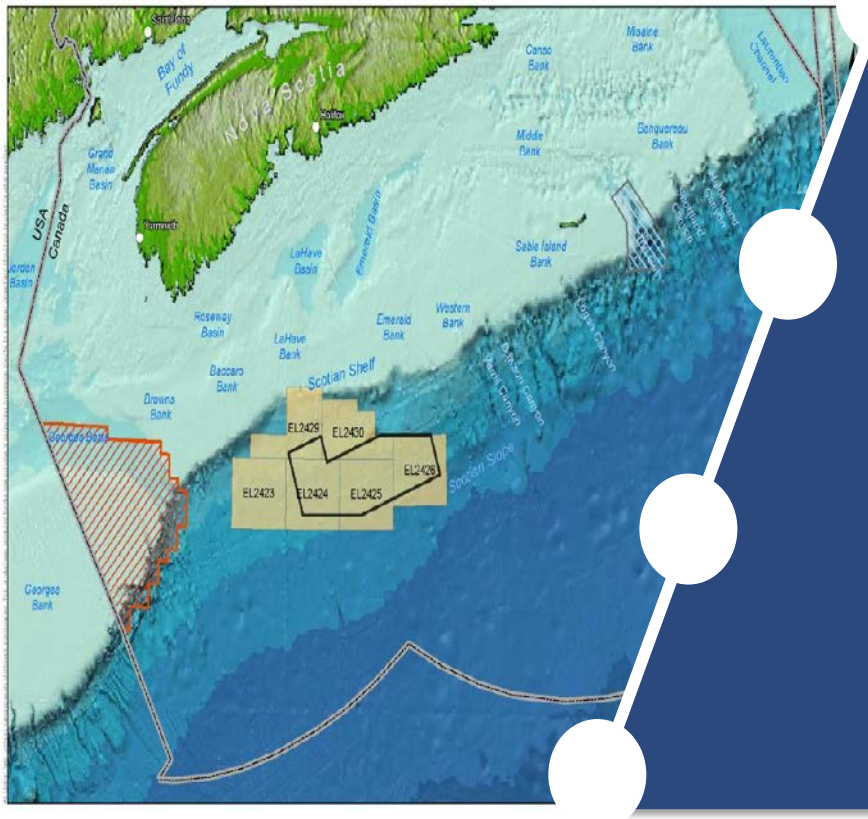
Canadian Environmental Assessment Agency | Agence canadienne d'évaluation environnementale

Shelburne Basin Venture Exploration Drilling Project

Draft Environmental Assessment Report



February 24, 2015

Canada

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Catalogue No: XXXXX-XXX/XXXXX

ISBN: XXX-X-X-XXX-XXXXX-X

This document has been issued in French under the title:
Rapport d'évaluation environnementale préliminaire: Projet de forage exploratoire dans le bassin Shelburne

Acknowledgement: This document includes figures, tables and excerpts from the *Shelburne Basin Venture Exploration Drilling Project Environmental Impact Statement*, prepared by Stantec Limited for Shell Canada Limited. These have been reproduced with the permission of both companies. References to scientific studies from the Environmental Impact Statement may be replicated below, as cited by the author, please refer to the Environmental Impact Statement for all information sources.

Executive Summary

Shell Canada Limited (the proponent) proposes to conduct an offshore exploration drilling program within its offshore Exploration Licences located in the Atlantic Ocean approximately 250 kilometres south of Nova Scotia. The Shelburne Basin Venture Exploration Drilling Project (the Project) would consist of up to seven exploration wells drilled in the period from 2015 to 2019, in association with the six-year exploration periods of the Licences. The Project would be divided into two separate drilling campaigns. The first phase, including specific drilling locations for up to three wells, would be based on the results of the proponent's Shelburne Basin 3D Seismic Survey conducted during the summer of 2013. The second phase of drilling would also consider the results of the first phase. A mobile offshore drilling unit designed for year-round operations in deep water will be used for the Project, as well as offshore support vessels that will travel between the drilling areas and an existing supply base in Halifax Harbour.

The Project will require authorization under the Canada-Nova Scotia Offshore Petroleum Resources Accord Implementation Act and may require authorization under the *Fisheries Act*. A permit under the *Species at Risk Act* may be required for effects on species that are listed as endangered or threatened on Schedule 1 of that Act.

The Canadian Environmental Assessment Agency (the Agency) conducted a federal environmental assessment (EA) of the Project in accordance with the *Canadian Environmental Assessment Act, 2012* (CEAA 2012). The Project is subject to CEAA 2012 because it is described in the *Regulations Designating Physical Activities* as follows:

> *The drilling, testing, and abandonment of offshore exploratory wells in the first drilling program in an area set out in one or more exploration licences issued in accordance with the Canada-Newfoundland Atlantic Accord Implementation Act or the Canada-Nova Scotia Offshore Petroleum Resources Accord Implementation Act.*

This Draft EA Report provides a summary and the main findings of the environmental assessment. The Agency prepared the report in consultation with the Canada-Nova Scotia Offshore Petroleum Board, Fisheries and Oceans Canada, Environment Canada, Health Canada, Natural Resources Canada and Transport Canada following a technical review of the proponent's Environmental Impact Statement and an evaluation of the potential environmental effects of the Project.

Valued components (VCs) are notable features of the natural and human environment that have the potential to be impacted by the Project. The EA focused on VCs that are considered to be within federal jurisdiction as described in subsection 5(1) of CEAA 2012, or are related to the exercise of the federal authorizations noted above as described in subsection 5(2). The following is a list of VCs included in the evaluation.

- fish and fish habitat
- marine mammal and sea turtles
- migratory birds
- current use of lands and resources for traditional purposes by Aboriginal peoples

- special areas
- species at risk
- commercial fisheries

The Agency assessed the potential for the Project to cause significant adverse effects on the VCs based on expert opinions, comments provided by Aboriginal communities, and comments provided by the public. Key comments from Aboriginal communities and the public were similar. Participants raised concerns about the Project's potential effects on the marine environment (e.g. marine mammals, fish, and birds) and potential interference with fishing (including for traditional food, social, or ceremonial purposes by Aboriginal peoples), but the dominant concern was the potential effects of a large spill, such as could occur from a blowout, on the marine ecosystem, fishing, and special areas such as Georges Bank.

For routine operations, the Project's main potential environmental effects in relation to section 5 of CEAA 2012 are:

- effects on fish habitat caused by the discharge of drilling fluid and cuttings to the benthic environment (ocean bottom);
- effects on fish and fish habitat caused by other discharges from the drilling unit, such as food waste, water from human uses (laundry, showers, toilets), cooling water, and well treatment fluids;
- effects on marine mammals due to underwater noise from vertical seismic profiling operations and from drilling unit operations;
- effects on migratory birds caused by lights used on the drilling unit;
- effects on migratory birds due to flaring, if well testing is required;
- interference with commercial fisheries, either Aboriginal or non-Aboriginal; and
- effects on fishing activity caused by wellhead structures that may be left in place after well abandonment.

The proponent's project plan and design incorporates mitigation measures to prevent or reduce the adverse effects of the Project. These include standard mitigation measures, compliance with regulatory standards, and best management practices for offshore oil and gas exploration drilling.

Accidents and malfunctions could occur during exploration drilling and result in adverse environmental effects. These include fuel spills, spills of synthetic-based drilling fluid (also referred to as drilling mud), and blowouts. Oil spill fate and trajectory modelling and analyses were performed to help evaluate potential effects of accidental spills and to enable oil spill response planning. Worst-case spill scenarios were conservatively modeled by assuming that no response measures are put in place to minimize or reduce effects. In the unlikely event of a real spill, oil spill containment, recovery, and shoreline protection operations would be undertaken to reduce adverse effects on marine and coastal resources. The proponent stated that in the event of a blowout, the well could be capped and contained in 12 to 21 days, the upper limit allowing for potential delays such as due to weather conditions. However, for worst-case modeling purposes, it was conservatively assumed that a blowout would continue for 30 days before being capped and contained.

Historically, the incidence of large spills during exploration drilling is very low. However, should one occur, and depending on its trajectory and when it occurs, it could cause significant adverse environmental effects on birds, special areas, commercial fisheries, or current Aboriginal land and resource use for traditional purposes. The proponent has proposed design measures, operational procedures, and dedicated resources to prevent and respond to spills of any size and concludes that, given their low probability of occurrence, significant spill-related environmental effects are not likely to occur during the Project.

The Project's potential effects on potential or established Aboriginal or Treaty rights were also examined. Fishing by First Nations communities for commercial or traditional purposes is the primary rights-based activities that could potentially be affected by the Project. The Agency believes that the recommended mitigation measures in relation to potential environmental effects on fish and fish habitat and effects of accidents and malfunctions are appropriate accommodation for potential impacts on rights.

The Agency will propose conditions in relation to key mitigation and follow-up measures for consideration by the Minister of the Environment. Conditions accepted by the Minister of the Environment would become legally binding on the proponent if she issues a decision statement indicating that the Project is not likely to cause significant environmental effects, or if it is determined by Governor in Council that any significant environmental effects are justified under the circumstances.

The Agency concludes that the Shelburne Basin Venture Exploration Drilling Project is not likely to cause significant adverse environmental effects, taking into account the implementation of mitigation measures. This Draft EA Report is being released for public and Aboriginal review. Comments received will be taken into account when finalizing the Report including recommended mitigation and follow-up measures to be implemented, for consideration by the Minister as potential environmental assessment conditions. The Final EA Report will be submitted to the Minister of the Environment for consideration when deciding whether or not the Project is likely to cause significant adverse environmental effects, taking into account the implementation of the mitigation measures that the Minister considers appropriate.

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List of Abbreviations and Acronyms

Abbreviation/Acronym	Definition
CEAA 2012	*Canadian Environmental Assessment Act, 2012*
Agency	Canadian Environmental Assessment Agency
Board	Canada-Nova Scotia Offshore Petroleum Board
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
EA	Environmental Assessment
EBSA	Ecologically and Biologically Significant Area
EIS	Environmental Impact Statement
ha	Hectare
km	Kilometre
LAA	Local Assessment Area
m	Metre
MARPOL	International Convention for the Prevention of Pollution from Ships
mg	Milligram
mm	Millimetre
PAH	Polycyclic aromatic hydrocarbon
Project	Shelburne Basin Venture Exploration Drilling Project
proponent	Shell Canada Limited
RAA	Regional assessment area
SARA	*Species at Risk Act*
µm	Micrometre
VC	Valued Component

1 Introduction

1.1 Purpose of the Draft Environmental Assessment Report

Shell Canada Limited (the proponent) proposes to drill up to seven exploration wells in the period from 2015 to 2019, within its Exploration Licences located in the Atlantic Ocean approximately 250 kilometres (km) south of Nova Scotia. The Shelburne Basin Venture Exploration Drilling Project (the Project) would consist of two separate drilling campaigns. Optimal drilling areas for the first phase of drilling will be selected based on the results of the proponent's Shelburne Basin 3D Seismic Survey conducted in summer 2013. The second phase of drilling will consider the seismic survey results and the results of the first phase of drilling conducted during the Project. Exact drilling locations will also consider the seabed and geotechnical survey undertaken in 2014.

The proponent proposes to use an existing onshore support base (Woodside Atlantic Wharf) located in Halifax Harbour. The Woodside base has been in operation for a number of years servicing the Nova Scotia offshore oil and gas sector. Helicopter operations (for crew changes and transporting light supplies) would operate from an existing air terminal at Halifax Stanfield International Airport.

The purpose of this environmental assessment (EA) report is to provide a summary of information and analysis considered by the Canadian Environmental Assessment Agency (the Agency) and sets out the Agency's conclusions in accordance with the *Canadian Environmental Assessment Act, 2012* (CEAA 2012) on whether the Project is likely to cause significant adverse environmental effects, after taking into account the proposed mitigation measures. Proposed mitigation measures can be found in Appendix A. This report will form the basis of the Agency's recommendation to the Minister of the Environment for her decision in relation to the Project.

1.2 Scope of Environmental Assessment

1.2.1 *Environmental assessment requirements*

The Project is subject to CEAA 2012 because it involves activities that are designated by the *Regulations Designating Physical Activities*. The proposed project includes the drilling, testing, and abandonment of offshore exploratory wells in the first drilling program in an area set out in one or more exploration licences issued in accordance with the *Canada-Nova Scotia Offshore Petroleum Resources Accord Implementation Act*. These activities are described in item 10 of the Schedule to the Regulations.

Based on the project description submitted by the proponent, the Agency screened the designated project in accordance with sections 8 to 12 of CEAA 2012 to determine if an EA was required. On December 2, 2013, the Agency posted a notice on the Canadian Environmental Assessment Registry Internet Site inviting the public to provide comments by December 23, 2013 on the designated project and its potential effects on the environment. On January 16, 2014 the Agency determined that a federal EA was required for the Project and began the EA on January 17, 2014.

The Canada-Nova Scotia Offshore Petroleum Board (the Board) conducts EAs of exploration drilling prior to deciding whether or not to authorize a project. The Agency and the Board collaborated during the technical review of the proponent's environmental impact statement (EIS). The federal EA of the Project conducted by the Agency satisfies the Board's EA requirements. Nova Scotia provincial EA approval is not required.

1.2.2 *Environmental effects assessed*

In accordance with section 5 of CEAA 2012, the EA focused on potential adverse environmental effects that are within federal jurisdiction, including:

Subsection 5(1):

- effects on fish and fish habitat,
- effects on other aquatic species,
- effects on migratory birds,
- effects on federal lands,
- effects that cross provincial or international boundaries, and
- effects that impact on Aboriginal peoples, such as their use of lands and resources for traditional purposes; and

Subsection 5(2):

- effects related to changes to the environment that are directly linked to or necessarily incidental to any federal decisions about a project.

The Project is located on federal land and requires authorization by the Board under the *Canada-Nova Scotia Offshore Petroleum Resources Accord Implementation Act* to proceed and may require authorization under the *Fisheries Act* and *Species at Risk Act* from Fisheries and Oceans Canada. Therefore, the EA considered effects under both subsections 5(1) and 5(2) of CEAA 2012. Specific valued components (VCs) considered in the assessment are described in Section 1.2.4.

1.2.3 *Factors considered in the environmental assessment*

In accordance with section 19 of CEAA 2012, the federal EA considered:

- the environmental effects of the Project,
- changes to the Project that may be caused by the environment,
- the effects of malfunctions or accidents that may occur in connection with the Project on components of the environment within federal jurisdiction,
- any cumulative effects on components of the environment within federal jurisdiction that are likely to result from the Project in combination with other physical activities that have been or will be carried out,
- the significance of the environmental effects of the Project,
- comments from the public,
- technically and economically feasible measures to mitigate any significant adverse environmental effects of the Project,
- the requirements of a follow-up monitoring program for the Project,
- the purpose of the Project, and

- alternative means of carrying out the Project that are technically and economically feasible and the effects of these alternatives on components of the environment within federal jurisdiction.

The federal EA also took into account community and Aboriginal traditional knowledge, including information about traditional use.

The following federal authorities provided specialist or expert information or knowledge relevant to the Project in the review of the proponent's EIS and the preparation of this Draft EA Report: the Board, Fisheries and Oceans Canada, Environment Canada, Health Canada, Natural Resources Canada, and Transport Canada.

1.2.4 *Selection of valued components*

The scoping process sets the limits of an EA, and focuses the study on relevant factors and concerns, which were outlined in the EIS Guidelines. The EIS Guidelines are available at: http://www.ceaa.gc.ca/050/documents-eng.cfm?evaluation=80058.

The EA focused on those components of the environment, described under "Factors Considered" (section 1.2.3), which have particular value or significance and are likely to be impacted by the Project. VCs refer to components of the environment that are valued in their role in the ecosystem and have value placed on them by humans. A selection of VCs associated with the Project has been identified as being of concern to the proponent, government agencies, Aboriginal peoples, and the public.

The proponent's VC selection process considered the temporal and spatial scope of the Project and anticipated project-environment interactions. The VCs selected reflect existing knowledge about typical environmental effects of offshore petroleum exploration drilling, concerns raised by the public and Aboriginal groups, and discussions with government agencies.

The Agency focused on VCs that pertain to the prediction of environmental effects on fish and fish habitat, other aquatic species, migratory birds, and Aboriginal peoples (as defined in subsection 5(1) of CEAA 2012) in its analysis of significance (Table 1). It also considered other environmental effects on federal lands (e.g. in the marine environment), including effects on species at risk and special areas. Section 5(1) of CEAA 2012 requires an assessment of aquatic species as defined in subsection 5(2) of the *Species at Risk Act* (SARA); this is included in the assessment of effects on fish and fish habitat. In addition to requirements under subsection 5(1) of CEAA 2012, environmental effects on species at risk were also considered in accordance with subsection 79(2) of SARA. Environmental effects of the Project on commercial fishing were assessed as defined in section 5(2) of CEAA 2012 based on the need for authorization by the Canada-Nova Scotia Offshore Petroleum Board under the *Canada-Nova Scotia Offshore Petroleum Resources Accord Implementation Act* and the potential need for authorization under the *Fisheries Act* and a permit under the *Species at Risk Act*. The VCs analyzed by the Agency and the corresponding VCs selected by the proponent are presented in Table 1.

Table 1 Potentially affected valued components

VC	Included by the Agency in EA Report?	Agency's Rationale for Inclusion or Exclusion of VC	Corresponding VCs Identified by the Proponent
Effects identified under Subsection 5(1) of CEAA 2012			
Fish and fish habitat	Yes	This VC is included as a result of anticipated interactions between the project and fish and fish habitat and the need to understand how those interactions will affect the ecological and the socio-economic importance of fisheries resources, the legislated protection of fish and fish habitat and applicable species of conservation concern. This VC includes corals.	• Fish and fish habitat
Marine plants	No	Potential effects on marine plants were considered in the assessment of effects on fish habitat. No concerns were raised by government agencies, public or Aboriginal groups.	• None
Marine mammals and sea turtles	Yes	This VC is included because of its ecological importance and applicable species of conservation concern, and the nature of potential project-VC interactions.	• Marine mammals and sea turtles
Migratory birds	Yes	This VC is included because of its ecological importance, the legislated protection of migratory birds and other applicable species of conservation concern, and the nature of potential project-VC interactions.	• Marine birds (includes waterbirds, shore birds and coastal waterfowl; landbirds were also included based on advice received from Environment Canada that landbirds could be affected in the event of an oil spill.)
Current use of lands and resources for traditional purposes by Aboriginal peoples (also reflects health and socio-economic conditions of Aboriginal peoples)	Yes	Changes to the environment causing a change in the use of lands for traditional purposes. Aboriginal commercial fishing activities are carried out under communal commercial licences in the project vicinity. Food, social, and ceremonial fishing is carried out in the nearshore waters of Nova Scotia. Aboriginal fisheries could be affected by the Project, especially by project-related malfunctions and accidents. In addition to commercial fishing, First Nations cite use of certain species for traditional purposes such as communal gatherings for feasts.	• Current Aboriginal use of lands and resources for traditional purposes.

VC	Included by the Agency in EA Report?	Agency's Rationale for Inclusion or Exclusion of VC	Corresponding VCs Identified by the Proponent
Physical or cultural heritage of Aboriginal peoples and historical, archaeological, paleontological or architectural sites or structures of Aboriginal peoples	No	Project activities and components are not anticipated to result in any changes to the environment that would have an effect on physical and cultural heritage. Surveys conducted in the project area prior to seabed disturbance (drilling) will allow detection and avoidance of heritage resources, if present.	• None
Special Areas	Yes	There are several areas of physical and cultural importance in the regional assessment area (RAA), which is entirely within federal lands (the offshore). These may be affected by the project.	• Special Areas
Federal species at risk	Yes	SARA requires consideration of listed species when conducting an EA under CEAA 2012. The Agency also examined effects on species assessed by COSEWIC.	• No distinct VC identified by the proponent. Proponent assessed species at risk within its VCs for marine mammals, sea turtles, and migratory birds.
Air quality	No	The proponent proposes compliance with the Nova Scotia *Air Quality Regulations*. Given its remote offshore location the project area is not close to any receptors that would be sensitive to atmospheric emissions from routine project activities or malfunctions or accidental events. No comments about air quality were received from Aboriginal groups or the public.	• None
Water quality	No	Potential changes in water quality were taken into account as applicable when assessing effects on other VCs.	• No distinct VC identified by the proponent, however, potential changes in water quality were taken into account as applicable when assessing effects on other VCs.
Effects identified under Subsection 5(2) of CEAA 2012			

VC	Included by the Agency in EA Report?	Agency's Rationale for Inclusion or Exclusion of VC	Corresponding VCs Identified by the Proponent
Commercial fisheries	Yes	There is commercial fishing activity in the area that could be affected by normal operations (e.g. exclusion zone) or by accidental events.	• Commercial Fisheries
Recreational fisheries	No	There is no known recreational fishing activity in the vicinity of the project area, which is 250 km from land. Routine project activities and components are not predicted to interfere with nearshore recreational fisheries due to the use of existing shipping routes by offshore support vessels. This fishing activity may be affected by accidental events associated with the Project since nearshore recreational fisheries tend to target the same species that are fished commercially. Mitigation proposed for the Fish and Fish Habitat VC and the Commercial Fisheries VC will mitigate similar environmental effects on recreational fisheries.	• None

1.2.5 *Spatial and temporal boundaries*

Spatial and temporal boundaries of an EA are established to define the area and timeframe within which the Project may interact with the environment and cause environmental effects. The spatial and temporal boundaries may vary among VCs depending on the nature of the potential environmental interaction with the Project. Spatial boundaries reflect the geographic range over which the Project's potential environmental effects may occur, recognizing that some environmental effects will extend beyond the immediate vicinity of the Project. Temporal boundaries identify when an environmental effect may occur in relation to specific project activities and components. Temporal boundaries are based on the timing and duration of project activities and the nature of the interactions with each individual VC. Spatial and temporal boundaries were developed for each VC in consideration of:

- the timing of activities for all project phases,
- understood natural variations of each VC,
- information gathered on current and traditional land and resource use,
- the time required for recovery from an environmental effect, and
- the potential for cumulative environmental effects.

The spatial boundaries established by the proponent for the Project are depicted in Figure 1-1 and are defined below with respect to project activities and components.

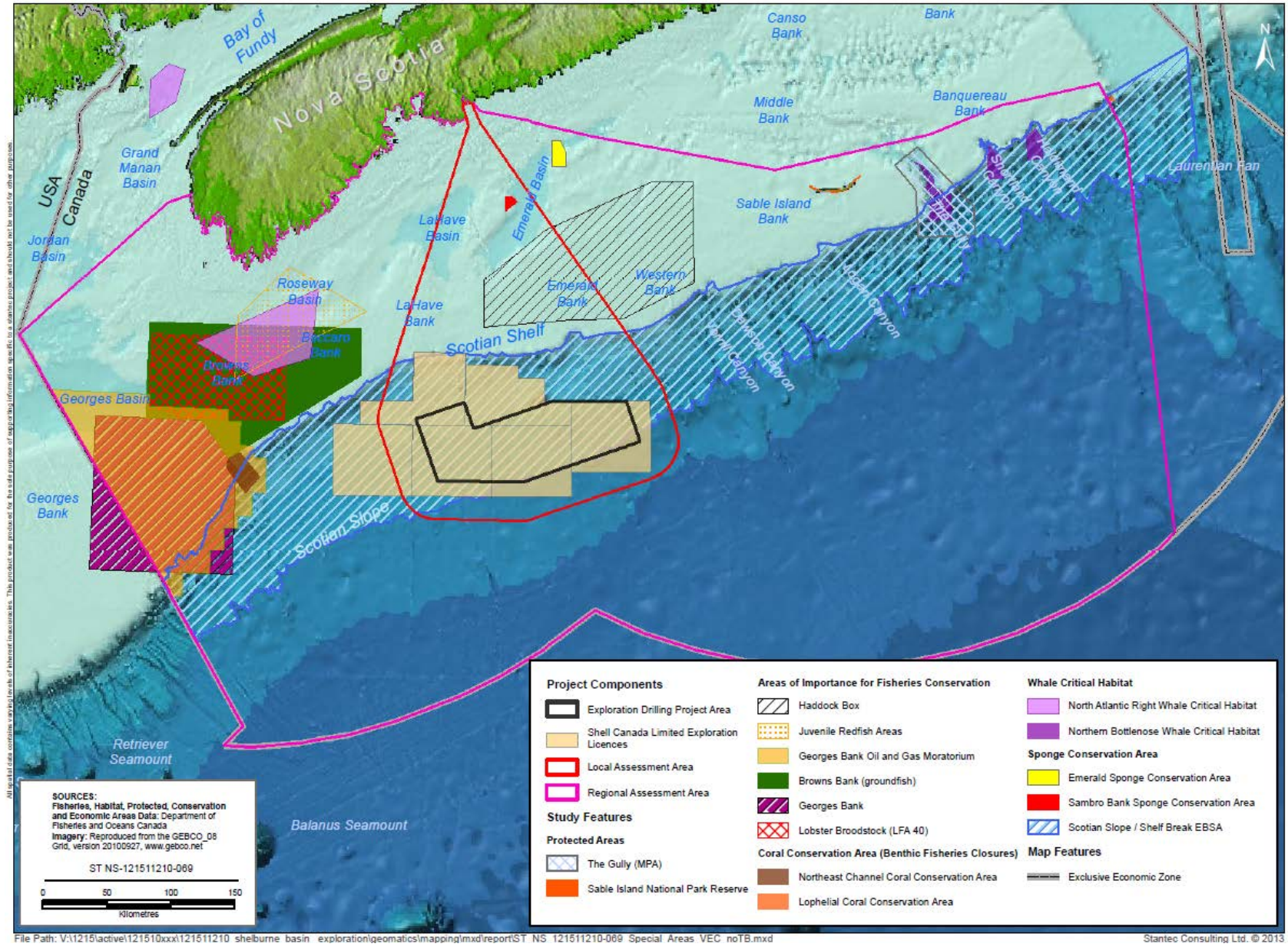
Project Area: The project area encompasses the immediate area in which project activities and components may occur and within which direct physical disturbance may occur as a result of the Project. Exact well locations have not currently been identified, but will occur within the project area. The project area includes portions of Exploration Licences 2424, 2425, 2426, 2429, and 2430.

Local Assessment Area (LAA): The LAA is the maximum area within which environmental effects from 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 based on available information and professional judgement. The LAA also includes support vessel routes between the project area and Halifax Harbour.

Regional Assessment Area (RAA): The RAA is restricted to the 200 nautical mile limit of Canada's Exclusive Economic Zone, including offshore marine waters of the Scotian Shelf and Slope within Canadian jurisdiction. The western extent of the RAA encompasses the Georges Bank Oil and Gas Moratorium Area and terminates at the international maritime boundary between Canada and the United States of America. The eastern extent of the RAA encompasses the Gully Marine Protected Area and terminates at the eastern edge of Banquereau Bank. A portion of the Scotian Shelf and the Nova Scotia coastline to the Bay of Fundy is also included as part of the RAA boundary.

The temporal boundaries to be assessed for the Project encompass all project phases, including well drilling, testing, and abandonment. Up to seven exploration wells will be drilled over the period from 2015 to 2019, with project activities at each well taking a maximum of 130 days to complete. Project activities could occur at any time of year.

Figure 1 Project Area and Environmental Assessment Spatial Boundaries



Source: Shell Canada Limited

1.2.6 *Methods and approach*

The Agency reviewed various sources of information in conducting its analysis, including:

- the EIS submitted by the proponent,
- additional information that the Agency requested from the proponent during the review of the EIS,
- advice from expert departments and agencies, and
- comments received from the public and Aboriginal participants.

In its EIS, the proponent assessed the Project's effects based on a structured approach that is consistent with international best practices for conducting environmental impact assessments and with the Agency's *Reference Guide: Determining Whether a Project is Likely to Cause Significant Adverse Environmental Effects*. The approach is designed to:

- focus on issues of greatest concern,
- consider key issues raised by Aboriginal peoples, stakeholders, and the public, and
- integrate engineering design and programs for mitigation and follow-up into a comprehensive environmental planning process.

The potential environmental effects of project activities and components were assessed using a standard framework to facilitate individual assessment of each VC. The analysis began with ranking potential project-VC interactions and effects. The assessment focused on those interactions that may result in an effect of concern. Evaluation tables and matrices were utilized for these interactions and residual project-related environmental effects (i.e. those environmental effects that remain after the planned mitigation measures have been applied) were characterized for each VC based on the following criteria:

- Magnitude: the potential effect after mitigation relative to the baseline condition.
- Extent: the geographic area over which an effect will occur.
- Duration: the period of time over which an effect will occur.
- Frequency: how often an effect will occur within a given time period.
- Reversibility: the degree to which the effect can or will be reversed.
- Natural environment and socio-economic context.

The significance of each residual project-related environmental effect was then determined based on pre-defined standards or thresholds (i.e. significance rating criteria). Appendix C summarizes the residual effects assessment for all VCs, for routine operations.

The Agency's assessment included both direct effects from the Project and those effects that may result from predicted changes to the environment. The Agency's analysis and conclusions on the significance of impacts on VCs are presented in Chapter 6.

Environmental effects were also assessed associated with:

- Accidents and malfunctions (potential events that could result in adverse environmental effects - Section 7.1),
- effects of the environment on the Project (potential changes to the Project that may result from interactions with the environment or natural events - Section 7.2), and
- cumulative environmental effects (the potential for the residual environmental effects of the Project to interact cumulatively with the residual environmental effects of other past, present, or future reasonably foreseeable physical activities in the vicinity of the Project - Section 7.3).

2 Project Overview

2.1 Project Location

The Project would take place in the Atlantic Ocean approximately 250 km south of Nova Scotia in a geographical offshore area known as the Southwest Scotian Slope and a geological region known as the Shelburne Basin. It includes portions of Shell's Exploration Licences 2424, 2425, 2426, 2429, and 2430, and encompasses a little over one third (7870 square km) of the total area of the Exploration Licences (19,845 square km). Water depth in the area ranges from 1000 to 3000 metres (m).

There is no existing infrastructure located in the project area or LAA. Other human uses of the area include fishing, shipping, research, and military (naval) manoeuvres. Figure 1 depicts the boundaries of the proposed drilling area and known important environmental features within the RAA.

2.2 Project Components

The Project will consist of the following primary components:

- A mobile offshore drilling unit designed for year-round operations in deep water, and
- Offshore exploration wells (up to seven) to be drilled over a period from 2015 through 2019 in two separate drilling campaigns (up to three wells in the first phase and up to four wells in the second).

Logistical support required for the Project consists of:

- offshore support vessels for re-supply and for on-site standby during drilling activities, and
- helicopter support for crew transport and delivering light supplies and equipment.

The only components to be newly developed as part of the Project will be the offshore exploration wells.

2.3 Project Activities

2.3.1 *Seabed Inspection*

Pre-drill site surveys will be conducted for each well using a remotely-operated underwater vehicle deployed to the seabed. These surveys include video inspection of the seabed, take approximately one day to conduct and are intended to confirm that there are no potential surface seabed hazards or sensitive features (e.g. rare corals or aggregations of corals) at the drilling location. Once the drilling unit has mobilized and remotely-operated underwater vehicle inspection of the seabed has been completed, drilling activities will commence. If any hazards or sensitive features are found during the pre-drill survey, the proponent would consult with relevant agencies to determine the need for any mitigation prior to commencing drilling operations, including the possibility of moving the drilling unit to avoid the feature of concern.

2.3.2 *Drilling*

Exploration drilling is planned in two campaigns. The first may include up to 3 exploration wells. Following this initial drilling activity, an assessment period of between 15 and 18 months will be taken to consider the results

of the first campaign. The second drilling campaign, if it proceeds, may include up to 4 exploration wells. Each well is anticipated to take approximately 130 days to drill.

The drilling of each offshore well can be broken into two components, starting with riserless drilling (i.e. an open system with no direct drill fluid return connection to the drilling unit) and continuing with riser drilling (i.e. a closed loop system with a direct drill fluid return connection to the drilling unit). Drilling fluid is also known as drilling mud.

The following activities will occur during the drilling phase of each exploration well:

Riserless Drilling

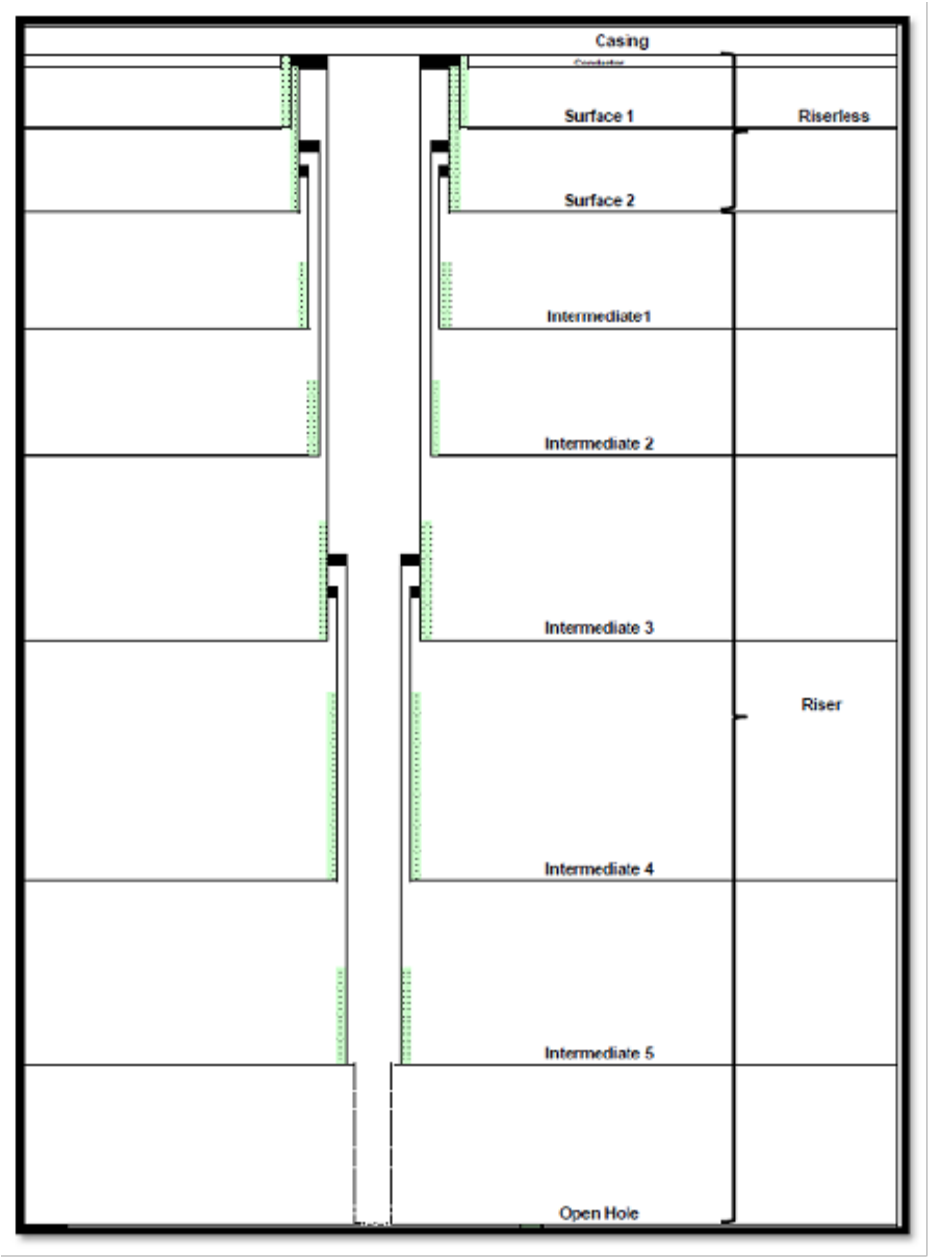
- The drilling will commence with jetting the conductor section in place to approximately 100 m below the sea floor.
- The drill string is then inserted into the conductor pipe and a surface hole section is drilled to approximately 1000 m below the sea floor. The surface casing is then lowered into the wellbore to the drilled depth and cemented in place to the surface of the wellbore. This process of drilling, casing, and cementing is followed for all further drill sections.

Riser Drilling

- A blowout preventer stack is then placed at the end of the drilling riser pipe that is lowered from the drilling unit to the well. The blowout preventer is a critical piece of safety equipment that is connected to the wellhead via the surface casing to connect the drilling unit to the well via the riser system.
- The remaining well sections are drilled to the desired depth during this phase of drilling using either a water-based or synthetic-oil-based drilling fluid. The *Offshore Chemical Selection Guidelines* (National Energy Board et al., 2009) will be applied in chemical selection for drilling.

Figure 2 depicts the profile of a typical exploration well that would be drilled for the Project.

Figure 2 Profile of a Typical Exploration Well for the Project



Source: Shell Canada Limited

2.3.3 *Vertical Seismic Profiling*

Vertical seismic profiling may be conducted in coordination with drilling activities. A vertical seismic profiling survey is used to calibrate surface seismic data, giving an accurate depth measure of geological features. By recording and analyzing the reflected seismic waves, the surface seismic data can be directly correlated to the well.

Vertical seismic profiling acquisition employs similar technology to that used during a full-scale seismic survey (source and receiver), but the size and volume of the array are far smaller and the survey takes place in a much

smaller areas and for a much shorter time. Vertical seismic profiling methods include zero-offset, offset, and walkaway. It is anticipated that a zero-offset vertical seismic profiling survey will be conducted in the first exploration wells. A typical survey could use a four-geophone array placed within the wellbore and a stationary sound source hung from a crane on the drilling unit. The survey would last for approximately one day. A walk-away survey would be conducted similarly, but the sound source would be located on a support vessel and activated at various distances from the well, to a maximum of 10 km.

2.3.4 *Testing*

If hydrocarbons are encountered in a drilled well, the well will be tested as required by the *Nova Scotia Offshore Petroleum Drilling and Production Regulations* to gather further details about the potential reservoir and to assess commercial viability.

The main objective of testing is to collect a sample from the well. This is done by perforating the well and allowing reservoir fluids to flow up the well to the deck of the drilling unit. A temporary flow-testing facility is installed to receive flow from the well. Reservoir fluids may contain hydrocarbons (e.g. oil and gas), formation water (e.g. produced water), or both. The hydrocarbons are measured and separated from the produced water. Produced hydrocarbons and small amounts of produced water are flared using high-efficiency igniters for complete combustion and reduced emissions. If produced water occurs, it will either be flared or treated in accordance with the *Offshore Waste Treatment Guidelines* prior to ocean discharge. Wells may be tested immediately after drilling or suspended for later re-entry and testing. All well suspensions will be in accordance with the *Nova Scotia Offshore Petroleum Drilling and Production Regulations*.

2.3.5 *Abandonment*

All wells drilled as part of the Project will be abandoned in accordance with the *Nova Scotia Offshore Petroleum Drilling and Production Regulations*. Abandonment will take place immediately following drilling, or after well testing. Abandonment activities include isolation of the wellbore using cement plugs placed at varying depths, separating and permanently isolating certain subsurface zones to prevent the escape of any sub-surface fluids from the well.

Abandonment plans for individual wells will be developed on a case-by-case basis and will require approval by the Board. Approval may be sought to leave the wellhead in place. Site-specific abandonment plans will include specific fisheries considerations. Engagement with commercial fisheries will be undertaken to allow appropriate consideration of potential fisheries implications of leaving seabed infrastructure in place. In addition to the potential for interaction with other commercial users, geotechnical considerations such as sediment stability and erosion potential are considered when contemplating whether or not to leave infrastructure in place.

If approval to leave the wellhead in place is granted, the associated subsea infrastructure that would be left in place would include a portion of the conductor casing extending above the seabed. This infrastructure would extend approximately 4 to 5 m above the seabed. Where removal of the wellhead is required, the wellhead and associated equipment (casing) will be removed up to 1 m below the sea floor by mechanical means (cutters).

2.3.6 *Supply and Servicing*

Offshore support vessels will be used to transport supplies from the support base to the drilling unit, return waste material for appropriate disposal onshore, and provide standby assistance during drilling activities. It is anticipated that two or three support vessels will be required to transport associated materials and equipment (drilling fluids, casing, water, cement, fuel, etc.) to and from the drilling unit and will make two or three round trips per week during drilling activities between the support base in Halifax and the drilling unit, approximately 250 km offshore. Transit to the project area from Halifax by sea takes approximately 12 hours at a speed of 22 km per hour (twelve knots).

