as well as marine mammals (e.g., seals) and marine and migratory bird species (e.g., murres). The magnitude of effects on marine species depends on the timing of a spill and extent to which the spill trajectory may intersect with areas inhabited by marine species. Dispersed oil is unlikely to reach nearshore and coastal areas where birds may congregate (e.g. near breeding colonies) but fish, bird, and marine mammal species may migrate through affected areas offshore.

In the event of an SBM spill from the MODU and marine riser, the SBM would rapidly sink to the seafloor within approximately 1 km from the MODU, resulting in a temporary degradation of benthic habitat and potential smothering of benthic fauna. Effects on commercial communal fisheries are expected to be negligible given the localized extent of benthic interaction. Although unlikely to occur, there is potential for an SBM spill to result in a surface sheen, which could potentially result in mortality or physical injury of marine birds in the immediate area of the spill. However, this is not predicted to result in population effects such that Indigenous harvesting of marine birds would be affected. No adverse effects are predicted on seals as a result of an SBM spill.

6.6 Commercial Fisheries and Other Ocean Users

Commercial Fisheries and Other Ocean Users are considered a combined VC due to the economic and cultural importance they carry for the province of NL. Activities related to the Project have potential to interact with commercial fishing and other ocean users. In the following assessment, commercial fishing refers to harvesting activities by domestic and foreign fleets for species of shellfish, groundfish, pelagic and molluscs. Other ocean users offshore NL include marine research, military exercises, shipping, other offshore oil and gas activities, and marine infrastructure (e.g., subsea cables, shipwrecks and legacy sites).

6.6.1 Existing Environment

The coastal and offshore areas of NL comprise important commercial fishing grounds for both domestic and international fleets. Fishing for commercial purposes has been, and continues to be an important activity, both economically and culturally, and plays an influential part in shaping the offshore marine environment.

There are two governing bodies that oversee commercial fisheries in the offshore region of NL: the Government of Canada (through DFO); and NAFO. The Government of Canada has jurisdiction over activities within the 200 nm EEZ, while NAFO manages activities outside the 200 nm limit out to 42° W longitude. Approximately 89.8% of the Project Area is within the NAFO Regulatory Area, with just 10.2% overlapping with the Canadian EEZ; approximately 52% of the Project Area overlaps with the NAFO area. The Project EL and Project Area are within NAFO Division 3L and contain portions of NAFO Unit Areas 3Le and 3Li. The RAA is inclusive of all Unit Areas within NAFO Divisions 3K and 3L, and portions of 2JH, 3MNOP, 3Ps and 4Vs.

Domestic commercial fishing occurs throughout the RAA, from the bays surrounding the Avalon Peninsula, along the Grand Banks, within the Flemish Pass and contouring along the slopes of the Grand Bank and the Newfoundland and Labrador Slopes. Between 2013 and 2017, there has been a decrease noted in catch weight from 165, 262 t to 80, 285 t, a decrease of approximately 51%. There is also a slight decrease (approximately 2%) in the value of domestic commercial fishing activities from $414,012,533 in 2013 to $404,638,782 in 2017.

The Project Area intersects Unit Areas 3Le and 3Li within NAFO Division 3L. From 2013 to 2017, the total catch weight decreased from 6,194 t to 3,524 t, a decline of 43%. During the same time period, the value increased from $19,450,352 to $22,765,912. The change in weight and values for each species and species

group that is fished within the Project Area indicate that the decrease in weight is largely in part due the decrease in the amount of northern shrimp that was caught in 2013 and 2014, followed by an absence of commercial fishing of northern Shrimp in 2015 and 2016. Starting in 2016, SFA 7, which overlaps with NAFO Division 3L, was closed to shrimp fishing. The lack of shrimp fishing saw an increase in the catch weight and value of snow crab. Seasonally, snow crab is fished from May to August within the Project Area, while Greenland halibut is fished throughout the year, with peak fishing occurring in August, September, and November.

The offshore area of NL hosts a range of other human-related activities that may interact with Project-related activities within the RAA and Project Area. These include marine research, shipping related activities, military operations, other offshore oil and gas projects, and marine infrastructure. Each of these activities are described in Section 7.2 of the EIS.

6.6.2 Anticipated Changes to the Environment

Routine Project activities have the potential to interact directly and indirectly with commercial fisheries resources. Direct interactions can include displacement from fishing grounds and loss or damage to gear. Indirect interactions include those that may result in physical or behavioural effects on commercially fished species, such as changes in fish health or quality, fish avoiding popular fishing grounds due to underwater sound, or changes in water quality. These direct and/or indirect effects have the potential to result in economic loss to commercial fisheries. For other human components and activities, behavioural effects on fish could indirectly affect research activities, and oil and gas activities may also limit certain areas for research or military exercises, which may result in changes in schedules, or relocation of vessels to alternate areas.

As a result of these considerations, the assessment of Project-related effects on commercial fisheries and other ocean users is focused on the following potential effect:

- Change in availability of resources

6.6.3 Potential Effects from Routine Operations

6.6.3.1 Change in Availability of Resources

Commercial fishing activity includes setting and retrieving gear in designated fishing grounds, as well as travel to and from those fishing grounds. Other ocean uses can include shipping and planned military activities, as well as ocean research activities, which include setting and retrieval of gear and/or equipment and travel to and from target sites. Project interactions that might interrupt or prevent these activities include obstacles that prevent access to and from fishing grounds or areas of other activities, closures applied in known fishing grounds, lost or damaged gear and equipment, or lost or reduced catch. Adverse effects to marine fish, including targeted fishery species, are discussed in Section 6.1.

The presence and operation of a MODU can affect the availability of resources for commercial fisheries and other ocean uses by direct interference through the establishment of safety zones associated with the MODU (when it is present and operational), which will restrict access to certain areas for commercial

fisheries and other ocean activities. When a MODU is set on location at the well site, a 500-m radius safety zone will be established prior to commencement of drilling and throughout the operation of the MODU. This will result in localized fisheries exclusion within an area of approximately 0.8 km² (less than 0.01% of the Project Area) for approximately 180 days for each well drilled. The potential also exists for the MODU to damage fishing gear, vessels, and equipment in the unlikely event of a direct interaction. Standard mitigation measures, such as ongoing communication with DFO, DND, and commercial fishing industry representatives, will help to reduce the risk of and interaction between the presence and operation of a MODU and other ocean activities that may be occurring in the area. Scheduled Project activities, including the planned location and timing of drilling activities, will be communicated in advance to the commercial fishing industry and other ocean users. Potential damage to gear, vessels, or other marine assets, although unlikely, would be managed through applicable compensation policies and procedures that will be developed by Chevron in accordance with applicable C-NLOPB policies and regulations.

In addition to a safety zone, the presence and operation of a MODU could result in other pathways for environmental interactions on available marine resources, including underwater sound from the operation of the MODU, and light emissions. Sound and light emissions have the potential to result in behavioural effects on target species for commercial fishing or research programs. During drilling operations, discharges from the MODU, such as organic and liquid wastes, and light emissions, may have the ability to attract fish species to a localized area for a short period of time. The effects of light and underwater sounds on fish are addressed in Section 6.1, which concluded that adverse environmental effects on marine fish species from interactions associated with the presence and operation of a MODU would be low in magnitude. Disturbances to fish species would be low in magnitude, localized, and temporary, returning to normal conditions once the MODU is removed. It is unlikely that marine resources will be affected or disturbed in a manner that would result in effects on the overall availability or quality of a marine resource for commercial fishers or other ocean users.

VSP activity could reduce catches if fish exhibit behavioural changes such as avoidance or a change in distribution. While source array activity could injure fish species if they are close to the sound source, it is likely that mobile fish will disperse from the source during array ramp-up or vessel approach and avoid harm (see Section 6.1). Although there is a small amount of fishing that occurs within the EL 1138, it is unlikely that effects on commercial fish species from VSP surveys would affect distribution in a way that would create a substantial change in availability of resources for commercial fishers and or other ocean users.

The discharge of drill muds and cuttings, and other discharges from the MODU and supply vessels, can result in a change in sediment and water quality of the surrounding area, up to 1 km from the location of the well. These changes have the potential to indirectly affect the quality or perceived quality of commercial fish species, and potential conditions for research activities. As discussed in the assessment of marine fish and fish habitat (Section 6.1), the effects from these discharges are expected to be low in magnitude and localized within the Project Area.

All wells drilled during the life of the Project will be plugged and abandoned upon completion of well evaluation activities, although the abandonment program has not yet been defined. If the wellhead is left in place, it would result in a permanent piece of infrastructure on the seafloor, which would have potential to

interact with fishing and/or research equipment and may potentially cause damage. It is estimated that there would not be a large amount of interaction with commercial fishing activities in the LAA, as most harvesting takes place along the shelf edge at shallower depths. It is unlikely that wellhead abandonment will result in an interaction with commercial fishing and offshore research activity in a way that would result in a substantial change to availability of resource or unmitigated damages. As part of its mitigation measures, Chevron will provide the locations for each decommissioned well to fishers and the Canadian Hydrographic Service and notify the Navigational Warning (NAVWARN) and Notices to Mariners (NOTMAR) systems. This will allow mobile-gear and fixed-gear fishers to avoid these locations or plan activities around the abandoned wellhead.

Supply and servicing can interact with commercial fishing activity and other ocean use through potential direct interference with fishing gear or offshore research equipment or if supply vessels are moving through areas where research/military programs are planned to take place. The implementation of standard industry measures and operation of vessels will reduce the likelihood of an interaction. In the unlikely event of an interaction between a supply vessel and fishing gear causing damage, compensation for damages will be managed in accordance with the Compensation Guidelines Respecting Damages Relating to Offshore Petroleum Activity (C-NLOPB and CNSOPB 2017b).

6.6.4 Potential Effects from Accidental Events

An accidental event can interact directly and indirectly with commercial fisheries and other ocean users by causing a change in availability of resources. Direct interactions can include displacement from fishing grounds and damage to gear, vessels or instruments, while indirect interactions include those that may result in physical effects on commercially fished species, such as changes in fish health or quality and fish avoiding popular fishing grounds due to changes in water quality.

The uptake of oil and hydrocarbons present in the water column by exposed fish poses a potential threat to human consumers and affects the marketability of catches. Market perceptions of poor product quality (e.g., tainting) can persist even when results demonstrate safe exposure levels for consumption, thereby prolonging the economic effects for fishers. Reduced demand for seafood that is perceived to be tainted can also lead to depressed market prices.

Physical contamination of boats, fishing gear, and aquaculture facilities can also occur, with flotation equipment (e.g., buoys, nets, fixed traps) and shoreline cultivation facilities at higher risk. In some cases, fouling of gear can result in oil being transferred to the catch or product (ITOPF 2011).

Fishery closures may be imposed after a spill to prevent gear from being contaminated and to protect or reassure seafood consumers while the spill is being remediated. Fishery closures are usually implemented in area where: a visible sheen exists on the ocean surface, which occurs at a surface oil thickness of 0.04 µm or more; in areas (including a buffer) with detectable levels of subsurface oil; and, as a precautionary measure, in areas where surface oil is predicted to occur based on trajectory modelling (National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling 2011).

With respect to other ocean users, the quality of marine research could be affected through closure of survey areas, fouling research gear, or contaminating research results due to the presence of hydrocarbons on surface water or in the water column. Offshore training exercises such as military training activities could also be affected if areas are closed due to a spill and operation need to be moved or delayed.

6.7 Cumulative Effects

In addition to assessing Project-specific environmental effects, section 19(1)(a) of CEAA 2012 requires that the environmental assessment of a designated project consider "any cumulative environmental effects that are likely to result from the designated project in combination with other physical activities that have been or will be carried out".

The approach and level of effort applied to assessing cumulative environmental effects takes into consideration:

- the characteristics of the Project
- the risks associated with the potential cumulative environmental effects
- the state (health, status or condition) of VCs that may be impacted by the cumulative environmental effects
- the potential for mitigation and the extent to which mitigation measures may address potential environmental effects
- the level of concern expressed by Indigenous groups or the public

Residual Project-related environmental effects were identified for the following VCs, as evaluated in Chapters 8 to 13 of this EIS:

- Marine Fish and Fish Habitat
- Marine and Migratory Birds
- Marine Mammals and Sea Turtles
- Special Areas
- Indigenous Communities and Activities
- Commercial Fisheries and Other Ocean Users

Since these VCs have residual environmental effects which could potentially contribute to cumulative effects, the Cumulative Effects Assessment (CEA) focuses on these VCs.

Other (non-Project) past, present, and future physical activities that are considered in the CEA because they have potential to result in residual environmental effects that may interact cumulatively with (i.e., overlap spatially and temporally with) the residual environmental effects of the Project within the RAA include:

- Hibernia Oilfield, including South Extension
- Terra Nova Oilfield and Extension Project
- White Rose Oilfield and Extension Project

- Hebron Oilfield
- Proposed Bay du Nord (BdN) Development Project
- Offshore Petroleum Exploration – Drilling
- Offshore Petroleum Exploration – Geophysical and Other Exploration Activities
- Fishing Activity
- Other Ocean Uses (including Other Marine Vessel Traffic)
- Hunting

Residual environmental effects from the Project may potentially combine with residual effects from one or more other physical activities potentially resulting in cumulative environmental effects on fish and fish habitat, marine and migratory birds, and marine mammals and sea turtles, including a cumulative change in risk of mortality or physical injury and/or a change in habitat quality. Given the life cycles associated with several marine fish, marine and migratory birds, and marine mammals and sea turtles includes long-distance movement within the RAA, there is potential for individuals of these species to be affected by the combined residual environmental effects of the Project and other physical activities. However, the Project is predicted to result in generally low magnitude and temporary residual effects, therefore the Project's contribution to cumulative effects is low. No additional mitigation measures, beyond those identified in the VC assessments are needed to address potential cumulative effects on marine fish, marine and migratory birds, and marine mammals and sea turtles. It is also assumed that operators of other physical activities will implement mitigation measures to reduce adverse environmental effects.

The Project Area or LAA overlaps with several special areas. Special areas, whose boundaries overlap with the Project Area, may experience effects on habitat quality associated with marine discharges, sound, and light emissions, including those that may result in direct interaction with and effects on the seabed and sensitive benthic organisms and habitat. Many of these special areas also overlap with Project Areas for proposed future exploration drilling programs which would be predicted to have similar environmental effects as the Project. The deposition of Project-related discharges of drill muds and cuttings from each well site could interact cumulatively with the residual environmental effects of fishing activity in the RAA, including the disturbance of benthic habitat. However, the extent of benthic disturbance would be localized per well site and, like Chevron, other operators proposing exploration drilling activities in these areas have committed to conducting seabed surveys prior to drilling to confirm the absence of sensitive environmental features, such as habitat-forming corals or species at risk and implementing an appropriate course of action in consultation with regulatory authorities to avoid or reduce adverse effects on these features. Collectively, these surveys will contribute to a better understanding of benthic features in the eastern NL offshore area. Furthermore, bottom-contact fishing is now restricted in certain areas (including the Northeast Newfoundland Slope Closure marine refuge) which will reduce cumulative adverse effects on sensitive benthic habitat.

Several offshore petroleum exploration drilling programs are proposed to be carried out in the RAA within a similar timeframe as the Project, in addition to existing and proposed production projects. A 500-m radius safety zone will be established around the Project MODU, within which Indigenous and non-Indigenous fisheries and harvesting activities will be excluded while the MODU is in operation. The safety zones associated with other offshore petroleum exploration and production drilling projects will increase the cumulative area that will be temporarily unavailable to Indigenous and non-Indigenous fishers and

harvesters at any given time during Project activities. Nine additional exploration drilling projects could occur during the timeframe of this Project. For the purpose of this assessment, it is assumed that each of these exploration projects would institute a 500-m radius safety zone (approximately 0.8 km²) from which Indigenous and non-Indigenous fisheries and other ocean uses would be temporarily excluded. It is unknown how many wells will actually be drilled and over what timeframe to be able to calculate an accurate estimate of fishing exclusion zones which could occur in the RAA at any given time, although these safety (exclusion) zones would be in addition to the approximately 380 km² footprint of safety zones associated with existing production projects in the RAA.

The level of fishing / harvesting effort within and surrounding the Project Area is relatively low. The Project Area does not include any unique fishing / harvesting grounds or concentrated fishing / harvesting effort that occurs exclusively within the Project Area, nor is it likely to represent a substantial portion of a customary fishing / harvesting area for an Indigenous or non-Indigenous fisher / harvester. The potential for temporary loss of access to preferred fishing / harvesting grounds as a result of the Project is therefore anticipated to be negligible and is unlikely to have any discernable effect on the overall distribution of fishing / harvesting effort within the RAA.

6.8 Effects of the Environment on the Project

The EIS considers how existing environmental conditions and natural hazards in and around the Project Area could adversely affect the Project. This consideration is required by section 19(1)(h) of CEAA 2012, relating to any change to the designated Project that may be caused by the environment.

The components of the physical environment that may affect the Project are: geohazards (seismic activity, tsunamis, and landslides); weather conditions (fog and visibility, lightning, and extreme wind and wave evens); currents; ice conditions (sea ice, icebergs, and superstructure icing); and climate change. Understanding the interaction between Project activities and environmental conditions will help to avoid or lessen the potential for accidental events to occur. The engineering design, operation procedures, and mitigation measures will be implemented to reduce the potential adverse effects of these environmental components on the Project. The primary means of mitigating adverse effects of the environment on the Project is through use of environmental design criteria, compliance with industry codes of practice, and avoidance of environmental hazards where possible.

The following factors / measures, will reduce the potential of occurrence, and magnitude of effects of the environment on the Project:

- Short-term duration of potential offshore activities between 2016 and 2025 (approximately 180 days drilling per well for eight wells)
- Absence of fixed offshore infrastructure
- Harsh-weather design criteria for the MODU
- Requirements of C-NLOPB's Operations Authorization for drilling an exploration well
- Requirements of the Newfoundland Offshore Certificate of Fitness Regulations and the Offshore Physical Environment Guidelines (NEB et al. 2008)

- Continuous monitoring of meteorological and oceanographic conditions
- Operating limits and stop-work procedures in the event of unsafe conditions

In addition to design standards and compliance with regulatory guidelines as the primary means for reducing adverse effects of weather conditions on the Project, Chevron has a number of plans to respond to adverse conditions, should they threaten Project operations. These plans include the EPP and a Safety Plan.

7.0 MITIGATION MEASURES AND COMMITMENTS

Mitigation measures are proposed to reduce or eliminate potential adverse effects and include compliance with regulatory requirements and guidelines, and measures developed specifically for the project. In some cases, compensation measures may be warranted (e.g., loss or damage to fishing gear). Each VC assessment indicates how the mitigation measures will reduce or eliminate potential adverse effects on the VC. A summary of standard mitigation and Project-specific commitments to be implemented is provided in Table 7.1.

Table 7.1 Summary of Standard and Project Specific Mitigation

No.	Proponent Commitments	EIS Reference
General		
1.	Contractors and subcontractors shall be required to demonstrate conformance with the requirements that have been established, including health, environment, and safety (HES) standards and performance requirements.	Section 2.10.3
2.	Chevron will obtain a Certificate of Fitness from an independent third-party Certifying Authority for the MODU prior to commencement of drilling operations in accordance with the Canada-Newfoundland and Labrador Offshore Petroleum Board's (C-NLOPB's) *Offshore Certificate of Fitness Regulations*.	Section 2.10.3 Section 16.4
3.	Chevron will collect detailed site-specific information on climatic, meteorological, and oceanographic conditions as part of the planning and design of an offshore program and implement a physical environment monitoring program, including metocean monitoring, onsite weather observation, and ice management, as required by the Offshore Physical Environment Guidelines (NEB et al. 2008).	Section 2.10.3 Section 16.4
4.	Chevron and contractors working on the Project will regularly monitor weather forecasts to forewarn supply vessels, helicopters, and the MODU of inclement weather or heavy fog before it poses a risk to their activities and operations. Extreme weather conditions that are outside the operating limits of supply vessels or helicopters will be avoided if possible. Captains / Pilots will have the authority and obligation to suspend or modify operations in case of adverse weather or poor visibility that compromises the safety of supply vessel, helicopter, or MODU operations.	Section 2.10.3
5.	Icing conditions and accumulation rates on supply vessels, helicopters, and the MODU will be monitored during fall and winter operations, particularly when gale-force winds may be combined with air temperatures below -2°C (DFO 2012).	Section 2.10.3
6.	Safe work practices will be implemented to reduce exposure of personnel to lightning risk (e.g., restriction of access to external areas on the MODU or supply vessel during thunder and lightning events).	Section 2.10.3