Project activities will also require helicopter support to transfer crew members and light supplies. During drilling activities, it is anticipated that there will be an average of one trip per day from onshore Nova Scotia (Halifax Stanfield International Airport) to the drilling unit. Helicopter support will also be used in the event that emergency medical evacuation (medevac) from the drilling unit is necessary. The drilling unit will be equipped with a helicopter landing pad, including fuelling facilities. Transit to the project area from Halifax by helicopter takes approximately 1.5 hours.

2.4 Schedule

Subject to the necessary regulatory approvals, authorizations, and permits, drilling could start as soon as the second quarter of 2015 and continue until 2019. Each well is expected to take approximately 130 days to complete. The proponent's proposed project schedule is outlined in Figure 3.

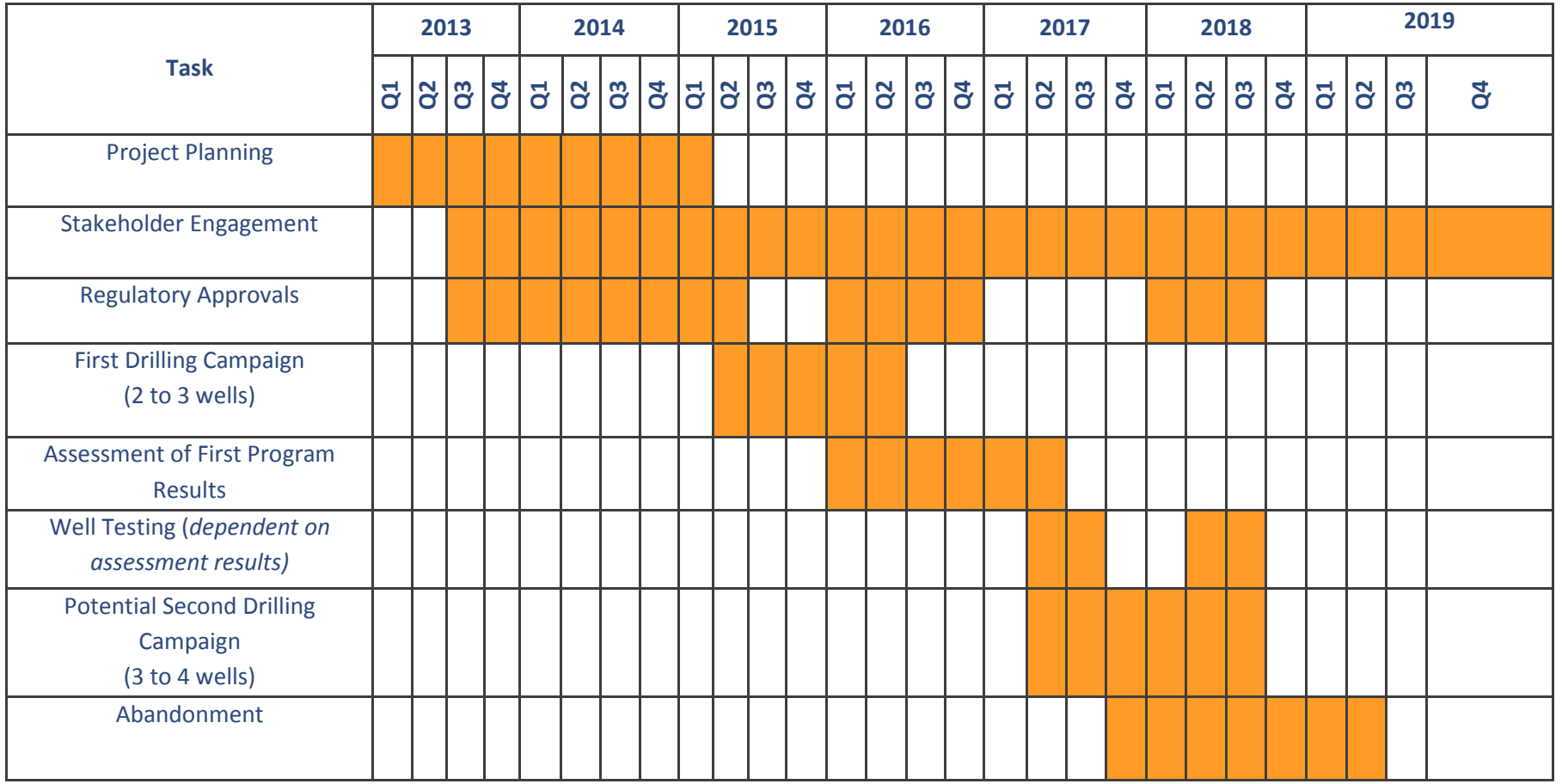
2.5 Environmental Planning

As part of its project planning and as required by the Board's authorization process for drilling projects, the proponent must prepare a number of documents, including:

- an EA Report (the EIS prepared for the Agency fulfils this requirement),
- an Environmental Protection Plan, including a Waste Management Plan,
- an Emergency Response Plan including an Oil Spill Response Plan, Well Containment Plan, Dispersants Operations Plan and a Relief Well Contingency Plan, and
- a Certificate of Fitness for the drilling unit proposed for use.

For the Project, the proponent will also prepare a Net Environmental Benefit Analysis associated with possible use of dispersants in spill response.

Figure 3 Proposed Project Schedule



Source: Shell Canada Limited

3 Purpose of Project and Alternative Means

3.1 Purpose of Project

The proponent has indicated that the purpose of the Project is to determine the presence, nature, and size of potential hydrocarbon resources and to meet the proponent's spending commitment requirements that must be fulfilled within the initial six-year exploration period of the offshore Exploration Licenses. Wells developed as part of the Project are developed specifically for exploration and appraisal of the potential hydrocarbon resource, not for development or production of the resource. Any wells proposed to be developed for production would be considered under a different project scope requiring a separate EA and further licensing from the Board.

3.2 Alternative Means of Carrying Out the Project

CEAA 2012 requires that every EA of a designated project take into account the alternative means of carrying out the Project that are technically and economically feasible and also consider the environmental effects of any such alternative means. The Agency's Operational Policy Statement Addressing *"Purpose of" and "Alternative Means" under the Canadian Environmental Assessment Act, 2012* (CEAA, 2013) sets out the general requirements and approach to address the alternative means of carrying out the designated project under CEAA 2012.

The proponent assessed alternative means of carrying out the Project by the following process:

1. Considering the technical feasibility of alternative means of carrying out the Project (e.g. safety, schedule, operational feasibility).
2. Considering the economic feasibility of alternative means of carrying out the Project.
3. Considering the environmental and socio-economic effects of the identified technically and economically feasible alternatives of carrying out the Project.
4. Selecting the preferred alternative means of carrying out the Project, based on the relative consideration of effects and of technical and economic feasibility.

The alternative means of carrying out the Project identified for evaluation in this EA were:

- type of mobile offshore drilling unit (drilling unit) (e.g. drill ship or semi-submersible);
- selection and use of drilling fluids (e.g. water-based or synthetic-based);
- options for drilling waste management (e.g. sea disposal, onshore disposal, or reinjection); and
- drilling unit lighting alternatives (e.g. reduced offshore lighting, spectral modified lighting, scheduled flaring).

The EIS Guidelines also directed the proponent to address the quantity and types of chemicals that may be used in support of the Project and its chemical selection process to identify less toxic alternatives. In its EIS, the proponent indicated that it had not yet selected a drilling fluids supplier and therefore could not provide detailed information on chemical selection alternatives. The proponent has committed to following the *Offshore Chemical Selection Guidelines* (NEB, 2009), which outline an accepted framework for the selection of chemicals

in support of offshore operations, and promote the selection of less-toxic alternatives. Appendix D contains further details of the alternative means analysis conducted for the Project.

3.2.1 *Views Expressed*

The Agency requested additional analysis of alternatives for managing drill cuttings, associated with both synthetic-based and water-based drilling, recognizing that the proponent has proposed to discharge cuttings and water-based drilling fluids on the seabed. The Agency also asked about the potential to reduce the amount of synthetic-based drilling fluid on cutting beyond 6.9 grams per 100 grams of wet solids prior to marine disposal. The proponent indicated that this would necessitate additional handling of cuttings on board the drilling unit and additional infrastructure for cuttings storage, thereby increasing overall costs and safety risk for the Project. There would also be a risk that drilling would have to stop if the cuttings storage limit is reached.

The proponent indicated that it is considering the possibility of sequencing two wells such that the drilling unit would drill the surface section of the first well, then move to the second location to drill the surface section of the second well before switching to synthetic-based drilling for the remaining sections. This would require the drilling unit to move between the two sites twice instead of once, but could reduce the total volume of the water-based drilling fluid discharged by eliminating one switchover from water-based to synthetic-based drilling.

The Agency also asked about transport of excess water-based drilling fluid to shore rather than discharge at sea. The proponent presented information supporting its view that offshore disposal of excess water-based drilling fluid is the preferred alternative based on technical, economic, and environmental considerations.

The Agency sought clarification of the proponent's rationale that drilling a dedicated disposal well renders cuttings re-injection economically unfeasible. The Agency asked if the proponent had considered a technique known as annular re-injection, whereby cuttings are injected into the annulus between the well bore and the casing, which could avoid the need to drill a dedicated disposal well and would permit a portion of the drill cuttings to be re-injected rather than disposed of on the seabed. The proponent provided information to demonstrate that annular re-injection is not technically feasible for subsea wellhead systems.

In response to a question from the Agency, the proponent indicated that while switching to riser drilling earlier than at the currently-planned 1000 m depth would likely reduce the amount of water-based drilling fluid discharged, it may prevent reaching the target depth and is therefore not considered operationally feasible.

Environment Canada requested that the proponent discuss technically and economically feasible alternatives to flaring (e.g. by incinerating or venting well fluids during well testing, rather than flaring), as a means to reduce risks to migratory birds. The proponent stated that there is currently no incinerator available with sufficient capacity for well testing that can be safely installed on the drilling unit. Venting is not considered a safe or technically-feasible alternative for dealing with the volumes and duration of gas release anticipated during well testing. The proponent considers flaring to be the only available option to deal with well fluids during testing.

Environment Canada also requested that the proponent consider avoiding flaring at night when testing the well, given that is when migratory birds are at greatest risk of being attracted to the flare. The proponent noted that testing would be conducted only for wells in which hydrocarbons were encountered and explained that a flow test is a three-step process that involves flowing a well for a certain period of time; initially for approximately 3

hours, then between 12 and 24 hours, and finally, between 48 and 120 hours for the main test. Due to the durations of these test periods, particularly the second and third periods, complete avoidance of flaring at night during testing is not technically feasible.

Environment Canada also asked if spectral-modified lighting can be used on the drilling unit to reduce bird attraction to lights. The proponent stated that the commercial availability of such lights is restricted and that it is not aware of any operating drilling units with the technical capability required for the Project that are equipped with spectral-modified lighting. The proponent does not own the drilling unit that will be used for the first phase of the drilling program (the Stena IceMAX). The Stena IceMAX has specialized LED lighting developed for outside use in Arctic conditions to address icing issues associated with other lights and modifications would not be technically feasible, regardless of commercial availability.

3.2.2 *Agency Analysis and Conclusion*

In its EIS, the proponent considered technically and economically alternative means of reducing the volumes of drilling waste discharged into the marine environment and reducing risks posed to migratory birds by lights and by flaring, if conducted.

The Agency is satisfied that the proponent has adequately assessed the alternative means of carrying out the Project.

4 Consultation Activities and Advice Received

4.1 Aboriginal Consultation

4.1.1 *Aboriginal consultation in the environmental assessment process*

The federal government has a duty to consult with Aboriginal peoples when it proposes to take an action or make a decision that might adversely affect established or potential Aboriginal or Treaty rights. Where appropriate, the federal government accommodates these interests.

CEAA 2012 facilitates consideration of potential impacts on Aboriginal groups by requiring that EAs consider the effects of any project-related changes to the environment on their health and socio-economic conditions, physical and cultural heritage, the current use of lands and resources for traditional purposes, and changes to any structure, site or thing that is of historical, archaeological, paleontological, or architectural significance to them. Aboriginal consultation is also an important element of good governance and sound policy development and decision making.

The Agency coordinated the federal government's consultation for this EA and consulted Aboriginal groups in Nova Scotia and New Brunswick.

Nova Scotia

Nova Scotia First Nations are signatories to Peace and Friendship Treaties from which the right to a moderate livelihood flows. For consultation purposes, Nova Scotia Mi'kmaq are represented in the process by either the Kwilmu'kw Maw-klusuaqn Negotiation Office or the Sipekne'katik First Nation.

- The Mi'kmaq of Nova Scotia assert Aboriginal and Treaty rights and Title over the province of Nova Scotia including its offshore. The Mi'kmaq of Nova Scotia have an established right to fish for a moderate livelihood. Several communities represented by the Assembly of Nova Scotia Mi'kmaq Chiefs (the Assembly) hold communal commercial fishing licences in North Atlantic Fisheries Organization areas 4X and 4W, which cover a large portion of the Scotian Shelf and Slope and overlap with the project area, LAA and RAA, or portions of them. The Mi'kmaq of Nova Scotia assert rights to the marine environment and its resources and believe that any potential effects on the marine environment, fish and fish habitat, and any obstruction affecting the Mi'kmaq from accessing these will impact their rights.
- Sipekne'katik First Nation is a Nova Scotia Mi'kmaq community. Sipekne'katik First Nation is a member of the Assembly of Nova Scotia Mi'kmaq Chiefs but in 2013 chose to represent itself in consultation, as opposed to being represented by the Kwilmu'kw Maw-klusuaqn Negotiation Office. Sipekne'katik First Nation asserts the same rights as other Mi'kmaq communities and holds communal commercial fishing licences in the project area.

New Brunswick

New Brunswick First Nations are signatories to Peace and Friendship Treaties from which the right to a moderate livelihood flows. A formal rights assertion by a New Brunswick First Nation has not been made for offshore Nova Scotia, but groups have indicated that they assert rights to species of importance in the federal

waters of the offshore that may be impacted. The Agency consulted the three New Brunswick First Nations that hold communal commercial fishing licences in fishing zones 4X and 4W:

- St. Mary's First Nation (Maliseet);
- Woodstock First Nation (Maliseet); and,
- Fort Folly First Nation (Mi'kmaq).

Coincident with the comment period for the draft guidelines for the EIS (see Table 2), the Agency provided draft consultation plans to the Kwilmu'kw Maw-klusuaqn Negotiation Office and to Sipekne'katik, St. Mary's, Woodstock and Fort Folly First Nations. No comments were received on any of the draft consultation plans.

The Agency also received a request from the Assembly of First Nations Chiefs in New Brunswick (New Brunswick Assembly) to consult all of its member groups. While there are only three New Brunswick First Nations holding fishing licences in the project area, the right to a moderate livelihood established by the Peace and Friendship Treaties extends to all signatory First Nations and is not exclusive to a reserve's location. The Agency invited the New Brunswick Assembly to provide more information on potential impacts to potential Aboriginal and Treaty rights of its member communities. No specific information was received. The Agency kept the New Brunswick Assembly informed throughout the EA, with the understanding that the Assembly would provide information and comments on behalf of its member nations, should any arise.

Aboriginal groups were invited to participate in the public comment periods on the summary of the project description, draft Guidelines for the EIS, and a plain-language summary of the EIS. The Agency is inviting Aboriginal groups to provide their input on the Draft EA Report (this document). Table 2 provides the dates and durations of the comment periods.

Table 2 Aboriginal and public comment opportunities during the environmental assessment

Document or Subject of Consultation	Dates
Summary of the project description	December 2 to 22, 2013 (20 days)
Draft EIS Guidelines	January 17 to February 16, 2014 (30 days)
EIS/EA report summary	June 6 to July 6, 2014 (30 days)
Draft EA report	February 24 to March 26, 2015 (30 days)

Written comments were received from the five Aboriginal groups identified above during the EA process. In addition, the Agency met with groups as needed to discuss the process and to ensure their concerns were understood. Two meetings with Sipekne'katik First Nation took place in November 2013 (prior to the EA commencement) to explain the EA process and the proposed project. A meeting was held with St. Mary's First Nation in September 2014 to discuss St. Mary's comments on the EIS. The Agency also maintained regular telephone contact with Aboriginal groups to verify that participants were aware of the process as it advanced

and to respond to any questions they might have. The Agency also met with representatives of the New Brunswick Assembly in July 2014 to discuss their role in the EA process.

The Agency supported Aboriginal participation in the EA through its Participant Funding Program. In total, the Agency awarded of $150 173 to reimburse eligible expenses incurred by Aboriginal groups that participated in the EA.

Main areas of concern raised by Aboriginal groups included effects on fish and fish habitat, effects on fishing for communal commercial and food, social or ceremonial purposes, effects of accidents and malfunctions (including concerns with use of dispersants in oil spill response) and compensation in the event of and damages from normal operation or due to accidents and malfunctions. Appendix E contains a complete record of concerns raised by the Aboriginal groups during the EA process, along with the proponent's and Agency's responses. The concerns raised are also discussed in the context of individual VCs throughout Chapter 6. Potential effects of the Project on current use of lands and resources for Aboriginal traditional purposes are described in section 6.2, while potential effects on potential or established Aboriginal or Treaty rights are discussed in Chapter 8. All comments received have been considered in developing this Draft EA report.

4.1.2 *Proponent's Aboriginal consultation and engagement activities*

Throughout the EA process, the proponent met with and provided information to the five Aboriginal groups identified by the Agency. The proponent also commissioned a Traditional Use Study to support the EA. The study was conducted by Membertou Geomatics Solutions and the Unama'ki Institute of Natural Resources. Several sources of information were employed to complete the Traditional Use Study, including:

- Mi'kmaq ecological knowledge;
- archival accounts of Mi'kmaq history and use;
- verification of fishing activities through interviews with communal commercial and traditional fishers; and,
- licences issued by Fisheries and Oceans Canada (from community-based interviews with commercial fishing managers).

The communities of Millbrook, Sipekne'katik and Acadia were the focus for the Traditional Use Study because of their proximity to the project site. Additional communities in Nova Scotia, including Eskasoni, Glooscap and Bear River were later included in the scope of the study at the Agency's request. Also at the Agency's request, the New Brunswick First Nations with identified fishing in the area (Woodstock, St. Mary's and Fort Folly) were asked to participate. All groups with interest in the area were provided with an opportunity to participate in the Traditional Use Study.

4.2 Public Participation

4.2.1 *Public participation led by the Agency*

The Agency provided four opportunities for the public to participate in the EA of the Project by providing comments on:

- the project description,

- the draft EIS Guidelines,
- the summary of the proponent's EIS, and
- the Draft EA Report (current public comment period).

The dates of these participation opportunities are in Table 2. Notices were posted on the Canadian Environmental Assessment Registry Internet Site and advertised through local media.

Groups and individuals that have participated in the EA to date, include environmental organizations, industry organizations, individuals, and Aboriginal organizations. Submissions have been received from:

- the Ecology Action Centre,
- the Seafood Producers Association of Nova Scotia,
- the Maritimes Aboriginal Peoples Council,
- the Maritimes Energy Association,
- the National Audubon Society Board,
- Waterford Energy Services,
- Extreme Spill Technology Ltd, and
- three individuals.

The Agency supported public participation in the EA through its Participant Funding Program. In total, the Agency awarded $17,590 to the Ecology Action Centre and the Native Council of Nova Scotia.

Several public comments expressed general opposition to oil and gas exploration. Other concerns were related to the effects of a blowout, both on the marine environment in general and specifically on Georges Bank, on which there is currently a moratorium on oil and gas activity. Georges Bank is located approximately 120 km west of the project area. There were also concerns about insufficient baseline data in the project area to support effects predictions, and about insufficient follow-up proposed by the proponent to verify effects predictions and the effectiveness of mitigation measures. To address the lack of baseline data, the proponent conducted a seabed survey in the fall on 2014; the results are summarized in sections 5.1 and 6.1.

The Seafood Producers Association of Nova Scotia expressed its view that the fishing and the oil and gas industries can continue to coexist in the Nova Scotia offshore. However, it also raised concerns raised about the need for inter-industry coordination and communication to minimize use conflicts. There were questions about environmental effects and compensation in the event of a large spill, the use of dispersants as part of spill response, and possible operational issues (e.g. gear snagging) associated with wellheads that may be left on the sea bottom after well abandonment. Two oil industry-related companies and organizations expressed support for the Project. Another company expressed concern about the effects of dispersants on the marine environment, if used in spill response, and recommended using mechanical recovery in the event of an oil spill. A selection of public comments submitted in relation to VCs are summarized and discussed in Chapter 6, along with additional information provided by the proponent in response to the comments.

4.2.2 *Public participation activities organized by the proponent*

The proponent's public consultation and engagement activities were aimed at specific sectors such as fishing organizations and special interest groups, with stated objectives to:

- provide current and relevant project information and regular updates of the proposed activities,
- identify stakeholder key areas of interest and concern,
- identify and implement a preferred consultation and engagement process,
- discuss the potential environmental and socio-economic effects of the Project, and the opportunities to reduce and mitigate these effects,
- identify existing activities in the project area, particularly related to commercial and traditional use, and
- establish feedback mechanisms for stakeholders to provide input on project design.

The proponent's engagement activities began in 2012 and initially focused on engaging stakeholders interested in or potentially affected by the Shelburne Basin 3D Seismic Survey. Engagement on the Project began in August 2013 and has involved a variety of methods including, but not limited to:

- project information packages,
- supplier information sessions,
- face-to-face meetings, and
- public project presentations (including speaking engagements at industry associations).

The proponent has stated that it will continue to engage stakeholders throughout the planning process and operational stages of the Project.

4.3 Participation of Federal and Other Experts

Federal departments with specialist information or expert knowledge relevant to the Project provided advice pursuant to section 11 of CEAA 2012 to help determine whether a federal EA was required. They also participated in the review of the Draft EIS Guidelines, the EIS, and provided input into the preparation of the Draft EA Report pursuant to section 20 of CEAA 2012.

The following departments and agencies contributed expert information and knowledge during the EA:

- The Board is responsible for regulating petroleum activities in the Nova Scotia offshore area, including safety and environmental protection. It has expertise in offshore drilling technology, the environmental effects of offshore drilling, and commonly-applied mitigation measures and their effectiveness. The Agency is considering having the Board verify that the Proponent is compliant with CEAA 2012, including a requirement to comply with the conditions in the Decision Statement. The Board has Memoranda of Understanding in place with Environment Canada and Fisheries and Oceans Canada to work together on environmental protection matters.

- Environment Canada contributed expertise related to its mandate under the *Migratory Birds Convention Act*, SARA, the pollution prevention provisions of the *Fisheries Act*, including prohibition of the deposit of deleterious substances into waters frequented by fish, and control of toxic substances under the *Canadian Environmental Protection Act, 1999*. Stemming from its mandate, the Department has expertise in oil spill trajectory modeling and oil spill response. It also has air quality expertise and knowledge of weather, sea state, and climate conditions that could be expected during the Project.
- Fisheries and Oceans Canada provided expertise related to its mandate under the *Fisheries Act* (e.g. fisheries protection), the *Oceans Act*, and SARA (aquatic species). It has expertise related to marine mammals, marine turtles, fish and fish habitat, and effects (and mitigation) of underwater noise on marine species. The Department also has expertise in fate and behaviour of oil and dispersed oil, other chemical discharges and associated biological effects.
- Health Canada participated in relation to its responsibilities for Aboriginal health.
- Transport Canada contributed expertise and knowledge related to marine shipping, navigation and oil spill surveillance based primarily on its mandate under the *Canada Shipping Act, 2001* and the *Navigation Protection Act*.
- Natural Resources Canada contributed expertise on potential effects of the environment on the Project, principally earthquake risk in the drilling area.
- Aboriginal Affairs and Northern Development Canada provided advice in relation to Aboriginal consultation activities conducted by the Agency.

The Agency also notified and invited comments from the Parks Canada Agency due to the Sable Island National Park Reserve being located within the RAA for the Project (approximately 220 km northeast of the project area).

5 Geographical Setting

The project area is a remote, open-ocean location with intermittent human presence associated with activities such as fishing, shipping, military exercises, and research. Development activities closest to the project area are two offshore natural gas production facilities: the Deep Panuke Offshore Gas Development Project (Deep Panuke Project) and the Sable Offshore Energy Project. These are located near Sable Island, approximately 160 and 180 km northeast of the project area, respectively.

5.1 Biophysical Environment

The Regional Assessment Area (RAA) is rich in marine life, including numerous fish and bird species, mammals (e.g. whales), and turtles. Available benthic data for the Scotian Slope suggests that the sea bottom in the project area is relatively barren, with low abundance and diversity of benthic fauna. Results of deepwater benthic surveys conducted in 2001 and 2002 on the Western Scotian Slope and reported in the BEPCo. Canada Company's EA Report for Exploratory Drilling on EL 2407 (BEPCo, 2004) indicate the presence of stony cup coral (Flabellum sp.), sea whips (Order Gorgonacea), and sea pens on soft sediments in water depths ranging from 400 to 2200 m. These corals may therefore be present in the project area.

There is generally a lack of benthic data for most of the Nova Scotia offshore. During the fall of 2014, the proponent collected seabed samples and photographs near five potential drilling locations. Results indicated that more than 80 percent of the sediment consists of silts and clays. No chemical parameters of concern were identified, suggesting that the benthic environment is relatively pristine. The results of the benthic invertebrate analysis indicate that the most species-diverse and relatively abundant organisms present in the sediment are polychaetes, followed by crustaceans and molluscs. The benthic habitat at each site is generally sparse with few epifauna. The types of macrofauna observed in the photos included uncommon occurrences of stony coral, octocoral, sea cucumbers, large blue nudibranchs and sponge species (e.g. stony cup coral, sea pen, sea whip, soft coral, and potential glass sponge). There were no aggregations or communities of corals, sponges, or other benthic epifauna observed at the site, nor was any type of macrofauna observed to be common or abundant. The types of organisms observed to date during the survey are generally consistent with those observed during benthic habitat characterization surveys previously undertaken in proximity to the project area (as summarized in the EIS) and did not include any unusual species that have not been previously observed on the Scotian Shelf and Slope. None of the species observed are considered species of conservation interest (i.e. listed as endangered, threatened, or special concern under SARA or assessed by COSEWIC).

5.1.1 *Atmospheric Environment*

The climate of the project area is affected by the varying air streams that converge in the region. Fog is relatively common in spring and summer months and tropical storms frequent the area in late summer and through autumn.

There are no air quality data available directly within the project area, but based on the lack of air pollutant sources in the vicinity, air quality is expected to be generally good. Historically, air quality in Nova Scotia has been adversely affected by air masses moving in from the north-eastern United States of America. However, improvements have occurred in recent years. Available data from an air quality monitoring station on Sable

Island, which is close to the Deep Panuke and the Sable Offshore Energy Projects indicate that the ambient air quality in the area is good most of the time, with the applicable limits for ozone being occasionally exceeded. Ozone is a secondary pollutant formed from the action of sunlight on nitrogen oxides and hydrocarbons; elevated ozone is typically associated with regional-scale emissions and is likely unrelated to the nearby natural gas production projects. Other parameters monitored at the Sable Island Air Station include particulate matter with diameters less than or equal to 2.5 microns ($PM_{2.5}$), nitrogen dioxide (NO_2), and sulphur dioxide (SO_2).

5.1.2 *Water quality*

Water temperatures on the Scotian Shelf and in the Gulf of Maine are among the most variable in the North Atlantic. Based on data collected in May 2010 by the Bedford Institute of Oceanography under the Atlantic Zone Off-Shelf Monitoring Program, surface temperatures on the Scotian Slope along the sampling line were as high as 20 degrees Celsius, while temperatures found in deeper waters ranged from about 4 degrees at 1500 metres to 2.5 degrees at 3000 m. Temperatures as low as -2 degrees Celsius were measured at depths greater than 4500 m.

Salinity is an important characteristic of seawater and influences the presence of marine life. A salinity profile taken during May 2010 depicts salinity decreasing with depth (and temperature), with values above 36 practical salinity units near the surface and approximately 35 practical salinity units in the water depths at which drilling is proposed.

Measured pH values in surface waters on the Scotian Shelf ranged from 8.05 to 8.11, with intermediate and bottom waters ranging from 7.89 to 8.03 based on data reported in the *Deep Panuke Project Comprehensive Study Report* (Encana 2002). Data collected in 1970 in the vicinity of the project area indicates pH values ranging from 7.82 to 8.06 (DFO pers. comm. 2014). It is expected that pH values in the project area and LAA would be comparable to those referenced for the Scotian Shelf.

The *Deep Panuke Project Comprehensive Study Report* found a paucity of data on suspended particulate matter in the region, referencing data collected in 1970 on Emerald Bank. These data indicated a concentration of 5.5 milligrams per litre (mg/L) at the surface, increasing to 10.1 mg/L at 20 m and then decreasing to 4.0 mg/L below this depth. Suspended particulate matter values in the project area are expected to be lower than those measured in the shallow waters on the Bank.

5.1.3 *Acoustic Environment*

Underwater noise is an important factor when assessing effects on certain species, especially marine mammals that rely on sound to communicate, locate food or detect threats. Sound transmits far better in water than in air. The ocean is a naturally noisy environment with ambient noise escalating as the wind and sea state rise. In addition, the Scotian Shelf is an active economic area with shipping, commercial fishing, oil and gas, defence, construction, marine research, and tourism that all contribute to the ambient noise in the area. Although there has not been a formal long-term program of monitoring ambient noise on the Scotian Shelf, several studies over the past 50 years, which have characterized its general ambient noise characteristics, show that there is considerable spatial and temporal variation in ambient noise levels. Wind and wave generated noise is generally higher than predicted for average sea states. Noise can be expected to be higher close to fixed developments and sites where there are various mechanical sources emitting noise concurrently.

5.2 Human Environment

There is no permanent or semi-permanent human presence in the project area. There is transitory human presence on vessels operating in the area for various purposes, including fishing, shipping, oil and gas surveys, military (naval) manoeuvres, and scientific research.

6 Predicted Effects on Valued Components

6.1 Fish and Fish Habitat

6.1.1 *Proponent's assessment of environmental effects*

The project area is typical of conditions along the Scotian Shelf break and Scotian Slope, with many species of fish frequenting the area. Marine benthic, demersal, and pelagic fish species and habitat are present in and around the project area, Local Assessment Area (LAA), and Regional Assessment Area (RAA). Key fish species of commercial, recreational, or Aboriginal value that are most likely to occur in the RAA are listed in Appendix E. Twenty-eight fish species of conservation concern are found in the RAA. A list of these can also be found in Appendix E. Under the *Fisheries Act*, marine mammals and seas turtles are included in the definition of "fish"; however, for this EA they are assessed as a separate VC (see section 6.4).

Eggs and larvae of the majority of fish species of commercial, recreational, or Aboriginal fisheries that may occur in the vicinity of the project area tend to be found on the banks of the Scotian Shelf and in near-shore waters rather than on the Slope. In particular, most larval fish species were found to occur along the banks of the Scotian Shelf from Emerald Bank to Sable Island, with some occurring even farther east (towards the Laurentian Channel), and others found in near-shore waters. Acadian redfish, deepwater redfish, roundnose grenadier, silver hake, and witch flounder are fish species potentially having eggs or larvae located on the Scotian Slope and in the vicinity of the project area. The eggs or larvae of these species are present on the Scotian Shelf and Slope from June to October (silver hake), April to August (Acadian redfish and deepwater redfish), May to December (witch flounder), and in some cases, year-round (roundnose grenadier).

Available benthic habitat mapping in the vicinity of the project area suggests the presence of a low energy, Holocene mud and clay benthos with Ophuroid, burrowing anemone, and sea urchin as typical benthic fauna likely to be encountered. A seabed survey was conducted in summer and fall 2014. The types of macrofauna observed in the photos included uncommon occurrences of stony coral, octocoral, sea cucumbers, large blue nudibranchs and sponge species (e.g. stony cup coral, sea pen, sea whip, soft coral, and potential glass sponge). Other epifauna such as criniods, red shrimps, small crabs, and squid were also uncommon, with brittle stars and gadoid fish being more occasionally observed. There were no aggregations or communities of corals, sponges, or other benthic epifauna observed, nor was any type of macrofauna observed to be common or abundant.

The proponent focused on how the Project could change the risk of fish mortality or physical injury and how it could change the quality and use of fish habitat in its assessment of the Project's potential effects on fish and fish habitat.

Discharges to the marine environment will occur during the approximately 130-day duration of each of the potential wells. Discharges into the water column include:

- drilling waste (spent water-based drilling fluid and drill cuttings and cuttings with synthetic-based mud adhered), and
- liquid wastes, including:
    - produced water (during testing),

- grey and black water,
- bilge and deck drainage water,
- fluids used in the blow-out preventer,
- cooling water,
- ballast water,
- well treatment fluids, and
- fire control system test water.

All discharges into the marine environment will be in accordance with the *Offshore Waste Treatment Guidelines* (NEB et al, 2010). For many of the liquid wastes, the primary contaminant of concern is hydrocarbons and there are performance targets specified in the *Offshore Waste Treatment Guidelines* for residual oil concentration (NEB et al, 2010). However, of the expected discharges from exploration drilling, drilling waste (drill cuttings and spent drilling fluid) constitutes by far the largest volume. The *Offshore Waste Treatment Guidelines* allow untreated discharge of spent water-based drilling fluid and associated cuttings (NEB et al, 2010). They prohibit the discharge of spent synthetic-based drilling fluid, but permit the discharge of associated cuttings, provided they are treated to limit the amount of synthetic-based fluid on the cuttings to 6.9 percent or less by wetted weight. For a typical well, as depicted in Figure 2, the estimated volumes of drilling waste are given in Table 3 below.

Table 3 Estimated Volumes of Drilling Waste Discharges into the Marine Environment

Type of discharge	Volume per well (cubic metres)	Total for seven wells (maximum proposed) (cubic metres)
Cuttings plus drilling fluid from water-based drilling	848	5936
Cuttings from synthetic-based drilling	579	4053
Synthetic-based drilling fluid retained on cuttings from synthetic-based drilling (after treatment)	257[1]	2056
TOTALS	1684	12,045

Water-based drilling fluid consists of a suspension of particulate minerals, dissolved salts, and organic compounds in freshwater, seawater, or concentrated brine. Other than water, the most abundant ingredients are barite (used as a weighting agent), salts, and bentonite viscosifier. The primary additives to synthetic-based

[1] Value is higher than was presented in the proponent's EIS (43 cubic metres), due to an error. The updated value was provided by the proponent on January 16, 2015. Fisheries and Oceans Canada, Environment Canada and the Board advised the Agency that this change does not affect the conclusions in the EIS

drilling fluid are emulsifiers, wetting agents, thinners, weighting agents, and gelling agents. Additives are typically used in small amounts and are considered non-toxic.

Drill waste discharges can result in temporary elevated levels of total suspended solids, as finer sediment from drill cuttings may become entrained in the water column; however, studies have predominantly focused on effects on the marine benthos. The proponent states that most field studies and environmental effects results have shown:

- no evidence of ecologically significant bioaccumulation of metals and petroleum hydrocarbons,
- no evidence of toxicity effects associated with water-based drilling fluid constituents,
- no or minimal short-term effects on zooplankton communities, and
- effects on benthic macro- and mega-faunal communities restricted to an approximately 100 m radius from the well.

The proponent states that the measurable adverse effects are primarily related to physical disturbance of the water column and benthic habitat, particularly when large amounts of solids accumulate on the seafloor causing burial and suffocation of benthic species. This can occur even when the discharge is in compliance with the *Offshore Waste Treatment Guidelines* (NEB et al, 2010). Effects of smothering can include mortality, reduced growth of some species, reduced larval settlement, and a change in fauna composition. However, recovery of other sites previously affected by drill cuttings (including those containing diesel-base drilling fluids that are no longer used) has been shown to occur in as little as four years.

Sediment dispersion modeling conducted for the Project based on typical well parameters shows that for each well approximately 1.89 hectares (ha) of benthos (or 155 m from the discharge point) will experience drill waste deposition thicknesses at or above 10 millimetres (mm), which is an average thickness shown to cause smothering of benthic communities comprised of sedentary or slow moving species. Less thick deposition, down to 1 mm, is predicted to extend up to 681 m from the discharge site and occupy a maximum area of 71.18 ha. Deposition dispersion and thickness may vary from well to well dependant on specific well design and conditions of the receiving environment. The proponent has proposed cuttings monitoring during riserless drilling and post-drilling visual inspection of cuttings piles prior to leaving the site to verify modeling predictions of thickness and areal extent within the vicinity of the wellhead. Additionally, the presence or absence of sensitive features such as aggregations of corals or unique benthic habitat at selected drilling locations will be verified by a survey conducted prior to drilling using a remotely-operated vehicle. Extensive seabed surveys of the potential drilling locations that were conducted in late 2014 do not show such features; therefore it is considered unlikely that they will be encountered. If they are observed, the proponent would consult with relevant agencies to determine the need for any operational mitigation, such as relocating the drilling unit where technically feasible, prior to commencing drilling operations.

Marine water quality is not expected to be measurably changed by the Project, except in close proximity to discharge points. Chemicals, including constituents of drilling fluids, will be screened using the *Offshore Chemical Selection Guidelines* (NEB et al. 2009) to promote using lower-toxicity chemical alternatives. Routine discharges may also affect habitat quality to the extent that they cause sensory disturbance that triggers behavioural responses (e.g. change in swimming patterns) in fish within the LAA.

Impacts of Noise

A change in habitat quality could result from underwater noise emissions from drilling unit operation, vertical seismic profiling surveys, support vessel operations, and well abandonment. Effects may include masking of certain frequency ranges and disturbance or displacement of fish.

Fish within the LAA may be subject to an increased risk of mortality or physical injury due to underwater noise emissions during certain project activities. Vertical seismic profiling surveys are estimated to emit the highest sound level of project activities and components and are expected to occur for a period of one day per well, if required. Based on the predictive sound modeling conducted for Shell's Shelburne Basin 3D Seismic Survey, sound levels from vertical seismic profiling surveys could cause physical injury to or mortality of fish located within an 80 m radius of the well during vertical seismic profiling. The majority of motile fish species are expected to avoid underwater noise at lower levels than levels at which injury or mortality would occur and thereby likely avoid physical effects. Mortality of fish eggs and larvae could also occur within a few metres of the seismic source; however, the diversity and abundance of fish eggs and larvae is expected to be low in the project area and surrounding LAA. The proponent will adhere to procedures outlined in the *Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment* to mitigate impacts of seismic sound. Overall, the proponent predicts that any mortality of fish eggs and larvae attributed to the Project would be negligible relative to total amount present in the RAA and well within the natural range of variability.

The proponent has committed to implementing additional mitigation measures as identified in Appendices A and B. The proponent predicts that, with the application of proposed mitigation, the residual environmental effects of the Project on fish and fish habitat are unlikely to be significant

6.1.2 *Views expressed*

Federal Authorities

Fisheries and Oceans Canada raised concerns regarding the discharge of drilling waste and the lack of information about the benthic environment in the project area. The Department also requested further information on the length of time it would take for the benthic environment to return to baseline conditions, given that most available monitoring data is from shallow-water high-energy environments, unlike the Project, which will take place in a deep-water, low-energy setting. The proponent acknowledged that limited information exists about the location and water depths at which the Project will take place, and explained it accounted for this by taking a conservative approach in its modeling. The proponent also undertook a seabed survey in 2014 to collect photographic and other data around five potential drilling locations, to address the lack of benthic baseline information. The results of the survey are discussed in sections 5.1 and 6.1.1.

Fisheries and Oceans Canada asked the proponent to describe how it will collect sediment deposition and acoustic monitoring data during and after drilling operations and how the data will be used to verify effects predictions. Fisheries and Oceans Canada also requested that details of the monitoring programs be submitted to it for review. The proponent is currently examining opportunities for coordinating data collection during drilling operations to validate and further characterize the predicted sound effects, and it anticipates supporting an opportunity to collect sound data during drilling operations. The proponent will validate its sediment deposition modelling predictions during operational drilling activities using a remotely-operated vehicle.

The Agency asked the proponent to compare its approach to requirements in other jurisdictions and to provide additional rationale for its follow-up plans for the Project. The proponent's response showed that very few jurisdictions have follow-up environmental effects monitoring requirements for exploration drilling. However, environmental compliance monitoring and spill-related follow-up requirements exist in most jurisdictions. Follow-up has not typically been required for exploration drilling in the Canadian offshore, based on the limited duration and predicted extent of its effects. The proponent's approach to follow-up for Project is consistent with that applied elsewhere in Canada and in other jurisdictions.