Table 7.1 Summary of Standard and Project Specific Mitigation

No.	Proponent Commitments	EIS Reference
7.	Prior to drilling activity, Chevron will conduct a comprehensive regional geohazard baseline review, followed by detailed geohazard assessments for each proposed well site.	Section 2.10.3 Section 16.4
8.	Chevron will require the Drilling Contractor to provide details of the safety zone to the Marine Communication and Traffic Services for broadcasting and publishing in the Navigational Warning and Notices to Mariners systems. Details of the safety (exclusion) zone will also be communicated by Chevron during ongoing consultations with commercial and Indigenous fishers.	Section 2.10.3 Section 12.3 Section 13.3
9.	Chevron will develop and implement a compensation program for damages resulting from Project activities. This compensation program will be developed in consideration of C-NLOPB guidelines, including the Compensation Guidelines Respecting Damages Relating to Offshore Petroleum Activities (C-NLOPB and Canada-Nova Scotia Offshore Petroleum Board [CNSOPB] 2017).	Section 2.10.3 Section 12.3 Section 13.3
10.	Chevron will continue to engage with Indigenous communities to share Project details and facilitate information sharing. This will be facilitated by the development and implementation of an Indigenous Fisheries Communication Plan.	Section 12.3
11.	Chevron will continue to engage commercial fishers to share Project details, as applicable and determine the need for a fisheries liaison officer during mobilization and demobilization of the MODU. This engagement will be coordinated through One Ocean, Fish, Food and Allied Workers-Unifor, Ocean Choice International, Association of Seafood Producers, and Groundfish Enterprise Allocation Council. A Fisheries Communication Plan will be used to facilitate coordinated communication with fishers.	Section 13.3
12.	Chevron will maintain ongoing communications with the Northwest Atlantic Fisheries Organization (NAFO) Secretariat, through Fisheries and Oceans Canada (DFO) as the Canadian representative, regarding planned Project activities, including timely communication of drilling locations, safety zone, and decommissioned well heads.	Section 13.3
13.	Chevron will contact DFO regarding timing and locations of planned DFO research surveys.	Section 13.3
14.	Chevron will contact the Department of National Defence regarding timing of planned offshore military exercises.	Section 13.3
15.	Supply vessels captains, helicopter pilots, and the MODU's Offshore Installation Manager will have the authority to suspend or modify operations in the case of adverse weather that could compromise the safety of supply vessels, helicopter, or MODU operations.	Section 16.4
16.	Safe work practices will be implemented to reduce the risk of lightning to Project personnel, such as restricting access to external areas of the supply vessels and MODU.	Section 16.4
17.	MODUs and supply vessels will incorporate water current loads into their design.	Section 16.4
18.	Chevron will prepare and submit an Ice Management Plan as part of the application for Drilling Program Authorization as per the Offshore Physical Environment Guidelines (NEB et al. 2008). This Plan will include details on sea ice / iceberg monitoring and detection, and risk assessment, mitigation, and contingency procedures.	Section 16.4

Table 7.1 Summary of Standard and Project Specific Mitigation

No.	Proponent Commitments	EIS Reference
Presence and Operation of the MODU		
19.	To maintain navigational safety during the Project, obstruction lights, navigation lights, and foghorns will be kept in working condition on board the MODU and supply vessels. Radio communication systems will be in place and in working order for contacting other marine vessels as necessary.	Section 2.10.3 Section 13.3 Section 16.4
20.	The MODU will be equipped with local communication equipment to enable radio communication between the supply vessels and the MODU's bridge. Communication channels will also be put in place for internet access and to enable communication between the MODU and shore.	Section 2.10.3 Section 16.4
21.	In accordance with the *Newfoundland Offshore Petroleum Drilling and Production Regulations*, a safety (exclusion) zone (estimated to be a 500-m radius) will be established around the MODU, within which non-Project related vessels are prohibited.	Section 2.10.3
22.	An imagery-based seabed survey will be conducted at the proposed well site(s) to confirm the absence of sensitive environmental features, such as habitat-forming corals or species at risk (as well as shipwrecks, debris on the seafloor, and unexploded ordnance). The survey will be carried out prior to drilling. If environmental or anthropogenic sensitivities are identified during the survey, Chevron will move the well site to avoid affecting them if it is feasible to do so. If it is not feasible, Chevron will consult with the C-NLOPB to determine an appropriate course of action. This survey will also provide baseline data for coral and sensitive benthic habitat that may be present and be used to inform discussions on potential follow-up and monitoring with respect to drill waste discharges.	Section 2.10.3 Section 8.7 Section 11.3 Section 13.3 Section 16.4
23.	Lighting will be reduced to the extent that worker safety and safe operations is not compromised. Reduction of light may include avoiding use of unnecessary lighting, shading, and directing lights towards the deck.	Section 2.10.3 Section 8.3 Section 9.3
24.	Supply vessel and MODU contractors will have a Maintenance Management System designed to direct the maintenance and efficient operation of the vessels and MODU, and equipment.	Section 2.10.3
25.	The loss of fish habitat will be mitigated through compliance with the *Fisheries Act.*	Section 8.3
26.	Chevron, in consultation with Environment and Climate Change Canada (ECCC) - Canadian Wildlife Services (CWS), will develop a protocol for systematic, daily searches for seabirds stranded on the MODU and supply vessels, which will include the documentation of search effort. Seabirds found will be recovered, rehabilitated, released and documented in accordance with the methods in *Procedures for Handling and Documenting Stranded Birds Encountered on Infrastructure Offshore Atlantic Canada* (ECCC 2017a). Chevron will provide training in these protocols and procedures. A Seabird Handling Permit will be obtained from ECCC-CWS annually. In accordance with ECCC-CWS requirements, an annual report and occurrence data that summarizes stranded and/or seabird handling occurrences will be submitted to ECCC-CWS.	Section 9.3 Section 11.3
27.	If flaring is required, Chevron will discuss flaring plans with the C-NLOPB including steps to reduce adverse effects on migratory birds. This may involve restricting flaring to the minimum required to characterize the wells' hydrocarbon potential and as necessary for the safety of the operation, reducing flaring during periods of migratory bird vulnerability, and the use of a water curtain to deter birds from the general vicinity of the flare.	Section 9.3
28.	Chevron will comply with Canadian regulations for engineering design, and adherence to international standards, where applicable.	Section 16.4

Table 7.1 Summary of Standard and Project Specific Mitigation

No.	Proponent Commitments	EIS Reference
29.	Engineering design of a MODU will consider the type and magnitude of loads imposed by ice, snow, waves, tides, currents, wind, and operating ambient temperatures.	Section 16.4
30.	MODU selected will be a deep-water, all-weather MODU that is specifically designed to operate in extreme environments. Engineering design of a MODU should consider anticipated changes in atmospheric and oceanographic conditions due to climate change, such that structural integrity can be maintained throughout the structure's lifetime.	Section 16.4
31.	MODU will have capability to disconnect the riser from the well in a short period of time, to reduce the risk of damage to the well, riser, and MODU.	Section 16.4
32.	Adequate food and water supplies will be stored on the MODU to accommodate delays.	Section 16.4
33.	If required due to extreme weather, the riser will be disconnected from the well, and the MODU will be moved to reduce the risk of damage or injury.	Section 16.4
34.	Supply vessels and the MODU will have lightning protection systems to ground lightning electrical charges and transfer the energy to the sea water where it can be dissipated.	Section 16.4
Waste Management		
35.	Air emissions from the Project will adhere to applicable regulations and standards including the Newfoundland and Labrador (NL) *Air Pollution Control Regulations*, National Ambient Air Quality Objectives, Canadian Ambient Air Quality Standards, regulations under the International Convention for the Prevention of Pollution from Ships (MARPOL) and the intent of the Global Gas Flaring Reduction Partnership.	Section 2.10.3
36.	Offshore waste discharges and emissions associated with the Project (i.e., operational discharges and emissions from the MODU and supply vessels) will be managed in accordance with relevant regulations and municipal bylaws as applicable, including the Offshore Waste Treatment Guidelines (NEB et al. 2010) and MARPOL, of which Canada has incorporated provisions under various sections of the *Canada Shipping Act, 2001*. Waste discharges not meeting legal requirements will not be discharged to the ocean and will be brought to shore for disposal.	Section 2.10.3 Section 8.3
37.	Selection of drilling chemicals will be in accordance with the Offshore Chemical Selection Guidelines for Drilling and Production Activities on Frontier Lands (OCSG; NEB et al. 2009), which provides a framework for chemical selection to reduce potential for environmental effects. During planning of drilling activities, where feasible, lower toxicity drilling muds and biodegradable and environmentally friendly additives within muds and cements will be preferentially used. Where feasible, the chemical components of the drilling fluids will be those that have been rated as being least hazardous under the Offshore Chemical Notification System scheme and pose little or no risk to the environment.	Section 2.10.3 Section 8.3
38.	Discharges of SBM mud and cuttings will be managed in accordance with the Offshore Waste Treated Guidelines (OWTG). SBM cuttings will only be discharged once the performance targets in OWTG of 6.9 g/100 g retained "synthetic on cuttings" on wet solids can be satisfied. The concentration of SBM on cuttings will be monitored on the MODU for compliance with the OWTG. In accordance with OWTG, no excess or spent SBM will be discharged to the sea. Spent or excess SBM that cannot be re-used during drilling operations will be brought back to shore for disposal.	Section 2.10.3 Section 8.3

Table 7.1 Summary of Standard and Project Specific Mitigation

No.	Proponent Commitments	EIS Reference
39.	Excess cement may be discharged to the seabed during the initial phases of the well, which will be drilled without a riser. Once the riser has been installed, cement waste will be returned to the MODU. Cement waste will then be transported to shore for disposal in an approved facility.	Section 2.10.3
40.	Small amounts of produced water may be flared. If volumes of produced water are large, some produced water may be brought onto the MODU for treatment so that it can be discharged in line with the OWTG.	Section 2.10.3 Section 8.7
41.	Deck drainage and bilge water will be discharged according to the OWTG, which state that deck drainage and bilge water can only be discharged if the residual oil concentration of the water does not exceed 15 mg/L.	Section 2.10.3
42.	Foreign vessels operating in Canadian jurisdiction must comply with the Ballast Water Control and Management Regulations of the *Canada Shipping Act, 2001* during ballasting and de-ballasting activities.	Section 2.10.3 Section 8.3
43.	Putrescible solid waste, specifically food waste generated offshore on the MODU and supply vessels, will be disposed of according to OWTG and MARPOL requirements. Food waste will be macerated so that particles are less than 6 mm in diameter and then discharged. There will be no discharge of macerated food waste within 3 nm from land.	Section 2.10.3
44.	Sewage will be macerated to a particle size of <6 mm and discharged as per the OWTG.	Section 2.10.3 Section 8.3
45.	Cooling water will be discharged according to the OWTG which states that any biocides used in cooling water are selected in line with a chemical management system developed in line with the OCSG.	Section 2.10.3 Section 8.7
46.	Blowout preventer (BOP) fluids and other discharges from the subsea control equipment will be discharged according to OWTG and OCSG.	Section 2.10.3
47.	Liquid wastes, not approved for discharge in OWTG, such as waste chemicals, cooking oils or lubricating oils, will be transported onshore for transfer to an approved disposal facility.	Section 2.10.3
48.	Waste generated offshore on the MODU and supply vessels will be handled and disposed of in accordance with relevant regulations and municipal bylaws. Waste management plans and procedures will be developed and implemented to prevent unauthorized waste discharges and transfers.	Section 2.10.3 Section 8.3
49.	Biomedical waste will be collected onboard by the medical professional and stored in special containers before being sent to land for incineration.	Section 2.10.3 Section 8.7
50.	Transfer of hazardous wastes will be conducted according to the *Transportation of Dangerous Goods Act.* Applicable approvals for the transportation, handling and temporary storage of these hazardous wastes will be obtained as required.	Section 2.10.3
51.	Information on the releases, wastes and discharges will be reported as part of a regular environmental reporting program in accordance with regulatory requirements as described in the OWTG.	Section 2.10.3
Vertical Seismic Profiling (VSP) Surveys		
52.	Passive acoustic monitoring will be implemented.	Section 2.10.3.

Table 7.1 Summary of Standard and Project Specific Mitigation

No.	Proponent Commitments	EIS Reference
53.	VSP activity will be planned and conducted in consideration of the Statement of *Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment* (DFO 2007). A ramp-up procedure (i.e., gradually increasing seismic source elements over a period of approximately 30 minutes until the operating level is achieved) will be implemented before VSP activity begins.	Section 2.10.3 Section 8.3 Section 10.3 Section 11.3
54.	Marine Mammal Observers (MMOs) will monitor and report on marine mammal and sea turtle sightings during VSP surveys to implement shutdown and ramp-up procedures.	Section 10.3
55.	MMOs will implement a pre-ramp up watch of 60 minutes prior to ramp-up. Ramp-up will be delayed if a marine mammal(s) or sea turtle(s) is detected within 500 m of the air gun array.	Section 10.3
56.	Shut down procedures will be implemented if a marine mammal or sea turtle listed as endangered or threatened on Schedule 1 of the *Species at Risk Act* (SARA), as well as any beaked whale species, is observed within 500 m of the air gun array.	Section 10.3
Supply and Servicing Operations		
57.	Supply vessels will follow established shipping lanes where they exist (i.e., in proximity to shore); where these do not exist, supply vessels will follow a straight-line approach to and from the Project Area. During transit to/from the Project Area, supply vessels will travel at vessel speeds not exceeding 22 km/hour (12 knots) except as needed in the case of an emergency.	Section 2.10.3 Section 10.3 Section 11.3 Section 12.3 Section 13.3.2
58.	In order to reduce the potential for vessel strikes during transiting activities outside the Project Area, supply vessels will reduce speed to a maximum of 13 km/hour (7 knots) when marine mammals or sea turtles are observed or reported within 400 m of a supply vessel, except if not feasible for safety reasons.	Section 2.10.3
59.	Vessel crew will keep a watch for marine mammals or sea turtles and reduce speed and/or alter course if practicable to avoid a collision.	Section 10.3
60.	In the event that a vessel strikes a marine mammal or sea turtle, Chevron will contact the C-NLOPB, DFO's Canadian Coast Guard Regional Operations Centre, as soon as reasonably practicable but no later than 24 hours following the collision. Indigenous groups will also be notified.	Section 2.10.3
61.	Lighting on supply vessels will be reduced to the extent that worker safety and safe operations is not compromised. Reduction of light may include avoiding use of unnecessary lighting, shading, and directing lights towards the deck.	Section 2.10.3 Section 9.3
62.	The supply vessels selected for this Project will be equipped for safe all-weather operations, including stability in rough sea conditions and inclement weather. In addition, measures to reduce superstructure icing hazards on supply vessels will be implemented as necessary and may include (DFO 2012): • Reducing vessel speed in heavy seas • Placing gear below deck and covering deck machinery, if possible • Moving objects that may prevent water drainage from the deck • Making the ship as watertight as possible • Manual removal of ice if required under severe icing conditions	Section 2.10.3 Section 16.4
63.	A supply vessel will remain on standby at the MODU at all times in the event that operational assistance or emergency response support is required.	Section 2.10.3
64.	Supply vessels will undergo Chevron's internal verification process, as well as additional external inspections / audits inclusive of the C-NLOPB pre-authorization inspection process, in preparation for the Project.	Section 2.10.3 Section 16.4

Table 7.1 Summary of Standard and Project Specific Mitigation

No.	Proponent Commitments	EIS Reference
65.	Searches for stranded birds and recovery, rehabilitation, release and documentation of birds will be conducted on supply vessels as outlined above for the MODU.	Section 9.3
66.	The regional ECCC-CWS office will be contacted for separation distances and altitudes between helicopters transiting to and from the MODU and migratory bird nesting colonies, as per ECCC-CWS guidelines (Government of Canada 2018) and routes will comply with provincial Seabird Ecological Reserve Regulations, 2015. Specific details will be provided in the environmental protection plan (EPP).	Section 9.3 Section 11.3
67.	Supply vessel routes transiting to and from the MODU will be planned to avoid passing within 300 m of migratory bird nesting colonies during the nesting period and will comply with provincial Seabird Ecological Reserve Regulations, 2015 and federal guidelines in order to minimize disturbance to colonies (ECCC 2017b). Specific details will be provided in the EPP.	Section 9.3 Section 11.3
Well Abandonment		
68.	A seabed survey will be conducted at the end of the drilling program using a remotely operated vehicle (ROV) to survey the seabed for debris.	Section 2.10.3
69.	Once wells have been drilled to True Vertical Depth and well evaluation programs completed (if applicable), the well will be plugged and abandoned according to applicable Chevron practices and C-NLOPB requirements. The final well abandonment program has not yet been finalized; however, these details will be confirmed to the C-NLOPB as planning for the Project continues.	Section 2.10.3 Section 8.7 Section 11.3
70.	Well decommissioning will be carried out as per Chevron's internal procedures and with the *Newfoundland Offshore Petroleum Drilling and Production Regulations*.	Section 8.7
71.	Given the water depths in the Project Area, approval from the C-NLOPB may be sought in order to leave the wellheads in place. Other subsea infrastructure will be removed; the BOP will only be removed once the cement plugs are in place.	Section 8.7
72.	If wellheads are to be removed, a mechanical casing / wellhead cutting device from the MODU will be used. The seafloor will then be inspected by a ROV or other equipment to verify that no obstructions or equipment remain in place.	Section 8.7 Section 11.3
73.	Chevron will communicate the locations of abandoned wellheads (if applicable) to Indigenous and non-Indigenous fishers and the Canadian Hydrographic Services for future nautical charts	Section 12.3 Section 13.3
Accidental Events		
74.	Chevron will implement multiple preventative and response barriers to manage risk of incidents occurring and mitigate potential consequences. See Section 2.5 for specific information on well control and blowout prevention, and Section 15.4 for a description of Chevron's contingency planning and emergency response measures.	Section 15.5.1 Section 15.5.2 Section 15.5.3
75.	As noted in Section 15.4, the Project will include contingency plans for responding to specific emergency events, including potential spill or well control events. The contingency plans, such as an Oil Spill Response Plan, will be submitted to the C-NLOPB prior to the start of any drilling activity as part of the Operations Authorization process.	Section 15.5.1 Section 15.5.2 Section 15.5.3
76.	Chevron will undertake a Spill Impact Mitigation Assessment (SIMA) / Net Environmental Benefit Analysis (NEBA) as part of the Operations Authorization process with the C-NLOPB. The SIMA is a structured process that will qualitatively evaluate the risks and trade-offs of feasible and effective response options, when compared to no action. The SIMA process will inform the selection of an overall spill response strategy for the Project. If identified as a preferred response option, use of chemical dispersants would not occur without first obtaining regulatory approval.	Section 15.5.1 Section 15.5.2 Section 15.5.3 Section 15.5.5 Section 15.5.6

Table 7.1 Summary of Standard and Project Specific Mitigation

No.	Proponent Commitments	EIS Reference
77.	In the unlikely event of a spill, specific monitoring (e.g., environmental effects monitoring) and follow-up programs may be required and will be developed in consultation with applicable regulatory agencies.	Section 15.5.1 Section 15.5.2 Section 15.5.3 Section 15.5.5 Section 15.5.6
78.	An Indigenous Fisheries Communication Plan will be implemented, which would include procedures for informing Indigenous communities of an accidental event and planned response. Emphasis will be on timely communication, allowing fishers to haul out gear from affected areas, and reducing potential of fouling of fishing gear.	Section 15.5.5
79.	A Fisheries Communication Plan will be implemented, which would include procedures for informing Indigenous communities of an accidental event and planned response. Emphasis will be on timely communication, allowing fishers to haul out gear from affected areas, and reducing potential of fouling of fishing gear. This engagement will be coordinated through One Ocean, Fish, Food and Allied Workers-Unifor, Ocean Choice International, Association of Seafood Producers, and Groundfish Enterprise Allocation Council.	Section 15.5.6
80.	Chevron will maintain ongoing communications with the NAFO Secretariat, through DFO as the Canadian representative, regarding the occurrence of an accidental event, including timely communication on restricted access zones and applicable buffers.	Section 15.5.6
81.	Chevron will develop and implement a compensation program for damages resulting from Project activities. This compensation program will be developed in consideration of C-NLOPB guidelines, including the Compensation Guidelines Respecting Damages Relating to Offshore Petroleum Activities (C-NLOPB and CNSOPB 2017).	Section 15.5.5 Section 16.6.6

8.0 SIGNIFICANCE OF RESIDUAL EFFECTS

Table 8.1 summarizes the residual effects predicted for each VC from routine operations and Table 8.2 summarizes residual effects predicted as a result of accidental events. Where an effect is predicted to be significant, the likelihood of that effect occurring is also presented.

Table 8.1 Summary of Residual Effects for Routine Operations

Valued Components	Area of Federal Jurisdiction (CEAA, 2012 s.5 "environmental effect")	Potential Effect	Project Activity	Residual Environmental Effect Characterization					Ecological / Socio Economic Context	Significance of Residual Effect	Likelihood of Significant Effect
				Magnitude	Geographic Extent	Duration	Frequency	Reversibility			
Marine Fish and Fish Habitat	s. 5(1)(a)(i)	Change in Risk of Mortality or Physical Injury	Presence and Operation of a MODU	L	PA	ST	IR	R	D	N	N/A
			VSP	L	PA	ST	IR	R	D	N	N/A
			Discharges	L	PA	MT-LT	IR	R	D	N	N/A
			Well Abandonment	L	PA	ST	IR	R	D	N	N/A
		Change in Habitat Quality and Use	Presence and Operation of a MODU	L	PA-LAA	MT	IR	R	D	N	N/A
			VSP	L	PA	ST	IR	R	D	N	N/A
			Discharges	L	PA	MT-LT	IR	R	D	N	N/A
			Well Abandonment	L	PA	ST-LT	IR	R	D	N	N/A
			Supply and Servicing	L	LAA	MT	IR	R	D	N	N/A
Marine and Migratory Birds	s. 5(1)(a)(iii)	Change in Risk of Mortality or Physical Injury	Presence and Operation of a MODU	L	LAA	ST	IR	R	D	N	N/A
			VSP	N-L	PA	ST	IR	R	D	N	N/A
			Discharge	L	PA	ST	IR	R	D	N	N/A
			Well Testing and Flaring	L	PA	ST	IR	R	D	N	N/A
			Supply and Servicing	L	LAA	ST	IR	R	D	N	N/A
		Change in Habitat Quality and Use	Presence and Operation of a MODU	L	LAA	ST	IR	R	D	N	N/A
			VSP	N	PA	ST	UL	R	D	N	N/A
			Discharge	L	PA	ST	UL	R	D	N	N/A
			Well Testing and Flaring	L	PA	ST	IR	R	D	N	N/A
			Supply and Servicing	L	LAA	ST	IR	R	D	N	N/A
Marine Mammals and Sea Turtles	s. 5(1)(a)(ii)	Change in Risk of Mortality or Injury	Presence and Operation of a MODU	N	PA	ST-MT	UL	R	D	N	N/A
			VSP	N-L	PA	ST-MT	UL	R	D	N	N/A
			Well Abandonment	N-L	PA	ST	UL	R	D	N	N/A
			Supply and Servicing	N-L	LAA	ST-MT	UL	R	D	N	N/A
		Change in Habitat Quality and Use	Presence and Operation of a MODU	L	PA-LAA	ST-MT	IR	R	D	N	N/A
			VSP	L	PA	ST-MT	IR	R	D	N	N/A
			Discharge	N	PA	ST	UL	R	D	N	N/A
			Well Abandonment	N	PA	ST	UL	R	D	N	N/A
			Supply and Servicing	L	LAA	ST-MT	IR	R	D	N	N/A
Special Areas	s. 5(1)(b)(i)	Change in Habitat Quality	Presence and Operation of a MODU	L-M	LAA	ST	IR	R	D	N	N/A
			VSP	L	PA	ST	IR	R	D	N	N/A
			Discharge	L-M	PA	ST-MT	IR	R	D	N	N/A
			Well Abandonment	L	PA	ST	IR	R	D	N	N/A
			Supply and Servicing	L	LAA	ST	IR	R	D	N	N/A