Aboriginal Communities

First Nations raised concerns about effects on certain species, such as Atlantic salmon, Atlantic herring, gaspereau, and sea urchin, which are important for food, social, and ceremonial fisheries. Aboriginal communities also raised concern about potential effects on sea urchin harvesting. The proponent noted that sea urchin harvesting takes place primarily in the nearshore and coastal environment and therefore would not likely be affected by planned operations in the project area.

In relation to Atlantic herring, Atlantic salmon, and gaspereau, the proponent provided information to demonstrate that project effects would be temporary, localized and reversible. In most studies to date of effects from seismic noise, responses by fish include startle responses, swimming away from the source, swimming towards the source, tightening of schools, downward distributional shifts, and eventual habituation. Potential damage to larvae and eggs can occur if they are located at very close range to the sound source (less than 15 m) although mortality rates are very low in comparison to natural mortality. The effects of marine discharges would be limited to the immediate area of the drilling unit due to their relatively small volumes and temporary nature. To be conservative, the effects assessment focused more on resident species, but transient species such as gaspereau and Atlantic salmon, which could be migrating through the LAA, could experience changes in habitat quality, albeit on a limited scale.

The Maritime Aboriginal Peoples Council raised concern about effects on corals and sponges, particularly the glass sponge *Vazella pourtalesi*, also known as the Russian hat sponge. The proponent's 2014 seabed survey near potential drilling locations found few individuals and no concentrations of corals or sponges, nor any individual corals or sponges that are of conservation concern. There are no known occurrences of the Russian Hat sponge near the project area. There are two known areas on the eastern Scotian Slope (Emerald Basin and Sambro Bank) where globally-unique concentrations of Russian hat sponges occur. These are approximately 180 km north of the project area, well outside the predicted zone of impact on the sea bottom. The proponent has committed to carrying out pre-drill visual inspections of the drill location and to consult with the relevant agencies if any sensitive features are observed to determine the need for any operational mitigation prior to commencing drilling operations.

Public

The Seafood Producers Association of Nova Scotia expressed concern about possible serious harm to fish or fish habitat. Fisheries and Oceans Canada reviewed the EIS with respect to effects on fish and fish habitat and has concluded that impacts on fish and fish habitat are not likely to be significant.

The Ecology Action Centre asked for monitoring of benthic impacts and associated dispersion of drilling waste, and noise propagation. As described in section 6.1.3.1, the proponent is currently examining opportunities for

coordinating data collection during drilling operations to validate and further characterize the predicted sound effects, and it anticipates supporting an opportunity to collect sound data during drilling operations. In addition, it will validate its sediment deposition modelling predictions during operational drilling activities using a remotely-operated vehicle.

The National Audubon Society asked if marine benthos would be smothered by drill waste in a larger radius than predicted due to ocean currents. Similar concerns were expressed by Aboriginal groups. The proponent indicated that the modeling used the best available ocean currents data set to simulate oceanic circulation in the project area. The proponent also provided information showing that the vast majority of cuttings discharged at surface from synthetic-based drilling would quickly settle to the bottom with minimal spreading, due to their weight. Available benthic information depicts a low-energy environment at the sea bottom, consistent with what is expected at the depths where the project drilling will occur. Fisheries and Oceans Canada is satisfied with the dispersion modelling conducted for the Project, but requested that results be confirmed post-drilling, to which the proponent has committed.

6.1.3 *Agency analysis and conclusion*

Primary impacts to fish and fish habitat include effects associated with discharges into the marine environment (e.g. smothering of up to 1.89 ha of benthos at each wellsite) and physiological and other effects of noise from vertical seismic profiling (e.g. physical injury to or mortality of fish, eggs, and larvae in proximity to the seismic source). The Agency considers the treatment of wastes in accordance with discharge limits set out in the *Offshore Waste Treatment Guidelines* an important mitigation for effects on benthic habitat, particularly for drilling waste. In addition, following the procedures outlined in the *Offshore Chemical Selection Guidelines* will promote use of the lower toxicity chemicals and further reduce the potential for significant adverse environmental effects.

The Agency further recommends that follow-up be undertaken to verify modeled predictions for drilling waste dispersion. Visual inspection of the seabed immediately prior to drilling is an important mitigation measure for avoiding sensitive seabed features such as corals. Provided that sensitive and rare features are avoided, impacts of the Project will be minor within the context of the Scotian slope.

The Agency notes that environmental effects monitoring programs have been conducted in the Nova Scotia offshore for drilling at the Sable Offshore Energy Project and the Deep Panuke Project. However, these projects are located in the relatively shallow waters of the Sable Bank and the Agency believes it is important to improve understanding of operating in deep-water conditions.

The Agency has identified the following mitigation measures as necessary to prevent significant adverse effects on fish and fish habitat.

- Ensure all discharges from the drilling unit into the marine environment are in accordance with *Offshore Waste Treatment Guidelines* (NEB et al 2010).
- Apply the *Offshore Chemical Selection Guidelines* (NEB et al 2009) to select lower toxicity chemicals that would be used and discharged into the marine environment, including drilling fluid constituents, and submit any necessary risk justification (Step 10 of the Guidelines) to the Board for acceptance prior to use.

- Ensure all discharges from the support vessels into the marine environment comply with the *International Convention for the Prevention of Pollution from Ships* (MARPOL).
- Conduct a pre-drill survey at each wellsite immediately prior to drilling to identify any aggregations of habitat-forming coral or sponge species or species of conservation concern. If aggregations of species or species of conservation concern are found during the pre-drill survey, move the drilling unit to avoid affecting them, if technically feasible. If not technically feasible, consult with the Board and Fisheries and Oceans Canada prior to commencing drilling to determine an appropriate course of action.

The Agency has also identified the following measures as part of a follow-up program to ensure the effectiveness of mitigation measures and to verify the accuracy of predicted effects on fish and fish habitat:

- Measure the concentration of synthetic-based drilling fluids retained on discharged drilling cuttings to verify that the discharge meets the limits set out in the *Offshore Waste Treatment Guidelines*; report test results to the Board and adjust treatment, if necessary.
- Validate sediment (drill waste) deposition modelling predictions of the thickness and areal extent of cuttings during drilling and after drilling by means such as a remotely-operated vehicle. Report results to the Board and Fisheries and Oceans Canada.

Taking into account the implementation of the mitigation measures and follow-up measures described above, the Agency is of the view that the project will not result in significant effects on fish and fish habitat.

6.2 Current Use of Lands and Resources for Traditional Purposes by Aboriginal People

6.2.1 *Proponent's assessment of environmental effects*

The Nova Scotia offshore is an important area for Aboriginal food, social, and ceremonial fishing and Aboriginal commercial fishing. Communal food, social, and ceremonial licences are held by 16 First Nations and the Native Council of Nova Scotia. Eleven of these communal licences are held by groups in Nova Scotia while the remaining five are held by groups in New Brunswick.

Fisheries in the project area pursue mainly large pelagic species such as tunas, swordfish and sharks. Lobster and herring were identified as currently being harvested for food, social, and ceremonial purposes within the Local Assessment Area (LAA) and several species (cod, herring, halibut, cusk, gaspereau, haddock, monkfish, pollock, red hake, silver hake, white hake, lobster, scallop, Jonah crab, sea urchin and marine worms) were identified in the traditional use study as being harvested for food, social, and ceremonial purposes within the Regional Assessment Area (RAA). American eel and Fundy Atlantic Salmon are particularly important to New Brunswick First Nations.

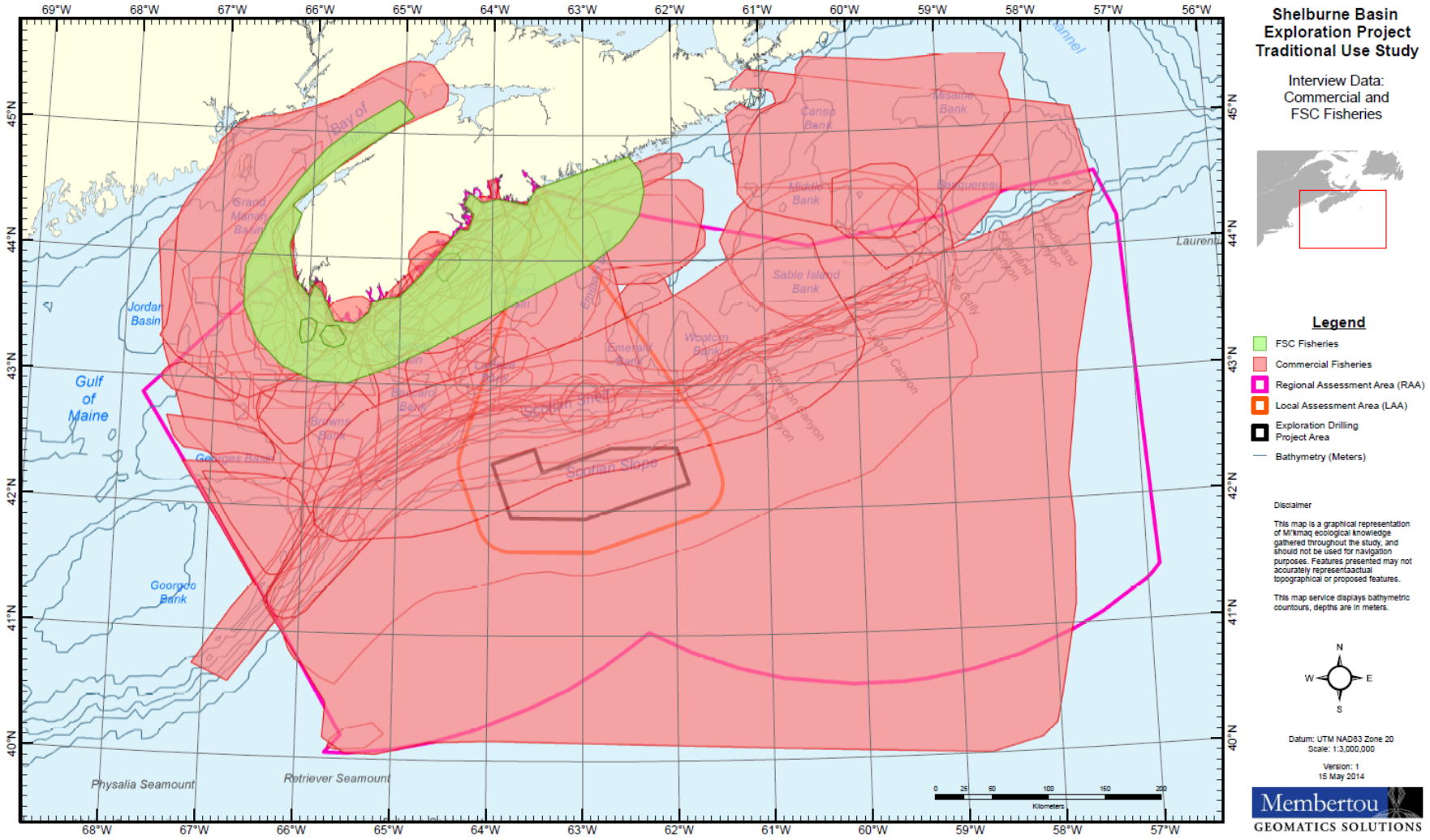
There are 144 communal commercial licences held by Aboriginal groups in the Maritimes Region. These licences are for crab, groundfish, hagfish, swordfish, bluefin tuna, mackerel, and lobster. Additional species which may be harvested in the RAA include Atlantic cod, Atlantic herring, northern shrimp, pollock, sharks and scallop. Many of these same species are fished by non-Aboriginal commercial fishers.

Membertou Geomatics and Unama'ki Institute of Natural Resources undertook a traditional use study that provided information on Aboriginal fishing activities in the RAA, with a focus on waters surrounding the project area. This scope of work included conducting a background review of commercial licences, and food, social, and ceremonial agreements, and interviews with elders, fishers, and fisheries managers from a representative subset of First Nations in Nova Scotia and New Brunswick, and the Maritimes Aboriginal Peoples Council. Based on these interviews, the traditional use study included information on target species, general fishing areas, and fishing seasons, along with any additional information pertaining to fish or sensitive areas. Figure 4 shows the locations of Aboriginal communal commercial and food, social, and ceremonial fisheries in and around the RAA.

The traditional use study reports that those interviewed did not identify any food, social, and ceremonial fishing activity in the project area. However, the traditional use study also acknowledges that some fishing activity may have been missed due to the interview sample size and that the project area may be accessed for future food, social, and ceremonial fisheries needs. The proponent therefore took a precautionary approach and assumed that food, social, and ceremonial fisheries could potentially occur in the project area, the LAA, and the RAA. It also acknowledged that species fished for food, social, and ceremonial purposes could be harvested outside the RAA but could potentially interact with the Project if they are migrating through the project area or LAA.

Commercial harvesting by the Mi'kmaq of Nova Scotia and Mi'kmaq and Maliseet of New Brunswick in the project areas targets many of the same species fished by non-Aboriginal commercial fishers, including tunas, sharks, swordfish, cod, haddock, halibut, and herring. As described in section 6.3 general fisheries landings data indicate that there is relatively little commercial fishing activity directly within the project area, but there is considerable fishing to the north on the upper part of the Scotian Slope as it transitions into the Scotian Shelf.

Figure 4 Location of Commercial and Food, Social, and Ceremonial Fisheries in Relation to the Project Area



Source: Traditional Use Study, Membertou Geomatics and UINR

According to the proponent's analysis, the only known Aboriginal current use in areas that could be affected by the Project is fishing. The potential changes in the environment that could affect Aboriginal fishing are closely linked to effects on fish and fish habitat. Thus potential environmental effects of the Project on Aboriginal fisheries, and associated mitigation measures, are similar to those for commercial fisheries, which are articulated in section 6.3.

The proponent stated that effects could occur as a result of:

- the presence of the drilling unit (including lights, safety zone, and underwater noise);
- discharges and emissions, including drilling fluids and drill cuttings;
- the presence and operation of the drilling unit;
- vertical seismic profiling;
- support vessel operations (including transit and transfer activities); and
- well abandonment (gear damage or loss, leakage from wells where hydrocarbons were encountered).

Temporary and localized changes to the fisheries resource, such as sensory disturbance that may trigger behavioural responses in targeted species, may result in a change in catch rates for Aboriginal fishers should they be fishing near the drilling unit or vertical seismic profiling operations. The establishment of a 500 m radius safety zone around the drilling unit may displace fishing activity; given the limited size of this exclusion zone and low fishing activity in the project area, the proponent considers this effect to be low. There is also a low potential for gear loss or damage. If it occurs, it would be compensated in accordance with the Board's *Compensation Guidelines with Respect to Damages Relating to Offshore Petroleum Activity*.

The proponent committed to a number of measures (Appendices A and B) that will mitigate the Project's effects on fish and fish habitat (section 6.1) and commercial fisheries (section 6.3). The proponent predicts that these measures will, in turn, mitigate effects of the Project on current use of lands and resources for traditional purposes by Aboriginal people. Key additional mitigation measures committed to by the proponent include:

- development and implementation of a Fisheries Communications Plan to facilitate coordinated communications with Aboriginal fisheries representatives for routine project activities and components. The plan will also include communications during emergency situations such as oil spills;
- Notices to Mariners and Notices to Shipping regarding the locations of the drilling operations so that these can be avoided; and
- continued engagement throughout the Project.

Given the localized nature and short duration of planned activities, the mitigation that will be implemented and the availability of other suitable fishing areas nearby, the proponent predicted that residual environmental effects on current Aboriginal use of lands and resources for traditional purposes will not be significant.

6.2.2 *Views expressed*

Aboriginal Groups

Key issues raised during Aboriginal engagement for the Project include general concern about the effects on fisheries, fish and fish habitat, the ecological significance and biodiversity of the RAA, its use by commercial or other important fish species during various life stages, its importance for migration and the potential presence of species that represent the primary food source for commercially or culturally important species.

Aboriginal communities commented on the need for the proponent to communicate its plans and coordinate its operations with fishing activities in the project area. The proponent has committed to continue engagement with Aboriginal communities as the Project advances, and to develop and implement a Fisheries Communications Plan with input from Aboriginal fishers.

Aboriginal communities also noted that the 500-metre safety zone around the drilling unit may interfere with fishing vessel manoeuvrability in the area and would be off limits to fishing. The proponent indicated that the safety zone would temporarily occupy a very small portion of the available fishing area and its location will be advertised in a Notice to Mariners, and as a notification under the Fisheries Communications Plan.

Woodstock First Nation and Fort Folly First Nation asked about long-term monitoring of abandoned wells in which hydrocarbons were encountered and the potential for leakage. The proponent noted that hydrocarbons may not be encountered and that abandonment plans for all wells are required by the Board, in accordance with regulatory requirements. Plans must demonstrate that every well that is abandoned can be readily located and is left in a condition that provides for long-term integrity. The proponent will engage Aboriginal fisheries representatives when developing its abandonment plans. The proponent stated that no long-term monitoring is planned or usually required for abandoned exploration wells. Further discussion of well abandonment can be found in Chapter 2 and section 6.1 of this report.

St. Mary's First Nation asked how effects on Aboriginal fisheries (commercial and food, social, and ceremonial) would be monitored and assessed to test predictions and the efficacy of any implemented mitigation measures. It also asked what proposed adaptive management measures the proponent has in place, or plans to have in place, should unexpected impacts on Aboriginal commercial or traditional fishing begin to materialize as a result of the proposed project. The proponent indicated that its analysis of planned project activities did not predict significant effects on current use for traditional purposes and expressed high certainty in this conclusion, based its experience with and monitoring results from past drilling projects. The proponent also noted the relatively short duration of exploration wells and stated that a follow-up program specific to Aboriginal fisheries is not warranted. However, follow-up is planned for effects on fish habitat (visual monitoring of drill cuttings).

Concerns were expressed in relation to the potential effects of malfunctions and accidents (including the use of dispersants) on special areas, fishing and the marketability of Nova Scotia seafood products, as well as oil and ice interactions, and compensation, as discussed in Chapter 7. A summary of comments from Aboriginal groups is presented in Appendix E.

6.2.3 *Agency analysis and conclusion*

There is a strong link between fisheries and fish and fish habitat. The mitigation measures planned for fish and fish habitat and for commercial fishing will also mitigate effects on Aboriginal fisheries, which is the only known current use.

The Agency has identified the following additional mitigation measures as necessary to prevent significant adverse effects on the current use of lands and resources for traditional purposes by Aboriginal peoples.

- Engage with Aboriginal and commercial fishers to minimize use conflicts between the Project and fishing activities. Develop and implement a Fisheries Communications Plan to address communications prior to and during drilling, testing and abandonment. The plan will include procedures to notify fishers a minimum of two weeks prior to the start of each well, and procedures to communicate with fishers in the event of an accident or malfunction.
- Ensure that details of 500 m safety exclusion zones, and the locations of abandoned wellheads if left on the seafloor, are published in Notices to Mariners and provided in Notices to Shipping.
- Prepare a well abandonment plan, including consultation with Aboriginal and commercial fishers if it is proposed that a wellhead be abandoned on the seafloor. Submit the well abandonment plan to the Board for approval 30 days prior to abandonment of each well.

As described in section 6.1.4, the Agency also recommends that the proponent measure the thickness and extent of drilling waste during and at the end of drilling to confirm model predictions and provide results to the Board and Fisheries and Oceans Canada.

The Agency notes that any disruption to fishing as a result of drilling, testing and abandonment of a well will be limited to the durations of those activities and to a very small portion of the area available for fishing. The Agency also recognizes the proponent's commitment to adhering to the *Compensation Guidelines with Respect to Damages Relating to Offshore Petroleum Activity*.

Taking into account the implementation of the mitigation measures and follow-up measures described above, the Agency is of the view that the project will not result in significant effects on current use of lands and resources for traditional purposes by Aboriginal people.

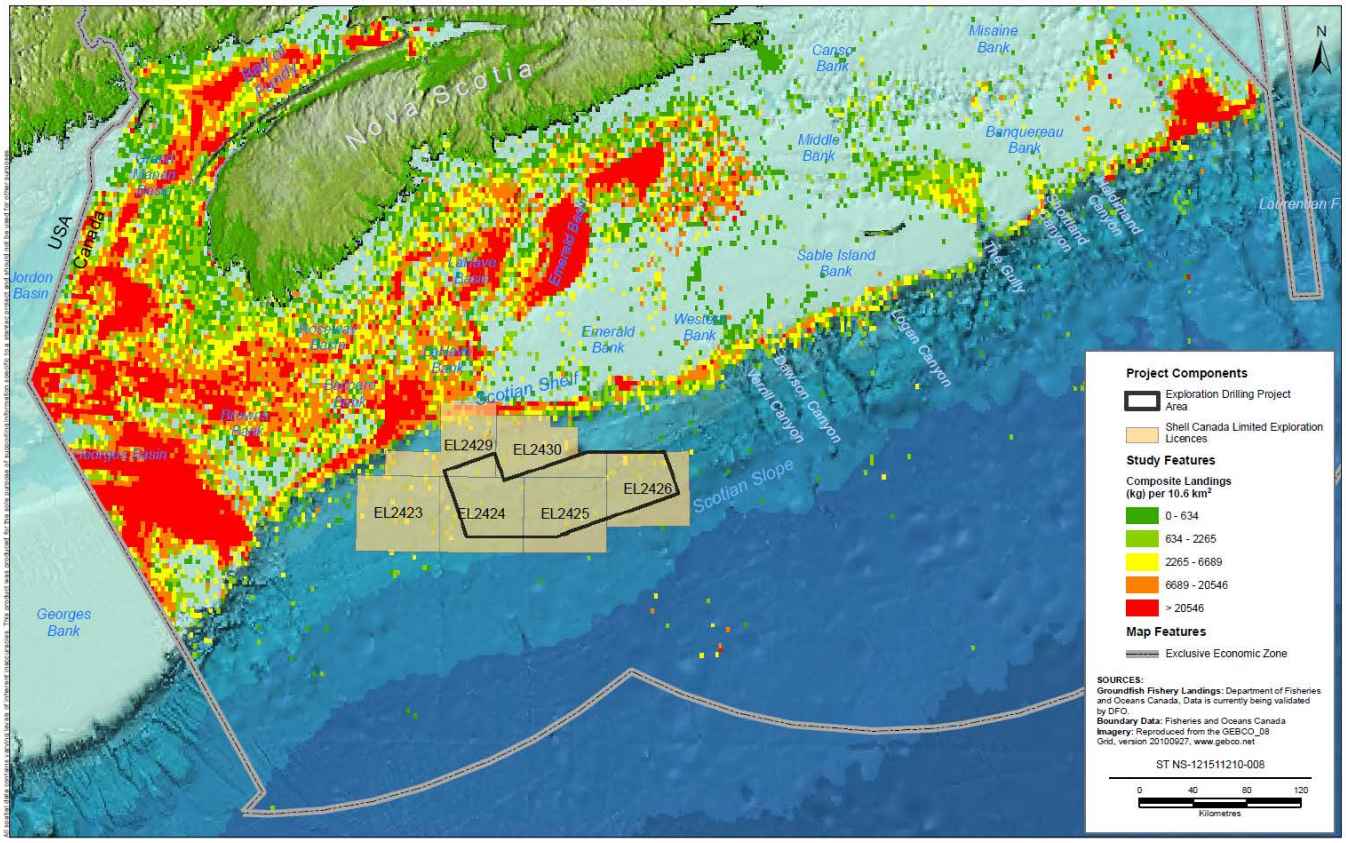
6.3 Commercial Fisheries

6.3.1 *Proponent's assessment of environmental effects*

Fisheries landings data from Fisheries and Oceans Canada indicate that there is relatively little fishing activity directly within the project area, but there is considerable fishing to the north on the upper part of the Scotian Slope as it transitions into the Scotian Shelf. There is a productive harvesting area approximately 50 km northwest of the project area between Baccaro and LaHave Banks. LaHave Bank is partly within the Local Assessment Area (LAA), while Baccaro Bank is outside the LAA. Harvesting in the LAA is primarily focused on Atlantic halibut, cod, haddock, pollock, cusk, flatfish, redfish, white hake, wolfish, and monkfish with limited fishing for crab and lobster. Within the project area fishing is primarily for large pelagic species such as tunas,

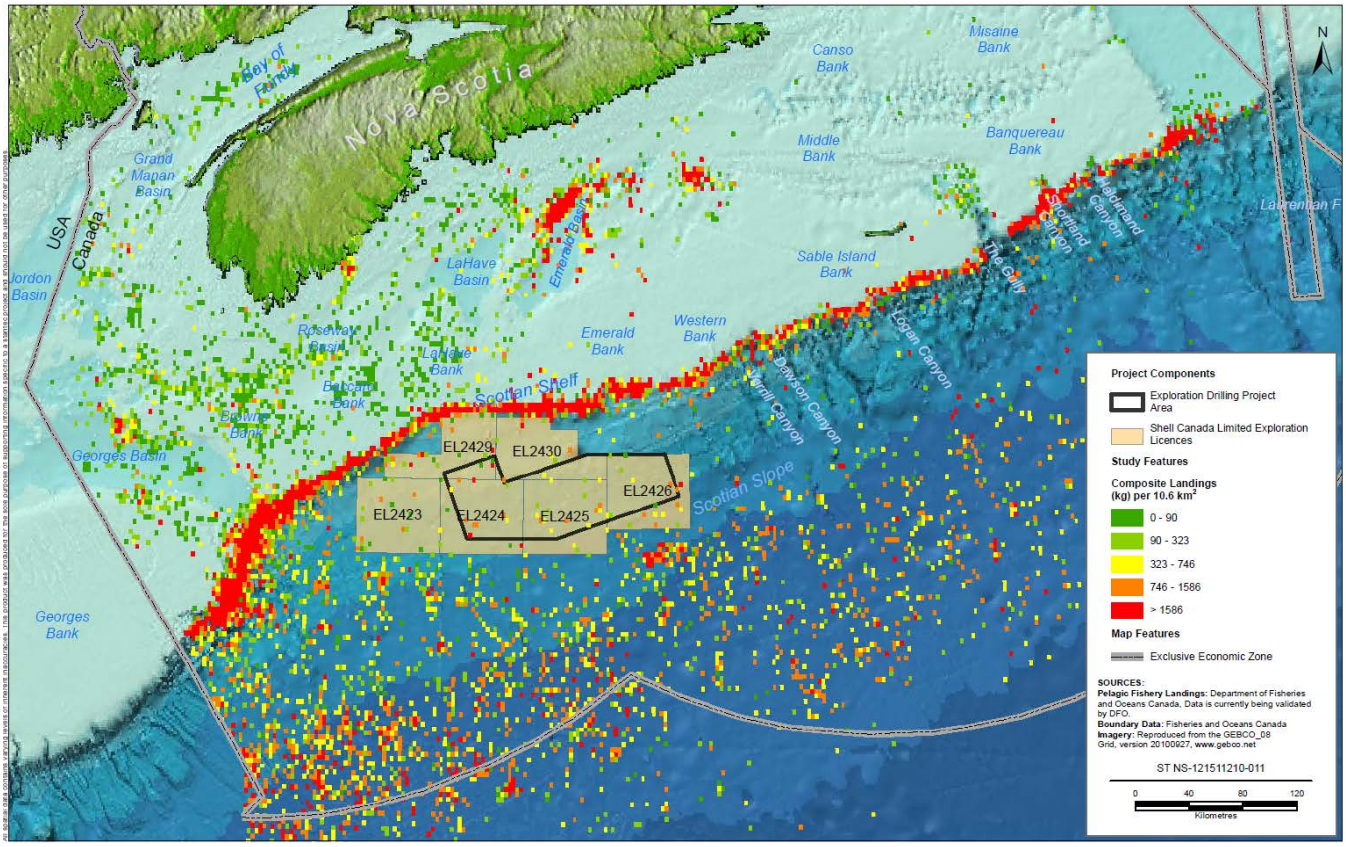
sharks and swordfish. Figures 5 and 6 depict, respectively, landings data for groundfish (all gear types) and large pelagic species from 2006 to 2010.

Figure 5 Groundfish Landings, All Gear Types, 2006-2010



Source: Shell Canada Limited

Figure 6 Large Pelagic Landings, 2006-2010



Source: Shell Canada Limited

The Project could have an effect on the fisheries resource (direct effects on fished species affecting fisheries success) and fishing activity (displacement from fishing areas, gear loss or damage). The proponent therefore focused its assessment of project-related environmental effects on commercial fisheries on possible changes in the availability of fisheries resources.

Temporary and localized changes to the fisheries resource (e.g. sensory disturbance that may trigger behavioural responses in targeted species) may affect catch rates for commercial fishers should they be fishing in proximity to the drilling unit or vertical seismic profiling operations. For example, underwater noise may cause fisheries species to temporarily avoid the area around the drilling unit. The proponent predicts that avoidance behaviour will be localized and temporary while fish become habituated to the sound levels, thereby not affecting commercial fisheries species to an extent that fishers would be adversely affected. Modelled noise from the vertical seismic profiling operations is conservatively predicted to result in behavioural responses in fish up to 26 km from the sound source. Overall, the proponent predicts that effects from vertical seismic profiling are expected to be limited and localized within the LAA, short-term in duration (1 day per well), and reversible. Effects are discussed in greater detail in the discussion of effects on fish and fish habitat.

The discharge of drill fluids and cuttings has the potential to result in sedimentation and localized changes in water quality, resulting in potential interaction with fisheries species. Discharges will be managed in accordance with *Offshore Waste Treatment Guidelines*. Localized mortality of sedentary or slow moving benthic species is expected to occur within the well site and the dispersion footprint of drill cuttings and fluids. As discussed in Section 6.1.2, discharges from a typical well are estimated to be at or above 1 mm in thickness up to 681 m from the discharge site for each well. Smothering effects may be realized up to 155 m from the discharge point (1. 89 ha per well).

The establishment of a 500 metre radius safety zone around the drilling unit may displace fishing activity. It would result in localized fisheries exclusion within an area of approximately 0.8 of square km for a maximum of 130 days for each well. The LAA does not include any unique fishing grounds or concentrated fishing effort that occurs exclusively within the LAA. Fishing activities in the LAA are transient in nature and similar alternative sites are readily available within the immediate area. Given the limited size of this exclusion zone and low fishing activity in the project area, the proponent considers this effect to be low. The proponent will communicate with fishers before, during, and after drilling programs and details of safety zones will be published in Notices to Mariners and Notices to Shipping.

There is also a low potential for gear loss or damage, but if it occurs, it would be compensated in accordance with the *Compensation Guidelines with Respect to Damages Relating to Offshore Petroleum Activity* (Canada-Newfoundland and Labrador Offshore Petroleum Board and Canada-Nova Scotia Offshore Petroleum Board, 2002).

The proponent has committed to developing and implementing a Fisheries Communications Plan for commercial fisheries representatives that will facilitate coordinated communication around routine project activities and components and accidental events

Given the localized nature of Shell's activities, the availability of other suitable fishing areas in proximity, and the notice that will be provided to fishers, the proponent predicts that the residual effects on commercial fisheries will likely not be significant.

6.3.2 *Views expressed*

Aboriginal Groups

Comments from Aboriginal communities are included in section 6.2 (Current Use) and in section 7.1 (Accidents and Malfunctions), as applicable.

Public

The Seafood Producers Association of Nova Scotia stressed the need for good coordination and communication between the two industries to avoid use conflicts. The proponent committed to develop a Fisheries Communications Plan and to provide project location information in Notices to Mariners.

Some comments expressed concern about leaving wellheads in place after abandonment, as opposed to complete removal. These may present additional opportunities for snagging of and damage to fishing gear. The proponent assessed effects and potential implications on marine benthos and commercial fisheries as a result of remaining subsea infrastructure (e.g. wellheads) following abandonment. Damages that are attributable to the

Project will be assessed under the *Compensation Guidelines with Respect to Damages Relating to Offshore Petroleum Activity*. In addition, the proponent will be required to develop abandonment plans for individual wellheads that must be approved by the Board. As described in Section 2.3, abandonment plans will include site-specific fisheries considerations. The proponent will engage with commercial fisheries operators in order to allow appropriate consideration of potential fisheries implications.

The proponent anticipates that the remaining wellheads would provide a hard substrate suitable for recolonization of benthic communities following drilling activities and would not result in any adverse residual effects. It further anticipates that any infrastructure left in place following abandonment would have a very low potential for any interactions as a result of the Project's location (approximately 250 km offshore), the water depths of the proposed wells (between 1500 m to 3000 m), the limited fishing efforts within and surrounding the project area, and the identified mitigation measures (wellheads to be noted on nautical charts). As such, the proponent does not anticipate any negative implications for commercial fishing operations associated with leaving the wellheads in place following abandonment.

The Seafood Producers Association of Nova Scotia asked about monitoring proposed for abandoned wells where hydrocarbons were found. The Board advised that long-term integrity of abandoned wells is addressed during well design and construction, as per the *Nova Scotia Offshore Petroleum Drilling and Production Regulations* and associated guidelines that are administered by the Board. Long-term monitoring is not usually required. The proponent must demonstrate that every well that is abandoned can be readily located and is left in a condition that provides for isolation of all hydrocarbon bearing zones and discrete pressure zones, and prevents any formation fluid from flowing through or escaping from the well-bore. The Board has expertise in well design and construction and reviews these plans to ensure regulatory compliance.

6.3.3 *Agency analysis and conclusion*

The Agency considers this VC to be similar to the fisheries identified under the Aboriginal traditional use VC. Mitigation identified by the Agency to prevent the potential for significant effects to the current use of lands and resources for traditional purposes by Aboriginal peoples (section 6.2) and to fish and fish habitat (section 6.1) is also considered necessary to prevent significant effects on the commercial fisheries. The Agency also recognizes the proponent's commitment to developing and implementing Fisheries Communications Plan and to adhering to the *Compensation Guidelines with Respect to Damages Relating to Offshore Petroleum Activity*.

Taking into account the implementation of the mitigation measures and follow-up measures described above, the Agency is of the view that the project will not result in significant effects on commercial fisheries.

6.4 Marine Mammals and Sea Turtles

6.4.1 *Proponent's assessment of environmental effects*

Three groups of marine mammals can be found on the Scotian Shelf and Slope: the Mysticetes (toothless or baleen whales), Odontocetes (toothed whales), and Pinnipeds (Seals).

Six species of Mysticetes and ten species of Odontocetes, including eight species of conservation concern are known to occur on the Western Scotian Slope and could potentially be present in the project area. There are

four species of sea turtles that can be found migrating and foraging on the Scotian Shelf and Slope, including two that are of conservation concern (Leatherback and Loggerhead sea turtle). A complete list of marine mammal and sea turtle species is provided in Appendix F including those that are of conservation concern, along with their conservation status.

There are five species of pinnipeds (seals) that can be found foraging year-round in the waters over the Scotian Shelf and Slope and the grey seal and harbour seal are known to breed in the Nova Scotia offshore (Sable Island). None of the seal populations present offshore Nova Scotia are designated under the *Species at Risk Act* or identified by the Committee on the Status of Endangered Wildlife in Canada.

Marine mammal and sea turtles within the Local Assessment Area (LAA) may be subject to an increased risk of mortality or physical injury due to auditory damage from underwater noise emissions during certain project activities (e.g. drilling unit operation and vertical seismic profiling surveys) and potential collisions with support vessels.

Underwater noise may temporarily affect the quality of marine mammal and sea turtle habitat and result in impacts on marine mammals and sea turtles within the LAA. There are two categories of potential effects from noise exposure on marine life: injury or mortality (including hearing loss) and behavioural (e.g. habitat avoidance, deviation in mitigation routes, communication masking, discomfort, and behavioral disturbance). Marine mammals rely on their ability to hear and use underwater sounds to communicate, locate prey, avoid predators, and gather other information about their surroundings. Masking can occur when an anthropogenic noise is strong enough to impair detection of biologically important sound signals, echolocation clicks, and passive detection cues used to navigate and find prey. As most species use a range of frequencies to communicate, it would be unlikely that the full range of frequencies would be masked for extended periods. Potential physiological effects include a threshold shift resulting in reduced hearing sensitivity.

Noise emissions from vertical seismic profiling are expected to be the most intense sound source generated by the Project. A change in risk of mortality or physical injury for marine mammals and sea turtles could occur up to approximately 78 m from the sound source based on modeling results from Shell's Shelburne Basin 3D Seismic Survey EA to estimate effects from vertical seismic profiling. The noise emissions could potentially also result in a change in habitat quality and use for marine mammals and sea turtles, sound levels of this nature could reach up to 26 km from the source. However, marine mammals and sea turtles are generally expected to temporarily avoid localized areas of seismic noise.

Some marine mammals (odontocetes) may experience auditory injury from drilling noise based on thresholds for auditory injury for various marine mammals as well as the estimated sound pressure levels generated by the drilling unit. However, the proponent does not expect cetaceans to experience a temporary or permanent reduction in hearing sensitivity (auditory threshold shift) due to drilling noise, based on published thresholds for auditory injury to various marine mammals. Studies have documented marine mammal avoidance of intense sound sources and temporary displacement, particularly if the marine mammals have been exposed to multiple simultaneous noise sources. Sensory disturbance associated with well abandonment and helicopter traffic may similarly elicit temporary behavioural changes.

The proponent has committed to implementing mitigation to reduce the effects of seismic sound during vertical seismic profiling surveys based on the *Statement of Canadian Practice with Respect to the Mitigation of Seismic Sound in the Marine Environment* (DFO, 2007).

Any change in habitat quality and use is expected to be restricted to within the LAA. Based on the current state of knowledge and the relatively low magnitude of expected noise emissions behavioural effects are not expected to occur outside of the LAA, or extend beyond the end of the drilling or vertical seismic profiling program. There is no known unique habitat or feeding areas for marine mammals or sea turtles that exists exclusively within the project area or the LAA. Any temporary avoidance of the LAA by marine mammals or sea turtles is not likely to result in population level effects. The proponent has committed to implementing the additional mitigation measures identified in Appendix B.

The presence and operation of support vessels potentially increases the risk of mortality or physical injury through collisions with marine mammals or sea turtles. Reduced vessel speed and use of existing shipping lanes will mitigate this risk.

The proponent predicted that, with the application of proposed mitigation and environmental protection measures, the residual environmental effects on marine mammals and sea turtles from project activities are not likely to be significant.

6.4.2 *Views expressed*

Federal Authorities

Fisheries and Oceans Canada raised concerns regarding the effects on marine mammals and of continuous noise from drilling operations over the 130-day duration of each well and also from vertical seismic profiling. The Department recommended that a Marine Mammal Monitoring Observer program be implemented during vertical seismic profiling surveys and requested that the proponent submit details of the planned program to Fisheries and Oceans Canada for review prior to operation to ensure that it is designed appropriately to meet its intended objectives. The proponent has committed to this.

Public

The National Audubon Society Board expressed general concerns about effects on whales (North Atlantic right whale, northern bottlenose whale, and fin whale). These concerns are similar to those raised by Fisheries and Oceans Canada, to which the proponent confirmed mitigation and monitoring commitments as described in sections 6.1.3 and 6.4.3 above.

6.4.3 *Agency analysis and conclusion*

The Agency recognizes the potential for impacts of the Project on marine mammals and sea turtles and the importance of requiring associated mitigation, particularly given the endangered status of several species. It will be important to implement mitigation procedures that are consistent with the *Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment*. Fisheries and Oceans Canada will be involved in the design of the Marine Mammal Observer Program to ensure its effectiveness in mitigating potential effects on marine mammals due to noise from vertical seismic profiling surveys. The Agency believes

that the implementation of waste management measures described generally for fish and fish habitat is also important for mitigating effects on marine mammals and sea turtles

The Agency has identified the following mitigation measures as necessary to prevent significant adverse effects on marine mammals and sea turtles:

- Abide by the Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment. The statement includes measures such as:
    - establishing a safety zone around the sound source (minimum 500 m radius);
    - implementing cetacean detection technology such as passive acoustic monitoring, if required during periods of low visibility;
    - gradually increasing the sound source intensity over a period of at least 20 minutes (ramp-up); and
    - immediately shutting down the sound source upon observing or detecting an endangered or threatened marine mammal or sea turtle within the safety zone.
- Implement a Marine Mammal Observer Program, using qualified individuals. When developing the program, the proponent shall:
    - if Passive Acoustic Monitoring will be used, provide the specific configuration to Fisheries and Oceans Canada for review 30-days prior to operation to ensure that operators can effectively monitor for all marine mammal vocalization frequencies that may occur within the project area; and
    - submit the Marine Mammal Observer Program to the Board for review 30-days prior to operation to enable verification that Marine Mammal Observers are trained in detecting all species that may occur within the safety zone either through visual observation or cetacean detection technology such as Passive Acoustic Monitoring and that observers have the ability to view the entire safety zone.
- To reduce risks of collisions with marine mammals:
    - reduce the speed of support vessels to 10 knots in the project area, or when marine mammals are observed or reported to be in the vicinity of the vessel; and
    - ensure support vessels use established shipping lanes, where they exist

The Agency has identified the following measures as part of a follow-up program to ensure the effectiveness of mitigation measures and to verify accuracy of predicted effects on marine mammals and seas turtles:

- Record and report the results of the Marine Mammal Observer Program (including sea turtle observations) to Fisheries and Oceans Canada and the Board.
- Promptly report any collisions with marine mammals or sea turtles to the Board and the Canadian Coast Guard Environmental Emergency Reporting Number.