Table 8.1 Summary of Residual Effects for Routine Operations

Valued Components	Area of Federal Jurisdiction (CEAA, 2012 s.5 "environmental effect")	Potential Effect	Project Activity	Residual Environmental Effect Characterization					Ecological / Socio Economic Context	Significance of Residual Effect	Likelihood of Significant Effect
				Magnitude	Geographic Extent	Duration	Frequency	Reversibility			
Indigenous Communities and Activities	s.5(1)(c)(i) s.5(1)(c)(iii)	Change in Health and Socio-economic Conditions	Presence and Operation of a MODU	N-L	RAA	ST	IR	R	D	N	N/A
			VSP	N-L	RAA	ST	IR	R	D	N	N/A
			Discharge	N-L	RAA	MT	IR	R	D	N	N/A
			Well Testing and Flaring	N-L	RAA	ST	IR	R	D	N	N/A
			Well Abandonment	N-L	RAA	MT-LT	IR	R	D	N	N/A
			Supply and Servicing	N-L	RAA	ST	IR	R	D	N	N/A
	s.5(1)(c)(i) s.5(1)(c)(iii)	Change in Current Use of Lands and Resources for Traditional Purposes	Presence and Operation of a MODU	N-L	RAA	ST	IR	R	D	N	N/A
			VSP	N-L	RAA	ST	IR	R	D	N	N/A
			Discharge	N-L	RAA	ST	IR	R	D	N	N/A
			Well Testing and Flaring	N-L	RAA	ST	IR	R	D	N	N/A
			Well Abandonment	N-L	RAA	ST	IR	R	D	N	N/A
			Supply and Servicing	N-L	RAA	ST	IR	R	D	N	N/A
Commercial Fisheries and Other Ocean Users	s. 5(2)(b)(i)	Change in Availability of Resources	Presence and Operation of a MODU	L	PA	ST	IR	R	D	N	N/A
			VSP	L	PA	ST	IR	R	D	N	N/A
			Discharge	L	PA	ST	IR	R	D	N	N/A
			Well Abandonment	L	PA	ST-P	IR	R-I	D	N	N/A
			Supply and Servicing	L	LAA	ST	IR	R	D	N	N/A

See Table 4.1 of the EIS for definitions. **Magnitude:** N: Negligible L: Low M: Moderate H: High	**Geographic Extent:** PA: Project Area LAA: Local Assessment Area RAA: Regional Assessment Area	**Duration:** ST: Short-term MT: Medium-term LT: Long-term P: Permanent	**Frequency:** UL: Unlikely S: Single event IR: Irregular event R: Regular event C: Continuous	**Reversibility:** R: Reversible I: Irreversible	**Ecological / Socio-Economic Context:** D: Disturbed U: Undisturbed	**Significance:** S: Significant N: Not Significant	**Likelihood:** U: Unlikely L: Likely N/A: Not applicable

Table 8.2 Summary of Residual Effects for Accidental Events

Valued Components	Area of Federal Jurisdiction (CEAA, 2012 s.5 "environmental effect")	Potential Effect	Accidental Event Scenario	Residual Environmental Effect Characterization					Ecological / Socio Economic Context	Significance of Residual Effect	Likelihood of Significant Effect
				Magnitude	Geographic Extent	Duration	Frequency	Reversibility			
Marine Fish and Fish Habitat	s. 5(1)(a)(i)	Change in Risk of Mortality or Physical Injury / Change in Habitat Quality and Use	Well Blowout Incident	M-H	RAA	ST-MT	S	R	D	N	N/A
			Marine Diesel Spill	M	RAA	ST-MT	S	R	D	N	N/A
			SBM Spill	L	LAA	ST-LT	S	R	D	N	N/A
Marine and Migratory Birds	s. 5(1)(a)(iii)	Change in Risk of Mortality or Physical Injury / Change in Habitat Quality and Use	Well Blowout Incident	H	RAA	ST-MT	S	R	D	S	U
			Marine Diesel Spill	L	LAA	ST	S	R	D	S	U
			SBM Spill	L	LAA	ST	S	R	D	N	N/A
Marine Mammals and Sea Turtles	s. 5(1)(a)(ii)	Change in Risk of Mortality or Physical Injury / Change in Habitat Quality and Use	Well Blowout Incident	M	RAA	MT-LT	S	R	D	N	N/A
			Marine Diesel Spill	L	LAA	ST	S	R	D	N	N/A
			SBM Spill	L	LAA	ST	S	R	D	N	N/A
Special Areas	s. 5(1)(b)(i)	Change in Habitat Quality	Well Blowout Incident	M-H	RAA	ST-LT	S	R	D	S	U
			Marine Diesel Spill	L-M	LAA-RAA	ST-MT	S	R	D	N	N/A
			SBM Spill	L	LAA	ST-LT	S	R	D	N	N/A
Indigenous Communities and Activities	s.5(1)(c)(i) s.5(1)(c)(iii)	Change in Health and Socio-economic Conditions / Change in Current Use of Lands and Resources for Traditional Purposes	Well Blowout Incident	M-H	RAA	MT-LT	S	R	D	S	U
			Marine Diesel Spill	N-L	RAA	ST-MT	S	R	D	N	N/A
			SBM Spill	N-L	RAA	ST	S	R	D	N	N/A
Commercial Fisheries and Other Ocean Users	s. 5(2)(b)(i)	Change in Availability of Resources	Well Blowout Incident	H	RAA	LT	S	R	D	N	N/A
			Marine Diesel Spill	L	RAA	ST-MT	S	R	D	N	N/A
			SBM Spill	L	LAA	ST	S	R	D	N	N/A

Notes:
* In certain scenarios, effects may extend beyond the RAA.
See Table 8.1 for key.

The environmental effects assessment for each VC examines the degree and nature of change to, and resulting effects on, the existing environment that may occur as a result of planned Project activities. The characterization of range of magnitude (range of natural variability) considers the reasonable worst-case scenario and is therefore considered to provide a conservative indication of effects. Mitigation, including regulatory compliance and project-specific commitments, has been proposed to reduce or eliminate adverse environmental effects all components of the Project scope. With the implementation of these proposed mitigation measures, residual adverse environmental effects of routine Project activities and components are predicted to be not significant for all VCs.

In the unlikely event of a Project-related accidental event resulting in the large-scale release of oil into the marine environment, a significant adverse effect is predicted for marine and migratory birds, special areas, and Indigenous communities and activities under certain circumstances. In the event of a well blowout, Chevron would attempt direct intervention measures where appropriate and in consultation with regulators (e.g., capping stack, dispersants). The magnitude and extent of potential effects would be reduced with the application of spill response measures; therefore, the risk of adverse effects would be reduced.

In summary, the Project is not likely to result in significant residual adverse environmental effects, including cumulative environmental effects, provided that the proposed mitigation is implemented.

9.0 FOLLOW-UP AND MONITORING PROGRAMS

Under CEAA 2012, a follow-up program is defined as a program for “verifying the accuracy of the environmental assessment of a designated project” and “determining the effectiveness of any mitigation measures.” Offshore Newfoundland and Labrador has a long history of oil and gas exploration and well-established oil production operations; therefore, most potential environmental interactions are well understood, and standard mitigation measures are well established. Proposed monitoring and follow-up programs are described below.

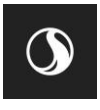
9.1 Marine Fish and Fish Habitat

Chevron will conduct an imagery-based seabed survey at the proposed well sites to confirm the absence of sensitive environmental features, such as habitat-forming corals or Species at Risk (SAR) prior to drilling. Chevron will also conduct a visual survey of the seafloor using an ROV after drilling activities to assess the visual extent of sediment dispersion and validate drill waste modelling predictions. The specific details of the follow-up program will be determined in consultation with the C-NLOPB and DFO in consideration of the pre-drill survey results.

9.2 Marine and Migratory Birds

For the duration of the drilling program for each well:

- Daily, systematic searches will be conducted for stranded birds on the MODU and supply vessels, and this effort documented, by trained personnel in accordance with facility-specific search protocols;



- Recovery, rehabilitation, release and documentation of stranded birds will be conducted according to *Procedures for Handling and Documenting Stranded Birds Encountered on* Infrastructure *Offshore Atlantic Canada* (ECCC 2017a) and associated permit conditions under the *Migratory Birds Convention Act, 1994* (MBCA) authorizing the capture and handling of migratory birds;
- Results of the monitoring program will be shared with the regulators to help further improve the understanding of bird strandings and mortality in the Newfoundland and Labrador offshore area.

9.3 Marine Mammals and Sea Turtles

Chevron will develop a marine mammal and sea turtle monitoring plan to be implemented during VSP surveys. The Plan will include marine mammal observer requirements, shutdown, and ramp-up procedures and reporting requirements. A report of the observational program will be submitted following each VSP program to the C-NLOPB and DFO, including documentation of marine mammal and sea turtle sightings.

In the unlikely event of a Project vessel collision with a marine mammal or sea turtle, Chevron will contact DFO through their 24-hour emergency contact number (1-888-895-3003).

9.4 Special Areas

Chevron will conduct an imagery-based seabed survey at the proposed well site(s) to confirm the absence of sensitive environmental features, such as habitat-forming corals or species at risk prior to drilling. Chevron also plans to conduct a visual survey of the seafloor using an ROV after drilling activities to assess the visual extent of sediment dispersion and validate drill waste modelling predictions. The specific details of the follow-up program will be determined in consultation with the C-NLOPB and DFO in consideration of the pre-drill survey results.