- Model underwater noise levels from the drilling unit and verify the model results during drilling operations. Provide the modeling results to the Board and Fisheries and Oceans Canada at least 30 days in advance of drilling, and the monitoring results within 90 days after a well is abandoned.

Taking into account the implementation of the mitigation measures and follow-up measures described above, the Agency is of the view that the project will not result in significant effects on marine mammals and sea turtles.

6.5 Migratory Birds

6.5.1 *Proponent's assessment of environmental effects*

Over 30 million seabirds use eastern Canadian waters each year. Large numbers of breeding marine birds and millions of migrating birds from the southern hemisphere and northeastern Atlantic can be found in the area throughout the year. The combination of northern hemisphere birds and southern hemisphere migrating birds results in a diversity peak during spring months. During the fall and winter, significant numbers of overwintering alcids, gulls, and Northern Fulmars can be found in Atlantic Canadian waters; in the summer, species assemblages are dominated by shearwaters, storm-petrels, Northern Fulmars, and gulls.

The waters of the Regional Assessment Area (RAA) are known to support approximately nineteen species of pelagic seabirds, fourteen species of neritic seabirds, eighteen species of waterfowl, and twenty-two shorebird species (Appendix E) , with more occurring in the area as rare vagrants or incidentals. However, many of these species have a coastal affinity and would therefore not be expected to regularly occur in waters of the project area. Six species of migratory bird sometimes found in the RAA are of conservation concern (Section 6.6).

During summer months, the coastline of the RAA supports over a hundred colonies of nesting marine birds, ranging in size from a few individuals to thousands of breeding pairs. These colonies are known to support Atlantic Puffins, Black-legged Kittiwakes, Common Eiders, cormorants, Leach's Storm-Petrels, Great Black-back Gulls, Herring Gulls, Razorbills, and terns including Common, Arctic, and Roseate Terns. Leach's Storm-Petrel is the most numerous breeding seabird in the RAA with the vast majority breeding on Bon Portage Island near Cape Sable Island.

Nine coastal Important Bird Areas are present within the RAA, located along the coast of Nova Scotia at the edge of the RAA. These, and their distances from the project area are listed in Table 4.

Table 4 Important Bird Areas within the Regional Assessment Area

Name	Distance from project area (closest point)
South Shore (Roseway to Baccaro)	170 km (northwest)
South Shore (Port Joli Sector)	172 km (north-northwest)
Eastern Cape Sable Island	175 km (northwest)
South Shore (Barrington Bay Sector)	180 km (northwest)
Bon Portage Island	192 km (northwest)

South Shore (East Queens County Sector)	199 km (north-northwest)
The Brothers	205 km (northwest)
Sable Island	218 km (northeast)
Grassy Island Complex	222 km (north)

These areas have been designated as Important Bird Areas for a variety of reasons including the presence of breeding habitat for species at risk, important shorebird migration habitat, important coastal waterfowl habitat, or the occurrence of regionally significant marine bird colonies. Sable Island is also a Migratory Bird Sanctuary and National Park Reserve.

Marine birds within the LAA may be subject to increased risk of mortality or physical injury due to:

- discharges and emissions;
- the presence of potential marine bird attractants (e.g. lights, flares, waste);
- auditory damage from underwater noise emissions during vertical seismic profiling surveys;
- collisions with the drilling unit, helicopters, and support vessels; and
- harm (e.g. incineration) from flaring on the drilling unit.

Artificial lighting on the drilling unit and support vessels and short-term flaring during well testing could result in birds becoming stranded and increased opportunities for predation, collisions, and exposure to vessel-based threats. In particular, lights and flares are known to attract storm-petrels, Dovekies, and shearwaters. A number of factors influence the potential severity of marine bird interactions with flares, including the time of year, location, height, light, cross-sectional areas of the obstacle, and weather conditions. In addition to damage from the flare, seabirds have been observed to circle flares for days, eventually dying of starvation. For exploration drilling, flaring is not conducted unless hydrocarbons are encountered and, in that event, tests last a maximum of six days per well. If all seven wells are drilled and tested, a maximum of 42 days of flaring is possible. The proponent committed to conducting regular checks during all operations to identify and record any stranded or dead birds found onboard or near the drilling unit and provide these records to Environment Canada.

Underwater noise emissions from drilling unit operation and vertical seismic profiling surveys may temporarily affect the ambient sound conditions of marine bird habitat. It may result in sensory disturbance that triggers behavioural responses in marine birds, such as temporary habitat avoidance or changes in activity state (e.g. feeding, resting, or travelling) within the LAA. The proponent predicts that effects will be localized within the project area and LAA. The proponent states that measures undertaken to mitigate the effects of vertical seismic sound on marine mammals (e.g. gradual ramp-up of sounds levels) will also reduce the potential for adverse effects on diving birds.

Discharge of drill muds and cuttings could result in a change in habitat quality for marine birds. Discharged drill cuttings will settle rapidly to the seabed, while extremely small volumes and fine particle sizes associated with synthetic-based drilling fluid adhered to drill cuttings will remain suspended in the upper water column,

contributing to increased levels of total suspended solids before dispersing. This could result in temporary avoidance of a localized area during cuttings discharge. Although there may be residual hydrocarbons in some allowable discharges (e.g. bilge water, ballast water, deck drainage), these discharges are not predicted to have a measurable effect on marine birds. The primary mitigation is to ensure that project discharges are in accordance with the *Offshore Waste Treatment Guidelines* or the *International Convention for the Prevention of Pollution from Ships* (MARPOL) as applicable.

Seabirds are known to aggregate around oil platforms and drilling rigs for a variety of reasons including night lighting, flaring, and food, with concentrations at the oil platform documented at up to 19 to 38 times higher than on transects leading up to the platform. Surveys conducted from 1999 to 2003 on the Grand Banks of Newfoundland documented seasonal shifts in marine bird occurrences, with higher densities of auks occurring in the fall around oil production facilities relative to surrounding areas and shearwaters in summer. This suggests a prey enhancement effect resulting from human waste discharges and attraction of fish to lights. Oiled auks and oiled gulls were also observed near the Hibernia platform. The results of bird monitoring at large platforms in the North Sea indicate that platforms can attract as many as 50,000 migrating birds in any one night. While not all these birds would be vulnerable to marine pollution, any aggregations of seabirds in the vicinity of the Project could be at risk in the event of a spill.

Land birds, due to their scarcity in the project area, are unlikely to be affected by the Project, except in the event of malfunctions or accidents, especially a large oil spill. These effects are discussed in section 7.1.

The proponent has committed to implementing mitigation measures as identified in Appendices A and B and has concluded that, with the application of proposed mitigation, the residual environmental effect on migratory birds during routine project activities are likely to be not significant.

6.5.2 *Views expressed*

Federal Authorities

In addition to its comments on alternatives that could reduce effects on migratory birds (see 3.2.1), Environment Canada recommended implementing bird detection technology on platforms, such as RADAR in the vicinity of the flare, to monitor bird abundance and interactions with flare operations. Environment Canada requested monitoring to determine whether or not the water curtain to be used around the flare, which is primarily intended as a safety measure, would also prevent birds from flying into the flare. The department also requested daily searches for dead or stranded birds on the drilling unit and reporting of results, noting the permitting requirements and health and safety considerations related to handling birds.

The proponent indicated that there are safety considerations with adding people on deck during flaring and with adding equipment to the drilling unit and reiterated that flaring will be an infrequent and short-duration activity that may not occur at all. The proponent will search for stranded or dead birds and ensure that all personnel on board the drilling unit report any dead or stranded birds. It further noted that previous attempts to deploy a RADAR system for bird detection at offshore oil and gas operations concluded that there was potential for the installed system to interfere with the existing RADAR systems on the platform that are of critical importance during offshore operations. As a result, the proponent has stated that the installation of this type of monitoring system is not considered safe at this time.

Given these circumstances, and the fact that it would be known well in advance that flaring is planned, the proponent committed to notifying Environment Canada 30 days before any flaring to identify specific concerns (e.g. sensitive periods such as fledging and foraging) and discuss monitoring or data collection opportunities.

Environment Canada also noted the lack of year-round bird abundance and distribution data in the project area, which limits the ability to accurately predict effects of the Project on the abundance and distribution of marine birds. It requested that additional bird observation data be collected during the Project. The proponent indicated its willingness to consider opportunities for bird observers on support vessels in transit or while on standby at the drilling site, to better understand bird abundance and distribution, and committed to further discussions with the Board and Environment Canada to develop a plan.

Environment Canada asked the proponent to confirm whether it would participate in the monitoring of oiled birds through beached bird surveys on Sable Island and analyses on a selection of oiled birds found, to ensure that baseline information on stranded birds is up to date. The proponent does not plan to do so at this time, but would consider funding and participating in the future should exploration prove successful and longer-term future development and production scenarios be considered.

Environment Canada asked the proponent to clarify if it intends to submit the records of marine mammals, sea turtles, and birds with visible oiling to regulators and at what intervals this would occur. The proponent indicated that any such records would be submitted to the Board to be made available to the appropriate regulatory agencies and that reporting frequency would depend on the nature and scale of an incident. In the event of a small scale, short-term incident, records would be provided following clean up and response. In the event of a larger scale, longer-term spill event, records would be provided at a frequency decided appropriate by Shell, the Board, and the respective regulatory agencies at the time of the incident.

Aboriginal Groups

Aboriginal communities did not express any concerns about the Project's potential effects on migratory birds. The Maritimes Aboriginal Peoples Council asked about reporting procedures for dead or stranded birds. The proponent will work with Environment Canada to ensure that proper protocols, procedures, and any required bird-handling permits are in place, as described in the previous section.

Public

There were no public comments received concerning the effects of planned project operations on migratory birds. A concern was raised about effects on breeding and migrating birds in the event of a spill reaching land. Modeling carried out by the Proponent indicates that, in the unlikely event of a blowout, and assuming no response measures are undertaken, there is less than a ten percent chance that oil would reach Sable Island, and less than a one percent chance of oil reaching mainland Nova Scotia, with minimum time to shore between 20 and 30 days after the blowout. Potential malfunctions and accidents, including oil spills, are further discussed in section 7.1.

6.5.3 *Agency analysis and conclusion*

Bird collisions at lit and floodlit structures are a known problem, particularly for nocturnal migrants and night-flying seabirds such as storm-petrels. Attraction to lights may also result in collision with other birds. Disoriented birds are prone to circling a light source and may deplete their energy reserves and either die of exhaustion, drop into the ocean and perish, or drop to the ground (or a hard surface) where they are at risk of depredation.

Environment Canada has indicated that incineration or partial incineration in flares is a concern and cited an incident in the fall of 2013 during which over 7500 landbirds were killed in one night by a flare at a liquefied natural gas facility in New Brunswick. While the Agency recognizes that there is a risk to birds associated with flaring, it also notes that well testing involving flaring would occur only at wells where hydrocarbons were encountered, and then for a maximum of 6 days. If the maximum seven wells are drilled and all tested, there would be a maximum of 42 days of flaring over the life of the Project.

The Agency recognizes that birds attracted to the drilling unit may be adversely affected, and that individuals could die. The Agency also notes that Environment Canada considers the death of an individual member of a species at risk to be a significant adverse effect. The limited spatial and temporal nature of the drilling program and any well testing activities such as flaring limit the potential for extensive bird attraction. Thus it is considered unlikely that a member of a species at risk would be killed. Nevertheless, it is important for the proponent to verify its predictions.

The Agency has identified the following mitigation measures as necessary to prevent significant adverse effects on migratory birds:

- Notify the Board and Environment Canada at least 30 days in advance of flaring to identify whether it would occur during periods of bird vulnerability such as fledging or foraging, and how to avoid effects on migratory birds;
- Implement a water-curtain barrier around the flare; and
- Limit flaring to the minimum required to characterize the well potential and as necessary for the safety of the operation. This includes opportunities to reduce nighttime flaring such as by starting flaring for the initial two short-duration test periods in the morning as opposed to at night.

The Agency has identified the following measures as part of a follow-up program to ensure the effectiveness of mitigation measures and to verify accuracy of predicted effects on migratory birds:

- To verify effects predictions related to bird collisions, conduct daily searches of the drilling unit during all operations to identify and record any stranded or dead birds found onboard and provide records to the Board and Environment Canada. Birds shall be handled according to the procedures described in the Environment Canada document *Best practices for stranded birds encountered offshore Atlantic Canada*.
- Notify the Board and Environment Canada at least 30 days in advance of flaring to identify opportunities, without compromising safety, to collect data associated with the abundance and distribution of migratory birds near the flare and on the effectiveness of the water curtain as mitigation to prevent birds from flying into the flare. Develop a protocol to collect the data, in consultation with the Board and Environment Canada.

- Retain qualified observers on support vessels during transit and when on stand-by near the drilling unit to verify impact predictions including potential bird attraction to drilling unit, bird behavior around the drilling unit and the types of species present (i.e. seabird versus migratory species). Data should be collected in accordance with Environment Canada's *Eastern Canada Seabirds at Sea (ECSAS) standardized protocol for pelagic seabird surveys from moving and stationary platforms*.

Taking into account the implementation of the mitigation measures and follow-up measures described above, the Agency is of the view that the project will not result in significant effects on migratory birds.

6.6 Federal Species and Risk

6.6.1 *Proponent's assessment of environmental effects*

Under section 79(2) of the *Species at Risk Act* (SARA), the Agency, as the responsible authority for the EA, must identify the Project's adverse effects on listed wildlife species and their critical habitats. If the Project proceeds, preventative measures must be taken in accordance with applicable recovery strategies and management plans to avoid or lessen effects and to monitor them.

There are twenty-eight fish, eight whale, two sea turtle, and six bird species that may be found in the Regional Assessment Area (RAA) that are of conservation concern. For this EA, species of conservation concern are considered to be those that are listed in Schedule 1 of SARA as endangered, threatened or special concern, or that have been assessed as such by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Species of conservation concern that may occur in the RAA their respective conservation status can be found in Appendix E. A permit under SARA may be required for fish, marine mammals and sea turtle species that are listed as endangered or threatened on Schedule 1 of the Act.

No critical habitat as defined by the SARA has been designated within the project area or Local Assessment Area (LAA), however critical habitat for marine mammal species occurs within the RAA. Critical habitat for the North Atlantic right whale (endangered) has been identified in Roseway Basin, which is approximately 95 km northwest of the project area and 65 km from the LAA. Critical habitat for the northern bottlenose whale (endangered) has been identified in the Gully, and Shortland and Haldimand canyons, which are approximately 260 km northeast of the project area and 230 km from the LAA (Figure 1). Although critical habitat has not yet been designated for the leatherback sea turtle (endangered), they and other sea turtles are known to migrate through and forage along the Scotian Slope. Critical habitat for the leatherback sea turtle is expected to be identified during project operations and may cover portions of the project area, LAA or RAA.

There is critical habitat within the RAA along the Nova Scotia coastline for both Piping Plover and Roseate Tern and on Sable Island for Roseate Tern. There is no critical habitat for either species within the LAA.

Landbird species at risk may be affected by oil spills in the nearshore or that reach land. The proponent identified 10 landbird species at risk at the edge of the RAA along the coastline of Nova Scotia. These are listed in Appendix E. Since landbirds could only be affected in the event of a malfunction or accident, they are more fully discussed in section 7.1 – Malfunctions and Accidents.

In its EIS, the proponent considered species at risk within each Valued Component (VC), where applicable. For example, fish species at risk were considered in the analysis of effects on fish and fish habitat and whale species at risk were considered in the analysis of effects on marine mammals and sea turtles.

While species at risk are more sensitive than other species, the proponent based its assessment on the premise that its effects predictions for the fish and fish habitat, marine mammals and sea turtle, and migratory bird VCs are equally applicable to species at risk. The proponent also considered that mitigation measures proposed for those VCs will protect species at risk.

6.6.2 *Views expressed*

Federal Authorities

Environment Canada asked that landbirds be included in the assessment because they could be affected by a spill. Impacts of spills are discussed in section 7.1. Environment Canada also advised that it considers the death of an individual member of a migratory bird species at risk to be significant.

Environment Canada reviewed the proponent's assessment of impacts of the Project on migratory birds and confirmed that it satisfies requirements under section 79(2) of SARA. It further confirmed that the mitigation and monitoring proposed in the Draft EA Report are adequate.

Fisheries and Oceans Canada reviewed the proponent's assessment of impacts of the Project on marine mammals, sea turtles, and fish and confirmed that it satisfies requirement under section 79(2) of SARA. It further confirmed that the mitigation and monitoring proposed in this Draft EA Report are adequate.

Aboriginal Groups

St. Mary's First Nation raised concern about Atlantic salmon, including the endangered (COSEWIC) Outer Bay of Fundy Atlantic salmon, which is known to migrate through the RAA and LAA. The proponent provided additional information about the Project's effects on migrating salmon and other fish species in the context of effects on fish and fish habitat (see section 6.1). In brief, the proponent provided information demonstrating that any project effects, including on migrating fish, would be temporary, reversible, and limited to near the drilling unit.

Public

The National Audubon Society Board noted the presence of northern bottlenose, North Atlantic right, and fin whales in the project area and that, although it seems the drilling will take place a sufficient distance from the North Atlantic right whale's usual path of migration, there has been variance in its route. The comment expressed concern about the loss of individuals of that species. The proponent assessed the effects of the Project on marine mammals, including whale species at risk, and has identified mitigation measures related to potential effects of vertical seismic profiling. This mitigation is discussed more fully in section 6.4 (marine mammals and sea turtles).

6.6.3 *Agency analysis and conclusion*

The Agency assessed the Project's potential impacts on federal species at risk in accordance with section 79(2) of SARA. Species at risk may occur in the project area. However, the species involved generally have large ranges of which the project area represents a small portion. There is no critical habitat for any species within the project area or LAA. Potential for interaction between planned project activities and species at risk include impacts of noise on marine mammals, sea turtles, and fish, and impacts of lights or discharges on migratory birds. Measures have been proposed by the proponent to mitigate these impacts (e.g. in association with vertical seismic profiling). In addition, impacts on species at risk would be monitored and the results submitted to Environment Canada and Fisheries and Oceans Canada for review as they are the competent departments for species at risk. Results should also be submitted to the Board.

Based on advice from competent departments, the Agency believes that the mitigation and follow-up measures that are planned for fish and fish habitat, marine mammals and sea turtles, and migratory birds are appropriate and that no additional measures are required specifically for species at risk. The applicable mitigation and follow-up measures are described in sections 6.1, 6.4 and 6. 5.

Taking into account the implementation of the mitigation measures and follow-up measures described above, the Agency is of the view that the project will not result in significant effects on federal species at risk.

6.7 Special Areas

6.7.1 *Proponent's assessment of environmental effects*

Special areas are important due to their ecological and socio-economic value, stakeholder and regulatory interests, and potential to interact with the Project. Further, special areas located within the marine environment of the Regional Assessment Area (RAA) and Local Assessment Area (LAA) fall within federal jurisdiction. The Scotian Slope/Shelf Break Ecologically and Biologically Significant Area (EBSA) overlaps with the project area. The EBSA is recognized for unique geology; high finfish and squid diversity; value as a migratory route for large pelagic fishes, cetaceans, and sea turtles; overwintering habitat for a number of shellfish (e.g. lobster) and finfish (e.g. Atlantic halibut); foraging area for leatherback sea turtles; feeding and overwintering area for seabirds; and habitat for Greenland sharks. Approximately 97 percent of the project area falls within the Scotian Slope/Shelf Break EBSA. The EBSA is very large (approximately 68,600 square km) and the project area constitutes about 11 percent of the total area of the EBSA. The footprint of the drilling operations will occupy only a small portion of the project area.

The LAA for the support vessel route crosses through the Haddock Box and encompasses the Sambro Bank Sponge Conservation Area. They are located 60 km and 152 km, respectively, from the project area. As discussed previously, nine coastal Important Bird Areas are present within the RAA.

Table 5 lists the special areas in the RAA and the approximate distance in order of proximity to the Project (drilling) Area and LAA. The locations of these areas are shown in Figure 1.

Table 5 Proximity of Special Areas to the Project Area and Local Assessment Area

Special Area	Distance from project area	Distance from LAA
Scotian Slope/Shelf Break EBSA	Overlaps with PA	Overlaps with LAA
Browns Bank (Haddock Spawning Closure)	56 km	26 km
Haddock Nursery Closure, Emerald/Western Bank (Haddock Box)	60 km	Overlaps with LAA
Redfish Nursery Closure Area (Bowtie)	92 km	33 km
North Atlantic Right Whale Critical Habitat/Area to be Avoided	95 km	65 km
Lobster Fishing Area 40 (Georges Bank)	105 km	75 km
Georges Bank Oil and Gas Moratorium Area	120 km	107 km
Northeast Channel Coral Conservation Area	130 km	100 km
Hell Hole (Northeast Channel)	135 km	105 km
Sambro Bank Sponge Conservation Area	152 km	Overlaps with LAA
Emerald Basin Sponge Conservation Area	182 km	27 km
Georges Bank Fishery Closure (5Z)	158 km	117 km
Sable Island National Park Reserve	220 km	185 km
The Gully Marine Protected Area	262 km	232 km
Northern Bottlenose Whale Critical Habitat (Sanctuaries): The Gully, Shortland Canyon, Haldimand Canyon	273 km, 330 km, 366 km	243 km, 300 km, 336 km
Lophelia Conservation Area	442 km	412 km

The majority of special areas on the Scotian Shelf and Slope are located outside the LAA and are thus not expected to interact with the Project during routine operations. The Project's potential interactions with special areas primarily relate to potential changes in the existing quality and use of natural habitats within them. The proponent therefore focused its assessment on that aspect. Underwater noise emissions from drilling unit operation, vertical seismic profiling surveys, support vessel operations, and well abandonment may temporarily reduce the quality of habitat in the portions of special areas encompassed by the LAA and result in sensory disturbance that triggers behavioural responses in marine species within these areas. Artificial night lighting and other attractants associated with drilling unit operation, and the degradation of water and sediment quality as a result of routine operational discharges and emissions may similarly affect habitat quality and use within these areas. The deposition of drill fluids and cuttings may smother marine benthos and cause changes to the composition of the benthic macrofauna community within a highly-localized area of the Scotian Slope and Shelf Break EBSA

The proponent predicted that, with the application of proposed mitigation and environmental protection measures for the Project as a whole, the residual environmental effect of routine project activities on special areas is not likely to be significant.

6.7.2 *Views expressed*

No specific issues were raised in stakeholder and Aboriginal engagement with respect to special areas. However, the proponent considered general questions and concerns around effects on fish and fish habitat (including the seabed), the biodiversity of marine life in and around the project area, and marine mammal migration.

6.7.3 *Agency Analysis and Conclusion*

The project area occupies 11 percent of the Scotian Slope/Shelf Break EBSA. Given the distances between the other special areas considered in the EA and the limited temporal and spatial extent of planned project activities, it is unlikely that special areas will be affected by the routine project operations.

Measures to mitigate impacts on fish and fish habitat, migratory birds, marine mammals, and commercial fishing will likewise prevent significant adverse effects on special areas. The Agency has not identified any specific follow-up measures in relation potential effects of routine project operations on special areas.

Taking into account the implementation of the mitigation measures and follow-up measures described above, the Agency is of the view that the project will not result in significant effects on special areas within federal jurisdiction.

7 Other Effects Considered

7.1 Effects of Accidents and Malfunctions

Pursuant to paragraph 19(1)(a) of CEAA 2012, the environmental assessment (EA) must take into account the environmental effects of malfunctions and accidents that may occur in connection with the designated project.

7.1.1 *Proponent's Description of Potential Accidents and Malfunctions*

The proponent selected four accident scenarios for assessment based on the project parameters and their potential to pose the greatest risk to VCs in the event of an occurrence, as follows:

- synthetic-based mud (drilling fluid) spill,
- operational batch spill [2] (100-barrel and 10-barrel),
- spill from a support vessel (offshore and nearshore), and
- blowout.

The proponent carried out three-dimensional oil spill fate and trajectory modelling to support the evaluation of potential effects from a blowout, batch spills or a spill from a support vessel. Accidental release of synthetic-based drilling fluid (mud) originating from the sea surface or marine riser was also modelled.

The proponent used a conservative approach in its environmental effects assessment for the modelled scenarios by assuming no measures are undertaken to mitigate effects. In a real event, response measures would be undertaken to mitigate the environmental consequences. The Project will incorporate features and procedures to reduce the probability that an accidental event would occur.

Of the incidents modelled, the greatest level of concern and potential for significant effects are associated with a large-scale blowout. The Agency has therefore focused its analysis on blowouts, but also considered the effects of the other types of incidents.

A support vessel may contain up to 2800 barrels of fuel. However, it is divided into several tanks, most of which are located away from the vessel's hull. Thus it is extremely unlikely that all fuel would be released and this scenario was not considered in the proponent's analysis. A spill of diesel fuel from a vessel while at the Project site is addressed through the modelling of batch diesel spills (100-barrel and 10-barrel scenarios). The potential for a spill from a support vessel in transit has been considered qualitatively, recognizing the possibility for a spill to occur anywhere along the transit route. The proponent's assessment focused on the plausible scenario of a fuel spill along the nearshore portion of the route as the only accidental event scenario with potential to affect Halifax Harbour and shoreline habitat.

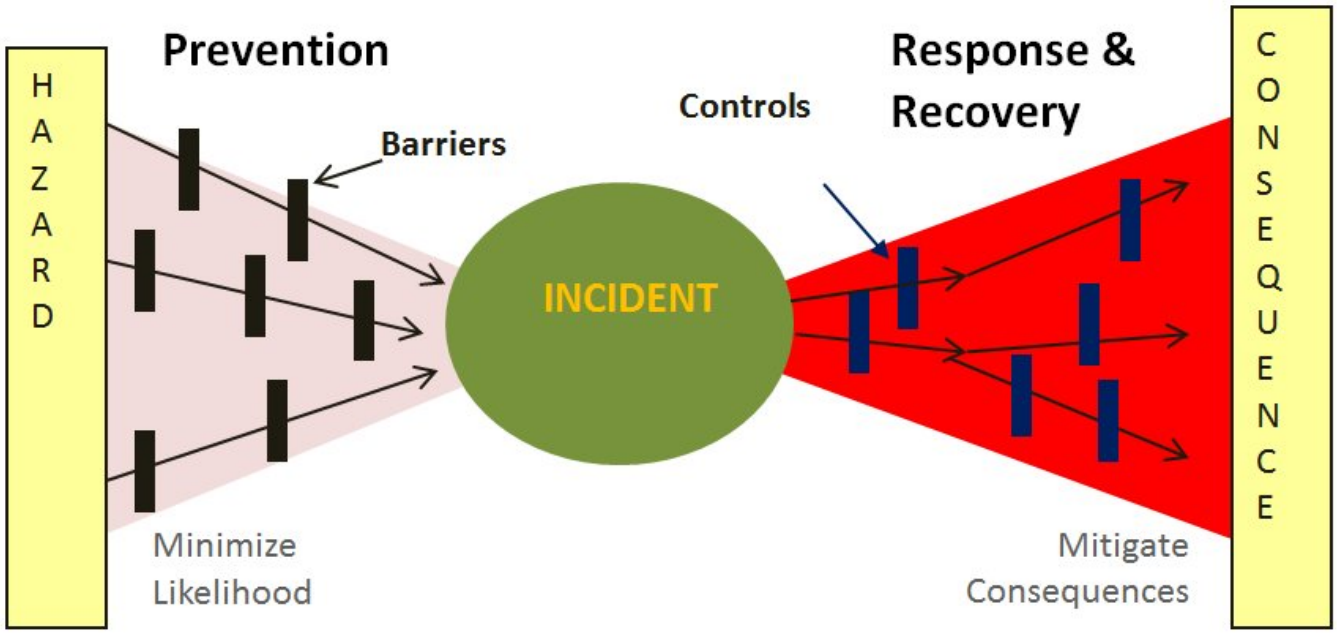
[2] Batch spills are relatively small operational spills from the drilling unit of various refined products such diesel, kerosene, hydraulic oil and other miscellaneous oils, but not crude oil from the well reservoir.

7.1.2 *Proponent's Description of Spill Prevention and Response*

The proponent has committed to conducting safe and environmentally responsible operations and considers spill prevention and response of critical importance. To prevent incidents, it will put numerous safeguards in place to prevent a spill from occurring. Response capabilities and contingency plans will provide the ability to respond to any spill that could occur.

The proponent uses the Bow Tie method in the assessment of high-risk hazards (i.e. risks with the greatest potential to impact people, the environment, and assets). The Bow Tie makes the link between risk controls and risk prevention management systems (Figure 7). The proponent's operational focus is on prevention, with the goal of putting in place sufficient barriers to never have to implement the response and recovery. In the unlikely event that an incident occurs, the focus shifts to response and recovery, with the goal of mitigating the incident so that the full potential impact (consequence) of an incident is never realized.

Figure 7 Bow Tie Method of Hazard Assessment



Source: Shelburne Basin Venture Exploration Drilling Project EIS

The proponent's prevention approach is founded on the following principles and policies:

- Leadership and Safety Culture,
- Global Standards and Procedures,
- Robust and Assured Well Design, Equipment Testing and Certification,
- Two Barrier Policy,
- Extensive Training, Competent Staff and Stringent Contractor Requirements,
- Remote Monitoring, and
- Safety Case Approach (Rig Safety Case).

The two-barrier safety policy is a key front-line element in effective prevention. A barrier is defined as any system or device that can be used to contain fluid or pressure within the confines of the well. Two independent barriers to flow are maintained at all times once the blowout-preventer is installed on the wellhead. Independent barriers include high pressure wellhead housings, multiple casing strings cemented in place, blowout preventers and weighted drilling fluids. All barriers are verified by testing both prior to and following installation, as well as at regular intervals during operations. Should one barrier be lost, operations are stopped and the focus shifts to re-gaining a two-barrier status.

In addition to prevention measures the proponent is committed to being prepared to effectively respond to an offshore oil spill, and will have a full complement of response tools and strategies available. Response measures may include dispersants to remove oil from the ocean surface (i.e. to reduce effects on birds, marine mammals and shorelines) and mechanical recovery of oil from the sea surface (e.g. skimmers, booms), in-situ burning; shoreline protection and recovery; and well control. Although the probability of occurrence of a diesel spill in the nearshore environment or a blowout reaching shore is extremely low, these events could require shoreline clean-up including possible collection and cleaning of fur-bearing marine mammal, birds, and sea turtles. Hazing techniques could be used if deemed appropriate to deter animals from entering affected areas. Smaller scale batch spills in calm conditions in the offshore environment may be mitigated via oil spill response measures and marine bird rehabilitation; however, these mitigations are recognized as limited.

Contingency plans will be in place to detail the associated practices and procedures for responding to an emergency. The proponent's Emergency Response Plan will include a number of integrated contingency plans including an Oil Spill Response Plan, a Dispersant Operations Plan, a Well Containment Plan, a Relief Well Contingency Plan and a Well Capping Plan.

Depending on the size and nature of an incident, specific monitoring (e.g. environmental effects monitoring) and follow-up programs may be required and will be developed in consultation with applicable regulatory agencies. This may involve monitoring various aspects of the marine environment until specific endpoints are achieved and residual hydrocarbons reach acceptable background levels. In addition, records of marine mammal, sea turtle, and birds with visible oiling would be maintained.

A capping stack can be deployed to the wellhead as part of the response to a well blowout incident in the unlikely event that the primary and secondary well control measures fail to control the well. The primary barrier is the drilling fluid, which provides hydrostatic overbalance on the formations drilled in order to prevent an influx entering the wellbore. The secondary barrier refers to mechanical devices, which are used to prevent flow should the primary barrier be lost. Secondary barriers include the blowout preventer, seal assemblies, the wellhead, casing, and cement plugs.

The Well Capping Plan will outline the plan to mobilize and deploy a capping stack, if required. A capping stack was used to ultimately stop the Deepwater Horizon blowout in the Gulf of Mexico in 2010 and is therefore proven technology. Capping stacks are located strategically throughout the world in areas where there is a high concentration of offshore oil and gas activity, such as the North Sea, the Gulf of Mexico, and Brazil. The capping stack identified for the Shelburne Project is located in Stavanger, Norway, with back-up stacks located in Aberdeen, South Africa, Singapore and Brazil.

7.1.3 *Proponent's Spill Probability Analysis*

The proponent conducted a detailed analysis of the probability of potential blowouts and spills from offshore wells and activities and also considered historical international and national spill data. The analysis and data show that well blow-outs and other well-related spills from offshore drilling activities are rare events. Table 6 shows the estimated probabilities of the specific spill volumes associated with the scenarios that were modelled for the Project (with all seven wells).

Spill probabilities are commonly expressed as recurrence intervals, also known as return periods. The return period is the time interval statistically required for an event to occur once, given its probability of occurrence. For example, a 100-year flood typically occurs once in 100 years, which corresponds to an annual probability of 1 percent. This does not mean that the event can occur only once within the estimated period, but rather indicates the probability of the event occurring within any given year. It is simply another way to express the probability of occurrence.

Table 6 Probabilities of Spill Scenarios during the Project

Scenario	Volume (Litres)	Probability in Project Time	Return Period (years)
Batch Spill-10 barrels	1590	0.121940	41
Batch Spill-100 barrels	15,900	0.006200	806
Synthetic-based drilling fluid Spill-1	60,000	0.004960	1,008
Synthetic-based drilling fluid Spill-2	573,000	0.000620	8,065
Spill (Site-1) - Blowout	234,000,000	0.000055	18,392
Spill (Site-2) - Blowout	118,000,000	0.000270	3,678

Source: ERC 2014

The analysis shows that the annual probability of a 10-barrel batch spill is 2 percent (i.e. 1/41). Return periods for the two modelled blow-out scenarios (two hypothetical wells in the project area) are 18,392 and 3,678 years respectively (0.0055 percent and 0.027 percent). The proponent's analysis also indicates that if a spill occurs, the volume is likely to be relatively small and small spills are more likely to occur than larger ones.

7.1.4 *Spill Fate and Behaviour*

Spills of Drilling Fluids

Synthetic-based drilling fluids could be released from a surface tank discharge, riser flex joint failure, or a blowout preventer disconnect. The size of the release, mode of release, and the ocean current conditions at the time of release will influence the spill deposition footprint. Two scenarios were modeled: a spill of 377.4 barrels (60,000 Litres), and a spill of 3604.2 barrels (573,000 Litres). In the event of a spill of synthetic-based drilling fluid, the suspended solids concentration in the water column is predicted to return to ambient conditions (<1 mg/L) within 30 hours of the release in all cases (RPS ASA 2014a).

Batch Spills and Spills from Support Vessels

Accidental discharges of marine diesel (e.g. 10-barrel and 100-barrel batch spill scenarios) resulted in limited modeled effects. Approximately 80 percent of the two batch spill releases evaporated within the first two to three days, with approximately 2 square km and 20 square km receiving in-water concentrations of dissolved aromatics in excess of one part per billion at any time for the 10-barrel and 100-barrel spills, respectively. The

modelling predicted that a portion of weathered diesel may continue to be transported at the surface for some distance (up to 100 km); however, the surface oil would likely be patchy and cover only a small area.

Blowout

The proponent carried out three-dimensional oil spill fate and trajectory modeling and analyses to support its evaluation of the potential effects from accidental spills associated with a blowout from the drilling unit. Continuous subsurface blowout scenarios were developed at two locations, chosen to be representative of the expected water depths that may be drilled within the project area and situated in proximity to sensitive areas (e.g. Georges Banks). The models were run over 30 days to simulate a continuous 30-day unmitigated release blowout scenario and were run under a range of conditions to simulate drilling in all seasons.

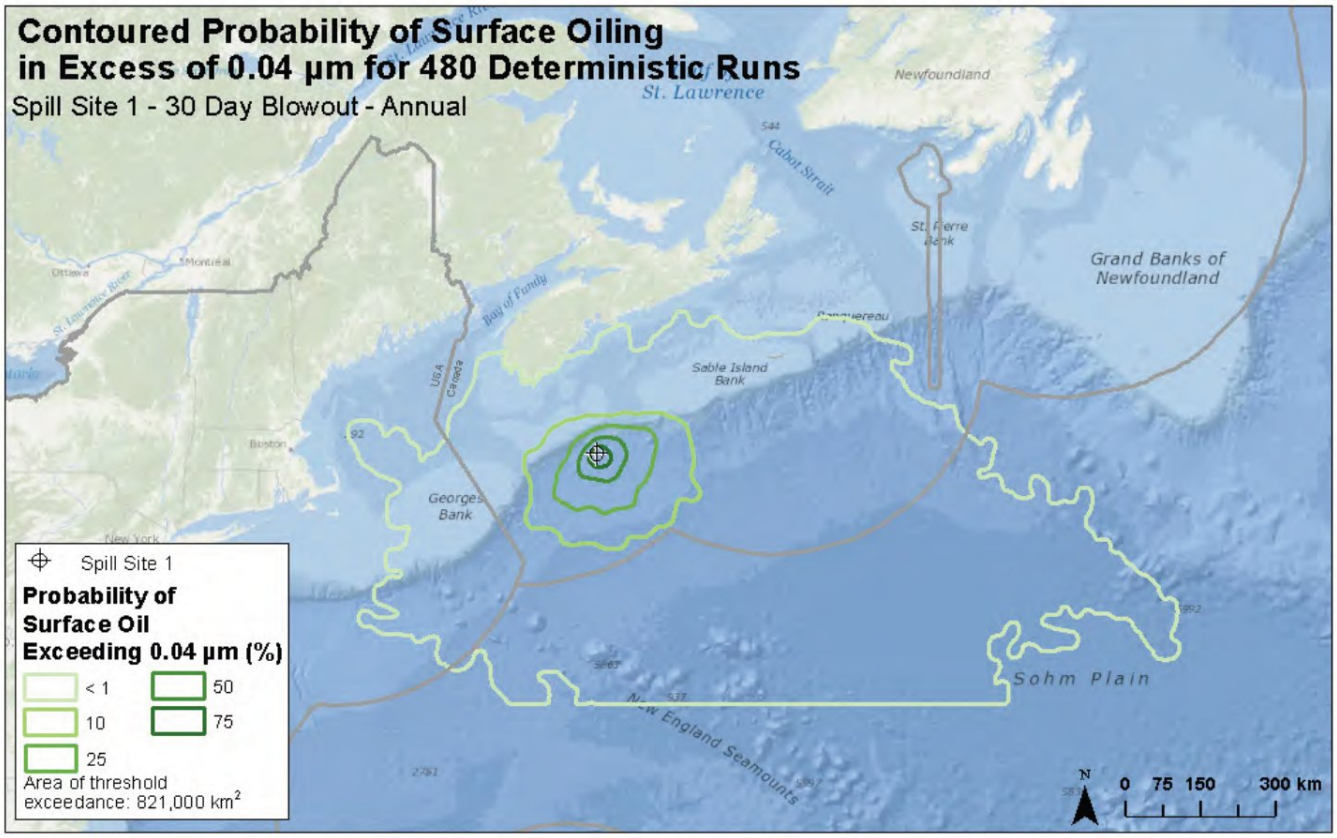
All scenarios were modeled conservatively to reflect a worst-case scenario by assuming no response measures to minimize or reduce effects. In reality, measures such as oil spill containment or dispersion and recovery and shoreline protection operations would be undertaken to reduce adverse effects to marine and coastal resources and to mitigate the spill's impacts. A 30-day scenario was selected for the modeling to simulate a conservative amount of time required to cap and contain the spill. In an actual incident, the proponent would respond immediately, and in the unlikely event of a blowout, the proponent predicted that the well could be capped and contained in 12 to 21 days, the upper limit allowing for weather-related or other delays.

Footprints from surface oiling and oil dissolved in the water column from unmitigated, 30-day release blowout scenarios indicated that oil generally travels to the east and northeast of spill sites. A seasonal trend was observed: during winter conditions, oil was more likely to be transported to the east farther offshore; while under summer conditions, transport was uniformly multi-directional. Figures 8 and 9 depict modeling results for probabilities of sea surface oiling from a 30-day unmitigated blowout at the two modeled sites.

Higher percentages of the released oil were found within the water column during winter months; this is the result of increased wind and wave action, which entrains surface oil droplets into the water column. Conversely, the greatest surface oiling occurred during summer months, with calmer conditions reducing entrainment from wind and waves.

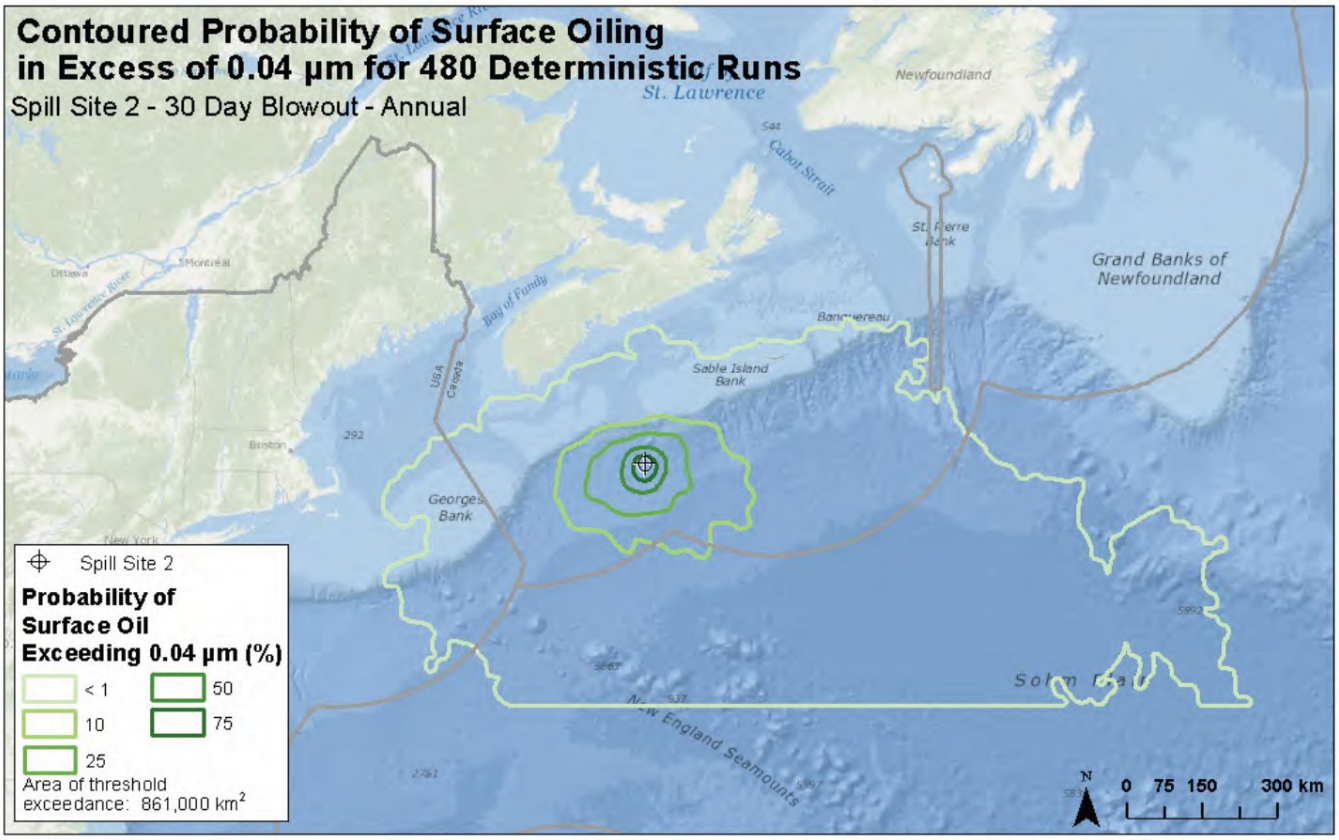
Following an unmitigated release, the likelihood of shoreline oiling was demonstrated to be very low. The modeled sites are far offshore and oil would need to remain on the surface for one month or more to be transported to shore. Furthermore, the predominately westerly winds would transport surface oil away from the coast and variable surface currents do not continuously transport surface oil in any one specific direction for significant periods of time. The possibility of shoreline oiling would only exist during the calmer summer months when a higher percentage of oil remains on the surface and there is a slightly increased probability of winds from the east and northeast transporting surface oil toward land. The probability of shoreline oiling for the modeled scenarios was found to be between 0.83 and 1.88 percent of all model runs conducted for the two blowout scenarios, and was only observed during the May, June, and July model runs. Based on the model results, the regions of potentially shoreline oiling would be the Southern tip of Nova Scotia, including the Yarmouth, Barrington, and Shelburne Regions, and Sable Island National Park Reserve (Figure 10). It is expected that stranded oil would be highly weathered as the minimum time to shore would be between 20 and 30 days.

Figure 8 Probabilities of Sea Surface Oiling from a 30-day Unmitigated Blowout at Model Site 1



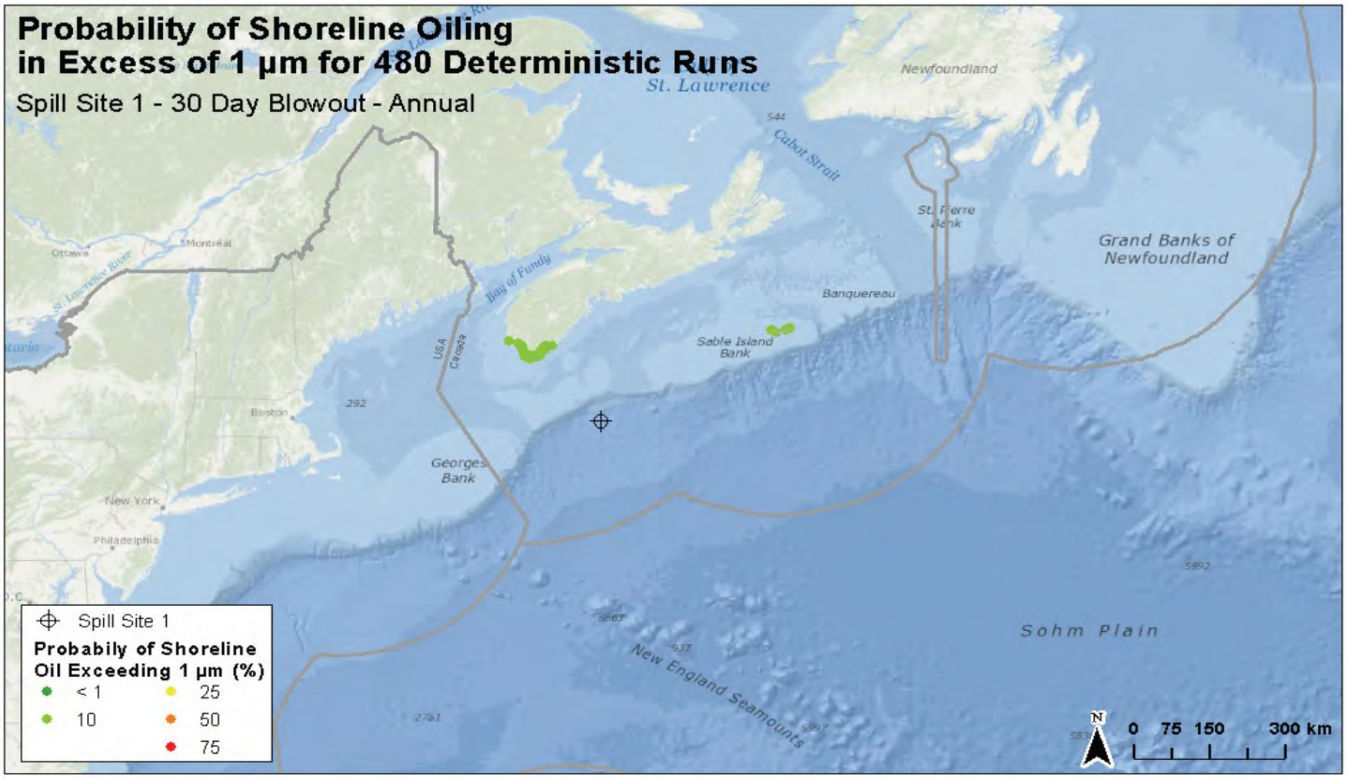
Source: Shell Canada Limited

Figure 9 Probabilities of Sea Surface Oiling from a 30-day Unmitigated Blowout at Model Site 2



Source: Shell Canada Limited

Figure 10 Probabilities of Shoreline Oiling from a 30-day Unmitigated blowout at Model Site 1[3]



Source: Shell Canada Limited

7.1.5 *Proponent's Assessment of Environmental Effects*

As described below, all of the four potential accidental event scenarios that were assessed could affect fish and fish habitat, marine mammals and sea turtles, migratory birds (marine and land birds), special areas, commercial fisheries, and the current Aboriginal use of lands and resources for traditional purposes.

Fish and Fish Habitat

The risk of exposure of fish and shellfish to an oil spill is dependent on the type of oil and the extent of the spill, but also on the habitat these species occupy, their behaviour, the time of year, their life history, and the general health of the stock at the time of the spill. In general, the proponent indicates that:

- adult pelagic and benthic fish occurring in relatively deep waters have low exposure risk because they are highly mobile and able to avoid oiled areas;
- larval and juvenile pelagic and benthic fish species may be at a greater risk of exposure as they are often less mobile than adults;

[3] For a 30-day blowout at Model Site 2, the proponent's modeling predicted a <10% chance of oil reaching Sable Island, no oil is predicted to reach mainland Nova Scotia.

- fish that spawn or occur in nearshore intertidal and subtidal zones and in shallow reef zones are at higher risk of exposure where there is shoreline oiling;
- shellfish have a moderate risk of exposure because they have some mobility, but utilize benthic habitats in shallow nearshore and estuarine areas. Species that burrow into sediments that may become contaminated, are at higher risk of exposure;
- sessile molluscs, especially bivalves, are at a high risk of contamination because they are unable to avoid exposure. They can ingest dispersed oil and oil attached to suspended sediments; and
- if fish eat contaminated zooplankton, they can accumulate hydrocarbons themselves. However, fish are also able to metabolize hydrocarbons and there is no potential for bio-magnification.

Studies have shown that bacterial respiration, through biodegradation of hydrocarbons, has the potential to cause oxygen depletion, eventually leading to hypoxia in areas near oil spills. Biodegradation of hydrocarbons by bacteria may also cause bioaccumulation and subsequent effects in the food web, although phytoplankton, zooplankton, and fish are all able to metabolize hydrocarbons. Finfish species are most vulnerable to hydrocarbon spills during early life stages when they cannot actively avoid oiled areas and have not developed any detoxification mechanisms.

Experimental studies of the effects of hydrocarbons on the early life stages for a variety of fish species have shown sub-lethal toxic effects. A recent study of the effects of the Deepwater Horizon Oil Spill on the spawn (embryos and larvae) of pelagic fish species demonstrated that exposure to polycyclic aromatic hydrocarbons (PAHs) caused defects in cardiac function.

Diesel is known to have immediate toxic effects on many intertidal (e.g. molluscs, amphipods) and benthic organisms with sessile and early life stages (i.e. eggs, larvae) the most at risk as they are unable to actively avoid the diesel or are in sensitive life stage development periods. Benthic invertebrates, including commercial species, have experienced sub-lethal effects resulting from low-level exposure to hydrocarbons, with crustaceans being the most sensitive taxa.

Fish and Fish Habitat – Spills of Drilling Fluid

Elevated total suspended solids levels can have detrimental effects on fish (e.g. physiological stresses, reduced growth, and adverse effects on survival). However, in the case of a spill of drilling fluid from the Project, the levels of total suspended solids required to affect fish and fish habitat would be limited to within a few hundred meters of the spill site and resulting conditions would be temporary. In addition, accidental releases of synthetic-based drilling fluid may create a small, thin surface sheen, with effects similar to those discussed above for hydrocarbon spills, but more limited. Overall, the proponent predicted that the residual environmental effects from a spill of drilling fluids would not be significant.

Fish and Fish Habitat – Batch Spills from Support Vessels

There is a risk of mortality of phytoplankton and zooplankton (food sources), and sub-lethal and lethal effects on larval and juvenile fish species present in the mixed surface layer of the water column; however, the effects of a diesel spill from the Project would likely only be felt in a highly localized area. 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 aromatics. Given the temporary, localized, and reversible nature

of the potential effects, the proponent predicts that the residual environmental effects from a diesel spill from the drilling unit would not be significant.

Residual effects following a near-shore diesel spill from a support vessel would likely include localized mortality and sub-lethal effects on fish eggs, larvae, and juveniles. Depending on the location and extent of the spill, near-shore spawning and nursery areas could potentially be affected. However, given the expected small spill volume as described in section 7.1.1 the proponent predicted that effects on nearshore areas would not be significant.

Fish and Fish Habitat – Blowout

Modelling conducted for the Project shows that oil could extend into the RAA with a low probability of extension beyond the RAA and a low probability of nearshore or shoreline effects, following a continuous, 30-day unmitigated blowout scenario.

The proponent predicts that greater concentrations of dissolved aromatics present near the surface may result in mortalities and sub-lethal effects on fish eggs, larvae, and juveniles following an incident during winter conditions. In the unlikely event that dissolved aromatics are transported towards nearshore waters, residual effects on fish may extend to low-level sub-lethal effects on the eggs, larvae, and juveniles of demersal species and other fish species within nearshore areas, including spawning and nursing areas.

In the event of a blowout, there will be a temporary decline in the abundance of phytoplankton in the immediate area of the spill. Zooplankton communities may be able to avoid exposure. Zooplankton, which cannot avoid exposure and experience sub-lethal effects, will depurate once the spill has subsided due to mitigation and natural weathering processes. The majority of adult fin fish will be able to avoid exposure via temporary migration. In the event that the spill encompasses areas where fish eggs or larvae are located, lethal and sub-lethal effects could occur. However, the majority of fish species on the Scotian Shelf and Slope spawn in a variety of large areas, over long time periods and a spill is not predicted to encompass all of these areas or time periods within the RAA to such a degree that natural recruitment may not re-establish the population(s) to their original level within one generation.

Concentrations above 1 part per billion of total dissolved aromatic concentrations are not likely to reach the Scotian Shelf, except during winter conditions where concentrations of 50-100 parts per billion may reach the shelf break. The majority of spawning areas for fish species in the RAA occur on the Scotian Shelf, with the eggs and larvae of some species being found along the Scotian Slope and Shelf break. In the event of a large blowout, the area impacted will not encompass all of the spawning locations for any one species. The majority of fish species on the Scotian Shelf and Slope spawn in multiple locations within the RAA, although there are a few species (e.g. smooth skate and sand lance) that tend to spawn in a limited geographic area. These species have the potential to spawn over many months or the entire year and with mitigation their spawning window will not be completely impacted by a blowout. Because most species spawn in multiple locations or over long time periods, the proponent predicts that it is not likely that an entire year class would be lost due to the toxic effects of oil on early life stages of fish as a result of a blowout. Overall, the proponent predicts that effects of a blowout on fish and fish habitat are not likely to be significant.

Marine Mammals and Sea Turtles

The accidental release of hydrocarbons may affect several physical and internal functions of marine mammals and sea turtles. These animals may ingest oil with water, contaminated food, or oil could be absorbed through the respiratory tract; absorbed oil could cause toxic effects. Hydrocarbons may cause behavioural changes, inflammation of mucous membranes, pneumonia, and neurological damage.

Whales exposed to an oil spill are unlikely to ingest enough oil to cause serious internal damage. In baleen whales, crude oil could coat the baleen and reduce filtration efficiency, but these effects are considered reversible. One researcher noted that adverse effects on cetaceans, such as sickness, stranding or mortality, tended to be associated with crude or bunker C oil, which is not the type of oil that would result from a spill or blowout for this project. While studies indicate that cetaceans can detect oil spills, they may or may not consistently avoid contact with most oil types. Monitoring studies of marine mammals following oil spill events in different parts of the world have provided evidence implicating oil spills with the mortality of cetaceans.

Oil fouling might affect seal locomotion, with heavy oiling causing flippers to stick to the body. Contact with oil also reduces the insulation value of hair, but in healthy seals this is not likely to be a major problem as they rely primarily on blubber for insulation. Seals became cleaner over time if they are not repeatedly exposed to oil.

It is believed that turtles do not exhibit avoidance behaviour when encountering oil. Gross histologic lesions developed in loggerhead sea turtles experimentally exposed to oil, but most effects were apparently reversed by the tenth day after cessation of exposure. Oil may also reduce lung diffusion capacity, decrease oxygen consumption, or digestion efficiency, or damage nasal and eyelid tissue.

Marine Mammals and Sea Turtles – Spill of Drilling Fluids

A spill of drilling fluid could cause a temporary local reduction in habitat quality for marine mammals and sea turtles due to increased levels of total suspended solids and possibly thin sheen associated with the spill. In addition, the potential risk of mortality or physical injury is considered low as a result of drilling fluids due to the limited and temporary nature of any surface sheen and the reduced potential for interaction with fur-bearing mammals. Overall, the proponent predicts that impacts are not likely to be significant.

Marine Mammals and Sea Turtles – Batch Spills from Support Vessels and Blowout

Non fur-bearing marine mammals and juvenile and adult sea turtles are not considered to be at high risk from the effects of oil exposure, and it is likely that only small proportions of any populations at risk would be within the affected area and likely to be exposed. Given the mobility of marine mammals, the proponent expects that they could avoid areas of harmful oil concentrations. Depending on the time of year, location of animals within the affected area, and type of oil spill or blowout, the effects of an accidental release on the health of cetaceans and sea turtles is predicted to be negligible to moderate, short-term to medium-term, and reversible.

Migratory Birds

Marine birds are among the most vulnerable and visible species to be affected by oil spills. At risk are pelagic species that come inshore only to nest, and shorebirds and other coastal water birds. External exposure to oil occurs when flying birds land in oil slicks, diving birds surface from beneath oil slicks, and swimming birds swim into slicks. Reported effects vary with species, type of oil, weather conditions, time of year, and duration of the spill. A change in risk of mortality or physical injury can occur through:

- oiling of feathers which can result in death from combinations of heat loss, starvation, and drowning;
- exposure of eggs from oiled birds returning to nests, causing high mortality of embryos; and
- ingestion of oil as a result of preening or consumption of contaminated food or water.

Long-term physiological changes may eventually result in lower reproductive rates or premature death, or decrease long-term survival.

The extent of bioaccumulation of the chemical components of oil in birds is limited because vertebrate species are capable of metabolizing them at rates that minimize bioaccumulation. Diving species are considered to be the most susceptible to the immediate effects of surface slicks. Other birds (e.g. Northern Fulmar, terns) are also vulnerable to contact with oil because they feed over wide areas and make frequent contact with the water's surface.

Long-term population effects on marine birds as a result of oil spills are not well understood. Some studies suggest that oil pollution is unlikely to have major long-term effects on bird productivity or population dynamics. However, seabirds are known to gather around oil platforms and drilling rig and could be at risk in the event of a spill.

Ivory Gull and Roseate Tern are the bird species identified as at risk in SARA that are most likely to occur within the project area. Roseate Terns are known to breed on Sable Island. Landbirds could be exposed to a spill from a support vessel.

Migratory Birds - Spills of Drilling Fluids

An accidental release of drilling fluid could create a sediment plume extending up to 10 km from the site; with the affected area returning to ambient conditions within 30 hours of the spill. A release at the surface could create a small, thin sheen and cause effects similar to those discussed above for hydrocarbon spills, but more limited in magnitude. Scientific investigations into the effects of thin oil sheens on the feathers of pelagic seabirds found that feather weight and microstructure changed significantly after exposure, concluding that a plausible link exists between even operational discharges of hydrocarbons and increased seabird mortality. However, sheens that form would be temporary and limited in size such that only birds in the immediate area of the spill would likely be affected. While the risk of mortality for individual birds coming into contact with the sheen would be increased, the limited nature of this sheen and the likely number of birds affected would be such that the proponent predicts that the resulting residual effect is not likely to be significant.

Migratory Birds - Batch Spills, Spills from Support Vessels and Blowout

Exposure to hydrocarbons frequently leads to hypothermia and death of affected marine birds. Although some may survive these immediate effects, long-term physiological changes may eventually result in lower reproductive rates or premature death. Sub-lethal effects may persist for a number of years, depending on generation spans of affected species and the persistence of any spilled hydrocarbons. Most marine birds are relatively long-lived. Adult marine birds foraging offshore to feed their young may become oiled and bring hydrocarbons on their plumage back to the nest to contaminate their eggs or nestlings, causing embryo or nestling mortality.

In the remote possibility (less than 2 percent probability based on unmitigated modelling results for the Project) that hydrocarbons released at the Project site reached the exposed coasts, the slick would likely be rapidly weathered and dispersed on the high energy coastline reducing direct effects on nesting habitat. The areas with the potential to be exposed to shoreline oiling, including the Yarmouth, Barrington, and Shelburne region, and Sable Island National Park, correspond to areas known to support breeding bird populations. A particularly dense population of marine bird nesting colonies is located in the area between Cape Sable Island and Yarmouth. This area has a large number of small islands that provide a high density of potential nesting sites. The proponent state that the timeframe required for oil to potentially reach these areas (20 to 30 days) would allow for response measures and containment equipment to be placed in advance to reduce or avoid effects. Response measures could, however, disturb nesting birds and cause reproductive failure. Although potential of effects on nesting habitat is unlikely, there is greater potential for effects on foraging habitat at sea.

The proponent cites a study indicating that while major oil spills have the potential to deplete bird populations or cause single seabird colonies to be deserted, reports from many spills demonstrate the resiliency of seabird populations to single catastrophic events. The proponent predicts that the environmental effects of a hydrocarbon spill from the Project range from low to high in magnitude, extend to the RAA, short- to medium-term in duration, and occur rarely. However, these environmental effects could be significant if carried over more than one generation. In addition, there is potential for mortality of individual birds from at risk species, particularly the Roseate Tern. The proponent states a precautionary conclusion that the residual environmental effects of a blowout, large batch spill, or vessel spill would be significant, but unlikely. The effects of infrequent small spills are predicted to be not significant.

The proponent's analysis of the effects of accidents in the nearshore environment and of spills reaching shore, including effects on species at risk, colonial nesters and concentrations of birds, is applicable to both marine birds and migratory landbirds which could be found in coastal areas, although the magnitude of potential effects on landbirds is expected to be less because of their habitat affinities.

Special Areas

The nature and extent of the effects of an accidental event on special areas would vary considerably depending on the type and magnitude of the event, the proximity to the special area to the event, and the ecological importance of the special area. Table 7 provides estimated probabilities of an unmitigated spill (e.g. no response measures undertaken) reaching each given special area. Special areas with the greatest potential to receive some surface oiling as a result of a vessel spill (based on proximity to the likely vessel routes) include: Scotian Slope/Shelf Break Ecologically and Biologically Significant Area (EBSA); Browns Bank (Haddock Spawning Closure); Haddock Nursery Closure, Emerald/Western Bank (Haddock Box); Redfish Nursery Closure Area (Bowtie); North Atlantic Right Whale Critical Habitat/Area to be Avoided; Sambro Bank and Emerald Basin Sponge Conservation Areas; and shoreline habitat (if a spill should occur close to port). The potential for a spill to affect any of these areas would depend on the nature, volume, and location of the spill along the transit route and not all of these areas would be affected by a single spill. Effects would most likely be temporary, but could result in effects on species most sensitive to surface oiling, including marine birds found in the EBSA.

Sambro Bank and Emerald Basin Sponge Conservation Areas contain *Vazella pourtalesi*, a glass sponge known in only three locations worldwide. The Scotian Shelf contains the only known locations of large aggregations of this

species. The proponent predicts that the potential for deeper sponges to be exposed to harmful dissolved aromatic concentrations following surface spills of diesel or a blowout scenario is very low.

Special Areas - Spills of Drilling Fluids, Batch Spills and Spills from Support Vessels

A spill of drilling mud, and a 10-barrel (1590-Litre) batch spill would be limited in magnitude, geographic extent, and duration. A 100-barrel (15,900-Litre) batch spill and a vessel spill could be wider spread, but would still be temporary and lower in magnitude for the majority of marine resources, as diesel would rapidly spread to a thin sheen and most of the diesel fuel would evaporate. Marine birds are vulnerable to oiling from even a thin sheen; thus a diesel spill, depending on its location and timing, could result in a measurable effect on aggregations of seabirds in the area. Although the project area only encompasses a very small portion of the Scotian Slope/Shelf Break EBSA, this area has been identified for a number of important ecological functions that occur in the larger region, including seabird feeding and overwintering. Spills of drilling fluid and diesel could result in a significant adverse effect on the Scotian Slope/Shelf Break EBSA. However, the low probability of occurrence of such events means that a significant effect is unlikely.

Blowout

A blowout would result in oiling of some portion of the EBSA and subsequent biological effects on fish, marine mammals and sea turtles, and marine birds. The Scotian Slope/Shelf Break EBSA is recognized as an important overwintering and feeding area for marine birds. The potential for either surface or water column oiling to interact with other special areas is relatively low, given their relative distance from the Project. There is a less than 10 percent probability of oil reaching Sable Island National Park Reserve or the south west coast of Nova Scotia from an unmitigated 30-day blowout; however, both areas support breeding bird colonies that are particularly sensitive to oiling effects. Adverse effects on critical habitat for the North Atlantic right whale and northern bottlenose whale are not anticipated based on the modelling results. Although highly unlikely, should oil reach Sable Island, it could cause significant effects on marine birds, particularly species at risk such as the Roseate Tern, which is known to breed on Sable Island.

Table 7 Unmitigated Probabilities of Spilled Diesel or Oil from a Blowout Reaching a Special Area

Special Area	Distance from project area/LAA	Probability of Diesel Reaching Area from Batch Spill	Probability of Diesel Reaching Area from Vessel Spill	Probability of Oil Reaching Area from Unmitigated Blowout
Scotian Slope/Shelf Break EBSA	Overlaps with project area and Local Assessment Area (LAA)	As the mobile offshore drilling unit will be operating within the Ecologically and Biologically Significant Area, a batch spill would result in both surface oiling and total dissolved aromatic concentrations in the vicinity of the spills.	The LAA passes through the area; therefore, a vessel spill in the portion of the LAA that overlaps with the EBSA would result in both surface oiling and total dissolved aromatic concentrations in the vicinity of the spill.	100% probability of surface oiling exceeding the 0.04 micrometre (µm) thickness threshold; 100% probability of water column oiling in excess of 1 part per billion (ppb) in areas closest to the drill site.
Browns Bank (Haddock Spawning Closure)	56 km/ 26 km	Surface oiling could occur in this area in the form of patchy sheen and weathered oil.	Due to the proximity of this area to the LAA (26 km), a vessel spill in the LAA could result in surface oiling.	0 to 25% probability of surface oiling exceeding the 0.04 µm thickness threshold and water column oiling in excess of 1 ppb.
Haddock Nursery Closure, Emerald/Western Bank (Haddock Box)	60 km/overlaps with LAA	No predicted interaction based on modelling results.	The LAA passes through the area; therefore, a vessel spill in the portion of the LAA that overlaps with the Haddock Box would result in both surface oiling and total dissolved aromatic concentrations in the vicinity	0 to 10% probability of surface oiling exceeding the 0.04 µm thickness threshold and water column oiling in excess of 1 ppb.

Special Area	Distance from project area/LAA	Probability of Diesel Reaching Area from Batch Spill	Probability of Diesel Reaching Area from Vessel Spill	Probability of Oil Reaching Area from Unmitigated Blowout
			of the spill.	
Redfish Nursery Closure Area (Bowtie)	92 km/ 33 km	Surface oiling could occur in this area in the form of patchy sheen and weathered oil.	Due to the proximity of this area to the LAA (33 km), a vessel spill in the LAA could result in surface oiling.	0 to 10% probability of surface oiling exceeding the 0.04 µm thickness threshold and water column oiling in excess of 1 ppb.
North Atlantic Right Whale Critical Habitat/Area to be Avoided	95 km/ 65 km	Surface oiling could occur in this area in the form of patchy sheen and weathered oil.	Due to the proximity of this area to the LAA (65 km), a vessel spill in the LAA could result in surface oiling.	0 to 10% probability of surface oiling exceeding the 0.04 µm thickness threshold and water column oiling in excess of 1 ppb.
Lobster Fishing Area 40 (Georges Bank)	105 km/ 75 km	No predicted interaction based on modelling results.	Due to the distance of this area from the LAA (75 km), no interaction is predicted.	0 to 25% probability of surface oiling exceeding the 0.04 µm thickness threshold and water column oiling in excess of 1 ppb.
Georges Bank Oil and Gas Moratorium Area	120 km/ 107 km	No predicted interaction based on modelling results.	Due to the distance of this area from the LAA (107 km), no interaction is predicted.	0 to 25% probability of surface oiling exceeding the 0.04 µm thickness threshold and water column oiling in excess of 1 ppb.
Northeast Channel Coral Conservation Area	130 km/ 100 km	No predicted interaction based on modelling results.	Due to the distance of this area from the LAA (100 km), no interaction is predicted.	0 to 25% probability of water column oiling in excess of 1 ppb.
Hell Hole (Northeast	135 km/ 105 km	No predicted interaction based on	Due to the distance of this area from the LAA (105 km),	0 to 25% probability of surface oiling exceeding the 0.04 µm thickness

Special Area	Distance from project area/LAA	Probability of Diesel Reaching Area from Batch Spill	Probability of Diesel Reaching Area from Vessel Spill	Probability of Oil Reaching Area from Unmitigated Blowout
Channel)		modelling results.	no interaction is predicted.	threshold and water column oiling in excess of 1 ppb.
Georges Bank Fishery Closure (5Z)	158 km/ 117 km	No predicted interaction based on modelling results.	Due to the distance of this area from the LAA (117 km), no interaction is predicted.	0 to 25% probability of surface oiling exceeding the 0.04 µm thickness threshold and water column oiling in excess of 1 ppb.
Sambro Bank Sponge Conservation Area Emerald Basin Sponge Conservation Area	152 km/ overlaps with LAA 182 km/ 27 km	No predicted interaction based on modelling results.	The LAA passes through the area; therefore, a vessel spill at in the overlapping area would result in both surface oiling and total dissolved aromatic concentrations in the vicinity of the spills.	0 to 10% probability of water column oiling in excess of 1 ppb.
Sable Island National Park Reserve	220 km/ 185 km	No predicted interaction based on modelling results.	Due to the distance of this area from the LAA (185 km), no interaction is predicted.	0 to 10% probability of surface oiling exceeding the 0.04 µm thickness threshold and shoreline oiling.
The Gully Marine Protected Area	262 km/ 232 km	No predicted interaction based on modelling results.	Due to the distance of this area from the LAA (232 km), no interaction is predicted.	0 to 10% probability of surface oiling exceeding the 0.04 µm thickness threshold and water column oiling in excess of 1 ppb.
Northern Bottlenose Whale Critical Habitat (Sanctuaries): The Gully, Shortland Canyon, Haldimand	273 km/ 243 km, 330 km/ 300	No predicted interaction based on modelling results.	Due to the distance of these areas from the LAA (243 300 and 336 km), no interaction is predicted.	0 to 10% probability of surface oiling exceeding the 0.04 µm thickness threshold and water column oiling in excess of 1 ppb.

Special Area	Distance from project area/LAA	Probability of Diesel Reaching Area from Batch Spill	Probability of Diesel Reaching Area from Vessel Spill	Probability of Oil Reaching Area from Unmitigated Blowout
Canyon	km, 366 km/ 366 km			
Lophelia Conservation Area	442 km/ 412 km	No predicted interaction based on modelling results.	Due to the distance of this area from the LAA (412 km), no interaction is predicted.	Less than 1% probability of water column oiling in excess of 1 ppb.

Commercial Fisheries

Adverse effects of spills could include:

- reduced access to fishing grounds (e.g. fisheries exclusion);
- reduced catches;
- reduced marketability; and
- loss of, damage to, or fouling of fishing gear or cultivation gear.

Although the Project is not located within an area of high harvesting activity, an oil slick could reach an active fishing area on the Scotian Shelf or shelf break where harvesting activity is more concentrated. Fishery closures may be imposed after a spill to prevent gear from being contaminated and to protect or reassure seafood consumers. Based on experience with the Deepwater Horizon, closures typically remain in place until an area is free of oil and oil sheen on the surface, there is low risk of repeat exposure based on predicted trajectory modeling, and seafood has passed sensory sampling (smell and taste) for oil exposure (taint) and chemical analysis for oil concentration (toxicity). Fish are able to readily metabolize PAHs. Other species such as crabs, oysters, shrimp, clams, and scallops, do not as readily metabolize PAHs, which can result in elevated levels in their fatty tissues. As a result, closure periods may vary depending on species type.

The implementation of a fishery closure, which would likely be based on a visible sheen threshold (e.g. 0.4 µm) would prevent localized or area-specific harvesting of fish, and potentially alleviate concerns about marketing of tainted products, but it also represents a material concern for fishers. Short-term losses in the Gulf following the Deepwater Horizon Oil Spill in 2010 included the closure to fishing of up to 80 000 square miles of the United States Exclusive Economic Zone. Physical and chemical characteristics of oil products, along with environmental and biological factors, such as wind, water temperature, solar radiation, shoreline type, and species, influence the degree to which seafood may become contaminated. The uptake of oil and polycyclic aromatic hydrocarbons (PAHs) by exposed fish poses a potential threat to human consumers and affects the marketability of catches. However, even when results demonstrate safe exposure levels for consumption and closed areas are reopened for fishing, market perceptions of poor product quality (e.g. tainting) can persist, thereby prolonging effects for fishers. Reduced demand for seafood that is perceived to be tainted can also lead to depressed market prices.

Predictive modelling indicates that it would take approximately 5 to 10 days for an unmitigated blowout to reach threshold concentrations at the shelf break or Georges Bank, where fishing effort is considerably more concentrated, thereby providing an opportunity to notify fishers of the spill and preventing the setting or hauling of gear in the affected area. The proponent states that the fouling of gear and catching of contaminated resources would therefore be reduced or avoided. Depending on the extent of the blowout and the effectiveness of mitigation, the proponent predicts that closure areas may not be widespread and fishers may also be able to fish in alternate areas.

While the effects of oil on aquaculture are similar to other commercial fisheries, aquaculture operations are unique in the type and variety of mitigation that can be used to limit effects of spills if operators are notified in a timely manner (e.g. moving floating facilities to avoid slicks, temporary sinking of specially designed cages to

allow oil to pass over, transfer of stock to other areas). However, mitigation measures can be technically, logistically, or financially challenging depending on the circumstances.

The focus of mitigation is accident prevention. In the event of a spill, a Fisheries Communications Plan would be implemented to inform fishers of an accidental event and appropriate response. Emphasis is on timely communication, providing fishers with the opportunity to haul out gear from affected areas, reducing the potential for fouling of fishing gear. In addition, the proponent would compensate for damage to gear in accordance with *Compensation Guidelines Respecting Damages Relating to Offshore Petroleum Activity*. Post-spill environmental effects monitoring would measure levels of contamination in fish with results integrated into a human health risk assessment to inform the fishing area closure status. The monitoring program would be developed in consultation with applicable regulatory agencies and may include sensory testing of seafood for taint (a smell or taste of oil), and chemical analysis for oil concentration and other substances as applicable (e.g. dispersants).

Commercial Fisheries - Spill of Drilling Fluids

Given the predicted affected area (up to 10 km), temporary period of measurable effect on water quality (up to 30 hours), and low toxicity of the product, effects of a synthetic-based drilling fluid spill are predicted to be not significant for commercial fisheries.

Commercial Fisheries - Batch Spills and Spills from Support Vessels

A 10-barrel (159-Litre) batch spill offshore is unlikely to measurably affect fisheries occurring outside the drilling unit's 500 m operational safety (fisheries exclusion) zone and therefore would not result in a significant adverse environmental effect on commercial fisheries. The proponent predicts that a spill of the same material and volume occurring in the nearshore environment could have potential effects on nearshore fisheries, potentially displacing fishers from traditional fishing ground for all or most of a fishing season, depending on the volume, location and timing of the spill. Effects on nearshore areas are expected to be limited, given the small-scale nature of the spill. Oil spill containment and recovery operations will further reduce residual effects on fish and fish habitat.

Commercial Fisheries - Blowout

In the very unlikely event of a blowout, fishers could potentially be displaced or unable to use substantial portions of the areas traditionally or currently fished for all or most of a fishing season (e.g. fishery closure). Fishers could also experience reduced catches, reduced marketability of fish, or increased expenses. For this reason, the proponent predicts that this event could result in a significant adverse effect on commercial fisheries. Given the low probability of occurrence, conservative spill, and proposed response procedures, significant effects are considered unlikely.

With respect to effects on fisheries, post-spill monitoring could involve monitoring contamination levels in fish species including sensory testing of seafood for taint, and chemical analysis, as deemed necessary by government authorities.

Current Aboriginal Use of Lands and Resources for Traditional Purposes

Accidents could have adverse environmental effects on the current Aboriginal use of lands and resources for traditional purposes, similar to those described for commercial fisheries. Although the Traditional Use Study did

not identify any food, social, and ceremonial fisheries near the project area, a spill could affect offshore food, social, and ceremonial activities should they be taking place, nearshore fisheries, or target species that could be migrating through or otherwise using the affected area.

Accidental events (e.g. spills) could contaminate fish species commonly harvested for human consumption through communal commercial or food, social, and ceremonial fisheries and adversely affect marketability of Nova Scotia seafood products. Fisheries closures would likely be imposed in the event of a large incident. These factors could all adversely affect First Nations whose communities rely on the fishery for food and livelihood.

Current Aboriginal Use of Lands and Resources for Traditional Purposes - Spill of Drilling Fluids

Given the predicted affected area (up to 10 km), temporary periods of measurable effects on water quality (up to 30 hours), and the low toxicity of the product, effects of a spill of synthetic-based drilling fluid are predicted to be not significant.

Current Aboriginal Use of Lands and Resources for Traditional Purposes - Batch Spills and Spills from Support Vessels

Spills from the drilling unit are predicted to have limited effects; around 80 percent of the spill would evaporate within 2 to 3 days, with only approximately 2 square km and 20 square km having in-water concentrations of dissolved aromatics in excess of 1 part per billion at any time for the 10-barrel and 100-barrel spill, respectively. Effects from a vessel diesel spill would be expected to be of similar magnitude although a spill could also affect nearshore commercial and food, social, and ceremonial fisheries depending on the location of the vessel. Diesel fuel is considered to result in a moderate to high risk of seafood contamination because of the relatively high content of water-soluble aromatic hydrocarbons, which are semi-volatile and evaporate slowly. If a fisheries closure was implemented due to the spill, it could cause a temporary loss of access to Aboriginal fishers for commercial or food, social, and ceremonial purposes. A diesel spill in the nearshore, while unlikely, could result in a displacement of Aboriginal fishers for all or most of a season, thereby potentially having a significant adverse residual environmental effect on Aboriginal commercial fisheries and traditional use.

Current Aboriginal Use of Lands and Resources for Traditional Purposes - Blowout

The probability of surface oiling from an unmitigated 30 day continuous blowout reaching the Scotian Shelf is between 1 and 10 percent. Modelling indicates it would take approximately 5 to 10 days for a blowout to reach threshold concentrations at the shelf break where fishing effort is considerably more concentrated. The proponent states that fisheries could be notified of the spill and the setting or hauling of gear in the affected area could be prevented. Identified fishing areas for demersal and invertebrate fisheries are almost exclusively located on the shelf, whereas pelagic fisheries occur throughout the RAA. Although significant adverse effects may occur in the event of a subsea blowout, they are considered unlikely given the low probability of occurrence of the event, the conservative nature of modeling, and the implementation of response procedures.