9.5 Indigenous Communities and Activities

The implementation of the Project's Indigenous Fisheries Communication Plan will facilitate ongoing feedback from Indigenous fishing interests about the implementation and effectiveness of related mitigation measures, and about changes in fishing activities or science research relevant to the Project Area. Chevron will develop and implement a compensation program for damages resulting from Project activities. This compensation program will be developed in consideration of C-NLOPB guidelines, including the Compensation Guidelines Respecting Damages Relating to Offshore Petroleum Activities (C-NLOPB and CNSOPB 2017).

9.6 Commercial Fisheries and Other Ocean Users

The implementation of the Project's Fisheries Communication Plan will facilitate ongoing feedback from fishing interests about the implementation and effectiveness of related mitigation measures, and about changes in fishing activities or science research relevant to the Project Area. Chevron will develop and implement a compensation program for damages resulting from Project activities. This compensation program will be developed in consideration of C-NLOPB guidelines, including the Compensation Guidelines Respecting Damages Relating to Offshore Petroleum Activities (C-NLOPB and CNSOPB 2017).

10.0 REFERENCES

Agency (Canadian Environmental Assessment Agency). 2018. Guidelines for the Preparation of an Environmental Impact Statement, pursuant to the *Canadian Environmental Assessment Act, 2012*. West Flemish Pass Exploration Drilling Project, Chevron Canada Limited. December 20, 2018. Available at: https://ceaa-acee.gc.ca/050/documents/p80161/126381E.pdf

Allen, J.K., M.L. Peterson, G.V. Sharrard, D.L. Wright and S.K. Todd. 2012. Radiated noise from commercial ships in the Gulf of Maine: Implications for whale/vessel collisions. Journal of the Acoustical Society of America, 132(3): EL229-EL235.

AMEC (Amec Environment & Infrastructure). 2014. Eastern Newfoundland Strategic Environmental Assessment. Available at: https://www.cnlopb.ca/sea/eastern/

AMEC (AMEC Foster Wheeler). 2017. Flemish Pass Exploration Drilling Program SBM Accidental Spill Modelling. Prepared for Nexen Energy ULC.

Baird, P.H. 1990. Concentrations of seabirds at oil-drilling rigs. Condor, 92: 768-771.

Beazley, L.I., E.L. Kenchington, F.J. Murillo and M. del Mar Sacau. 2013. Deep-sea sponge grounds enhance diversity and abundance of epibenthic megafauna in the Northwest Atlantic. ICES Journal of Marine Science, 70(7): 1471-1490.

Bird Studies Canada. 2016. Important Bird Areas of Canada Database. Bird Studies Canada, Port Rowan, ON. http://www.ibacanada.org Accessed: 8 March 2018.

BP Canada. 2016. Scotian Basin Exploration Drilling Project – Environmental Impact Statement. Prepared by Stantec Consulting Ltd.

BP Canada Energy Group ULC. 2018. The Newfoundland Orphan Basin Exploration Drilling Program Environmental Impact Statement. Available at: https://ceaa-acee.gc.ca/050/evaluations/document/125873?culture=en-CA

Brown, R.G.B. 1986. Revised atlas of Eastern Canadian seabirds. 1. Shipboard surveys. Bedford Institute of Oceanography and Canadian Wildlife Service, Dartmouth, NS, and Ottawa, ON. 111 p.

Buhl-Mortensen, L. and P.B. Mortensen. 2005. Distribution and diversity of species associated with deep-sea sea gorgonian corals off Atlantic Canada. Pp. 849-879. In: A. Freiwald and J.M. Roberts (eds.). Cold-water corals and ecosystems. Springer-Verlag, Berlin Heidelberg.

Buhl-Mortensen, L., A. Vanreusel, A.J. Gooday, L.A. Levin, I.G. Priede, P. Buhl-Mortensen, H. Gheerardyn, N.J. King, and M. Raes. 2010. Biological structures as a source of habitat heterogeneity and biodiversity on the deep ocean margins. Marine Ecology Progress Series, 31: 21-50.

REFERENCES

Buskey, E. J., White, H. K., and A.J. Esbaugh. 2016. Impact of Oil Spills on Marine Life in the Gulf of Mexico: Effects on Plankton, Nekton, and Deep-Sea Benthos. Oceanography, 29(3), 174-181.

Carls, M.G., L. Holland, M. Larsen, T.K. Collier, N.L. Scholz and J.P. Incardona. 2008. Fish embryos are damaged by dissolved PAHs, not oil particles. Aquat. Toxicol., 88(2): 121-127.

Carroll, A.G., R. Przeslawski, A. Duncan, M. Gunning and B. Bruce. 2017. A critical review of the potential impacts of marine seismic surveys on fish and invertebrates. Mar. Poll. Bull., 114: 9-24.

Carroll, J., F. Vikebø, D. Howell, O.J. Broch, R. Nepstad, S. Augustine and J. Juselius. 2018. Assessing impacts of simulated oil spills on the Northeast Arctic cod fishery. Mar. Poll. Bull., 126: 63-73.

Chapman, C.J. and A.D. Hawkins. 1969. The importance of sound in fish behaviour in relation to capture by trawls. FAO Fish. Rep., 62: 717-729.

Clark, R.B. 1984. Impact of Oil Pollution on Seabirds. Environmental Pollution (Series A), 33: 1-22.

C-NLOPB (Canada-Newfoundland and Labrador Offshore Petroleum Board). 2019. Licence Information Tables. Available at: https://www.cnlopb.ca/exploration/tables/

C-NLOPB (Canada-Newfoundland and Labrador Offshore Petroleum Board) and CNSOPB (Canada-Nova Scotia Offshore Petroleum Board). Drilling and Production Guidelines. 2017a. Available at: http://www.cnlopb.ca/pdfs/guidelines/drill_prod_guide.pdf?lbisphpreq=1

C-NLOPB (Canadian-Newfoundland and Labrador Offshore Petroleum Board) and CNSOPB (Canada-Nova Scotia Offshore Petroleum Board). 2017b. Compensation Guidelines Respecting Damages Relating to Offshore Petroleum Activity. 20 pp. Available at: https://www.cnsopb.ns.ca/sites/default/files/pdfs/compensation_guidelines-finalnovember_7_2017_-_includes_isbn.pdf.

Cordes, E.E., D.O.B. Jones, T.A. Schlacher, D.J. Amon, A.F. Bernardino, S. Brooke, R. Carney, D.M. DeLeo, K.M. Dunlop, E.G. Escobar-Briones, A.R. Gates, L. Génio, J. Gobin, L. Henry, S. Herrera, S. Hoyt, M. Joye, S. Kark, N.C. Mestre, A. Metaxas, S. Pfeifer, K. Sink, A.K. Sweetman and U. Witte. 2016. Environmental impacts of the deep-water oil and gas industry: A review to guide management strategies. Frontiers in Environmental Science, 4: 1-26.

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

Davies, T.W., J.P. Duffy, J. Bennie and D.J. Gaston. 2014.The nature, extent, and ecological Implications of marine light pollution. Front Ecol. Environ., 12(6): 347-355. Doi:10.1890/130281.

Denny, S. and S. Kavanagh. 2018. Review of the Timing of the American Eel Migratory Journey off Nova Scotia. Window of Sensitivity Defined for the American Eel.

REFERENCES

Denny, S., and L. Fanning. 2016. A Mi'kmaw perspective on advancing salmon governance in Nova Scotia, Canada: Setting the stage for collaborative co-existence. The International Indigenous Policy Journal, 7(3).

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

DFO (Fisheries and Oceans Canada). 2011. 2011-2015 Integrated Fisheries Management Plan for Atlantic Seals. Available at: http://www.dfo-mpo.gc.ca/fm-gp/seal-phoque/reports-rapports/mgtplan-planges20112015/mgtplan-planges20112015-eng.htm.

DFO (Fisheries and Oceans Canada). 2012. Ice navigation in Canadian waters. Icebreaking Program, Navigational Services Directorate, fisheries and Oceans Canada, Canadian Coast Guard, Ottawa, ON. Available at: http://www.ccg-gcc.gc.ca/folios/00913/docs/icenavigation-dans-les-galces-eng.pdf

DFO (Fisheries and Oceans Canada). 2016. Recovery Strategy for the leatherback sea turtle (*Dermochelys coriacea*) in Atlantic Canada [Proposed]. *Species at Risk Act* Recovery Strategy Series. Fisheries and Oceans Canada, Ottawa, ON. vii + 43 pp.

DFO (Fisheries and Oceans Canada). 2017. Integrated Fisheries Management Plan, snow crab (*Chionoecetes opilio*), Newfoundland and Labrador Region [Effective February 6, 2015]. Fisheries and Oceans Canada. 54 pp. + Appendices.

DFO (Fisheries and Oceans Canada). 2018a. DFO RV Trawl Coordinates and associated data.

DFO (Fisheries and Oceans Canada). 2018b. Integrated Oceans Management. Fisheries and Oceans Canada. Available at: https://www.dfo-mpo.gc.ca/oceans/management-gestion/index-eng.html.

DFO (Fisheries and Oceans Canada). 2019. List of Marine Refuges. Fisheries and Oceans Canada. Available at: https://www.dfo-mpo.gc.ca/oceans/oeabcm-amcepz/refuges/index-eng.html.

ECCC (Environment and Climate Change Canada). 2016. Best Practices for Stranded Birds Encountered Offshore Atlantic Canada. 17 pp.

ECCC (Environment and Climate Change Canada). 2017a. Procedures for handling and documenting stranded birds encountered on infrastructure offshore Atlantic Canada -- Draft May 2017. Environment and Climate Change Canada. 17 pp.

ECCC (Environment and Climate Change Canada). 2017b. Seabird and waterbird colonies: Avoiding disturbance. Available at: https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds/seabird-waterbird-colonies-disturbance.html Accessed: 16 August 2019.

REFERENCES

ExxonMobil Canada Properties. 2017. Eastern Newfoundland Offshore Exploration Drilling Project. Available at: https://ceaa-acee.gc.ca/050/evaluations/document/121311?culture=en-CA

Fewtrell, J.L. and R.D. McCauley. 2012. Impact of air gun noise on the behaviour of marine fish and squid. Mar. Pollut. Bull., 64(5): 984-993.

Fifield, D.A., K.P. Lewis, C. Gjerdrum, G.J. Robertson and R. Wells. 2009. Offshore Seabird Monitoring Program. Environmental Studies Research Funds ESRF Report 183. 68 p.

Fisher, C.R., A.W. Demopoulos, E.E. Cordes, I.B. Baums, H.K. White and J.R. Bourque. 2014. Coral communities as indicators of ecosystem-level impacts of the DWH spill. BioScience, 64(9): 796-807.

Frasier, K.E., A. Solsona-Berga, L. Stokes, and J.A. Hildebrand. 2020. Impacts of the DWH oil spill on marine mammals and sea turtles. Pp. 431-462 In: S.A. Murawski, C. Ainsworth, S. Gilbert, D. Hollander, C. Paris, M. Schlüter, and D. Wetzel (eds.). Deep Oil Spills; Facts, Fate, and Effects. Springer, Cham.