7.1.6 *Views Expressed*

Federal Authorities

Environment Canada requested details on what measures would be taken to protect birds (including avian species at risk) and sensitive habitats in the event of a spill of a substance harmful to birds. The proponent indicated that its Oil Spill Response Plan will include a Wildlife Response Plan to identify wildlife response,

protection, and rehabilitation strategies and operations, if required during an incident. The Oil Spill Response Plan will also identify specific wildlife sensitivities (species and habitats), include strategies and measures to be taken to prevent and respond to wildlife impacts, outline available response resources (equipment and personnel), and monitoring measures to be taken at the time of an incident. The proponent committed to taking into account the document *Birds and Oil – Canadian Wildlife Service Response Plan Guidance*, as advised by Environment Canada, in developing its plan.

Environment Canada noted that, in addition to marine birds, migratory landbirds that may be present in the vicinity of the drilling unit or in coastal areas may be affected by accidental events and requested that relevant species, including those at risk, be identified.

The proponent stated that a high diversity of landbird species could potentially occur in coastal areas that may be affected by accidental events and provided a list of the most relevant species. It is estimated that it would take 20 to 30 days for oil to reach coastal areas, providing time for response measures and containment equipment to reduce or avoid effects on coastal environments. Furthermore, the proponent stated that if oil reaches the coast (less than 2 percent probability) the slick will likely be weathered and dispersed on the high energy coastline, reducing direct effects.

Aboriginal Groups

First Nations participants are very concerned about the potential effects of oil spills, particularly a large spill such as could result from a blowout. They are concerned about overall effects on the marine environment and species of interest to Aboriginal participants for commercial or traditional purposes. They are also concerned about use of dispersants as a spill response measure and potential for loss of fishing access and compensation in the event of a large spill. The proponent noted that any damages would be compensated for in accordance with the *Compensation Guidelines Respecting Damages Relating to Offshore Petroleum Activity*. In addition, it committed to developing specific follow-up and monitoring programs, in consultation with applicable regulatory agencies, Aboriginal groups, the public, and stakeholders.

The Nova Scotia Mi'kmaq asked that a capping stack that the proponent proposes to use to stop a large blowout be located in Halifax. The proponent indicated that there is a large amount of infrastructure required to support the capping stack, including highly-specialized vessels that are typically found only in areas where capping stacks are now located (areas with high levels of offshore oil and gas activity such as the North Sea and the Gulf of Mexico). The proponent stated due to the specialized requirements for the capping stack, the necessary facilities, equipment, and trained personnel are not available in Atlantic Canada. It would require substantial time (i.e. more than the term of the Exploration Licences) to develop such capacity locally, and capital investment would be prohibitively high.

St. Mary's First Nation asked about the effects of spills on Atlantic salmon, Atlantic herring and gaspereau. The proponent recognized that, in the event of an offshore spill, Atlantic herring, which spawn in offshore locations, could have various life stages present in the affected area. Interaction with gaspereau would be limited to adult fish migrating through or feeding in the affected area. Interaction with juvenile gaspereau would only be possible in the event of spilled material reaching the nearshore.

In the unlikely event of a blowout, effects on Atlantic salmon would be larger and the potential for interaction would be greater than a diesel spill. Adult fish would be expected to avoid exposure. The proponent predicted that effects on food, social or ceremonial species would not be significant. However, given the potential economic and cultural effects that could result from damage to fishing gear or loss or reduced access to fishing areas, effects on Aboriginal fisheries (including food, social, and ceremonial fisheries) are predicted to be significant for a 100-barrel batch diesel spill, a vessel spill, and well blowout.

A 10-barrel or 100-barrel spill of diesel from the drilling unit is not expected to result in biological effects on fish over a large area since 80 percent of the spill will be evaporated within 2 to 3 days, with approximately 2 square km and 20 square km, respectively, experiencing in-water concentrations of dissolved aromatics in excess of 1 part per billion at any time. A nearshore spill of diesel from an offshore support vessel is more likely to affect breeding or feeding areas of anadromous species, such as Atlantic salmon, although these effects would be temporary and would not be predicted to affect local populations.

Spill prevention and response measures would reduce the likelihood and severity of environmental effects from accidental events. The proponent's Fisheries Communications Plan would facilitate communication with Aboriginal organizations and fishers to understand potential economic and cultural effects associated with a spill and disruption in food, social, and ceremonial harvest and appropriate response measures.

St. Mary's First Nation asked about the potential for sea ice to occur at the drilling area and how that could affect oil spill behaviour and response. The proponent indicated that sea ice and icebergs are very rare in offshore Nova Scotia. However, there is limited potential for oil and ice interaction in certain locations. At 40 to 60 percent ice coverage, modelling results predict a very slight modification to surface oil trajectory, as oil would move with the sea ice and wind. The evaporation and emulsification of oil at the surface would be reduced due to shielding from wind and waves. The presence of ice would reduce wave energy and therefore also reduce entrainment of surface oil into the water column. The spreading of surface oil would also be slowed and reduced due to cold temperatures and herding effects from ice. The end result would be a smaller area of thicker, fresher oil remaining at the surface for a longer period of time, with a lower portion of the oil found in the water column or atmosphere, when compared to an ice free case. No major challenges to incident response measures are anticipated should there be any interaction between oil and the presence of sea ice.

St. Mary's First Nation also requested an opportunity to review various emergency response planning documents during their development, such as the Net Environmental Benefit Analysis (required in conjunction with possible use of dispersants) and the Oil Spill Response Plan. The Maritimes Aboriginal Peoples Council also expressed similar interest in the review of emergency and other plans. The proponent is required to provide these documents to the Board to support its application for an offshore drilling authorization. It has committed to provide information to First Nations about its plans (Oil Spill Response Plan, Net Environmental Benefits Analysis, Environmental Protection Plan and associated documentation) and has proposed meetings on the matter. The proponent did not commit to provide drafts for review, stating that these documents would still be under development at that time and are controlled documents. The proponent will conduct a mock emergency response planning exercise prior to commencing drilling to demonstrate its capabilities to implement its emergency response plan and to effectively respond to a spill. The exercise will include members from government agencies who would be directly involved in responding to an incident, as well as the Board's Fisheries Advisory Committee, Nova Scotia Department of Fisheries and Aquaculture, and Mi'kmaq fisheries

representatives who have expressed an interest in understanding how emergency and spill response work in practice. Saint Mary's First Nations Nova Scotia commercial fisheries representative has been invited and is scheduled to participate in the exercise.

Public

The public expressed general concern about the effects of potential oil spills, including effects on breeding and migrating birds. The impacts of accidents and malfunctions on birds were assessed by the proponent. Environment Canada has reviewed the analysis of impacts on migratory birds and provided advice to the Agency. The residual environmental effects of a blowout, large batch spill, or vessel spill on migratory birds are predicted to be significant, but unlikely to occur. The effects of infrequent small spills are predicted to be not significant.

The Seafood Producers Association of Nova Scotia raised concern about the effects of spills on Georges Bank. The proponent's analysis indicated that neither batch spills nor spills from support vessels are expected to reach Georges Bank, due to its distance from the project area and LAA. In the event of an unmitigated 30-day blowout, the proponent predicted that there is a 0 to 25 percent chance of surface oiling exceeding the 0.04-micrometre thickness threshold for adverse effects due to surface oiling.

7.1.7 *Agency Analysis and Conclusion*

The Agency acknowledges that the proponent operates throughout the world and has significant experience in offshore drilling, including in deep water. It further recognizes that the Board has facility safety and emergency prevention requirements with which the proponent must comply. The Agency is satisfied with the proponent's approach to risk management and that the proponent will take all reasonable measures to minimize the probability of malfunctions and accidents. The Agency is satisfied that the proponent's response plans that will be developed to meet the Board's regulatory standards will be appropriate for the scenarios that could occur. This includes the proponent's commitment, in the event of a blowout, to begin the immediate mobilization of primary and back-up capping stacks and associated equipment to the project area.

The Agency has identified the following measures as necessary to prevent or mitigate significant adverse effects from accidents and malfunctions:

- Undertake all reasonable measures, to the Board's satisfaction, to prevent accidents and malfunctions that may result in adverse environmental effects and effectively implement appropriate emergency response procedures and contingencies developed in relation to the Project.
- Prepare an Oil Spill Response Plan and submit to the Board for approval 90 days prior to drilling. The Plan must include:
    - procedures to respond to an oil spill (e.g. oil spill containment, oil recovery).
    - measures for wildlife response, protection, and rehabilitation (e.g., collection and cleaning of marine mammals, birds, and sea turtles) and measures for shoreline protection and clean-up, developed in consultation with the Board, Fisheries and Oceans Canada and Environment Canada.
    - A Dispersant Operations Plan;

- Conduct a desktop exercise of the Oil Spill Response Plan prior to the commencement of project activities and adjust the plan to address any deficiencies identified during the exercise.
- The Oil Spill Response Plan shall be reviewed and updated as required following the completion of each well.
- Prepare a Well Containment Plan, including a Relief Well Contingency Plan and a Well Capping Plan describing the plan to mobilize and deploy a capping stack if required.
- Undertake a Net Environmental Benefit Analysis to understand the potential risks and consequences of using dispersant and provide it to the Board for review.
- Consult with Aboriginal groups during the development of the Oil Spill Response Plan, Well Containment Plan and Net Environmental Benefit Analysis and provide the approved versions to Aboriginal groups.
- In the event of a well blowout, begin the immediate mobilization of primary and back-up capping stacks and associated equipment to the project area to stop the spill.
- Compensate for any damages in accordance with the Board's *Compensation Guidelines Respecting Damages Relating to Offshore Petroleum Activity*.

The Agency has identified measures as part of a follow-up program to ensure the effectiveness of mitigation measures and to verify accuracy of predicted effects in the event of a spill. Measures may include:

- Monitoring the environmental effects of oiling on components of the marine environment to be identified by the Board in consultation with Fisheries and Oceans Canada and Environment Canada until the specific endpoints identified by respective departments are achieved and residual hydrocarbons reach acceptable background levels. As applicable, monitoring shall include:
    - sensory testing of seafood for taint, and chemical analysis for oil concentrations;
    - measuring levels of contamination in fish species with results integrated into a human health risk assessment to determine the fishing area closure status; and
    - monitoring for marine mammals, sea turtles, and birds with visible oiling and reporting results to the Board.

The Agency considers that the effects of a major accident or malfunction from the Project on marine birds, current use, and fisheries would likely be significant; however, the probability of occurrence for a major event is very low and thus significant effects are unlikely to occur. As a result, the Agency concludes that Project is not likely to cause significant adverse environmental effects as a result of accidents and malfunctions. Notwithstanding this conclusion, the Agency will recommend to the Minister that the mitigation measures and follow-up program elements identified above be included as conditions of the decision statement should the project be allowed to proceed.

7.2 Effects of the Environment on the Project

Extreme environmental conditions or events (e.g. hurricanes, tsunamis, and earthquakes) can increase the probability of an accident or malfunction, such as an oil spill, that in turn could affect the environment. For this reason, the effects of the environment on the Project are considered.

7.2.1 *Proponent's Assessment of Environmental Effects*

Environmental phenomena that could potentially affect the Project include: fog, sea ice and superstructure icing, seismic events and tsunamis, hurricanes, winds, waves, extreme weather events, and sediment and seafloor stability. Effects from sea ice, seismic activity, tsunamis, and sediment and seafloor stability will be minimal given the limited duration of offshore activities (i.e. approximately 130 days to drill an individual well), the absence of permanent offshore infrastructure, and the lack of site-specific risk factors, e.g. low potential for sea ice, seismic activity, or tsunamis in the project area. Risks will be further reduced by selecting a drilling unit that is designed for harsh weather and by implementing standard operating procedures for the drilling unit and support vessels including site-specific weather and sea state forecasting, real-time weather monitoring, stop-work procedures, and safe work practices.

There is independent oversight of drilling unit approval. In accordance with the *Nova Scotia Offshore Certificate of Fitness Regulations* operators of all drilling units in the Nova Scotia offshore must obtain a Certificate of Fitness issued from an internationally-recognized certification authority such as Det Norsk Veritas, the American Bureau of Shipping, or Lloyds Register. Certification provides independent third-party assurance that the facility meets all applicable safety standards and is fit for its intended purpose.

7.2.2 *Views Expressed*

Federal Authorities

Environment Canada provided a number of updates to information presented in the proponent's EIS to ensure a complete understanding of the meteorological and oceanographic conditions that may be experienced at the site. The proponent confirmed that its facility will be designed to meet all applicable standards and operate safely in all expected conditions. Natural Resources Canada stated that it is satisfied with the proponent's conclusion that earthquake and tsunami occurrences do not pose issues for the operation of the temporary mobile drilling unit or its sea-bottom components.

7.2.3 *Agency analysis and conclusion*

There are no permanent offshore facilities proposed for the Project. The drilling unit and support vessels will be required to meet international standards of fitness for year-round operations in the North Atlantic Ocean, and must also comply with the *Nova Scotia Offshore Certificate of Fitness Regulations*. The Agency notes that the drilling unit proposed for use in the initial phase of drilling, the Stena IceMAX, is designed for harsh conditions and that, regardless of the drilling unit, the proponent will have operating plans in place for weather-related shut-downs, including weather thresholds (e.g. forecast wind speed and wave height) that would trigger a shut-down. Site-specific weather and sea-state forecasting services are standard procedure for operators in the Canadian offshore.

7.3 Cumulative Environmental Effects

7.3.1 *Approach and Scope*

Consistent with the Agency's operational policy statement *Addressing Cumulative Environmental Effects under the Canadian Environmental Assessment Act*, the cumulative environmental effects of a project are those that are likely to result when a residual environmental effect of a project acts in combination with the residual environmental effects of other projects or activities that have been or will be carried out. The proponent predicted residual effects on fish and fish habitat, marine mammals and sea turtles, marine birds, special areas, commercial fisheries, and current Aboriginal use of lands and resources for traditional purposes. Species at risk were included in the applicable VC. The proponent also concluded that these residual effects could overlap temporally with the residual effects of past, present, and future (i.e. certain or reasonably foreseeable) physical activities, including:

- offshore gas development projects on the Scotian Shelf (e.g. Sable Offshore Energy Project and Deep Panuke Project);
- commercial, Aboriginal, and recreational fisheries; and,
- other ocean uses, such as shipping, scientific research, and military activities.

The proponent also assessed potential cumulative effects in association with a proposed 2015 BP 3D seismic survey. However, that survey has been cancelled and therefore those effects no longer require consideration. BP has also not announced intent to drill on its Exploration Licences; therefore drilling by BP is speculative at this time and was not considered in the cumulative effects analysis conducted by the proponent.

The proponent carried out its effects assessment in three stages by:

- establishing the context for the cumulative effects,
- determining if project-specific environmental effects interact with the environmental effects of other physical activities, and then
- assessing the cumulative environmental effects and the Project's contribution to them.

The proponent predicted that spatially, the residual environmental effects of the Project on each VC will be limited to the project area and LAA. Despite the lack of spatial overlap between the residual environmental effects of the Project and the residual environmental effects of offshore gas development projects on any VC, certain VCs may nonetheless be adversely affected by sequential exposure to the residual environmental effects of the Project, the Deep Panuke Project and/or the Sable Offshore Energy Project. The life cycles of several species of fish, marine mammals, sea turtles and marine birds include long-distance movement with the RAA, and there is potential for members of these species to be adversely affected by the combined residual environmental effects of the Project and offshore gas development projects. For example individuals may be exposed to the residual environmental effects of multiple physical activities during the course of their migrations within the RAA. Similarly, because the customary or traditional fishing grounds of commercial or Aboriginal fishers may encompass a broad area or include multiple areas, some may be adversely affected by the combined residual environmental effects of the Project and fishers and other ocean users; the same fishers

may be exposed to the residual environmental effects of multiple physical activities during the course of their traditional activities within the RAA.

Offshore Gas Development

The Sable Offshore Energy Project and the Deep Panuke Project are the only offshore oil and gas projects presently operating in the RAA. Both are located near Sable Island, approximately 130 km north east of the Shelburne project area. The Sable Offshore Energy Project has been producing natural gas since 1999 and has a total project life expectancy of approximately 25 years, while the Deep Panuke Project began producing natural gas in 2013 and is anticipated to have a 13-year life; however, new discoveries could extend the life of either project. These past and present offshore gas development projects comprise similar physical activities and components to the Project being assessed (albeit on a larger spatial and temporal scale). Typical activities include operational discharges, underwater noise, lights and flares from production platforms. There are also support vessel and helicopter operations, with associated potential effects such as vessels colliding with mammals or turtles or helicopters eliciting diving behaviours in whales or hitting birds. These effects may occur in special areas; however, the results of environmental effects monitoring completed to date for the two projects have not identified any residual environmental effects on habitat quality and use in designated special areas. Additionally, the oil and gas industry has adopted support vessel and helicopter traffic restrictions around Sable Island which includes maintaining a 2 km buffer from the island, except in the case of an emergency, to reduce the potential effects on marine birds.

Sound pressure levels from the gas developments are similar to those predicted for the Project and are high enough to affect fish, marine mammals, and sea turtles, including risk of injury for marine mammals and sea turtles. Nocturnally migrating birds may be attracted or disoriented by artificial night lighting on the Sable Offshore Energy Project and the Deep Panuke Project platforms, thereby increasing their risk of injury or mortality. Offshore gas development projects have localized effects on access to fisheries resources for commercial and Aboriginal fishers due to the establishment of 500 m radius safety zones around the production platforms. Fishing activity has been and will continue to be excluded within these safety zones for the duration of the projects.

Despite the lack of spatial overlap between the residual environmental effects of the Project and the residual environmental effects of offshore gas development projects on any VC, certain VCs may nonetheless be adversely affected by sequential exposure to the residual environmental effects of the Project, the Deep Panuke Project, and the Sable Offshore Energy Project. The life cycles of several species of fish, marine mammals, sea turtles, and marine birds include long-distance movement within the RAA, and there is potential for members of these species to be adversely affected by the combined residual environmental effects of the Project and offshore gas development projects (e.g. the same individuals may be exposed to the residual environmental effects of multiple physical activities during the course of their migrations within the RAA).

Fisheries

Fishing is the main activity affecting fish and fish habitat in the RAA. Commercial, recreational, and Aboriginal fisheries within the RAA cause a direct change in risk of mortality or physical injury for targeted fish species as well as any non-targeted fish species that may be taken as bycatch. Mobile bottom-contact fishing gear that is dragged along the seafloor (e.g. trawlers) for certain fisheries can remove plants, corals, and sessile food items; overturn rocks; level rock outcrops; crush, bury, or expose benthic organisms; and re-suspend sediments,

thereby causing a change in habitat quality and use and change in risk of mortality or physical injury for marine benthos. Given that the Scotian Slope/Shelf Break EBSA is not currently subject to any fishing closures or gear restrictions, the use of mobile bottom-contact fishing gear has potential to cause a change in habitat quality and use in that special area, which is partially located within the project area.

Fishing vessels may cause a localized change in habitat quality and use for fish, marine mammals, and sea turtles through the generation of underwater noise from engines and propellers during transiting. Although sound pressure levels produced during the transiting of fishing vessels are below the thresholds for physical injury to marine species, sound pressure levels of other physical activities that may be carried out by fishing vessels (e.g. depth sounding, bottom profiling, and side scan sonar) are high enough to cause injury or mortality to fish at close ranges. Fishing vessels may also strike marine mammals and sea turtles and create risk of sea turtle mortality as a result of entanglement in fishing gear.

Noise associated with fisheries may cause sensory disturbance of marine birds. Any vessels that employ artificial night lighting may also attract and/or disorient nocturnally migrating marine birds. Discharges from fishing vessels (e.g. grey and black water, ballast water, bilge water, and deck drainage) may cause localized effects on fish, marine mammals, sea turtles, and marine birds. Depending on the location of the fishing vessel at the time that the discharge is made, these effects could occur in a special area.

If fisheries resources are not harvested sustainably, the residual environmental effects of present fishing activity in the RAA could affect future commercial and Aboriginal fishers due to decreased catch rate as well as resource depletion.

Because the customary or traditional fishing grounds of any given commercial or Aboriginal fisher may encompass a broad area or include multiple areas, there is potential for some fishers to be adversely affected by the combined residual environmental effects of the Project and fisheries and other ocean users (i.e. the same fishers may be exposed to the residual environmental effects of multiple physical activities during the course of their harvesting activities within the RAA).

Other Ocean Uses

Other ocean uses, primarily shipping, involves potential effects similar to that described for operation of fishing vessels (noise, discharges).

7.3.2 *Potential Cumulative Effects on Fish and Fish Habitat*

Cumulative effects on fish and fish habitat include impacts of noise and discharges (e.g. drill muds and cuttings). In addition, groundfishing activities can adversely affect the benthic environment. Overall impacts resulting in fish mortality or physical injury are predicted to be low in magnitude and limited to the LAA. Cumulative water quality and noise effects are considered by the proponent to be unlikely to disrupt the use of important habitat areas by fish. Affected areas represent a relatively small proportion of the total amount of habitat available in the RAA. Residual effects on habitat quality are predicted to be low to moderate in magnitude and limited to the LAA.

7.3.3 *Potential Cumulative Effects on Marine Mammals and Sea Turtles*

Cumulative effects on marine mammals and sea turtles include impacts from underwater or above-water noise (e.g. from exploration activities or helicopters), changes in water quality, and from and strikes or collisions. Sea turtles are also at risk of mortality due to entanglement in fishing and seismic gear. Overall, the proponent predicts that cumulative effects resulting in mortality or physical injury would be low in magnitude and limited to the LAA. Cumulative effects on habitat quality and use may disrupt reproductive, foraging and feeding, or migratory behaviour or marine mammals and sea turtles, if the availability of important habitat areas is affected. However, the likelihood is considered low given the distances over which activities are taking place, as well as the localized nature of potential project effects. Overall, the cumulative water quality and noise effects are unlikely to substantially disrupt the use of important habitat areas by marine mammals or sea turtles. Project-related underwater noise will represent only a small incremental increase over existing levels in the RAA. Residual effects on habitat quality are predicted by the proponent to be low to moderate in magnitude, but limited in extent to the LAA.

7.3.4 *Potential Cumulative Effects on Migratory Birds*

Cumulative effects on birds include effects of underwater noise emissions, helicopter strikes, artificial night lighting, and atmospheric noise. Marine birds are vulnerable to potential injury or mortality when exposed to hydrocarbon contaminations such as from crude and heavy fuel oil, lubricants, or diesel. Residual effects on marine birds resulting in mortality or physical injury and on habitat quality and use are predicted to be low in magnitude and limited to the LAA.

7.3.5 *Potential Cumulative Effects on Special Areas*

Given the importance of the Haddock Box and the Sambro Bank Sponge Conservation Area for fish and fish habitat, as well as the importance of the Scotia Slope/Shelf Break EBSA for fish, marine mammals, sea turtles, and marine birds, much of the analysis of cumulative environmental effects provided for these other VCs is also applicable to Special Areas. The proponent predicts that residual effects will be low to moderate in magnitude and limited to the LAA.

7.3.6 *Potential Cumulative Effects on Commercial Fisheries*

Cumulative effects on Fisheries include loss of access to the safety zones around offshore petroleum facilities, the vessels and streamers from seismic activity, the presence of competing fishing vessels, and marine traffic associated with other ocean users. The level of fishing effort within and surrounding the project area is low. The LAA does not include any unique fishing grounds or concentrated fishing effort that occurs exclusively within the LAA, nor is it likely to represent a substantial portion of a customary fishing area for a fisher. Consequently, the proponent predicts that residual effects would be low in magnitude and limited to the LAA.

7.3.7 *Potential Cumulative Effects on Current Use of Lands and Resources for Traditional Purposes by Aboriginal Peoples*

The proponent states that the analysis of cumulative effects on commercial fisheries is also directly applicable for Aboriginal fishers. In addition, the analysis of potential cumulative effects related to fish and fish habitat and special areas should also be referenced given that these VCs were identified by Aboriginal groups as important

considerations with respect to traditional use. The residual cumulative effects are predicted by the proponent to be low in magnitude and limited in extent to the LAA.

The proponent concluded that with the application of proposed project-related mitigation and environmental protection measures, the residual cumulative adverse environmental effects of the Project, in combination with other projects, are not likely to be significant. The proponent has high confidence in its conclusion based on existing knowledge of the general environmental effects of exploration drilling and other physical activities in the RAA, and the effectiveness of standard mitigation measures.

7.3.8 *Views Expressed*

Aboriginal Groups

The Kwilmu'kw Maw-klusuaqn Negotiation Office asked about the cumulative effects of drilling seven wells. The proponent assessed the effects of multiple wells as part of its assessment of project effects, and not in its cumulative effects analysis. The proponent provided information showing that potential residual effects are short-term and localized in proximity to offshore project activities and that this is consistent with industry-reported monitoring results from other jurisdictions, including off Nova Scotia and on the Grand Banks of Newfoundland.

Public

The Ecology Action Centre expressed the view that a project-by-project, site-based focus downplays the cumulative effects of human activities on the Shelf and Slope. The Agency notes the perspective provided but also that the assessment of cumulative effects presented by the proponent was conducted in accordance with the requirements of CEAA 2012 and is appropriate in relation to the Project. However, it is noted that the Board has conducted Strategic Environmental Assessments of petroleum exploration activities in relation to areas of the Nova Scotian offshore.

7.3.9 *Agency Analysis and Conclusion*

The proponent predicted residual effects of the Project on fish and fish habitat, marine mammals and sea turtles, marine birds, special areas, commercial fisheries, and current Aboriginal use of lands and resources for traditional purposes. It provided an assessment of cumulative effects of the Project in combination with other physical activities that have been or will be carried out as required by CEAA 2012.

Taking into account the implementation of the mitigation measures described above, the Agency is of the view that the project will not result in significant adverse cumulative environmental effects.

8 Impacts on Potential or Established Aboriginal or Treaty Rights

8.1 Potential or Established Aboriginal or Treaty Rights in the Project Area

The Mi'kmaq of Nova Scotia claim all of Nova Scotia, including its offshore, as its traditional territory. Therefore, the project area is within the claimed territory. Under the Constitution Act, 1982, existing Aboriginal and Treaty rights are recognized as constitutionally protected rights. Between 1725 and 1779, various Peace and Friendship Treaties were established between the Mi'kmaq, the Maliseet, and British settlers, the terms of which were intended to help establish peace and commercial relations. As affirmed by the courts, these treaties guarantee Aboriginal rights to hunt and fish throughout the region in pursuit of a moderate livelihood.

The Governments of Canada and Nova Scotia continue to work with First Nations to negotiate outstanding Treaty, title, and Aboriginal rights questions in Nova Scotia. A Made-in-Nova Scotia Process has been established as a rights-based process to ensure that the interests of Aboriginal groups in land, resource management, and environmental protection are realized and that claimants share in the benefits of development. On February 23, 2007, a framework agreement was signed between the Mi'kmaq of Nova Scotia, the Province of Nova Scotia, and the Government of Canada to set out the process to promote efficient, effective, orderly, and timely negotiations towards a resolution of issues respecting Mi'kmaq rights and title.

In addition to the engagement efforts by the proponent, the federal government consulted with Aboriginal communities and representative organizations in Nova Scotia and New Brunswick to understand potential project impacts on potential or established Aboriginal or Treaty rights and to take any adverse effects into consideration before reaching an EA decision on the Project.

8.2 Potential Adverse Impacts of the Project on Potential or Established Aboriginal or Treaty Rights

The Project may interact with Aboriginal fishers exercising their rights under a communal food, social, and ceremonial or commercial licence, as detailed in section 6.4 (Current Use). The Agency assessed the potential impact of the Project on the right to fish, considering both access to preferred areas and any potential effects on fish and fish habitat that could potentially reduce the availability and quality of fish A discussion of potential effects on fish and fish habitat is presented in Section 6.1 of this report; along with the Agency's conclusion that the Project is unlikely to cause significant adverse effects on this VC either by itself or in combination with other activities in the LAA or RAA.

Displacement from a preferred fishing area as a result of drilling operations and the 500 m safety zone around the drilling unit may result in fishers having to fish elsewhere in their licence area. The proponent assessed the potential effect of any displacement of fishers during drilling operations and found that with the implementation of mitigation any effect on either commercial or Aboriginal fisheries would be negligible.

The Agency found that any adverse impacts to rights from normal operations would be infrequent, limited to a very small portion of the available fishing license area, and be reversible after operations cease. The Agency also

considers that any displacement of Aboriginal fishers from their preferred area would result in minimal disturbance to the ability to exercise their rights.

The Agency also considered effects of accidents and malfunctions, which are discussed in depth in Section 7.1, on potential or established Aboriginal or Treaty rights. The Agency found that the resultant effect of a blowout, if not controlled quickly, could have a high impact on Aboriginal or Treaty rights to fish for both food, social and ceremonial purposes and for a moderate livelihood. The ability to exercise the right to fish in the LAA and parts of the RAA could be significantly diminished. However, a blowout is unlikely to occur and therefore the effects are also unlikely to occur. Impacts from an accident or malfunction would be compensated in accordance with the *Compensation Guidelines Respecting Damages Relating to Offshore Petroleum Activity*.

Aboriginal groups submitted comments regarding the potential impact of the Project on potential or established Aboriginal or Treaty rights with the greatest concern being the potential impact of a blowout. The comments communicated to the Agency are summarized in Appendix E.

8.3 Proposed Accommodation Measures

The proponent's mitigation measures identified for fish and fish habitat, current use of lands and resources for traditional purposes and commercial fisheries (sections 6.1, 6.2 and 6.3) will also serve as accommodation measures to minimize or avoid potential adverse impacts on potential or established Aboriginal or Treaty rights. Key measures include:

- Ensure all discharges from the drilling unit into the marine environment are in accordance with the *Offshore Waste Treatment Guidelines* and the *Offshore Chemical Selection Guidelines*.
- Engage with Aboriginal and commercial fishers to develop a strategy for managing the interaction between the Project and fishing activities, including Fisheries Communications Plan. The plan will address communications prior to and during all project phases.
- Ensure that details of 500 m safety exclusion zone, and the locations of abandoned wellheads, if left on the seafloor, are published in Notices to Mariners and provided in Notices to Shipping.
- Prepare a well abandonment plan, including consultation with Aboriginal and commercial fishers if it is proposed that a wellhead be abandoned on the seafloor. Submit the well abandonment plan to the Board for approval 30 days prior to abandonment of each well.
- Consult with Aboriginal groups during the development of the Oil Spill Response Plan, Well Containment Plan and Net Environmental Benefit Analysis and provide the approved versions to Aboriginal groups.

The Agency also recognizes the proponent's commitment to adhering to the *Compensation Guidelines with Respect to Damages Relating to Offshore Petroleum Activity.*

8.4 Issues to be Addressed During the Regulatory Approval Phase

The regulatory approval phase of the Project consists of authorizations, licenses, or approvals related to areas of federal jurisdiction (e.g. effects on fish and fish habitat). In order to proceed, the Project will require authorization by the Board. The Board is established under federal-provincial legislation for which the federal

Minister of Natural Resources and the Provincial Minister of Energy are jointly responsible. Authorization from Fisheries and Oceans Canada may also be required. In this situation, the federal government would consult Aboriginal communities, as appropriate, prior to making regulatory decisions. The decision to undertake additional Crown consultation will take into consideration the consultation record resulting from the EA. Coordination of Crown consultation for the regulatory phase would be the responsibility of federal government departments or agencies with a regulatory decision for the Project.

8.5 Agency Views Regarding Impacts to Aboriginal Rights

In assessing impacts to potential or established Aboriginal or Treaty rights, the Agency considered the analysis of environmental effects of the Project on Aboriginal peoples and the related mitigation measures outlined in section 6.1 (fish and fish habitat), section 6.2 (current use by Aboriginal peoples for traditional purposes), section 6.3 (commercial fisheries), and section 7.1 (malfunctions and accidents). It also considered the potential impacts and accommodation measures to be provided by the proponent. Taking all this into account, the Agency is satisfied that the potential impacts of the Project on potential or established Aboriginal or Treaty rights have been adequately identified and appropriately accommodated.

If the Minister of the Environment decides that the Project is not likely to cause significant adverse environmental effects or if Cabinet decides that significant adverse environmental effects that the Minister decides are likely to occur are justified in the circumstances, the Minister will establish conditions in relation to the mitigation measures. Conditions requiring the proponent to implement mitigation measures that address environmental effects on current Aboriginal use of lands and resources for traditional purposes, fish and fish habitat, commercial fisheries and accidents and malfunctions would also constitute accommodation of potential impacts on potential or established Aboriginal or Treaty rights.

9 Conclusions and Recommendations of the Agency

The Agency took into account the proponent's EIS as well as its responses to information requests that were posed by the Agency based the views of the public, government agencies, and Aboriginal groups in assessing whether the Project is likely to cause significant adverse environmental and in considering the requirements of the follow-up monitoring plan to be implemented by the proponent.

The environmental effects of the Project and their significance have been determined using assessment methods and analytical tools that reflect current accepted practices of environmental and socio-economic assessment practitioners, including consideration of potential accidents and malfunctions.

The Agency concludes that the Shelburne Basin Venture Exploration Drilling Project is not likely to cause significant adverse environmental effects, taking into account the implementation of the mitigation measures described in this Draft EA Report.

Following a public consultation on this Draft EA Report, the Agency will take any comments received into account, finalize the EA report, and submit it to the Minister of the Environment. The Minister of the Environment will decide whether the Project is likely to cause significant adverse environmental effects, taking into account the implementation of mitigation measures she considers appropriate. The Agency has proposed potential conditions in relation to mitigation measures that it will recommend to the Minister of the Environment for consideration. Following the Minister's decision[4] she must issue a decision statement to the proponent including any conditions she establishes.

[4] Or, where applicable, Cabinet's determination that any significant adverse environmental effects are justified in the circumstances.

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11 Appendices

Appendix A Key Mitigation and Follow-Up Measures Identified by the Agency

Valued Component (VC)	Mitigation	Follow-Up
Fish and Fish Habitat (Section 6.1)	• Ensure all discharges from the drilling unit into the marine environment are in accordance with *Offshore Waste Treatment Guidelines*. • Apply the *Offshore Chemical Selection Guidelines* (NEB et al 2009) to select lower toxicity chemicals that would be used and discharged into the marine environment, including drilling fluid constituents, and submit any necessary risk justification to the Board for acceptance prior to use. • Ensure all discharges from the support vessels into the marine environment comply with the *International Convention for the Prevention of Pollution from Ships* (MARPOL). • Conduct pre-drill survey at each wellsite immediately prior to drilling to identify any aggregations of species or species of conservation concern. If aggregations of species or species of conservation concern are found during the pre-drill survey, move the drilling unit to avoid affecting them, if technically feasible. If not technically feasible, consult with the Board and Fisheries and Oceans Canada prior to commencing drilling to determine an appropriate course of action.	• measure the concentration of synthetic-based drilling fluids retained on discharged drilling cuttings to verify that the discharge meets the limits set out in the *Offshore Waste Treatment Guidelines*; report test results to the Board and adjust treatment, if necessary. • Validate sediment (drill waste) deposition modelling predictions of thickness and areal extent of cuttings during and after drilling by means such as a remotely-operated vehicle. Report results to the Board and Fisheries and Oceans Canada.
Current use of lands and resources for traditional purposes of	• Engage with Aboriginal and commercial fishers to minimize use conflicts between the Project and fishing activities. Development and implement a Fisheries Communications Plan to address communications prior to and during drilling, testing	• Measure the thickness and extent of drilling waste during and at the end of drilling to confirm model predictions and provide results to the Board and Fisheries and Oceans Canada**.**

Valued Component (VC)	Mitigation	Follow-Up
Aboriginal Groups (Section 6.2)	and abandonment. The plan will include procedures to notify fishers a minimum of two weeks prior to the start of each well, and procedures to communicate with fishers in the event of an accident or malfunction. • Ensure that details of safety zone, and the locations of abandoned wellheads, if left on the seafloor, are published in Notices to Mariners and provided in Notices to Shipping. • Prepare a well abandonment plan, which includes consultation with Aboriginal fisheries organizations and commercial fishers, if it is proposed that a wellhead be abandoned on the seafloor. Submit the well abandonment plan to the Board for approval 30 days prior to abandonment of each well.	
Commercial Fisheries (Section 6.3)	• Mitigation required to prevent the potential for significant effects to the current use of lands and resources for traditional purposes by Aboriginal peoples and to fish and fish habitat is also considered necessary to prevent significant effects on the commercial fisheries. • The Agency also recognizes the proponent's commitment to developing and implementing a Fisheries Communications Plan and to adhering to the *Compensation Guidelines with Respect to Damages Relating to Offshore Petroleum Activity*.	
Marine Mammals and Sea Turtles (Section 6.4)	• Abide by the *Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment*. The statement includes measures such as: o establishing a safety zone around the sound source (minimum 500 m radius); o implementing cetacean detection technology, such as	• Record and report the results of the Marine Mammal Observer program (including sea turtle observations) to Fisheries and Oceans Canada and the Board. • Promptly report any collisions with marine mammals to the Board and the Canadian Coast Guard Environmental Emergency Reporting • Model underwater noise levels from the drilling unit and verify the model

Valued Component (VC)	Mitigation	Follow-Up
	passive acoustic monitoring, if required during periods of low visibility; o gradually increasing the sound source intensity over a period of at least 20 minutes (ramp-up); and o immediately shutting down the sound source upon observing or detecting an endangered or threatened marine mammal or sea turtle within the safety zone. • Implement a marine mammal observer program, using qualified individuals. The proponent should: o If Passive Acoustic Monitoring will be used, provide the specific configuration to Fisheries and Oceans Canada for review 30-days prior to operation to ensure that operators can effectively monitor for all marine mammal vocalization frequencies that may occur within the project area; o submit the Marine Mammal Observer Program to the Board for review 30-days prior to operation to enable verification that Marine Mammal Observers are trained in detecting all species that may occur within the safety zone either through visual observation or cetacean detection technology such as Passive Acoustic Monitoring and that observers have the ability to view the entire safety zone. • To reduce risks of collisions with marine mammals: o reduce the speed of support vessels to 10 knots in the project area, or when marine mammals are observed or reported to be in the vicinity of the vessel; and o ensure support vessels use existing shipping lanes, where they exist.	results during drilling operations. Provide the modeling results to the Board and Fisheries and Oceans Canada at least 30 days in advance of drilling, and the monitoring results within 90 days after a well is abandoned.

Valued Component (VC)	Mitigation	Follow-Up
Migratory Birds (6.5)	• Notify the Board and Environment Canada at least 30 days in advance of flaring to identify whether it would occur during periods of bird vulnerability such as fledging or foraging, and how to avoid effects on migratory birds. • Implement a water-curtain barrier around the flare. • Limit flaring to the minimum required to characterize the well potential and as necessary for the safety of the operation. This includes opportunities to reduce nighttime flaring such as by starting flaring for the initial two short-duration test periods in the morning as opposed to at night.	• Conduct daily searches of the drilling unit during all operations to identify and record any stranded or dead birds found onboard and provide these records to the Board and Environment Canada. Birds shall be handled according to the procedures described in the Environment Canada document *Best practices for stranded birds encountered offshore Atlantic Canada*. • Notify the Board and Environment Canada at least 30 days in advance of flaring to identify opportunities, without compromising safety, to gather data associated with the abundance and distribution of birds near the flare and data on the effectiveness of the water curtain as mitigation to prevent birds from flying into the flare. . Develop a protocol to collect the data, in consultation with the Board and Environment Canada. • Retain qualified observers on support vessels during transit and when on stand-by near the drilling unit to verify impact predictions including potential bird attraction to drilling unit, bird behavior around the drilling unit and the types of species present (i.e. seabird versus migratory species. Data should be collected in accordance with Environment Canada's *Eastern Canada Seabirds at Sea (ECSAS) standardized protocol for pelagic seabird surveys from moving and stationary platforms*.
Federal Species at Risk (Section 6.6)	• Mitigation measures that are planned for fish and fish habitat, marine mammals and sea turtles, and migratory birds are appropriate and no additional measures are required specifically for species at risk. The list of mitigation measures is included above.	• Follow-up measures that are planned for fish and fish habitat, marine mammals and sea turtles, and migratory birds, which are described above, are appropriate.
Special Areas (Section 6.7)	• Measures to mitigate impacts on fish and fish habitat, migratory birds, marine mammals and sea turtles, and current use will likewise prevent significant adverse effects on special areas. The list of mitigation measures is included above.	• The Agency has not identified any specific follow-up measures in relation potential effects of routine project operations on special areas.
Accidents and Malfunctions	• Undertake all reasonable measures, to the Board's satisfaction,	• Monitor the environmental effects of oiling on components of the marine

Valued Component (VC)	Mitigation	Follow-Up
(Section 7.1)	to prevent accidents and malfunctions that may result in adverse environmental effects and effectively implement appropriate emergency response procedures and contingencies developed in relation to the Project. • Prepare an Oil Spill Response Plan and submit it to the Board for approval 90 days prior to drilling. The Plan must include: o procedures to respond to an oil spill (e.g. oil spill containment, oil recovery); o measures for wildlife response, protection, and rehabilitation (e.g., collection and cleaning of marine mammals, birds, and sea turtles) and measures for shoreline protection and clean-up, developed in consultation with the Board, Fisheries and Oceans Canada and Environment Canada; o A Dispersant Operations Plan. • Conduct a desktop exercise of the Oil Spill Response Plan prior to the commencement of project activities and adjust the plan to address any deficiencies identified during the exercise. • The Oil Spill Response Plan shall be reviewed and updated as required following the completion of each well. • Prepare a Well Containment Plan, including a: o Relief Well Contingency Plan, and. o Well Capping Plan describing the plan to mobilize and deploy a capping stack if required. • Undertake a Net Environmental Benefit Analysis to understand the potential risks and consequences of using dispersants and	environment to be identified by the Board in consultation with Fisheries and Oceans Canada and Environment Canada until the specific endpoints identified by respective departments are achieved and residual hydrocarbons reach acceptable background levels. As applicable, monitoring shall include; o sensory testing of seafood for taint, and chemical analysis for oil concentrations; o measuring levels of contamination in fish species with results integrated into a human health risk assessment to determine the fishing area closure status; and o monitoring for marine mammals, sea turtles, and birds with visible oiling and reporting results to the Board.

Valued Component (VC)	Mitigation	Follow-Up
	provide it to the Board for review. • Consult with Aboriginal groups during the development of the Oil Spill Response Plan and Net Environmental Benefit Analysis and provide the approved versions to Aboriginal groups prior to drilling. • In the event of a well blowout, immediately begin mobilization of the primary and back-up capping stacks and associated equipment to the project area to stop the spill. • Compensate for any damages in accordance with *Compensation Guidelines Respecting Damages Relating to Offshore Petroleum Activity*.	
Cumulative Environmental Effects (Section 7.3)	• No additional mitigation measures identified in relation to cumulative effects.	• No additional follow-up measures identified in relation to cumulative effects.
Impacts on Potential or Established Aboriginal or Treat Rights (Section 8)	• Measures to mitigate impacts on fish and fish habitat, current use by Aboriginal peoples for traditional purposes, commercial fisheries, and accidents and malfunctions are appropriate. The list of mitigation measures is included above.	• Follow-up measures related to fish and fish habitat, current use by Aboriginal peoples for traditional purposes, commercial fisheries, and accidents and malfunctions are appropriate. The list of follow-up is included above.

Appendix B Proponent's Mitigation and Monitoring Commitments

No.	Proponent Commitments made in the Environmental Impact Statement (EIS)	EIS Section Reference	Relevant Category of Environmental Effect Under Section 5 of the *Canadian Environmental Assessment Act*, 2012				
			Changes to the Environment			Effects of Changes to the Environment	
			Changes to Components Within Federal Jurisdiction	Changes Occurring on Federal or Transboundary Lands	Changes that are Directly Linked or Necessarily Incidental to Federal Decisions	Effects On Aboriginal People	Effects that are Directly Linked or Necessarily Incidental to Federal Decisions
GENERAL							
1	Shell will comply with the terms and conditions of approval, for all permits, authorizations, and licences obtained in support of the Project.	13.2	✓	✓	✓	✓	✓
2	Prior to mobilization at the selected drilling site, the mobile offshore drilling unit will undergo the required regulatory inspections to demonstrate that it meets Canadian and Canada-Nova Scotia Offshore Petroleum Board safety and technical specifications.	2.4	✓	✓	✓	✓	✓
3	Shell will obtain a Certificate of Fitness from an independent third party Certifying Authority for the mobile offshore drilling unit prior to commencement of drilling operations in accordance with the *Nova Scotia Offshore Certificate of Fitness Regulations*.	9.3	✓	✓	✓	✓	✓
4	Flaring, during exploration drilling, will be restricted to the amount necessary to characterize the well potential and as necessary for the safety of the operation.	2.7, 7.4	✓	✓	✓		✓
5	All operations relating to the Project will be required at a minimum to comply with Shell standards and with external regulatory standards. Where	2.8, 13.1	✓	✓	✓	✓	✓

No.	Proponent Commitments made in the Environmental Impact Statement (EIS)	EIS Section Reference	Relevant Category of Environmental Effect Under Section 5 of the *Canadian Environmental Assessment Act*, 2012				
			Changes to the Environment			Effects of Changes to the Environment	
			Changes to Components Within Federal Jurisdiction	Changes Occurring on Federal or Transboundary Lands	Changes that are Directly Linked or Necessarily Incidental to Federal Decisions	Effects On Aboriginal People	Effects that are Directly Linked or Necessarily Incidental to Federal Decisions
	requirements differ, the more stringent requirement will apply. Shell will require contractors to demonstrate that they have in place a Health, Safety and Environment Management System compatible with these standards, and that they are committed to implementing it.						
6	Routine checks for stranded birds will be conducted on the drilling unit and offshore support vessels and appropriate procedures for release will be implemented. If stranded birds are found during routine inspections, they will be handled using the protocol outlined in *The Leach's Storm Petrel: General Information and Handling Instructions* (Williams and Chardine 1999), and updated protocols provided by Environment Canada, including obtaining the associated permit from Environment Canada, and in compliance with the requirements for documenting and reporting strandings and mortalities.	7.4, 13.2	✓	✓	✓		✓
7	Notify Environment Canada approximately 30 days before any flaring to identify specific concerns (e.g. sensitive periods such as fledging and foraging) and discuss monitoring or data collection opportunities	Information Request	✓	✓	✓		
8	The observation, forecasting and reporting of physical environment data will be conducted in accordance with the *Offshore Physical Environment Guidelines* (NEB *et al.* 2008) to promote the safe and prudent conduct of routine	9.3, 13.2	✓	✓	✓	✓	✓

No.	Proponent Commitments made in the Environmental Impact Statement (EIS)	EIS Section Reference	Relevant Category of Environmental Effect Under Section 5 of the *Canadian Environmental Assessment Act*, 2012				
			Changes to the Environment			Effects of Changes to the Environment	
			Changes to Components Within Federal Jurisdiction	Changes Occurring on Federal or Transboundary Lands	Changes that are Directly Linked or Necessarily Incidental to Federal Decisions	Effects On Aboriginal People	Effects that are Directly Linked or Necessarily Incidental to Federal Decisions
	operations and emergency response.						
9	The following project-specific management plans will be developed and submitted to the Canada-Nova Scotia Offshore Petroleum Board for review and approval: o Environmental Protection Plan o Safety Plan o Emergency Response Plan, Well Control Plan, Oil Spill Response Plan, and Relief Well Contingency Plan o Waste Management Plan	2.7, 2.8, 8.4, 13.1, 13.2	✓	✓	✓	✓	✓
Offshore Support Vessels and Helicopters							
10	Offshore support vessels will be compliant with the *Canada Shipping Act, 2001* and national and international regulations while at sea, *Eastern Canadian Vessel Traffic Services Zone Regulations* when operating in nearshore or	2.4, 7.4	✓	✓ ✓	✓	✓	✓

No.	Proponent Commitments made in the Environmental Impact Statement (EIS)	EIS Section Reference	Relevant Category of Environmental Effect Under Section 5 of the *Canadian Environmental Assessment Act*, 2012				
			Changes to the Environment			Effects of Changes to the Environment	
			Changes to Components Within Federal Jurisdiction	Changes Occurring on Federal or Transboundary Lands	Changes that are Directly Linked or Necessarily Incidental to Federal Decisions	Effects On Aboriginal People	Effects that are Directly Linked or Necessarily Incidental to Federal Decisions
	harbour areas, and applicable Port Authority requirements when in a port. Ship operations will also adhere to Annex I of MARPOL, of which Canada has incorporated provisions under various sections of *the Canada Shipping Act, 2001* and its regulations.						
11	In preparation for the Project, offshore support vessels will undergo Shell's internal audit process as well as additional external inspections/audits, including the Canada-Nova Scotia Offshore Petroleum Board's pre-authorization inspection process.	2.4	✓	✓	✓	✓	✓
12	Offshore support vessels will avoid the Gully, as per the *Gully Marine Protected Area Regulations*, when travelling to and from the drilling location.	7.5	✓	✓	✓		✓
13	Fuelling of offshore support vessels will be conducted at a permitted facility and in accordance with fuelling procedures, reducing the risk of a spill during transfer operations.	8.1	✓	✓	✓	✓	✓
14	Offshore support vessels will use existing shipping routes when travelling to and from the drilling location, adhere to standard navigation procedures, and reduce speeds to 18.5 km/hour (10 knots) within the project area.	7.4, 7.7, 7.3, 7.6	✓	✓	✓	✓	✓
15	To reduce risk of collision, project offshore support vessels will avoid critical habitat for the northern bottlenose whale (The Gully, and Shortland and	7.3, 7.5	✓	✓	✓		✓

No.	Proponent Commitments made in the Environmental Impact Statement (EIS)	EIS Section Reference	Relevant Category of Environmental Effect Under Section 5 of the *Canadian Environmental Assessment Act*, 2012				
			Changes to the Environment			Effects of Changes to the Environment	
			Changes to Components Within Federal Jurisdiction	Changes Occurring on Federal or Transboundary Lands	Changes that are Directly Linked or Necessarily Incidental to Federal Decisions	Effects On Aboriginal People	Effects that are Directly Linked or Necessarily Incidental to Federal Decisions
	Haldimand canyons) and will avoid critical habitat for the North Atlantic right whale (Roseway Basin) from June 1 to December 31. They will also maintain a 2 km avoidance buffer around Sable Island.						
16	Except in the case of an emergency, project helicopters will avoid flying over Roseway Basin and Sable Island.	2.4, 7.3	✓	✓	✓		✓
17	Helicopters transiting to and from the mobile offshore drilling unit will fly at altitudes greater than 300 m and at a lateral distance of 2 km from active colonies when possible.	7.4, 7.5	✓	✓	✓		✓
18	Measures will be taken as appropriate to monitor and mitigate effects of the environment (e.g., icing, fog) on offshore support vessels and helicopter transportation. Pilots and offshore support vessel operators will have the authority and obligation to suspend or modify operations in case of adverse weather that compromises the safety of helicopter or offshore support vessel operations.	9.3	✓	✓	✓	✓	✓
Project Design							
19	Engineering design for the Project will adhere to national/international standards for site-specific normal and extreme physical environmental	9.3	✓	✓	✓	✓	✓

No.	Proponent Commitments made in the Environmental Impact Statement (EIS)	EIS Section Reference	Relevant Category of Environmental Effect Under Section 5 of the *Canadian Environmental Assessment Act*, 2012				
			Changes to the Environment			Effects of Changes to the Environment	
			Changes to Components Within Federal Jurisdiction	Changes Occurring on Federal or Transboundary Lands	Changes that are Directly Linked or Necessarily Incidental to Federal Decisions	Effects On Aboriginal People	Effects that are Directly Linked or Necessarily Incidental to Federal Decisions
	conditions.						
20	Lighting on Project infrastructure will be reduced to the extent that worker safety is not compromised.	7.4	✓	✓	✓		✓
21	Well design reviews will be carried out and approved by appropriate qualified internal discipline authorities and technical experts. The same principles apply to the input parameters, which are used as the basis for the well design.	8.4	✓	✓	✓	✓	✓
22	The transfer of synthetic-based drilling fluids to offshore support vessels and spent synthetic-based drilling fluids from offshore support vessels will occur through a closed system thereby minimizing the risk of spillage to the marine or terrestrial environment.	8.1	✓	✓	✓	✓	✓
23	Shell will conduct a seabed survey in the project area in 2014 to obtain site-specific information on the seafloor conditions at the potential wellsites and identify potential geohazards (e.g. sediment scour, liquefaction of sediments from seismic events, shallow gas pockets, and slope failure) that could be present in the vicinity of proposed drilling sites and therefore require avoidance. Any evidence of sediment scour or seafloor instability will be noted and incorporated into project planning and design as appropriate.	9.2, 9.3, 11.2	✓	✓	✓	✓	✓

No.	Proponent Commitments made in the Environmental Impact Statement (EIS)	EIS Section Reference	Relevant Category of Environmental Effect Under Section 5 of the *Canadian Environmental Assessment Act*, 2012				
			Changes to the Environment			Effects of Changes to the Environment	
			Changes to Components Within Federal Jurisdiction	Changes Occurring on Federal or Transboundary Lands	Changes that are Directly Linked or Necessarily Incidental to Federal Decisions	Effects On Aboriginal People	Effects that are Directly Linked or Necessarily Incidental to Federal Decisions
24	The results of the seabed survey conducted in the spring of 2014 and pre-drill video surveys conducted at each potential wellsite will inform the selection of drilling locations that avoid areas where known heritage resources, coral concentrations, or other sensitive or unique benthic habitat are present.	6.2, 7.2, 7.5	✓	✓	✓	✓	✓
25	Once the drilling unit is in position, pre-drill video surveys will be conducted using a remotely-operated vehicle deployed to the seabed. These surveys will be conducted to confirm that no potential surface seabed hazards or sensitivities are present at the drilling location.	2.4, 11.2	✓	✓	✓	✓	✓
26	Two independent barriers will be maintained at all times once the blowout preventer is installed on the wellhead. These barriers will be verified by testing both prior to and following installation; should one barrier be lost, operations will be stopped and the focus of operations will shift to regaining a two-barrier status.	8.4	✓	✓	✓	✓	✓
WASTE/DISCHARGES							
27	The *Offshore Chemical Selection Guidelines* will be applied in selecting chemicals for drilling, as well as to guide the proper treatment and disposal of chemicals selected.	2.7	✓	✓	✓	✓	✓

No.	Proponent Commitments made in the Environmental Impact Statement (EIS)	EIS Section Reference	Relevant Category of Environmental Effect Under Section 5 of the *Canadian Environmental Assessment Act*, 2012				
			Changes to the Environment			Effects of Changes to the Environment	
			Changes to Components Within Federal Jurisdiction	Changes Occurring on Federal or Transboundary Lands	Changes that are Directly Linked or Necessarily Incidental to Federal Decisions	Effects On Aboriginal People	Effects that are Directly Linked or Necessarily Incidental to Federal Decisions
28	Constituents in drilling muds will be screened using the *Offshore Chemical Selection Guidelines* to assess the viability of using lower toxicity chemicals.	7.5	✓	✓	✓	✓	✓
29	Offshore waste discharges and emissions associated with the Project (i.e. operational discharges and emissions from the drilling unit and offshore support vessels will be managed in compliance with MARPOL and treated in accordance with the *Offshore Waste Treatment Guidelines*, as applicable.	2.7, 7.2, 7.3, 7.4, 7.5	✓	✓	✓	✓	✓
30	In accordance with the *Offshore Waste Treatment Guidelines*, drilling solids associated with the use of synthetic-based drilling fluid will be treated prior to marine disposal such that the "synthetic-on-cuttings" does not exceed 6.9 g/100 g oil on wet solids.	2.7, 7.2, 7.5	✓	✓	✓	✓	✓
31	No whole synthetic-based drilling fluid or any whole drilling fluid containing synthetic base fluid will be discharged at sea.	2.7	✓	✓	✓	✓	✓
32	Waste discharges that do not meet *Offshore Waste Treatment Guidelines* requirements will not be discharged to the ocean, but brought to shore for disposal.	7.5	✓	✓	✓	✓	✓
33	Hazardous wastes, including any waste dangerous goods, generated during the Project will be stored in the appropriate containers/containment and in	2.7	✓	✓	✓	✓	✓

No.	Proponent Commitments made in the Environmental Impact Statement (EIS)	EIS Section Reference	Relevant Category of Environmental Effect Under Section 5 of the *Canadian Environmental Assessment Act*, 2012				
			Changes to the Environment			Effects of Changes to the Environment	
			Changes to Components Within Federal Jurisdiction	Changes Occurring on Federal or Transboundary Lands	Changes that are Directly Linked or Necessarily Incidental to Federal Decisions	Effects On Aboriginal People	Effects that are Directly Linked or Necessarily Incidental to Federal Decisions
	designated areas on board the drilling unit for transportation to shore.						
34	The transportation of any dangerous goods, waste dangerous goods or hazardous substances will occur in compliance with the *Transportation of Dangerous Goods Act* and its associated regulations.	2.7	✓	✓	✓	✓	✓
35	Wastes destined for onshore treatment, recycling and/or disposal will be managed in accordance with the Nova Scotia *Solid Waste-Resource Management Regulations* and will comply with any applicable federal and provincial waste requirements as well as municipal by-laws.	2.7			✓		✓
36	The air emissions from the Project will comply with the *Air Quality Regulations* under the Nova Scotia *Environment Act*, and meet the National Ambient Air Quality Objectives under the *Canadian Environment Protection Act, 1999*.	2.7		✓	✓		✓
37	Any flaring required as an essential safety component of well drilling will occur in accordance with the Canada-Nova Scotia Offshore Petroleum Board's *Drilling and Production Guidelines*.	2.7	✓	✓	✓		✓
38	Prior to transiting into Canadian waters, the drilling unit will undergo normal ballast tank flushing procedures, as required under the International l Maritime Organization's *Ballast Water Management Convention* and Transport Canada's	2.7	✓	✓	✓	✓	✓

No.	Proponent Commitments made in the Environmental Impact Statement (EIS)	EIS Section Reference	Relevant Category of Environmental Effect Under Section 5 of the *Canadian Environmental Assessment Act*, 2012				
			Changes to the Environment			Effects of Changes to the Environment	
			Changes to Components Within Federal Jurisdiction	Changes Occurring on Federal or Transboundary Lands	Changes that are Directly Linked or Necessarily Incidental to Federal Decisions	Effects On Aboriginal People	Effects that are Directly Linked or Necessarily Incidental to Federal Decisions
	Ballast Water Control and Management Regulations.						
ACCIDENTAL EVENTS							
39	Shell and its contractors will have measures in place to reduce the potential for vessel spills. This includes: • All activities adhering to Annex I of MARPOL • Adherence to standard navigation procedures, Transport Canada regulations and Canadian Coast Guard requirements, and • Special attention to activities presenting increased risks for marine traffic including loading and offloading, docking and extreme weather events.	8.2	✓	✓	✓	✓	✓
40	A Dispersants Operations Plan will be developed as part of the Oil Spill Response Plan, which will outline the process and procedures for determining whether to utilize dispersants and initiate deployment of dispersants in the unlikely event of an oil spill incident in the project area.	8.1	✓	✓	✓	✓	✓

No.	Proponent Commitments made in the Environmental Impact Statement (EIS)	EIS Section Reference	Relevant Category of Environmental Effect Under Section 5 of the *Canadian Environmental Assessment Act*, 2012				
			Changes to the Environment			Effects of Changes to the Environment	
			Changes to Components Within Federal Jurisdiction	Changes Occurring on Federal or Transboundary Lands	Changes that are Directly Linked or Necessarily Incidental to Federal Decisions	Effects On Aboriginal People	Effects that are Directly Linked or Necessarily Incidental to Federal Decisions
41	Shell will have available local staff and agencies, and Aboriginal representatives trained in accordance with its Incident Command System and able to respond to accidental spills. Dependent on the size and scale of the incident, Shell will draw on various support organizations/agencies to provide the appropriate and necessary resources and response.	8.1	✓	✓	✓	✓	✓
42	Personnel potentially involved in oil spill response will receive specialized training, and drills will be conducted periodically to familiarize personnel with on-site equipment, proper deployment techniques and maintenance procedures, and management of incidents.	8.1	✓	✓	✓	✓	✓
43	Shell will work with the appropriate government agencies and undertake a Net Environmental Benefits Analysis to evaluate the risks and benefits of dispersing oil in the water column.	8.1, 8.5	✓	✓	✓	✓	✓
44	If required, for a nearshore spill, shoreline clean-up and possible collection and cleaning of fur-bearing marine mammals and oiled marine birds would be conducted.	8.5	✓	✓	✓	✓	✓
45	As part of spill response, marine mammal and marine bird hazing techniques may be used if deemed necessary to deter animals from entering affected areas and prevent further oiling.	8.5	✓	✓	✓		✓

No.	Proponent Commitments made in the Environmental Impact Statement (EIS)	EIS Section Reference	Relevant Category of Environmental Effect Under Section 5 of the *Canadian Environmental Assessment Act*, 2012				
			Changes to the Environment			Effects of Changes to the Environment	
			Changes to Components Within Federal Jurisdiction	Changes Occurring on Federal or Transboundary Lands	Changes that are Directly Linked or Necessarily Incidental to Federal Decisions	Effects On Aboriginal People	Effects that are Directly Linked or Necessarily Incidental to Federal Decisions
46	In the unlikely event of an accidental spill, oiled birds will be collected and rehabilitated as practical.	8.5	✓	✓	✓		✓
47	In the event that a vessel collision with a marine mammal or sea turtle occurs, Shell will contact the Marine Animal Response Society or the Coast Guard to relay the incident information.	7.3, 13.2	✓	✓	✓		✓
48	Incidents will be reported in accordance with the *Incident Reporting and Investigation Guidelines* (C-NLOPB and CNSOPB 2012).	13.2	✓	✓	✓	✓	✓
49	In the unlikely event of an accidental 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.	8.5, 13.2	✓	✓	✓	✓	✓
50	As part of any spill monitoring, records will be kept of any marine mammals or sea turtles encountered and any evidence of visible oiling.	8.5	✓	✓	✓		✓
51	Project-related damage to fishing gear, if any, will be compensated in accordance with the *Compensation Guidelines with Respect to Damages Relating to Offshore Petroleum Activity* (C-NLOPB and CNSOPB 2002).	7.6, 7.7, 8.5		✓	✓	✓	✓
Vertical Seismic Profiling							

No.	Proponent Commitments made in the Environmental Impact Statement (EIS)	EIS Section Reference	Relevant Category of Environmental Effect Under Section 5 of the *Canadian Environmental Assessment Act*, 2012				
			Changes to the Environment			Effects of Changes to the Environment	
			Changes to Components Within Federal Jurisdiction	Changes Occurring on Federal or Transboundary Lands	Changes that are Directly Linked or Necessarily Incidental to Federal Decisions	Effects On Aboriginal People	Effects that are Directly Linked or Necessarily Incidental to Federal Decisions
52	Vertical Seismic Profiling surveys will adhere, at a minimum, with mitigation measures described in the *Statement of Canadian Practice with Respect to the Mitigation of Seismic Sound in the Marine Environment*.	7.3	✓	✓	✓	✓	✓
53	A ramp-up procedure will be implemented before any Vertical Seismic Profiling activity begins. Additionally, Vertical Seismic Profiling shutdown procedures will be implemented if a marine mammal or sea turtle species listed on Schedule 1 of SARA, as well as all other baleen whales and sea turtles are observed within 1 km of the wellsite.	7.3	✓	✓	✓		✓
54	Marine Mammals Observers will be employed to monitor and report on marine mammal and sea turtle sightings during Vertical Seismic Profiling surveys to enable shutdown or delay in the presence of a marine mammal or sea turtle species listed on Schedule 1 of SARA, as well as all other baleen whales and sea turtles. Monitoring will involve visual observations. Following the program, copies of the marine mammal and sea turtle observer reports will be provided to Fisheries and Oceans Canada.	7.3, 13.2	✓	✓	✓		✓
Consultation and Engagement							
55	Shell will communicate with fishers before, during, and after drilling programs. Details of safety zones will be published in Notices to Mariners and Notices to	7.6, 7.7		✓	✓	✓	✓

No.	Proponent Commitments made in the Environmental Impact Statement (EIS)	EIS Section Reference	Relevant Category of Environmental Effect Under Section 5 of the *Canadian Environmental Assessment Act*, 2012				
			Changes to the Environment			Effects of Changes to the Environment	
			Changes to Components Within Federal Jurisdiction	Changes Occurring on Federal or Transboundary Lands	Changes that are Directly Linked or Necessarily Incidental to Federal Decisions	Effects On Aboriginal People	Effects that are Directly Linked or Necessarily Incidental to Federal Decisions
	Shipping, which will allow fishers and other ocean users to plan accordingly.						
56	Shell will continue to engage commercial and Aboriginal fishers to share project details as applicable. A Fisheries Communications Plan will be used to help facilitate coordinated communication with commercial and Aboriginal fishers.	3, 4, 13.2		✓	✓	✓	✓

Source: Shelburne Basin Venture Exploration Drilling EIS

Appendix C Proponent's Summary of Project-Related Residual Environmental Effects from Routine Operations

Valued Component	Nature of Effect	Residual Environmental Effects Characteristics						Significance	Prediction Confidence
		Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Context		
Fish and Fish Habitat	Adverse	Low	LAA	Medium-term to Long-term	Regular	Reversible	Low Disturbance	Not significant	High confidence
Current Use of Lands and Resources for Traditional Purposes by Aboriginal Peoples	Adverse	Low	LAA	Medium-term	Regular	Reversible	Low Disturbance	Not significant	High confidence
Commercial Fisheries	Adverse	Low	LAA	Medium-term	Regular	Reversible	Low Disturbance	Not significant	High confidence
Marine Mammals and Sea Turtles	Adverse	Low	LAA	Medium-term	Regular	Reversible	Moderate Disturbance	Not significant	High confidence
Migratory Birds	Adverse	Low	LAA	Medium-term	Regular	Reversible	Moderate Disturbance	Not significant	High confidence
Federal Species at Risk	Adverse	Low	LAA	Medium-term	Regular	Reversible	Moderate Disturbance	Not significant	High confidence
Special Areas	Adverse	Low	LAA	Medium-term	Regular	Reversible	Moderate Disturbance	Not significant	High confidence

Valued Component	Nature of Effect	Residual Environmental Effects Characteristics						Significance	Prediction Confidence
		Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Context		

KEY:

Magnitude

Low = measurable change but within the range of natural variability; will not affect population viability

Moderate = measurable change outside the range of natural variability but not posing a risk to population viability

High = measurable change that exceeds the limits of natural variability and may affect long-term population viability

Geographic Extent

PAA = Effects restricted to wellsite and Project Area

LAA = Effects restricted to Local Assessment Area

RAA = Effects restricted to Regional Assessment Area

Duration

Short-term = effect extends for a portion of the duration of the Project

Medium-term = effect extends through the entire duration of the Project

Long-term = effects extend beyond the duration of the Project, after well abandonment

Permanent = measurable parameter unlikely to recover to baseline

Frequency

Once = effect occurs once

Sporadic = effect occurs sporadically at irregular intervals

Regular = effect occurs on a regular basis and at regular intervals throughout the Project

Continuous = effect occurs continuously

Reversibility

Reversible = will recover to baseline conditions before or after Project completion (well abandonment)

Irreversible = permanent

Context

High Disturbance = effect occurs within a disturbed area that is substantially affected by past or present human activities

Moderate Disturbance = effect occurs within a moderately disturbed area that is affected by past or present human activities

Low Disturbance = effect occurs within a relatively pristine area that is unaffected or not adversely affected by past or present human activities

Appendix D Proponent's Assessment of Alternative Means and Preferred Options

Component	Alternative Means of Carrying Out the Project Considered	Technically Feasible?	Economically Feasible?	Biophysical Effects	Socio-economic Effects	Preferred Option(s)
Drilling Unit	Drill ship	Yes	Yes	There is no substantive difference in environmental effects between a dynamically-positioned drillship versus a semi-submersible, although a drillship will emit more noise. A drillship travels at faster than a semi-submersible during mobilization to the site; however, the speed range of both is below that considered to be high risk for marine mammal strikes.	There is no substantive difference in socio-economic effect between either drilling unit alternative. Both require a similar-sized safety zone, resulting in similar effects on fishing activity.	✓
	Semi-submersible	Yes	Yes, but additional costs associated with mobilization/ demobilization activities			
	Jack-up	No	Not applicable (not technically feasible)	Not applicable (not technically feasible)	Not applicable (not technically feasible)	
	Anchored semi-submersible	No	Not applicable (not technically feasible).	Not applicable (not technically feasible)	Not applicable (not technically feasible)	
Drilling Fluid	Water-based fluid only	Yes, but technical issues with borehole stability	Yes, but additional costs associated with potential operation delays associated with technical issues	There is no substantive difference in environmental effects between the two alternatives assuming the *Offshore Waster Treatment Guidelines* are followed with respect to synthetic-based cuttings discharge. Synthetic-based drill waste generally accumulates closer to the well site, limiting the zone of influence. Water-based drill wastes tend to remain suspended longer with greater potential to affect filter-feeding organisms. Both types of drill fluids would be treated and disposed of in compliance with	No substantive difference in socio-economic effects between the two alternatives. Compliance with the *Offshore Waste Treatment Guidelines* will prevent serious harm to fish, and consequent effects on fisheries. Fishing inside the mandatory 500 m safety zone will be restricted regardless of the type of drilling fluid used.	
	Synthetic-based fluid and water-based fluid	Yes	Yes			✓

Component	Alternative Means of Carrying Out the Project Considered	Technically Feasible?	Economically Feasible?	Biophysical Effects	Socio-economic Effects	Preferred Option(s)
				the *Offshore Waste Treatment Guidelines* and would not cause serious harm to fish.		
Drilling Waste Management	Seabed/surface disposal	Yes	Yes	Onshore disposal would have less environmental effect on marine environment; but transport of drill wastes to shore results in additional transit emissions and the potential effects of onshore waste disposal. Both types of drill muds would be in compliance with the *Offshore Waste Treatment Guidelines* and would not cause serious harm to fish.	No substantive difference in socio-economic effects between water-based mud and water-based mud/synthetic-based mud. Will not affect fisheries outside the safety zone.	✓
	Onshore disposal	Yes	Yes, but additional costs for transport and for possible operational delays			
	Reinjection	No, this option would require additional reinjection well to be drilled.	No, increased costs for additional infrastructure and reinjection well would not make this option economically feasible.	Not applicable (not technically and economically feasible)	Not applicable (not technically and economically feasible)	
Managing excess water-based drilling fluid	Well sequencing	Yes, dependent on Canada-Nova Scotia Offshore Petroleum Board approval and project scheduling.	Yes	Well sequencing results in less excess water-based drilling fluid disposed of at sea. Conventional offshore disposal is assessed in the EIS (Section 7.1.2), which identifies "no evidence of toxicity effects associated with water-based drilling fluid constituents", and no significant environmental effects. Conventional offshore disposal of water-based drilling fluids in	Increased vessel and road traffic associated with onshore disposal of water-based drilling fluid could marginally affect other users (ocean and road) through the potential for more frequent interactions. Biological effects and discharge of excess water-based drilling fluid offshore will not cause serious harm to fish or affect fisheries outside the drilling safety zone.	✓
	Conventional offshore disposal of water-based drilling fluid	Yes	Yes			✓
	Transportation of excess water-based drilling fluid to shore	Yes, but with increased personnel safety	Yes, but additional costs associated with transportation			

Component	Alternative Means of Carrying Out the Project Considered	Technically Feasible?	Economically Feasible?	Biophysical Effects	Socio-economic Effects	Preferred Option(s)
	for disposal	risks, increased infrastructure needs and potential operational impacts	and storage	accordance with the *Offshore Waste Treatment Guidelines* is considered an appropriate and acceptable disposal option. Onshore disposal of excess water-based drilling fluid would result in increased vessel and road transport as well as an increased need for land-based facilities to accept this waste stream.		
Managing cuttings associated with water-based drilling fluid (riserless drilling)	Riserless drilling to approximately 1000 m below sea floor	Yes	Yes	Biophysical effects associated with the discharge of cuttings associated with riserless drilling are described in Section 7.1.2 of the EIS. Specifically, "long-term population and ecosystem effects to benthic communities from drill fluid (water-based and synthetic-based) and cuttings discharges are low" (Bakke *et al.* 2013). These discharges will be in compliance with the *Offshore Waste Treatment Guidelines*, and will not cause serious harm to fish.	Biological effects and discharge of excess water-based drilling fluid offshore will not affect fisheries outside the drilling safety zone.	✓
	Riserless drilling to approximately 500 m below sea floor	No – risks ability to reach target depth, which would affect overall operational feasibility of the Project.	No – could risk the entire cost success of the well.	Not applicable (not technically and economically feasible)	Not applicable (not technically and economically feasible)	

Component	Alternative Means of Carrying Out the Project Considered	Technically Feasible?	Economically Feasible?	Biophysical Effects	Socio-economic Effects	Preferred Option(s)
Managing cuttings associated with synthetic-based drilling fluid (riser drilling)	Re-injection of cuttings	No – creates well stability issues	No – prohibitively costly	Not applicable (not technically and economically feasible)	Not applicable (not technically and economically feasible)	
	Treatment in accordance with the *Offshore Waste Treatment Guidelines* (6.9% synthetic oil-on-cuttings) and offshore disposal	Yes	Yes	Drilling waste sediment dispersion modeling completed for the EIS (see Appendix C of the EIS) indicated that deposition of a thickness of ≥10 mm will extend up to 155 m from each well. While these effects may result in some smothering of sedentary or slow moving benthic species, these effects are of low magnitude, highly localized, short term, sporadic, and reversible. Overall, deposition of drill cuttings in accordance with the *Offshore Waste Treatment Guidelines* does not result in significant adverse environmental effects.	Increased vessel and road traffic associated with onshore disposal of water-based drilling fluid could increase the potential to affect other users (ocean and road) through the potential for more frequent interactions. Biological effects and discharge of excess water-based drilling fluid offshore will be in compliance with the *Offshore Waste Treatment Guidelines*, and will not cause serious harm to fish or affect fisheries outside the drilling safety zone.	✓
	Additional treatment beyond the maximum of 6.9% synthetic oil-on-cuttings and offshore disposal	Yes, but with increased personnel safety risks, increased infrastructure needs and potential operational impacts	Yes, but with additional costs associated with increased project infrastructure needs and potential delay			
	Transport to shore for disposal	Yes, but with increased personnel safety risks, increased infrastructure needs and potential operational impacts	Yes, but additional costs associated with transportation and storage.			
Drilling unit Lighting and Flaring	Standard lighting	Yes	Yes	The drilling unit lighting can attract migratory birds and result in strandings or harm from the flare. Opportunities may exist to reduce lighting and direct lighting to reduce effects without compromising worker safety.	There are no socio-economic effects associated with these options, assuming health and safety of workers is not compromised by reduced flaring.	✓
	Timing restrictions on flaring	No	Not applicable (not technically feasible).			
	Venting	Yes, but only	Yes			✓

Component	Alternative Means of Carrying Out the Project Considered	Technically Feasible?	Economically Feasible?	Biophysical Effects	Socio-economic Effects	Preferred Option(s)
		during non-routine encounters with hydrocarbons and not during well testing		Activities are of short-duration. Biophysical effects, if any, would be minor.		
	Incineration	No	Not applicable (not technically feasible)	Not applicable (not technically and economically feasible)	Not applicable (not technically and economically feasible)	
	Spectral modified lighting	No; not readily available for commercial use at this time	No; not considered commercially viable at this time.	Not applicable (not technically and economically feasible)	Not applicable (not technically and economically feasible)	

Source: Shell, Shelburne Basin Venture Exploration Drilling EIS

Appendix E Summary of Aboriginal Concerns

Groupr	Subject	Comment or Concern	Summary of Proponent's Response	Agency Response
St. Mary's First Nation	Fish and Fish Habitat	Effects on Atlantic salmon, Atlantic herring, gaspereau and sea urchin, which are important for food, social, and ceremonial fisheries. Effects on sea urchin harvesting. Also noted that Atlantic salmon species include the endangered Outer Bay of Fundy population (Committee on the Status of Endangered Wildlife in Canada).	The proponent provided information to demonstrate that project effects on Atlantic herring, Atlantic salmon and gaspereau would be temporary, reversible and limited to a maximum radius of 26 km (for potential behavioral effects from vertical seismic profiling noise) or less (marine discharges). To be conservative, the effects assessment focused more on resident species, but transient species such as gaspereau and Atlantic salmon, which could potentially be migrating through the LAA, could experience changes in habitat quality, albeit on a reduced scale. The proponent noted that sea urchin harvesting takes place primarily in the near-shore and coastal environment and therefore would not likely be affected by planned operations in the project area.	The Agency requested additional information from the proponent and incorporated it into its analysis. The Agency identified mitigation measures and related potential conditions to prevent significant adverse effects on fish and fish habitat and follow-up measures to verify the effectiveness of mitigation measures and accuracy of predicted effects. These are described in section 6.1.4 and in Appendix A. The Agency is satisfied with the proponent's response.
Maritimes Aboriginal Peoples Council	Fish and Fish Habitat	Concern about effects on corals and sponges, particularly the glass sponge *Vazella Pourtalesi*, also known as the Russian hat sponge.	The proponent's 2014 seabed survey near potential drilling locations found few individuals and no concentrations of corals or sponges, nor any individual corals or sponges that are of conservation concern. There are no known occurrences of the Russian Hat sponge near the project area. There are two known areas on the eastern Scotian Slope (Emerald Basin and Sambro Bank) where globally-unique concentrations of Russian hat sponges occur. These are approximately 180 km north of the project area, well outside the predicted zone of impact on the	The Agency requested additional information from the proponent and has recommended site-specific seabed surveys immediately prior to drilling to look for aggregations of corals, rare corals, or other important features. If such features are found, the drilling unit will be re-located to an alternate site to avoid affecting the feature, if technically feasible. If not technically feasible, the proponent will consult with the Board and Fisheries and Oceans Canada prior to commencing

Groupr	Subject	Comment or Concern	Summary of Proponent's Response	Agency Response
			sea bottom. The proponent has committed to carrying pre-drill video inspections of the sea bottom and to moving the drill site to avoid affecting sensitive features such as corals and sponges.	drilling to determine an appropriate course of action. The Agency is satisfied with this approach.
Nova Scotia Mi'kmq - Kwilmu'kw Maw-klusuaqn Negotiation Office	Fish and fish habitat	Importance of pockmarks, either as hazards to the project, or as potential refuge for benthic species	The proponent uses high-resolution bathymetry derived from 3D seismic data to identify pockmarks on the sea bed. Pockmarks are typically characterized by circular depressions that can be found in isolation or as pockmark clusters. The 3D seismic data is also used to extract seafloor amplitude; pockmarks with higher amplitudes at the seafloor are more likely to be active and contain benthic communities. Active pockmarks also typically show connection to deeper geophysical amplitudes via faults and seismic dim zones characteristic of shallow gas migration. If significant pockmark areas are identified, the proponent uses a system based on their seismic response and habitat to classify the pockmarks as either active or inactive. For exploration wells, avoidance of active pockmarks with likely benthic communities is the primary mitigation. Pockmarks already identified via current 3D seismic data interpretation will be avoided by proposed well locations. Drop camera imagery, using a remotely-operated vehicle, is also used at proposed well locations to verify seafloor interpretations, to either confirm pockmark indications or identify smaller features that may be below seismic resolution. Final site clearance is accomplished via remotely-operated vehicle video at the time of drilling the well to ensure no benthic communities of conservation interest or geohazards have been overlooked by	The Agency requested additional information from the proponent and has recommended site-specific seabed surveys immediately prior to drilling to look for aggregations of corals, rare corals, or other important features. If such features are found, the drilling unit will be re-located to an alternate site to avoid affecting the feature, if technically feasible. If not technically feasible, the proponent will consult with the Board and Fisheries and Oceans Canada prior to commencing drilling to determine an appropriate course of action. The Agency is satisfied with this approach.