French McCay, D.P. 2009. State-of-the-Art and Research Needs for Oil Release Impact Assessment Modelling. Pp: 601-653. In: Proceedings of the 32nd AMOP Technical Seminar on Environmental Contamination and Response, Emergencies Science Division, Environment Canada, Ottawa, ON. Available at https://www.researchgate.net/publication/253993158_State-of-the-Art_and_Research_Needs_for_Oil_Spill_Impact_Assessment_Modeling

Gallaway, B.J., W.J. Konkel and B.L. Norcross. 2017. Some thoughts on estimating change to Arctic cod populations from hypothetical oil spills in the Eastern Alaska Beaufort Sea. Arctic Sci., 3(4): 716-729, https://doi.org/10.1139/as-2016-0056.

Gates, A.R. and D.O.B. Jones. 2012. Recovery of benthic megafauna from anthropogenic disturbance at a hydrocarbon drilling well (380 m depth in the Norwegian Sea). PLOS One, 7(10):1-14.

Gates, A.R., D.O.B. Jones and J. Kaariainen. 2008. Orphan Basin SERPENT Final Report, National Oceanography Centre Southampton Research and Consultancy Report; No. 41.

Gauthreaux, S.A., Jr. and C.G. Belser. 2006. Effects of artificial night lighting on migrating birds. Pp. 67-93. In: C. Rich and T. Longcore (eds.). Ecological Consequences of Artificial Night Lighting, Island Press, Washington, DC.

Graham, W.M., R.H. Condon, R.H. Carmichael, I. D'Ambra, H.K. Patterson, L.J. Linn and F.J. Hernandez, Jr. 2010. Oil carbon entered the coastal planktonic food web during the Deepwater Horizon oil spill. Environ. Res. Lett., 5(4): 045301, doi:10.1088/1748-9326/5/4/045301.

REFERENCES

Guijarro, J., L. Beazley, C. Lirette, E. Kenchington, V. Wareham, K. Gilkinson, M. Koen-Alonso and F.J. Murillo. 2016. Species distribution modelling of corals and sponges from research vessel survey data in the Newfoundland and Labrador region for use in the identification of significant benthic areas. Canadian Technical Report for Fisheries and Aquatic Sciences, 3171: vi + 126 pp.

Hanson, J., M. Helvey and R. Strach (Editors). 2003. Non-fishing impacts to essential fish habitat and recommended conservation measures. Long Beach (CA): National Marine Fisheries Service (NOAA Fisheries) Southwest Region. Version 1. 75 pp.

Helm, R.C., D.P. Costa, T.D. DeBruyn, T.J. O'Shea, R.S. Wells, and T.M. Williams. 2015. Overview of the effects of oil spills on marine mammals. Pp. 455-475. In: M. Fingas (ed.). Handbook of Oil Spill Science and Technology. John Wiley & Sons, Inc.

Henry, L.A., D. Harries, P. Kingston and J.M. Roberts. 2017. Historic scale and persistence of drill cuttings impacts on North Sea benthos. Marine Environmental Research, 129: 219-228.

Hsing, P.Y., B. Fu, E.A. Larcom, S.P. Berlet, T.M. Shank, A.F. Govindarajan, A.J. Lukasiewicz, P.M. Dixon and C.R. Fisher. 2013. Evidence of lasting impact of the DWH oil spill on a deep Gulf of Mexico coral community. Elem Sci Anth, 1.

Husky Energy. 2018. Exploration Drilling Environmental Impact Statement. Available at: https://ceaa-acee.gc.ca/050/evaluations/document/125646?culture=en-CA

Hutchison, L.V. and B.W. Wenzel. 1980. Olfactory guidance in foraging by Procellariiforms. Condor, 82: 314-319.

Incardona J.P., T.L. Swarts, R.C. Edmunds, T.L. Linbo, A. Aquilina-Beck. C.A. Sloan and N.L. Scholz. 2013. *Exxon Valdez* to Deepwater Horizon: Comparable toxicity of both crude oils to fish early life stages. Aquat. Toxicol., 142: 303-316.

IOGP (International Association of Oil & Gas Producers). 2016. Environmental fates and effects of ocean discharge of drill cuttings and associated drilling fluids from offshore oil and gas operations. Report 543, Version 1, March 2016. 145 pp.

Irwin, R.J. 1997. Environmental Contaminants Encyclopedia Crude Oil Entry. National Park Service, Water Resources Divisions, Water Operations Branch, CO.

ITOPF (International Tankers Owners Pollution Federation Limited). 2011. Effects of Oil Pollution on Fisheries and Mariculture. Technical Information Paper 11. Available at: https://www.itopf.org/knowledge-resources/documents-guides/technical-information-papers/

Jensen, A.S. and G.K. Silber. 2003. Large Whale Ship Strike Database. US Department of Commerce, NOAA Technical Memorandum. NMFS-OPR. 37 pp.

REFERENCES

Jewett, S.C., T.A. Dean, R.O. Smith and A. Blanchard. 1999. *Exxon Valdez* oil spill: Impacts and recovery in the soft-bottom benthic community in and adjacent to eelgrass beds. Mar. Ecol. Prog. Ser., 185: 59-83.

Kenchington, E., L. Beazley, C. Lirette, J. Murillo-Perez, J. Guijarro-Sabaniel, V. Wareham, K. Gilkinson, M. Koen-Alonso, H. Benoît, H. Bourdages, B. Sainte-Marie, M. Treble and T. Siferd. 2018. Delineation of coral and sponge Significant Benthic Areas in Eastern Canada using kernel density analyses and species distribution models. Mendeley. DOI: 10.17632/hnp4xr2sy3.1. Available at: https://data.mendeley.com/datasets/hnp4xr2sy3/1.

Laist, D.W., A.R. Knowlton, J.G. Mead, A.S. Collet and M. Podesta. 2001. Collisions between ships and whales. Marine Mammal Science, 17: 35-75.

Law, R., C. Kelly, K. Graham, R. Woodhead, P. Dyrynda and E. Dyrynda. 1997. Hydrocarbons and PAH in Fish and Shellfish from Southwest Wales following the *Sea Empress* Oil Spill in 1996. Available at: http://ioscproceedings.org/doi/pdf/10.7901/2169-3358-1997-1-205.

Lee, K., M. Boufadel, B. Chen, J. Foght, P. Hodson, S. Swanson and A. Venos. 2015. Expert Panel Report on the Behavior and Environmental Impacts of Crude Oil Released into Aqueous Environments. Royal Society of Canada, Ottawa, ON.

Legendre, L. and F. Rassoulzadegan. 1995. Plankton and nutrient dynamics in marine waters. Ophelia, 41(August 2013), 153-172.

LGL Limited. 2003. Orphan Basin Strategic Environmental Assessment. LHL Rep. SA767. Prepared by LGL Limited, St. John's, NL for Canada-Newfoundland and Labrador Offshore Petroleum Board. 229 pp.

LGL Limited. 2008. Environmental Assessment of StatoilHydro Canada Ltd. Exploration and Appraisal / Delineation Drilling Program for Offshore Newfoundland, 2008-2016. Available at: https://www.cnlopb.ca/wp-content/uploads/nhdrill/shearpt.pdf

Lock, A.R., R.G.B. Brown and S.H. Gerriets. 1994. Gazetteer of marine birds in Atlantic Canada: An atlas of seabird vulnerability to oil pollution. Canadian Wildlife Service Atlantic Region. 137 p.

Mactavish, B., J. Clarke, J. Wells, A. Buckley and D. Fifield. 2016. Checklist (2016) of the Birds of Insular Newfoundland. Nature Newfoundland & Labrador, St. John's, NL.

McCauley, R.D., J. Fewtrell, A.J. Duncan, C, Jenner, M.-N. Jenner, J.D. Penrose, R.I.T. Prince, A. Adhitya, J. Murdoch and K. McCabe. 2000a. Marine Seismic Surveys: Analysis of Airgun Signals and Effects of Air Gun Exposure on Humpback Whales, Sea Turtles, Fishes and Squid. Report prepared by the Centre for Marine Science and Technology (Report R99-15), Curtin University, Perth, WA, for Australian Petroleum Production Association, Sydney, NSW.

REFERENCES

McCauley, R.D., J. Fewtrell, A.J. Duncan, C. Jenner, M.-N. Jenner, J.D. Penrose, R.I.T. Prince, A. Adhitya, J. Murdoch and K. McCabe. 2000b. Marine seismic surveys-A study of environmental implications. Australian Petroleum Producers and Exploration Association. APPEA J., 40: 692-706.

McKenna, M.F., D. Ross, S.M. Wiggins and J.A. Hildebrand. 2012. Underwater radiated noise from modern commercial ships. Journal of the Acoustical Society of America, 131(1): 92-103.

Melle, W., J. Runge, E. Head, S. Plourde, C. Castellani, P. Licandro and H. Debes. 2014. The North Atlantic Ocean as habitat for Calanus finmarchicus: environmental factors and life history traits. Progress in Oceanography, 129. 244-284.

Milton, S., P. Lutz, and G. Shigenaka. 2003. Oil toxicity and impacts on sea turtles. In: G. Shigenaka (ed.). Oil and Sea Turtles: Biology, Planning, and Response. National Oceanic and Atmospheric Administration, 112 pp.

Montevecchi, W.A., F.K. Wiese, G.K. Davoren, A.W. Diamond, F. Huettmann and J. Linke. 1999. Seabird attraction to offshore platforms and seabird monitoring from offshore support vessels and other ships: Literature review and monitoring designs. Prepared for the Canadian Association of Petroleum Producers. 56 p.

Morandin, L.A. and P.D. O'Hara. 2016. Offshore oil and gas, and operational sheen occurrence: is there potential harm to marine birds? Environmental Reviews, 24(3): 285-318.National Commission on the BP DWH Oil Spill and Offshore Drilling. 2011. Rebuilding an Appetite for Gulf Seafood after DWH. Staff Working Paper No. 16. Available at: http://permanent.access.gpo.gov/gpo8569/Rebuilding%20an%20Appetite%20for%20Gulf%20Seafood%20after%20Deepwater%20Horizon_0.pdf

Müeller-Blenkle, C., E. Jones, D. Reid, K. Lüdemann, R. Kafemann and A. Elepfandt. 2008. Reactions of cod (*Gadus morhua*) to low frequency sound resembling offshore wind turbine noise emissions. Bioacoustics, 17: 207-209.

NAFO (Northwest Atlantic Fisheries Organization). 2019. Conservation and Enforcement Measures 2019. Serial No. N6901. NAFO/COM Doc. 19-01. Northwest Atlantic Fisheries Organization. 82 pp. + Annexes. Available at: https://www.nafo.int/Fisheries/Conservation.