Groupr	Subject	Comment or Concern	Summary of Proponent's Response	Agency Response
			previous analyses and available resolution data.	
St. Mary's First Nation	Monitoring and verification of impact predictions	Lack of concrete monitoring and follow-up programs	The proponent discussed follow-up in its EIS (section 13.2) and indicated that that follow-up and monitoring are generally implemented in situations where there is high uncertainty about environmental effects or the effectiveness of mitigation measures, where significant environmental effects are predicted, or in areas of particular sensitivity. These circumstances do not exist. Nonetheless, it proposed certain measures and made related commitments. The proponent's view is that the follow-up program described in its EIS is appropriate for the Project, given that the effects of exploration drilling activities and the effectiveness of mitigation measures are well understood. However, the proponent committed that in the event of an accidental event, specific monitoring programs would be developed through consultation with federal and provincial government agencies, Aboriginal groups, the public and other stakeholders.	The Agency requested additional information from the proponent including peer-reviewed literature on follow-up and monitoring requirements in other jurisdictions and incorporated it into its analysis. The Agency identified potential EA conditions based on specific follow-up measures described throughout Chapter 6 and in Appendix A of this report. The Agency is satisfied with the proponent's response.
St. Mary's First Nations	Monitoring	Request for information about audit and monitoring of offshore projects, including adaptive management and the roles of the Board and the Agency.	This comment was responded to by the federal government, which is responsible for the regulatory regime.	The Agency consulted with the Canada-Nova Scotia Offshore Petroleum Board (Board) and provided details of the Board's regulatory regime to St. Mary's First Nation. The Agency also clarified its own compliance and enforcement role for the Project. The Board is responsible for the regulation of petroleum activities in the Nova Scotia offshore area. The Board was established in 1990 and operates under the authority

Groupr	Subject	Comment or Concern	Summary of Proponent's Response	Agency Response
				of the Canada-Nova Scotia Offshore Petroleum Resources Accord Implementation Acts (parallel federal and provincial legislation). It is an independent joint agency of the Governments of Canada and Nova Scotia and reports to the federal Minister of Natural Resources and the Nova Scotia Minister of Energy. The Board's responsibilities include: health and safety of offshore workers, protection of the environment, management and conservation of offshore petroleum resources, compliance with the provisions of the Accord Acts that deal with Canada-Nova Scotia employment, industrial benefits issuance of licences for offshore exploration and development, and resource evaluation, data collection, curation and distribution. The Board regularly conducts environmental compliance audits and inspections at offshore work sites and Operator offices. The Board also has a monitoring program in place to evaluate operator compliance with environmental regulatory requirements while conducting authorized petroleum related work activities. Operators are required to submit reports detailing the status of their work programs on an ongoing basis, along with other documentation to demonstrate compliance with regulatory requirements. Operational status reports are provided on a daily basis for drilling and production activities, and on a weekly basis for other

Groupr	Subject	Comment or Concern	Summary of Proponent's Response	Agency Response
				activities. Reports filed with the Board are reviewed by staff to identify environmental compliance issues, and such issues are addressed accordingly. Board staff may investigate environmental incidents that occur at offshore worksites, depending upon their nature and severity. An investigation is normally conducted using conservation officer powers granted by the Accord Act legislation. The Board has an established compliance and enforcement policy to address situations of regulatory noncompliance and has Memoranda of Understanding in place with Fisheries and Oceans Canada and Environment Canada, both of whom provide advice to the Board in carrying out its mandate. The Canadian Environmental Assessment Agency is the responsible authority for the EA of the Project and, in accordance with section 53 of the *Canadian Environmental Assessment Act, 2012*, the Minister of the Environment will establish any conditions based on the outcome of the EA, such as implementation of mitigation and follow-up measures. These conditions are enforceable, if the Minister of the Environment ultimately issues a decision statement that would allow the Project to proceed. The Agency is considering having the Board verify that the Proponent is compliant with CEAA 2012, which includes a requirement to comply with the

Groupr	Subject	Comment or Concern	Summary of Proponent's Response	Agency Response
				conditions in the Decision Statement.
Fort Folly First Nation	Accidents and Malfunctions	How are fuels contained and controlled on the drilling unit?	Shell will manage all chemical substances, inclusive of fuels on board the drilling unit, in a way that does not create a hazard to safety or to the environment. A number of measures are in place for the containment and control of onboard fuels. Fuels are contained within naturally vented hull tanks and equipped with monitoring systems tied into an integrated alarm system that will sound should any variation in levels or unplanned outflow be detected. Tanks are filled to a maximum of 90 percent tank capacity and contained to mitigate any spillage. Any overflow from the fuel tanks on board is routed to a secondary overflow tank which is located within a bunded (secondary containment) area and fitted with a sensor to indicate whether any inflow is detected. Additionally, every fuel tank is fitted with a remote operated quick closing valve that can be activated should emergency closure be required. All on vessel fuel transfers are conducted using transfer pumps, which are connected into the integrated alarm system. The alarm will sound if any unusual pressure changes are detected during transfer activities. In addition to remote monitoring equipment, staff onboard the mobile offshore drilling unit also conduct routine maintenance checks (alarm system, valves, fittings, transfer pumps and hoses, etc) as well as visually monitoring any transfer activities to ensure that storage and transfer equipment is in good working order. All transfers and bunkering activities are tracked and recorded inclusive of details regarding the	The Agency requested details from the proponent. The additional information was taken into account in the Agency's analysis. The Agency determined that the measures to be implemented to contain and control all fuels used for the Project are appropriate.

Groupr	Subject	Comment or Concern	Summary of Proponent's Response	Agency Response
			location, start and stop time, quantity, to and from for the associated transfer operations. Helifuel is contained onboard the vessel within industry standard stainless steel tanks. These helifuel tanks are located on top of a bund to contain any spillage of fuel onboard. Prior to any onboard helicopter refueling, the appropriate couplings are engaged and emergency stops are function tested to ensure appropriate seals and protection is in place in advance of fueling activities. Compliance with legislation, regulation and guidance for the drilling unit will be conducted as part of the Certificate of Fitness requirement, whereby the rig contractor and a third party Certifying Authority will inspect and audit the vessel to verify compliance. The Certificate of Fitness is a key regulatory submission of the Board's Operations Authorization process. Fuels used by the drilling unit and helicopters will be assessed as part of the Certificate of Fitness.	
Fort Folly First Nation and Woodstock First Nation	Long-term monitoring of abandoned wells where hydrocarbons were encountered.	Leakage of hydrocarbons into the marine environment.	The proponent noted that hydrocarbons may not be encountered in all wells and that abandonment plans for all wells are required by the Board, in accordance with regulatory requirements. Plans must demonstrate that every well that is abandoned can be readily located and is left in a condition that provides for long-term integrity. The proponent will engage Aboriginal fisheries representatives when developing its abandonment plans. The proponent stated that no long-term monitoring is planned, or usually required for, abandoned exploration wells. Further discussion of well	The Agency requested details from the Board and is satisfied that the appropriate oversight is in place. The Agency has recommended a potential condition requiring the proponent to engage with Aboriginal groups if proposing to leave wellhead structures in placed at abandoned wells.

Groupr	Subject	Comment or Concern	Summary of Proponent's Response	Agency Response
			abandonment can be found in Chapter 2 and section 6.1 of this report.	
Fort Folly First Nation	Effects of drill waste discharge on benthic (fish) habitat.	Long-term dispersion of deposited drill waste.	The proponent indicated that after deposition, sediment may be remobilized by hydrodynamic forcing. However, substantial resuspension is unlikely due to the weak currents at depth. Currents velocities near the seabed are unlikely to resuspend the deposited cuttings.	The Agency requested additional information from the proponent and identified potential conditions based on measures to mitigate the effects of drill waste disposal and to verify effects predictions (see Section 6.1.3 and Appendix A).
Fort Folly First Nation	Effects of the Project on fish migration and fishing.	Will fish migration patterns change due to the Project activities? If so, will this affect where fishermen lay traps or install nets?	The proponent assessed the effects of noise on fish behaviour. Noise from the drilling unit may cause fish to temporarily avoid the area particularly during mobilization and commencement of drilling. However, this avoidance behaviour is expected to be localized and temporary as fish become habituated to the continuous sound levels from the drilling unit. This is not expected to affect commercial fisheries species (including their migration patterns) such that fishers would be adversely affected.	The Agency requested more information from the proponent and has identified potential conditions related to modeling and monitoring noise levels to verify EA predictions.
Maritimes Aboriginal Peoples Council	Migratory birds	Effects on migratory birds and associated reporting procedures for dead or stranded birds.	The proponent will work with Environment Canada to ensure that proper protocols, procedures and any required bird-handling permits are in place, as described in the section 6.5	The Agency requested additional information from the proponent and has identified potential conditions related to implementation of follow-up measures to verify the accuracy of predicted effects on migratory birds. These include monitoring of bird abundance and distribution and inspections on the drilling unit for dead or stranded birds.
St. Mary's First Nation	Aboriginal fishery (commercial and food, social or	Monitoring of effects on Aboriginal fisheries, including adaptive management.	The proponent indicated that its analysis of planned project activities did not reveal predicted significant effects on current use for traditional purposes. It is confident of this	The Agency requested additional information from the proponent and has recommended measures to mitigate potential effects on Aboriginal fisheries,

Groupr	Subject	Comment or Concern	Summary of Proponent's Response	Agency Response
	ceremonial)		conclusion based on experience with and monitoring results from past drilling projects. The proponent also noted the relatively short duration of exploration wells. Therefore, the proponent has stated that a follow-up program specific to Aboriginal fisheries is not warranted. The proponent committed, in the event of an accidental spill, to develop specific follow-up and monitoring programs, in consultation with applicable regulatory agencies, Aboriginal groups, the public and other stakeholders, as discussed in section 7.1.	including measures such as a Fisheries Communications Plan to ensure good coordination between project activities and fisheries and discussion of any effects that may be occurring. An Emergency Response Plan will be developed to ensure the proponent is prepared to respond appropriately to incidents, including monitoring of and compensation for effects on all fisheries.
Various groups	Effects on Aboriginal fisheries	Coordination between the Project and fishing activity.	The proponent will prepare a Fisheries Communications Plan and that notification during operations will use a combination of Notice to Mariners as well as individual emails notices sent to previously identified stakeholders. These notifications will be established as part of the Fisheries Communications Plan and will be disseminated weekly. The notifications will include specific details including the associated vessel and drilling unit contact information, drilling unit location and deployment routes as applicable, identifying picture or photograph and Shell personnel contact information prior, during and post operations. The proponent further said that the Fisheries Communications Plan has been developed to date with input provided by numerous members of the fishing industry and includes both Commercial and First Nations fisheries contacts. Active fisheries have numerous forums via the Fisheries Communications Plan to interact with	The Agency requested additional information from the proponent and is satisfied with the proponent's stated inter-industry coordination commitments and has recommended a potential condition requiring the development of a Fisheries Communications Plan.

Groupr	Subject	Comment or Concern	Summary of Proponent's Response	Agency Response
			both Shell and the operations crew with questions, concerns and information pertinent to their activities.	
Various groups	Effects on Aboriginal fisheries	500-m safety zone around the drilling unit may interfere with fishing vessel manoeuvrability in the area and would be off limits to fishing.	The proponent indicated that the safety zone would temporarily (approximately 130 days) occupy a very small portion of the available fishing area and its location will be advertised in a Notice to Mariners. As well, fisheries contacts will be notified as per the Fisheries Communications Plan.	The Agency requested additional information from the proponent and has identified potential conditions to aid inter-industry coordination, including developing a Fisheries Communications Plan.
St. Mary's First Nation	Effects on Aboriginal fisheries	Compensation in the event of effects on fishing operations from normal project activities.	The proponent has stated that it takes concerns regarding its operations very seriously and would respond to reports that its operations have impacted a potential or established Aboriginal Right, or a commercial fishing operation. Specific issues or concerns of impacts raised will be followed up on and responded to in a timely manner. Should an impact be reported, the proponent would contact the reporting party to discuss the situation. The specific response to, and measures taken to address the identified impact would depend upon the situation. For example, if the report concerns damaged fishing gear, the proponent would discuss the specific circumstances with the party whose gear was damaged. Depending on the circumstances, specific measures taken in response could include providing appropriate compensation, revising its communications plan, and potentially modifying aspects of its operations. If the concern is related loss of access to a preferred area for exercising potential or established Aboriginal rights, depending on the	The Agency requested additional information from the proponent and the Board regarding compensation. The Agency is satisfied that an appropriate and established compensation regime is in place and took this into account in its analysis.

Groupr	Subject	Comment or Concern	Summary of Proponent's Response	Agency Response
			circumstances, the specific measures taken in response could include re-considering the routing of its operations or modifying the timing of its operations in order to try to avoid the areas or times when activities would occur. In any event, the proponent would respond by seeking to take steps and implement measures to prevent such damage, interference or impacts from reoccurring. In addition, the *Compensation Guidelines Respecting Damages Relating to Offshore Petroleum Activity* (CNSOPB and CNLOPB, 2002) provide for compensation for damage that may occur either as a consequence of a spill or as a result of debris left on the ocean floor. Further details about the compensation guidelines are provided in the response to the concern about compensation in relation to accidents and malfunctions (in this table, below)	
Nova Scotia Mi'kmaq (KMKNO)	Accidents and malfunctions	Capping stack (to be used in the event of a blowout) should be located in Halifax.	The proponent indicated that there is a large amount of infrastructure required to support the capping stack, including highly-specialized vessels that are typically found only in areas where capping stacks are now located (areas with high levels of offshore oil and gas activity). The proponent stated that time and the cost that would be required to establish such a facility in Nova Scotia render it technically and economically unfeasible for the Shelburne Project. The proponent evaluated available capping stack locations and determined that a capping stack located in Norway is the most appropriate for this project, based on least deployment time. Back-up stacks have also been identified. In the event of a blowout, the	The Agency requested additional justification and rationale from the proponent concerning its planned capping stack location and deployment plans. The Agency assessed the new information along with the proponent's stated commitments and is satisfied that the proponent's plans are appropriate and reasonable.

Groupr	Subject	Comment or Concern	Summary of Proponent's Response	Agency Response
			proponent committed to immediate mobilization of the primary and back-up capping stacks to the site, while other response measures are under way.	
St. Mary's First Nation	Accidents and malfunctions	Effects of spills on Atlantic salmon, Atlantic herring and gaspereau.	The proponent recognized that, in the event of an offshore spill, Atlantic herring, which spawn in offshore locations, could have various life stages present in the affected area. With respect to gaspereau, interaction would be limited to adult fish migrating through the affected area. Interaction with juvenile gaspereau would only be possible in the event of spilled material reaching the nearshore. A 10 barrel or 100 barrel spill of diesel fuel from the drilling unit is not expected to result in biological effects on fish over a large area since 80 percent of the spill will be evaporated within 2 to 3 days, with approximately 2 square km and 20 square km, respectively. A nearshore spill of diesel from an offshore support vessel is more likely to affect breeding or feeding areas of anadromous species, such as Atlantic salmon, although these effects would be temporary and would not be predicted to affect local populations. In the unlikely event of a blowout, effects on Atlantic salmon would be larger and the potential for interaction would be greater than for a diesel spill. Adult fish would be expected to avoid exposure. Effects on food, social or ceremonial (food, social, and ceremonial) species are predicted to be not significant. However, in recognition of	The Agency requested additional information from the proponent about the effects of accidents and malfunctions, particularly spills. The Agency has identified mitigation measures and related potential conditions to prevent significant environmental effects from accidents and malfunctions, including spills. An Emergency Response Plan will be developed to ensure that the proponent is prepared to respond appropriately to incidents, including monitoring of effects on fish and monitoring of and compensation for effects on fisheries.

Groupr	Subject	Comment or Concern	Summary of Proponent's Response	Agency Response
			potential economic and/or cultural effects that could result from damage to fishing gear and/or loss or reduced access to fishing areas, effects on Aboriginal fisheries (including food, social, and ceremonial fisheries) are predicted to be significant for a 100-barrel batch diesel spill, a vessel spill, and well blowout. Spill prevention and response measures would reduce the likelihood and severity of environmental effects from accidental events. Shell's Fisheries Communications Plan would facilitate communication with Aboriginal organizations and fishers to understand potential economic and cultural effects associated with a spill and disruption in food, social, and ceremonial harvest and appropriate response measures.	
St. Mary's First Nation	Accidents and malfunctions	Potential for sea ice to occur at the drilling area and how that could affect oil spill behaviour and response.	The proponent indicated that sea ice and icebergs are very rare in offshore Nova Scotia. However, there is limited potential for oil and ice interaction in certain locations. At 40 to 60 percent ice coverage, modelling results predict a very slight modification to surface oil trajectory, as oil would move with the sea ice and wind. The evaporation and emulsification of oil at the surface would be reduced due to shielding from wind and waves. The presence of ice would reduce wave energy and therefore also reduce entrainment of surface oil into the water column. The spreading of surface oil would also be slowed and reduced due to cold temperatures and herding effects from ice. The end result would be a smaller area of thicker, fresher oil remaining at the surface for a longer period of time, with a lower portion of the oil found in the water column or atmosphere, when compared to an ice free case. No major challenges to incident	The Agency requested additional information from the proponent and assessed the information received. The Agency is satisfied with the proponent's response.

Groupr	Subject	Comment or Concern	Summary of Proponent's Response	Agency Response
			response measures are anticipated should there be any interaction between oil and the presence of sea ice.	
St. Mary's First Nation, Maritimes Aboriginal Peoples Council	Accidents and malfunctions	Requested an opportunity to review various emergency response planning documents during their development.	The proponent is required to provide these documents to the offshore regulator (the Board) to support its application for an offshore drilling authorization. It is prepared to provide information to First Nations about its plans and has proposed meetings in late 2014 and early 2015 to discuss the Oil Spill Response Plan, the Net Environmental Benefit Analysis, Environmental Protection Plan and associated documentation. The proponent committed that, following finalization and approval of the Oil Spill Response Plan by the Board, it will provide a final version to Aboriginal groups. The proponent will conduct an emergency response planning exercise prior to commencing drilling to demonstrate its capabilities to implement its Emergency Response Plan and to effectively respond to a spill. The exercise, planned for the week of April 20, 2015, will include members from government agencies who would be directly involved in responding to an incident, as well as stakeholders (the Board's Fisheries Advisory Committee members, Nova Scotia Aquaculture, Mi'kmaq fisheries representatives) who have expressed an interest in understanding how emergency and spill response works in practice. Saint Mary's First Nation's commercial fisheries representative for Nova Scotia has been invited and is scheduled to attend the exercise.	The Agency requested additional information from the proponent and also organized a meeting between the proponent and St. Mary's First Nation to discuss the issue raised. The Agency is satisfied with the proponent's response and associated commitments and considered those in its analysis, including identifying a potential condition requiring the proponent to consult with Aboriginal groups during the development of the Oil Spill Response Plan, the Well Containment Plan and Net Environmental Benefit Analysis and provide the approved versions to Aboriginal groups before the start of drilling.
St. Mary's First Nation	Accidents and malfunctions	Effects (consequences) of spills and how they might be mitigated by response and recovery measures.	The proponent's EIS includes an assessment of the potential environmental effects (i.e. environmental consequences) resulting from the	The Agency requested additional information from the proponent in relation to the issue raised.

Groupr	Subject	Comment or Concern	Summary of Proponent's Response	Agency Response
		Effects on Georges Bank.	modelled accident scenarios. Trajectory modelling conducted for the EIS has considered an unmitigated 30 day spill scenario, providing a highly conservative basis for identifying and assessing potential environmental effects. As a result of this conservative basis, it is anticipated that the associated effects assessment is a comprehensive consideration of the temporal and spatial effects that may occur in the unlikely event of well blowout. Mitigated scenarios inclusive of consideration given to response measure are anticipated to result in reduced environmental effects and thus would not allow for as conservative a basis to estimate potential effects. As part of the Oil Spill Response Plan being compiled for the Project, a Net Environmental Benefit Analysis and associated trajectory modelling is currently being conducted. The final a Net Environmental Benefit Analysis report will include evaluation of potential spatial and temporal environmental effects resulting from both unmitigated and mitigated spill scenarios. The Net Environmental Benefit Analysis will be used to assist in identifying the most appropriate mitigation and response methods and will be used to inform the Oil Spill Response Plan. The EIS also considers potential environmental effects to special areas, inclusive of Georges Bank, and commercial fisheries from an unmitigated 30-day blowout respectively. The proponent predicted that the probability of surface oiling from an unmitigated 30-day continuous blowout reaching Georges Bank is between 1 and 10 percent.	The Agency identified potential conditions for accidents and malfunctions, including: • requiring the development of an Emergency Response Plan to ensure the proponent is prepared to respond appropriately to incidents, • preparing a Net Environmental Benefit Analysis to understand the potential risks and consequences of using dispersants, and • ensuring that First Nations are involved in emergency planning. The Agency is satisfied with the proponent's response.

Groupr	Subject	Comment or Concern	Summary of Proponent's Response	Agency Response
St. Mary's First Nation	Accidents and malfunctions	Effects of dispersants as a spill response measure.	The proponent states that in general, the toxicity of modern dispersants (those maintained within the Global Response Network) is much less than the toxicity of the crude oil itself. Many studies have concluded that toxicity effects of dispersed oil likely arise from the oil components as opposed to the dispersant itself (i.e. oil composition, as opposed to a specific dispersant, is likely to drive the toxicity of the mixture) (NRC 1989, 2005). Environment Canada has extensively evaluated dispersants and chemical cleaners (Fingas et al, 1995) using standard tests with rainbow trout to assess the toxicity of more than 60 products. Common household detergents were included for comparative purposes and for perspective on dispersant toxicity. The proponent stated that the results of Environment Canada's evaluations show that today's dispersants are an order of magnitude less toxic to rainbow trout than common household detergents. The United States Environmental Protection Agency evaluated the eight commercially available dispersants and found that the dispersants tested had different levels of toxicity, but Corexit® EC9500A, was among the least toxic. Ultimately, the crude oil by itself was found to be more toxic to the test species than the dispersants alone; the dispersants alone were less toxic than the dispersant-oil mixture; and the oil alone displayed toxicity results similar to the dispersant-oil mixtures (EPA ORD, 2010). By United States Environmental Protection Agency definition dispersant alone is either	The Agency understands that there is considerable concern about dispersants as a spill response tool and therefore requested substantial additional information and supporting rationale for their use in spill response. The Agency also consulted extensively with the Board and is satisfied that appropriate safeguards are in place to ensure that dispersants use would only be approved when it can be clearly shown that it would be the best alternative in the circumstances. The Agency also identified a potential condition requiring the proponent to consult with Aboriginal groups during the development of the Oil Spill Response Plan, the Well Containment Plan and Net Environmental Benefit Analysis and provide the approved versions to Aboriginal groups before the start of drilling.

Groupr	Subject	Comment or Concern	Summary of Proponent's Response	Agency Response
			"Practically Non-toxic" or "Slightly Toxic" to standard test organisms. Studies have shown that under open water conditions, both physically and chemically dispersed oils dilute rapidly as a result of wave and current action and water mixing (Cormack and Nichols, 1977; McAuliffe et al, 1980 and 1981; Lichtentaler and Daling, 1983; Lunel, 1994; Lewis et al, 1995; Brandvik et al. 1996; Strom-Kristiansen et al. 1997). This results in oil concentrations quickly reducing over time. Small-scale field tests have indicated that dispersants also rapidly dilute even in the absence of oil. Oil dispersed subsea is also subject to fast dilution since a much larger water column is available compared to a surface application of dispersants that facilitates mixing of the oil only in the top 10 to 20 m of the water column. Studies conducted with the environmentally realistic concentrations and proper chemical characterization of the water accommodated fraction show that toxicity is driven by the oil components and dispersants addition does not increase the toxicity of dispersed oil and does not cause synergistic toxicity effects (Gardner, 2013; Adams et al, 2014; Coelho et al, 2013; Bejarano et al, 2014; and Prince and Parkerton, 2014) Available data indicate that exposure of the marine environment to dispersed oil will be limited in space and time most likely affecting only a small portion of the larval and planktonic organisms in the Shelburne Basin. While some short-term toxicity to certain species present in	

Groupr	Subject	Comment or Concern	Summary of Proponent's Response	Agency Response
			the dispersed oil cloud will occur, it is important that the resultant impacts are evaluated within the context of the overall impacts of dispersed and undispersed oil on all potentially affected ecosystems (net environmental benefit analysis approach). This approach not only considers the toxicity of dispersed and surface oil to various organisms, duration and concentration of exposure, but also the density of such organisms in the area, their role in the ecosystem, and their ability to recover from the impact. For example, offshore and especially deepwater habitats have much smaller primary productivity than nearshore areas and tend to recover from the spill impact much quicker than shoreline (AURIS !994). Studies have consistently shown that the highest impacts on the ecosystem take place when oil reaches nearshore areas or comes into contact with a significant number of birds. Hence every effort is made to remove oil from the water surface as quickly as possible and treat it offshore, away from the sensitive areas and locations with dense populations of birds and marine mammals as well as the public. Preventing oil from reaching nearshore areas and shorelines by transferring it from the water surface to the water column in the form of small droplets facilitates faster natural biodegradation in the part of the ecosystem with higher resilience and smaller primary productivity. The proponent stated that the Net Environmental Benefit Analysis document that will be submitted in support of the Project emergency planning will discuss this topic in greater detail.	

Groupr	Subject	Comment or Concern	Summary of Proponent's Response	Agency Response
Various groups	Accidents and malfunctions	Compensation in the event of a spill	The proponent's primary aim is for its operations to take place safely and without incident. In support of this the proponent puts in place measures to prevent incidents from occurring. In the event of an accident, existing mechanisms (regulatory regime and corporate policy) are in place to address compensation. Specific compensation measures will depend on the nature and magnitude of the incident, the associated effects and the specific claims received. The following is a general overview of the existing regime and mechanisms in place to address compensation for damages in the unlikely event of an incident. Existing legislation (i.e. the *Fisheries Act* and the *Canada-Nova Scotia Offshore Petroleum Resources Accord Implementation Act* (Accord Act)) and the *Compensation Guidelines Respecting Damages Relating to Offshore Petroleum Activity* (C-NLOPB and CNSOPB 2002) (CNSOPB Compensation Guidelines) allow fishers and other affected parties to recover "actual loss or damage" resulting from a spill. Actual loss or damage includes loss of current and future income including, with respect to Aboriginal people, loss of hunting, fishing and gathering opportunities. The Compensation Guidelines describe compensation sources available as well as the role of companies and the Board in considering and providing compensation. The Guidelines also describe the claims process. Under existing legislation, a committee consisting of members of government agencies, the petroleum industry, and the fishing industry may be established to monitor the payment of claims.	The Agency requested additional information from the proponent concerning compensation and also consulted with the Board and to confirm that the *Compensation Guidelines Respecting Damages Relating to Offshore Petroleum Activity* provide for fishers and other affected parties to recover loss or damage resulting from a spill. The Agency identified potential conditions for accidents and malfunctions, including: • requiring the development of an Emergency Response Plan to ensure the proponent is prepared to respond appropriately to incidents, • preparing a Net Environmental Benefit Analysis to understand the potential risks and consequences of using dispersants, and • ensuring that First Nations are involved in emergency planning The Agency is satisfied with the proponent's response.

Groupr	Subject	Comment or Concern	Summary of Proponent's Response	Agency Response
			The Proponent also has internal policies and systems to address compensation claims in the event of an incident. It conducts regular engagement with First Nations and other fishers that may be affected by its projects and activities. Proponent representatives are available to discuss issues regarding any damages that may arise during operations. In the event of an incident, the proponent's Emergency Response Plan would be engaged. The Proponent uses the Incident Command Structure consisting of a designated and trained response team. As part of this team, personnel responsible for handling claims can be put in place to communicate the claims process to the public, gather information regarding claims, and manage the claims process. A 1–800 phone number can also be activated to assist the public in contacting the proponent to make a claim. The claims process is part of the proponent's standard Incident Command Structure protocol, and personnel are trained to initiate and establish the claims system. Claims-related training, including associated mock exercises, is planned for the Project in 2015. Under the *Canada-Nova Scotia Offshore Petroleum Resources Accord Implementation Act* (Accord Act), the proponent will be required to provide a security deposit to the Board to demonstrate that sufficient funds are available to address liabilities in the event of a major incident (i.e. blowout). The Board can require that incident-related claims be paid out of this security deposit. The amount of the security deposit required for the Project will be determined by the Board.	

Groupr	Subject	Comment or Concern	Summary of Proponent's Response	Agency Response
			The overall purpose of the claims process is to facilitate full, fair and timely compensation for actual losses attributable to the operations, leaving claimants in no worse or better a position than before the damage occurred. In the event of a spill, the Proponent will seek to ensure that appropriate compensation is provided for legitimate claims for damages attributable to its work or activities. The Accord Act and its regulations have specific provisions to address liabilities, liability limits and security deposits in respect of offshore petroleum activities. These are set out in sections 165–169 of the Act and in the *Oil and Gas Spills and Debris Liability Regulations*. Proposed changes to the Accord Act (Bill C-22) have been proposed that will result in changes to the existing standards. It is not certain at this time when these changes will come into effect. Among other proposed changes the new standards would substantially increase the limit on liability and the amount that may be required for the security deposit.	

Appendix F Species Found in the Regional Assessment Area and their Status

Fish Species and their Status (identifies whether there is commercial, recreational, or Aboriginal value)

Common Name	Scientific Name	*Species at Risk Act* (SARA)	Committee om the Status of Endangered Wildlife in Canada (COSEWIC)	Commercial, Recreational, or Aboriginal Value
Groundfish Species				
Acadian redfish	*Sebastes fasciatus*	Not Listed	Threatened	x
American plaice	*Hippoglossoides platessoides*	Not Listed	Threatened	x
Atlantic cod (Laurentian South population)	*Gadus morhua*	Not Listed	Endangered	x
Atlantic cod (Southern population)	*Gadus morhua*	Not Listed	Endangered	x
Atlantic halibut	*Hippoglossus hippoglossus*			x
Atlantic (striped) wolfish	*Anarhichas lupus*	Special Concern	Special Concern	
Cusk	*Brosme brosme*	Not Listed	Endangered	x
Deepwater redfish	*Sebastes mentalla*	Not Listed	Threatened	x
Haddock	*Melanogrammus aeglefinus*			x
Hagfish	*Myxine glutinosa*			x
Monkfish	*Lophius americanus*			x
Northern wolffish	*Anarhichas denticulatus*	Threatened	Threatened	
Pollock	*Pollachius virens*			x
Red hake	*Urophycis chuss*			x
Roughhead grenadier	*Macrourus berglax*	Not Listed	Special Concern	
Roundnose grenadier	*Coryphaenoides rupestris*	Not Listed	Endangered	
Sandlance	*Ammodytes dubius*			x
Silver hake	*Merluccius bilinearis*			x
Smooth skate (Laurentian-Scotian population)	*Malacoraja senta*	Not Listed	Special Concern	
Spiny dogfish (Atlantic population)	*Squalus acanthias*	Not Listed	Special Concern	
Spotted wolffish	*Anarhichas minor*	Threatened	Threatened	
Thorny skate	*Amblyraja radiate*	Not Listed	Special Concern	
Turbot – Greenland flounder	*Reinhardtius hippoglossoides*			x
White hake	*Urophycis tenuis*			x
Witch flounder	*Glyptocephalus cynoglossus*			x
Yellowtail founder	*Limanda ferruginea*			x
Pelagic Species				
Albacore tuna	*Thunnys alalunga*			x
American eel	*Anguilla rostrata*	Not Listed	Threatened	
Atlantic bluefin tuna	*Thunnus thynnus*	Not Listed	Endangered	
Atlantic herring	*Clupea harengus*			x
Atlantic mackerel	*Scomber scombrus*			x
Atlantic salmon (Inner Bay of Fundy population)	*Salmo salar*	Endangered	Endangered	
Atlantic salmon (Outer Bay of Fundy population)	*Salmo salar*	Not Listed	Endangered	
Atlantic salmon	*Salmo salar*	Not Listed	Endangered	

Common Name	Scientific Name	*Species at Risk Act* (SARA)	Committee om the Status of Endangered Wildlife in Canada (COSEWIC)	Commercial, Recreational, or Aboriginal Value
(Eastern Cape Breton population)				
Atlantic salmon (Nova Scotia Southern Upland population)	*Salmo salar*	Not Listed	Endangered	
Atlantic sturgeon (Maritimes Populations)	*Ancipenser oxyrinchus*	Not Listed	Threatened	
Basking shark (Atlantic population)	*Cetorhinus maximus*	Not Listed	Special Concern	
Bigeye tuna	*Thunnus obesis*			x
Black dogfish	*Centroscyllium fabricii*			x
Bluefin tuna	*Thunnus thynnus*			x
Blue shark	*Prionace glauce*	Not Listed	Special Concern (Atlantic)	x
Capelin	*Mallotus villosus*			x
Porbeagle shark	*Lamna nasus*	Not Listed	Endangered	x
Shortfin mako shark	*Leurus oxyringus*	Not Listed	Threatened	x
Striped bass (Southern Gulf of St. Lawrence population)	*Morone saxatilis*	Not Listed	Special Concern	
Striped bass (Bay of Fundy population)		Not Listed	Endangered	
Swordfish	*Xiphias gladuis*			x
White marlin	*Tetrapturus albidus*			x
White shark	*Carcharodon Carcharias*	Endangered	Endangered	
Yellowfin tuna	*Thunnus albacores*			x
Invertebrates				
American lobster	*Homarus americanus*			x
Jonah crab	*Cancer borealis*			x
Atlantic sea scallop	*Placopecten magellanicus*			x
Iceland sea scallop	*Chlamys islandica*			x
Northern shrimp	*Panadalus borealis*			x
Sea cucumber	*Class holothuroidea*			x
Shortfin squid	*Illex illecebrosus*			x
Snow crab	*Chionoecetes opilio*			x
Striped shrimp	*Panadalus montagui*			x
Stimpson's surf clam	*Mactromeris polynyma*			x

Marine Mammals and Sea Turtles and their Status

Common Name	Scientific Name	SARA	COSEWIC
Mysticetes (Toothless or Baleen Whales)			
Blue whale (Atlantic population)	*Balaenoptera musculus*	Schedule 1, Endangered	Endangered
Fin whale (Atlantic population)	*Balaenoptera physalus*	Schedule 1, Special Concern	Special Concern
Humpback whale (Western North Atlantic population)	*Megaptera novaeangliae*	Schedule 3, Special Concern	Not at Risk
Minke whale	*Balaenoptera acutorostrata*		
North Atlantic right whale	*Eubalaena glacialis*	Schedule 1, Endangered	Endangered
Sei whale	*Balaenoptera borealis*		
Odontocetes (Toothed Whales)			
Atlantic white-sided dolphin	*Lagenorhynchus acutus*		
Harbour porpoise (Northwest Atlantic population)	*Phocoena phocoena*	Schedule 2, Threatened	Special Concern
Killer whale (Northwest Atlantic/Eastern Arctic population)	*Orcinus orca*	Not Listed	Special Concern
Long-finned pilot whale	*Globicephala melas*		
Northern bottlenose whale (Scotian Shelf Population)	*Hyperoodon ampullatus*	Schedule 1, Endangered	Endangered
Sowerby's beaked whale	*Mesoplodon bidens*	Schedule 1, Special Concern	Special Concern
Short-beaked common dolphin	*Delphinus delphis*		
Sperm whale	*Physeter macrocephalus*		
Striped dolphin	*Stenella coeruleoalba*		
White-beaked dolphin	*Lagenorhynchis albiorostris*		
Sea Turtles			
Leatherback sea turtle	*Dermochelys coriacea*	Schedule 1, Endangered	Endangered
Loggerhead sea turtle	*Caretta caretta*	Not Listed	Endangered
Kemp's ridley turtle	*Lepidochelys kempii*		
Green sea turtle	*Chelonia mydas*		

Marine Birds and their Status

Common Name	Species Name	SARA	COSEWIC
Pelagic Seabirds			
Atlantic Puffin	*Fratercula arctica*		
Black-legged Kittiwake	*Rissa tridactyla*		
Common Murre	*Uria aalge*		
Cory's Shearwater	*Calonectris diomedea borealis*		
Dovekie	*Alle alle*		
Great Shearwater	*Puffinus gravis*		
Great Skua	*Stercorarius skua*		
Leach's Storm-Petrel	*Oceanodroma leucorhoa*		
Long-tailed Jaeger	*Stercorarius longicaudus*		
Manx Shearwater	*Puffinus puffinus*		
Northern Fulmar	*Fulmarus glacialis*		
Northern Gannet	*Morus bassanus*		
Parasitic Jaeger	*Stercorarius parasiticus*		
Pomarine Jaeger	*Stercorarius pomarinus*		
Razorbill	*Alca torda*		
Sooty Shearwater	*Puffinus griseus*		
South Polar Skua	*Stercorarius maccormicki*		
Thick-Billed Murre	*Uria lomvia*		
Wilson's Storm-Petrel	*Oceanites oceanicus*		
Neritic Seabirds			
Arctic Tern	*Sterna paradisaea*		
Black Guillemot	*Cepphus grille*		
Black-headed Gull	*Larus ridibundus*		
Bonaparte's Gull	*Larus philadelphia*		
Common Tern	*Sterna hirundo*		
Double-Crested Cormorant	*Phalacrocorax auritus*		
Glaucous Gull	*Larus hyperboreus*		
Great Black-backed Gull	*Larus marinus*		
Great Cormorant	*Phalacrocorax carbo*		
Herring Gull	*Larus argentatus*		
Iceland Gull	*Larus glaucoides*		
Ivory Gull	*Pagophila eburnea*	Schedule 1, Endangered	Endangered
Ring-billed Gull	*Larus delawarensis*		
Roseate Tern	*Sterna dougallii*	Schedule 1, Endangered	Endangered
Waterfowl			
American Black Duck	*Anas rubripes*		
American Green-winged Teal	Anas crecca		
Barrows Goldeneye	*Bucephala islandica*	Schedule 1, Special Concern	Special Concern
Black Scoter	Melanitta nigra		
Bufflehead	*Bucephala albeola*		
Canada Goose	*Branta Canadensis*		
Common Eider	*Somateria mollissima*		
Common Goldeneye	*Bucephala clangula*		

Common Name	Species Name	SARA	COSEWIC
Common Loon	*Gavia immer*		
Greater Scaup	*Aythya marila*		
Harlequin Duck	*Histrionicus histrionicus*	Schedule 1, Special Concern	Special Concern
Lesser Scaup	Aythya affinis		
Long-tailed Duck	*Clangula hyemalis*		
Mallard	Anas platyrhynchos		
Red-breasted Merganser	*Mergus serrator*		
Red-throated Loon	*Gavia stellata*		
Surf Scoter	Melanitta perspicillata		
White-winged Scoter	Melanitta fusca		
Shorebirds			
American Golden-Plover	*Pluvialis dominica*		
Black-bellied Plover	*Pluvialis squatarola*		
Dunlin	*Calidris alpina*		
Greater Yellowlegs	*Tringa melanoleuca*		
Killdeer	*Charadrius vociferus*		
Least Sandpiper	*Calidris minutilla*		
Lesser Yellowlegs	*Tringa flavipes*		
Pectoral Sandpiper	*Calidris melanotos*		
Piping Plover (melodus subspecies)	*Charadrius melodus melodus*	Schedule 1, Endangered	Endangered
Purple Sandpiper	*Calidris maritima*		
Red Knot rufa ssp	*Calidris canutus rufa*	Schedule 1 - Endangered	Endangered
Red Phalarope	*Phalaropus fulicaria*		
Red-necked Phalarope	*Phalaropus lobatus*		
Ruddy Turnstone	*Arenaria interpres*		
Sanderling	*Calidris alba*		
Semipalmated Plover	*Charadrius semipalmatus*		
Semipalmated Sandpiper	*Calidris pusilla*		
Short-billed Dowitcher	*Limnodromus griseus*		
Spotted Sandpiper	*Actitis macularius*		
Whimbrel	*Numenius phaeopus*		
White-rumped Sandpiper	*Calidris fuscicollis*		
Willet	*Tringa semipalmata*		

Land Birds of Conservation Concern and their Status

Common Name	Scientific Name	SARA	COSEWIC
Canada Warbler	*Wilsonia canadensis*	Schedule 1, Threatened	Threatened
Chimney Swift	*Chaetura pelagica*	Schedule 1, Threatened	Threatened
Common Nighthawk	*Chordeiles minor*	Schedule 1,Threatened	Threatened
Eastern Whip-Poor-Will	*Caprimulgus vociferus*	Schedule 1, Threatened	Threatened
Eastern Wood-Pewee	*Contopus virens*	Not listed	Special Concern
Olive-sided Flycatcher	*Contopus cooperi*	Schedule 1, Threatened	Threatened
Peregrine Falcon anatum ssp	*Falco peregrinus anatum*	Schedule 1, Special Concern	Special Concern
Rusty Blackbird	*Euphagus carolinus*	Schedule 1, Special Concern	Special Concern
Savannah Sparrow princeps ssp	*Passerculus sandwichensis princeps*	Schedule 1, Special Concern	Special Concern
Short-eared Owl	*Asio flammeus*	Schedule 1, Special Concern	Special Concern
Wood Thrush	*Hylocichla mustelina*	Not listed	Threatened