National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling. 2011. Rebuilding an Appetite for Gulf Seafood after Deepwater Horizon. Staff Working Paper No. 16. Available at: http://permanent.access.gpo.gov/gpo8569/Rebuilding%20an%20Appetite%20for%20Gulf%20Seafood%20after%20Deepwater%20Horizon_0.pdf

NEB (National Energy Board), C-NLOPB (Canadian Newfoundland and Labrador Offshore Petroleum Board), and CNSOPB (Canada-Nova Scotia Offshore Petroleum Board). 2008. Offshore Physical Environmental Guidelines. Available at: https://www.nebone.gc.ca/bts/ctrg/gnthr/2008ffshrphsnvrgd/index-eng.html

REFERENCES

NEB (National Energy Board), C-NLOPB (Canadian Newfoundland and Labrador Offshore Petroleum Board), and CNSOPB (Canada-Nova Scotia Offshore Petroleum Board). 2009. Offshore Chemical Selection Guidelines for Drilling and Production Activities on Frontier Lands. iii + 13 pp. Available at: http://www.C-NLOPB.nl.ca/pdfs/guidelines/ocsg.pdf

NEB (National Energy Board), C-NLOPB (Canadian Newfoundland and Labrador Offshore Petroleum Board), and CNSOPB (Canada-Nova Scotia Offshore Petroleum Board). 2010. Offshore Waste Treatment Guidelines. vi + 28 pp. Available at: http://www.C-NLOPB.nl.ca/pdfs/guidelines/owtg1012e.pdf

Nevitt, G.A. 1999. Olfactory foraging in Antarctic seabirds: a species-specific attraction to krill odors. Marine Ecology Progress Series, 177: 235-241.

Nevitt, G.A. and K. Haberman. 2003. Behavioral attraction of Leach's storm-petrels (*Oceanodroma leucorhoa*) to dimethyl sulfide. Journal of Experimental Biology, 206: 1497-1501.

Nexen Energy ULC. 2018. Nexen Energy ULC Flemish Pass Exploration Drilling Project. Available at: https://ceaa-acee.gc.ca/050/evaluations/document/122065?culture=en-CA

Nightingale, B. and C. Simenstad. 2002. Artificial night-lighting effects on salmon and other fishes in the Northwest. Ecological Consequences of Artificial Night Lighting conference, February 23-24, 2002, sponsored by the Urban Wildlands Group and the UCLA Institute of the Environment.

NOAA (National Oceanic and Atmospheric Administration). 2016. What Happens to Dispersed Oil? Available at: http://response.restoration.noaa.gov/oil-and-chemical-spills/oil-spills/resources/9-what-happens-dispersed-oil.html.

Nogueira, A., X. Paz and D. González-Troncoso. 2017. Demersal groundfish assemblages and depth-related trends on Flemish Cap (NAFO division 3M): 2004-2013. Fisheries Research, 186: 192-204.

Nowacek, D.P., L.H. Thorne, D.W Johnston and P.L. Tyack. 2007. Responses of cetaceans to anthropogenic noise. Mammal Review, 37: 81-115.

O'Hara, P.D. and L.A. Morandin. 2010. Effects of sheens associated with offshore oil and gas development on the feather microstructure of pelagic seabirds. Mar. Poll. Bull., 60(5): 672-678.

Panigada, S., G. Pesante, M. Zanardelli, F., F. Capoulade, A. Gannier and M.T. Weinrich. 2006. Mediterranean fin whales at risk from fatal ship strikes. Mar. Poll. Bull., 52(10): 1287-1298.

Pepin, P., A. Cuff, M. Koen-Alonso and N. Ollerhead. 2010. Preliminary analysis for the delineation of marine ecoregions on the Newfoundland and Labrador Shelves. NAFO SCR Doc., 10/72: 24 pp.

Piatt, J.F. and D.N. Nettleship. 1985. Diving depths of four alcids. Auk, 102: 293-297.

REFERENCES

Popper, A.N., A.D. Hawkins, R.R Fay, D.A. Mann, S. Bartol, T.J. Carlson, S. Coombs, W.T. Ellison, R.L. Genrey, M.B. Halvorsen, S. Lokkeborg, P.H. Rogers, B.L. Southall, D.G. Zeddies and W.N. Tavolga. 2014. Sound Exposure Guidelines for Fishes and Sea Turtles. A Technical Report prepared by ANSI-Accredited Standards Committee S3/SC1 and registered with ANSI.

Prouty, N.G., C.R. Fisher, A.W. Demopoulos and E.R. Druffel. 2016. Growth rates and ages of deep-sea corals impacted by the DWH oil spill. Deep Sea Research Part II: Topical Studies in Oceanography, 129: 196-212.

Ragnarsson, S.Á., J.M. Burgos, T. Kutti, I. van den Beld, H. Egilsdóttir, S. Arnaud-Haond and A. Grehan. 2017. The impact of anthropogenic activity on cold-water corals. Pp. 989-1023. In. S. Rossi, L. Bramanti, A. Gori and C. Orejas (eds.). Marine Animal Forests: The Ecology of Benthic Biodiversity Hotspots, Springer International Publishing. 1366 pp.

Rice, S.D. 1985. Effects of oil on fish. Pp: 157-182. In: F.R. Engelhardt (ed.). Petroleum Effects in the Arctic Environment, Elsevier Science Publishing Co., NY. xxiv + 282 pp.

Richardson, W.J. 1979. Southeastward shorebird migration over Nova Scotia and New Brunswick in autumn: A radar study. Can. J. Zool., 57: 107-124.

Richardson, W., C. Greene, C. Malme and D. Thomson. 1995. Marine Mammals and Noise. 1st Edition. Academic Press. 576 pp.

Ronconi, R.A., K.A. Allard and P.D. Taylor. 2015. Bird interactions with offshore oil and gas platforms: Review of impacts and monitoring techniques. Journal of Environmental Management, 147: 34-45.

Sanders, H.L., J.F. Grassle, G.R. Hampson, L.S. Morse, S. Garner-Price and C.C. Jones. 1980. Anatomy of an oil spill: Long-term effects from the grounding of the barge Florida off West Falmouth, Massachusetts. J. Mar. Res., 38: 265-380.

Shannon, G., M.F. McKenna, L.M. Angeloni, K.R. Crooks, K.M. Fristrup, E. Brown, K.A. Warner, M.D. Nelson, C. White, J. Briggs., S. McFarland and G. Wittemyer. 2016. A synthesis of two decades of research documenting the effects of noise on wildlife. Biological Reviews of the Cambridge Philosophical Society, 91(4): 982-1005.

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

Statoil Canada Ltd. 2017. Flemish Pass Exploration Drilling Project. Available at: https://ceaa-acee.gc.ca/050/evaluations/document/121309?culture=en-CA

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

Suttle, C. A. 2005. Viruses in the sea. Nature, 437(7057), 356-361.

Tasker, M.L., P. Hope-Jones, B.F. Blake, T J. Dixon and A.W. Wallis. 1986. Seabirds associated with oil production platforms in the North Sea. Ringing and Migration, 7: 7-14.

Tyack, P.L. 2008. Implications for marine mammals of large-scale changes in the marine acoustic environment. Journal of Mammalogy, 89(3): 549-558.

van der Hoop, J.M., A.S.M. Vanderlaan, T.V.N. Cole, A.G. Henry, L. Hall, B. Mase-Guthrie, T. Wimmer and M.J. Moore. 2015. Vessel strikes to large whales before and after the 2008 ship strike rule. Conservation Letters, 8(1): 24-32.

Vanderlaan, A.S.M. and C.T. Taggart. 2007. Vessel collisions with whales: The probability of lethal injury based on vessel speed. Marine Mammal Science, 23(1): 144-156.

Vanderlaan, A.S.M, C.T. Taggart, A.R. Serdynska, R.D. Kenney and M.W. Brown. 2008. Reducing the risk of lethal encounters: Vessels and right whales in the Bay of Fundy and on the Scotian Shelf. Endangered Species Research, 4(3): 283-297.

Vanderlaan, A.S.M., J.J. Corbett, S.L. Green, J.A. Callahan, C. Wang, R.D. Kenney, C.T. Taggart and J. Firestone. 2009. Probability and mitigation of vessel encounters with North Atlantic right whales. Endangered Species Research, 6(3): 273-285.

Vander-Zanden, H.B., A.B. Bolten, A.D. Tucker, K.M. Hart, M.M. Lamont, I. Fujisaki, K.J. Reich, D.S. Addison, K.L. Mansfield, K.F. Phillips, M. Pajuelo, and K.B. Bjorndal. 2016. Biomarkers reveal sea turtles remained in oiled areas following DWH oil spill. Ecological Applications, 26(7): 2145-2155.

Vázquez, A., J.M. Casas, W.B. Brodie, F.J. Murillo, M. Mandado, A. Gago, R. Alpoim, R. Bañón and A. Armesto. 2013. List of Species as recorded by Canadian and EU Bottom Trawl Surveys in Flemish Cap. NAFO Scientific Council Research Document, 13/005: 1-13.

Wang, Z. and B.J.W. Greenan. 2014. Physical oceanographic conditions on the Newfoundland Shelf / Flemish Cap – from a model perspective (1990-2012). Scientific Council Meeting – June 204. NAFO SCR Doc. 14 / 008. 25 pp.

Wiens, J.A., R.H. Day, S.M. Murphy and K.R. Parker. 2004. Changing habitat and habitat use by birds after the *Exxon Valdez* oil spill. Ecological Applications, 14: 1806-1825.

Wiese, F.K. and W.A. Montevecchi. 1999. Marine Bird and Mammal Surveys on the Newfoundland Grand Bank from Offshore Supply Vessels. Contract report prepared for Husky Oil Operations Limited, St. John's, NL. 23 pp.

Wiese, F.K., W.A. Montevecchi, G.K. Davoren, F. Huettmann, A. W. Diamond and J. Linke. 2001. Seabirds at risk around offshore oil platforms in the North-west Atlantic. Mar. Poll. Bull., 42: 1285-1290.

Wiese, F.K. and G.J. Robertson. 2004. Assessing seabird mortality from chronic oil discharges at sea. J. Wildl. Mgmt., 68(6): 627-638.

Wiley, D.N., C.A. Mayo, E.M. Maloney and M.J. Moore. 2016. Vessel strike mitigation lessons from direct observations involving two collisions between noncommercial vessels and North Atlantic right whales (*Eubaleana glacialis*). Marine Mammal Science, 32(4): 1501-1509.

Wilkin S.M., T.K. Rowles, E. Stratton, N. Adimey, C.L. Field, S. Wissmann, G. Shigenaka, E. Fougères, B. Mase, and Network SRS. 2017. Marine mammal response operations during the DWH oil spill. Endangered Species Research, 33: 107-118.

Williams, T.C. and J.M. Williams. 1978. An oceanic mass migration of land birds. Scientific American, 239: 166-176.

Wolfe, D.A., M.M. Krahn, E. Casillas, S. Sol, T.A. Thomas, J. Lunz and K.J. Scott. 1996. Toxicity of intertidal and subtidal sediments in contaminated by the *Exxon Valdez* oil spill. Pp. 121-139. In: S.D. Rice, R.B. Spies, D.A. Wolfe and B.A. Wright (eds.). Proceedings of the *Exxon Valdez* Oil Spill Symposium, American Fisheries Society Symposium 18.

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